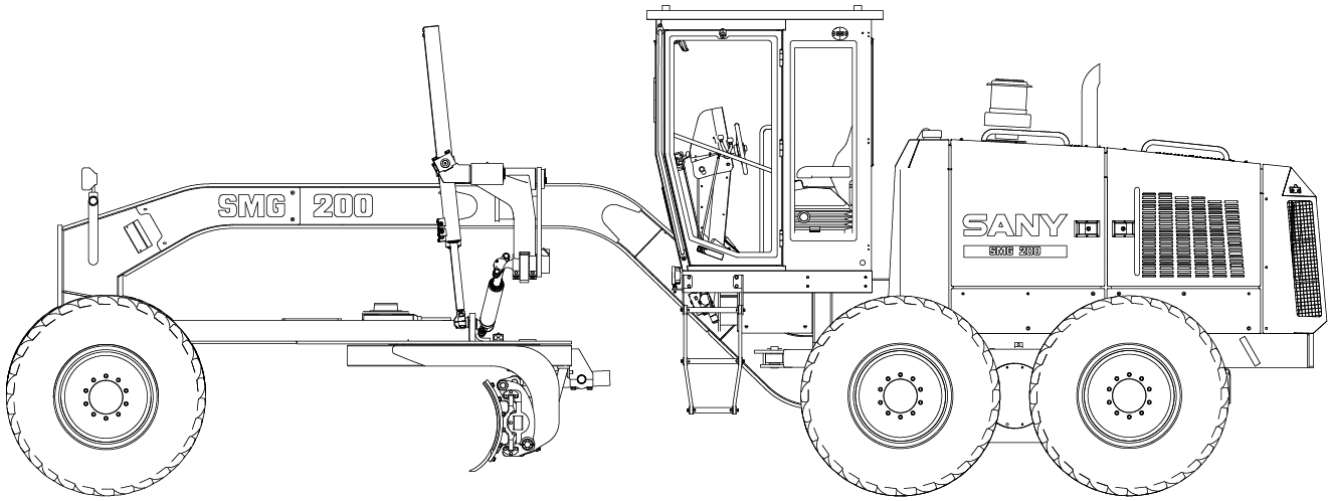
SANY

Quality Changes the World

Motor Grader

SMG200



Safety, Operation & Maintenance Manual

SANY

SMG200 Motor Grader

Safety, Operation & Maintenance Manual

WARNING

Read and follow the safety precautions and instructions in this manual and on the machine decals. Failure to do so can cause serious injury, death or property damage. Keep this manual with the machine for reading and future reference.

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Delineation of responsibility

Specific declaration

A grader is an enginnering vehicle with a blade used to finish soil and creat a flat surface. Graders are commonly used in the construction and maintenance of gravel road and subgrade. Graders are also used to strip topsoil or greensward, produce ditches, finish side slope. Graders can mix up, backfill, bulldoze and pave materials. If equipped with a front dozer blade, it can pave, stack and backfill loose materials. If equipped with a rear scarifier, it can loose hard and dense soil. Any other use or any operation beyond the specified working range is not authorized use. SANY expressly bears no liability for any consequence due to any unauthorized use.

Information in this manual is used to guide qualified operators to operate and maintain graders correctly. SANY expressly bears no liability for any consequence due to any use not observing the information in this manual.

It is forbidden to convert the grader without authorization.Sany expressly bears no liability for any consequence. When crack or electrical malfunction on the grader occurs, please contact the supplier, and don’t conduct welding or make changes without permission, or else, for any consequence due to such contravention, SANY shall not bear any liability.

Use genuine spare parts from SANY. SANY expressly bears no liability for any machine damage or accident due to the use of untested or unauthorized spare parts or tools.

Operate and maintain parts (such as engine, a/c) on the grader, and observe related regulations on User's guide supplied from their manufacturer.

SANY expressly bears no liability for any machine failure or damage due to force majeure of natural disasters (earthquake, typhoon) and wars.

SANY cannot predict every circumstance that might involve a potential hazard in operation or maintenance. Operators and owners should highly attach importance to safety. Local specific safety rules of the countries may be stricter. If they differ from the regulations in this manual, observe the stricter one.

Duty of SANY

- Be responsible for providing qualified products and correct documents.
- Fulfill their promises on after-sales service, and document all maintenance and repair working done by after-sales service personnel.
- Train the operation and maintenance personnel based on their needs.

Duty of owners or other authorized personnel

• Only after each person involved in the product's operation, maintenance and repair is trained and fully understands the Parts Book and Operation and Maintenance Manual, can they operate and maintain the grader.

- Ensure the operation and maintenance personnel are qualified and know their related responsibilities.
- Periodically check related personnel's safety consciousness during working.
- If any fault which will lead to unsafety occurs, stop the grader immediately.
- SANY service personnel have the right to check the grader for safety if necessary.
- Besides check items regulated by SANY, observe local laws and regulations to check the grader.
- Ensure timely maintenance and repair on the grader.
- Carefully plan the use of the grader.

Duty of all working personnel

- If there is any abnormal symptom which may cause abnormal working of the grader or potential hazard, report to your leader. If possible, correct fault in time.
- All personnel working around the grader must observe all warning signals and take care of their own and others' safety.
- All personnel should know their working tasks and procedures.
- Watch something like high voltage wire, unrelated personnel and poor ground for potential danger, and report to the operators and signalmen.

Duty of managers

- Ensure the operators are trained and fully understand the Operation and Maintenance Manual supplied by SANY. Ensure they are in physical fitness and have the certification of operation. Otherwise, it is forbidden to operate the grader.
- Ensure the operators have good judgement ability, teamwork consciousness and psychological quality. Otherwise, it is forbidden to operate or repair the grader.
- Ensure the signalmen have good vision and acoustic judgement, master standard command signals. At the same time, they should have enough experience in recognizing danger factors correctly, and inform the operators of danger factors to avoid them in time.
- Ensure assistant workers can identify the model and working condition to choose a proper grader.
- Make each working person take their related responsibilities, and require them to report unsafe factors to their leader in time.

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SANY

Introduction

1 Introduction

⚠ WARNING

Read and understand all safety precautions and instructions in this manual before reading any other manuals provided with this machine and before operating or servicing the machine. Failure to do this can cause property damage, personal injury or death.

1 INTRODUCTION

1.1 Overview

- Sany-built equipment offers high-quality performance and excellent after-sales service support.
- Sany-built equipment is widely used throughout the industry for various types of applications.
- Sany is a leading manufacturer of heavy construction equipment worldwide.

This operator's manual provides safety, operation, maintenance, troubleshooting and technical specifications. In order to properly use your equipment, it is important to read this manual carefully before beginning any operations.

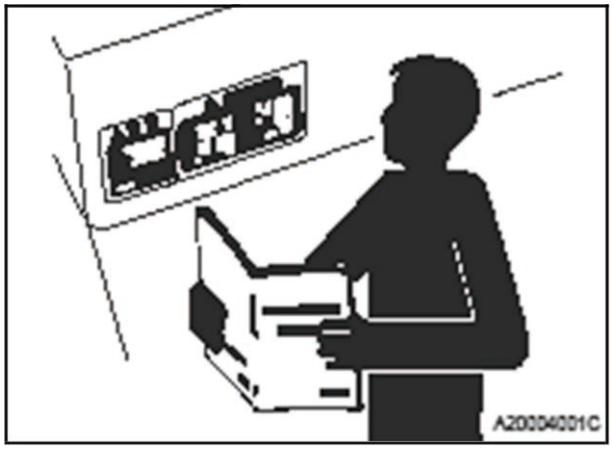


Fig.1-1

Items addressed in this manual are designed to help you:

- Understand the structure and performance of your motor grader.
- Reduce improper operation and point out possible hazardous situations when using equipment.
- Increase equipment efficiency during operation.
- Prolong the service life of your equipment.
- Reduce maintenance costs.

Always keep this manual nearby and have all personnel involved with any work operations read it periodically.

If you sell the equipment, be sure to give this manual to the new owner.

Continuing improvements in the design can lead to changes in detail which may not be reflected in this manual. Always consult your Sany distributor for the latest available information on your equipment or if you have questions regarding information in this manual.

1.2 Your Documentation Package

The attached data includes:

- User's Guide ;
- Parts Book: including the Parts List and the drawings needed when ordering parts. If the Parts Book is not attached with the equipment, contact Sany.

1.2.1 Recommendations on the use of data

- The documents only apply to the equipment herein.
- Ensure the documents are complete and are the latest editions.
- Put all data in a folder (if including leaflets), and print and replace the lost, damaged and blotted documents.
- Add the latest Sany data in time and destroy the inapplicable old documents.

1.2.2 Storage of data

- Put this User's Guide in the equipment operation room;
- You'd better put the Parts Book in the maintenance area or office to enable the maintenance personnel to find it at any time.

1.2.3 Structure of this User's Guide

This User's Guide covers use and maintenance of your equipment. Get familiar with it before performing any operations. Put this manual within easy reach for your reference. Replace it if it is lost or damaged. Due to improvement and updating of products, some information may differ from your equipment. If you have any question on your equipment, contact your Sany distributor before operating or maintaining the equipment.

1.2.3.1 Introduction

This section provides an overview of what is covered in the rest of this manual, including machine label information and Sany contact information.

1.2.3.2 Safety

This section covers basic safety information relating to this equipment. Make sure you fully understand all the precautions described in this manual and the safety labels on the machine before operating or maintaining this machine. Failure to do so may result in serious injury or death.

1.2.3.3 System functions

This section provides an overview of all the controls and prompt & operating systems on your equipment. Only when you are familiar with all systems, can you operate and maintain the equipment safely.

1.2.3.4 Operation

This section provides the basic operating procedures for the job. It is important to study and become familiar with all procedures before performing any operations with the equipment.

1.2.3.5 Maintenance

This section provides all general maintenance and repair procedures. It is important to study and become familiar with all the maintenance and repair procedures before performing any maintenance or repair operations on the equipment.

1.2.3.6 Troubleshooting

This section outlines common malfunctions and fault diagnostic procedures for the operating system. Basic mechanical, hydraulic and electrical system troubleshooting is included.

1.2.3.7 Technical specifications

This section provides the basic performance parameters of this equipment. Some information may change as design modification.

1.3 Your Sany Machine

1.3.1 Test run

Your equipment has been well adjusted and tested before delivery, but the initial operation on the machine in severe conditions will seriously affect the performance or reduce the service life of the machine. Thus Sany recommends you to perform 100-hour test run before putting the equipment into production use.

During the test run:

- Preheat the equipment before performing any operations.
- Avoid operating or running the equipment at a high speed in overload working conditions.
- Avoid sudden starting, rapid movement or abrupt stop of the equipment.
- Cool down the equipment system at the end of every working day.

1.3.2 Machine Information

The factory numbers (serial numbers) and models on the data plate are important numbers required for ordering replacement parts or requiring assistance for your equipment. So please write down the related information in this manual for further use (**see: section 1.3.4 “Serial number and distributor information” on Page 1-6**).

The data plate (a) is riveted on the front frame,
see Fig.1-2.

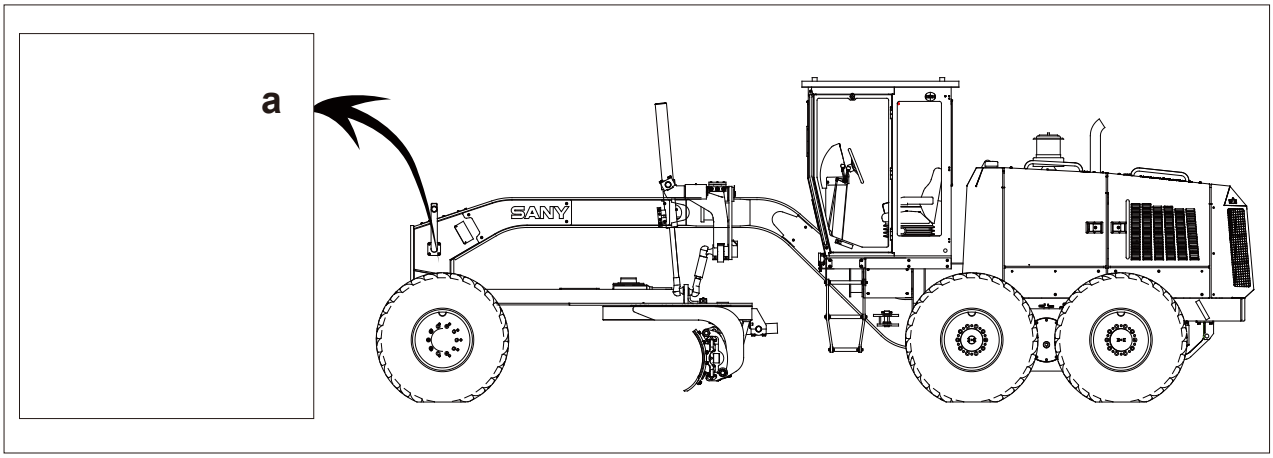


Fig.1-2

1.3.3 Equipment directions

(A) Front
(B) Back
(C) Left
(D) Right

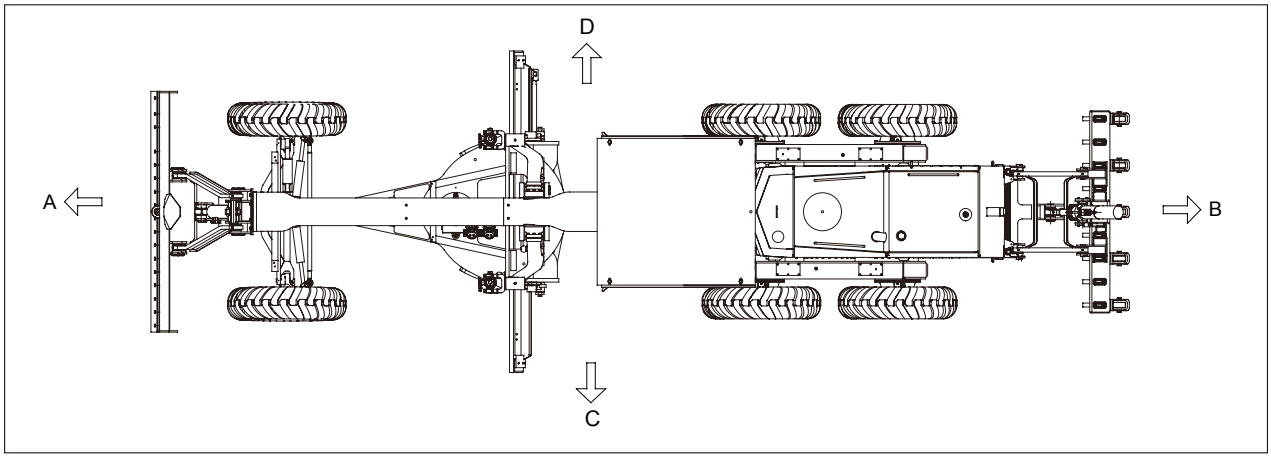


Fig.1-3

1.3.4 Serial number and distributor information

This location is for you to record information relating to your equipment. It is advised that you keep this manual with your equipment at all times for reference.

Model No.	
Serial No.	
Build Date	
Truck V.I.N. No.	

Distributor Name:

Address:

Phone Numbers:

1.4 Contact Information

Thank you for purchasing a Sany product. In the event that you should need to contact us for any reason, you can reach us as follows:

Our address:
SANY SANY Industry Town, Economic and Technological Development Zone,
Changsha, Hunan, China, 410100

Service Hotline: 0086 4006098318
Email: crd@sany.com.cn

SANY

Safety

2 Safety

⚠ WARNING

Read and understand all safety precautions and instructions in this manual before reading any other manuals provided with this machine and before operating or servicing the machine. Failure to do this can cause property damage, personal injury or death.

2 SAFETY

2.1 Introduction

The safety information in this manual provides a basic guide line for safe operation for all authorized personnel.

It contains technical and safety information necessary for operation of your machine. Read and understand each section of the manual.

Always operate your equipment according to national, provincial, prefectural and municipal laws and regulations. The safety information for operation in this manual are just suggestive.

Sany is unable to forecast all risks on work site. The Safety messages provided in this manual and on the product are, therefore, not all inclusive. If a procedure, work method or operating technique that is not specifically recommended in this manual is used, you must be sure that it is safe for you and for others. You should also ensure that the product will not be damaged or be made unsafe by the operation, lubrication, maintenance or repair procedures that you choose.

Machine covered by this manual are used for various operations under normal conditions. Never use the machine in flammable or explosive environment, or in areas containing asbestos dust.

A Sany grader with standard configuration is suitable for high-altitude operation ≤2500m under the working temperature -20℃ ~40℃ . If the working condition disatisfies the reqirements for standard-configured machine, contact Sany for special configuration applicable to different altitude and ambient temperature.

The information, specifications, and illustrations in this publication are on the basis of information that was available at the time that the publication was written. Sany reserves the right to change these information at any time without prior notice. Consult Sany dealer for the latest information or if you have any question on the information provided in this manual.

Before starting operation and maintenance, operator and maintainer shall observe the following items.

- Read and understand the manual.
- Read and understand the safety notices provided in this manual and the safety messages on the machine.
- Never apply or operate your equipment under any circumstances in a manner that is prohibited in this manual.

The manual should be kept in the cab all the time for operator to refer to at any time. Contact Sany dealer to obtain a new manual if the original one is missing or cannot be read.

Fig.2-1

2.1.1 Intended use

This machine is mainly designed for the following operations.

- clearing the foundation, fine leveling the cracked old roads or hard grounds, scraping slopes, refinishing, mixture paving, collecting and compacting materials.
- removing ice and snow.

2.1.2 Unintended use

If the motor grader is used for other purposes or under environments with potential hazard, such as in areas like anoxic plateaus, inflammable or explosive environment, or areas with asbestos dust, special safety regulations should be obeyed, and the machine must be equipped with devices for corresponding purposes.

2.1.3 Operator qualifications

- The machine can only be operated by trained and authorized persons who are at least 18 years old.
- The operator must fully understand and observe the operation rules of the machine.
- Persons under the influence of alcohol, medication or drugs are not allowed to operate, service or repair the machine.
- Only trained and qualified personnel can carry out maintenance and repair tasks.

Fig.2-2

2.1.4 Conversions and alterations to the machine

Any modification to the machine without authorization from Sany may have an adverse effect on the machine's performance or pose more serious hazard. Improper operation or unauthorized application may lead to failure, personal injury or possible death. Sany assumes no responsibility for such losses.

2.2 Safety Message

The following warning deacals and safety messages are used on the machine.

- Make sure that you get familiar with the locations and information of all safety decals on the machine.
- All warning decals must be placed on the proper locations on the machine. They must be kept clean for readability. Never use organic solvent or gasoline to clean the warning decals, which may cause the paints on the safety decal to fall.
- Other signs are also on the machine besides safety decals and safety messages, which must be kept clean and intact.
- Use a new safety decal or safety message in a timely manner to replace the old one which are damaged or missing.

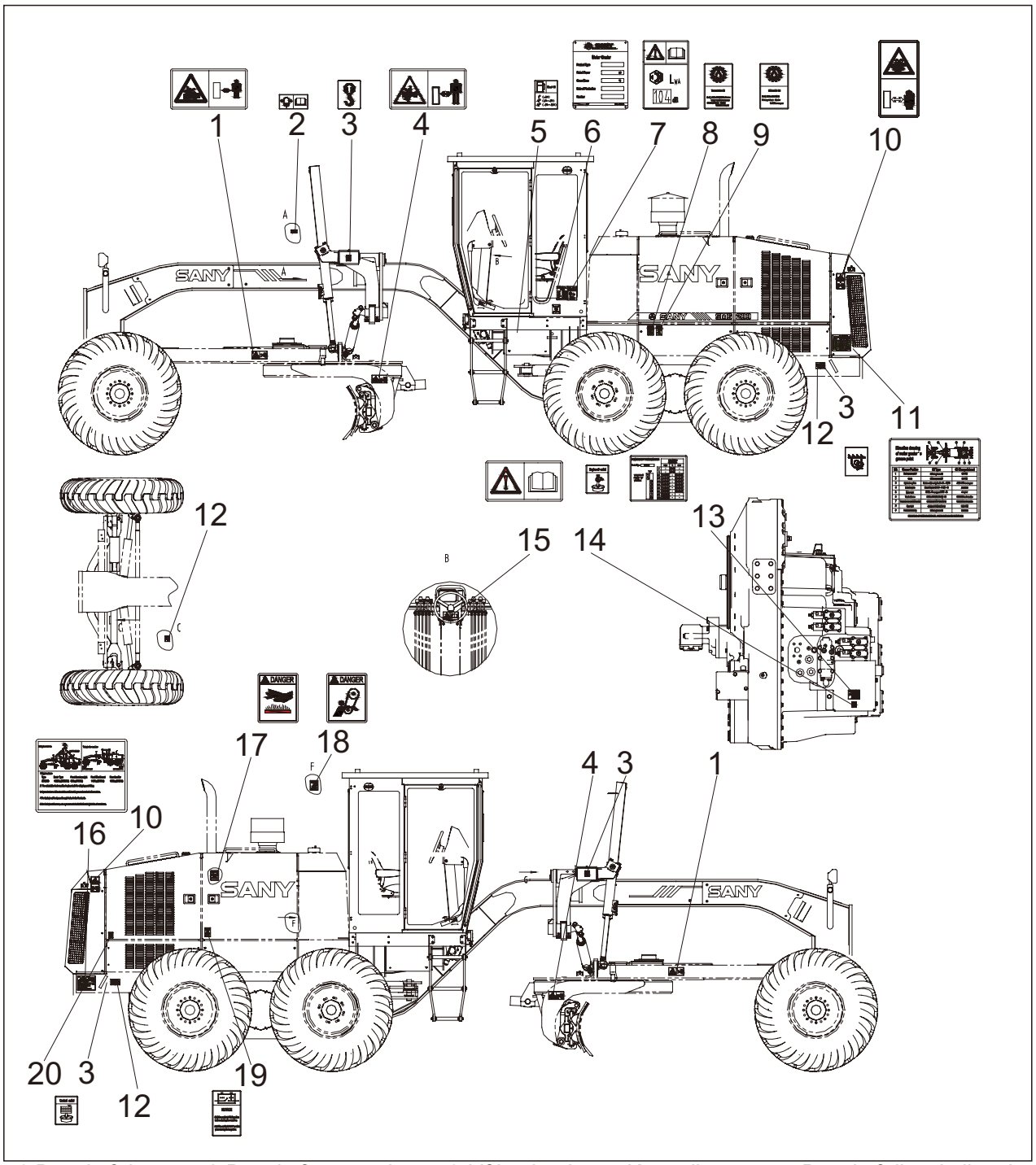
2.2.1 Safety message introduction

For using the machine safely and properly, this manual has provided you with the detailed illustration to the decals on the machine to make you be aware of potential hazards and prevent the hazards.

All operators or maintenance personnel involved with the use of this machine must read this manual thoroughly and fully understand the safety message on the machine prior to operating or maintaining this machine. Strictly observe the safety rules provided in this manual to avoid personal injury and damage to the machine.

2.2.2 Safety message locations

Carefully read and observe all safety message locations on the machine, **see Fig. 2-3 on page 2-5.**



1-Decal of danger 2-Decal of accumulator 3-Lifting hooks 4-Keep distance 5-Decal of diesel oil tank 6-Nameplate 7-Noise & Read the manual 8-Decal of transmission oil 9-Decal of diffferential lock oil 10-Decal of fan danger 11-Diagram of lubricant points 12-Fixation points 13-Decal of transmission 14-Decal of Engine oil drainage 15-Read the manual 16-Lifting notice 17-Heat danger 18-Decal of belt safety 19-Battery label 2 20-Decal of coolant drainage

Fig.2-3

2.2.3 Signal words

The following signal words are used to inform you there may be potential dangers that lead to personal injury or damage.
In this manual and on the machine decals, different signal words or illustrations are used to express the potential level of hazard.

Table 2-1 Safety Decal and Explanation

Safety Decal	Explanation
⚠ DANGER	Indicates an imminent hazard which, if not avoided, will result in serious injury or death.
⚠ WARNING	Indicates a potentially hazardous situation which, if not avoided, could result in injury or possibly death.
⚠ CAUTION	Indicates a possible potential hazardous situation which, if not avoided, could result in minor or major injury.
NOTICE	Indicates a situation which can cause damage to the equipment, personal property and/or the environment, or cause the equipment to operate improperly.
	This hazard alert symbol appears with most hazard alerts. It means attention, become alert, your safety is involved! Please read and abide by the message that follows the hazard alert symbol.
	Indicate the operation disobeys the safety regulations, which may cause personal injury or death and is prohibited.

2.2.4 An example of signal words

NOTICE

If the hydraulic oil level is found to have dropped during the daily check, check all lines and hydraulic elements for leaks, or it may cause failure in operation and environment pollution.

2.2.5 Safety decals

Safety signs are adhered to the machine, which are used to alert local operator or maintenance workers that potential danger might be involved when operating or servicing the machine.
The machine uses "safety words" and "safety symbols" to indicate safety measures.

2.2.5.1 Safety words

Fig.2-4

2.2.5.2 Safety symbols

As shown in Fig. 2-5, safety symbol uses an image to indicate a hazardous situation that is equivalent to a signal word. To make an operator or serviceman understand the type and level of a hazardous situation at any time, these safety signs are presented with images. The safety symbol indicates the type of dangerous situation when the operator or serviceman does some work on the machine that the safety symbol is adhered to.

Fig.2-5

Caution against the danger

Personal injury may occur in this area for the sudden movement of the blade. To prevent unexpected blade movement and possible injury, please keep away from this area especially when the machine is running.

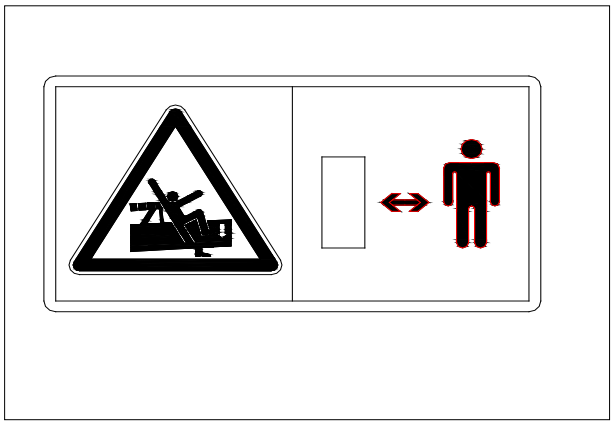


Fig.2-6

Hook point

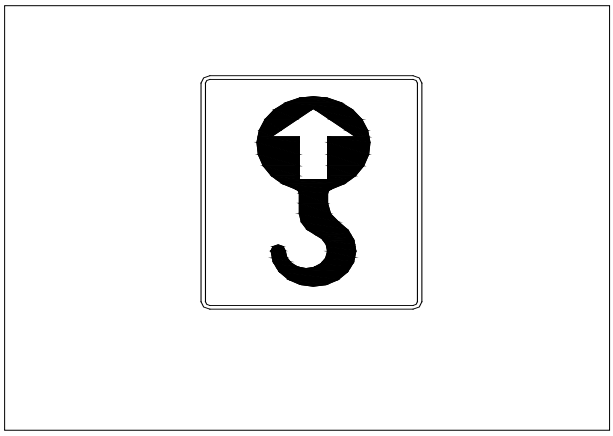


Fig.2-7

Keep away

Personal injury may occur in this area for the sudden movement of the machine. Keep away from this area especially when the machine is on.

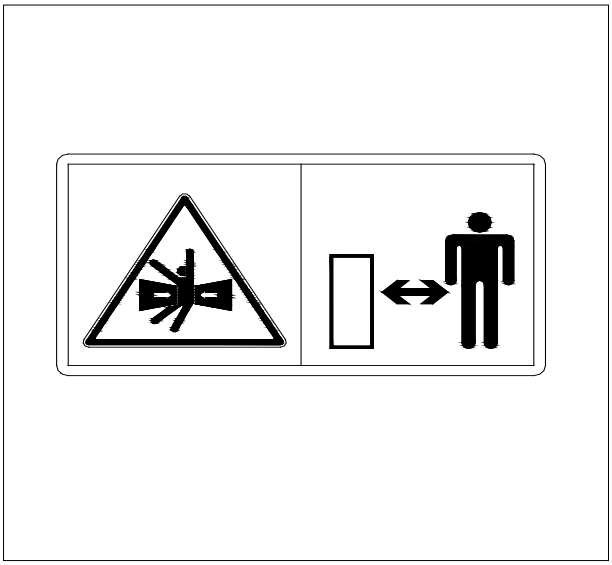


Fig.2-8

Read the manual

Before operating this machine, please read and understand the Manual carefully.
In order to avoid death or serious injury, please operate the machine only from operator's seat.

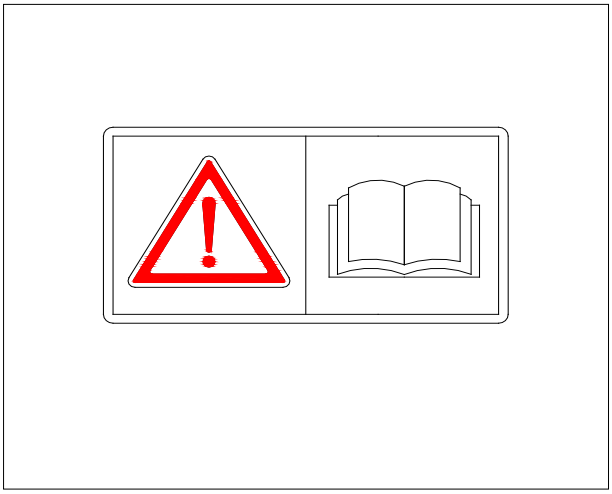


Fig.2-9

Diesel fuel indication

The fuel tank must be far away from fire, or it may be dangerous.

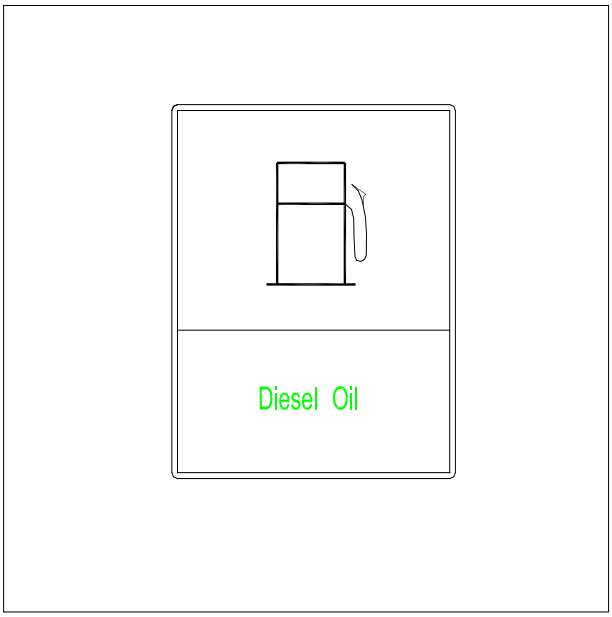


Fig.2-10

Transmission oil indication

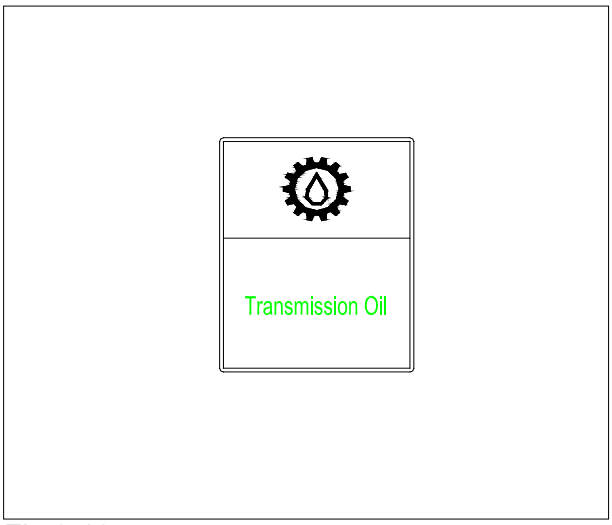


Fig.2-10

Differential oil indication

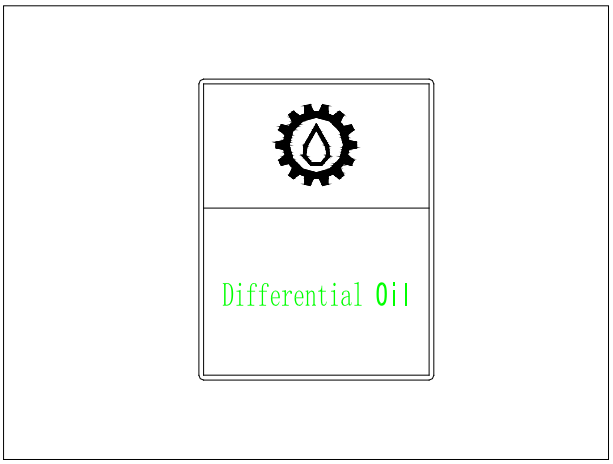


Fig.2-12

Fan danger

When the machine starts, the revolving radiator fan may hurt you, so be care of it.

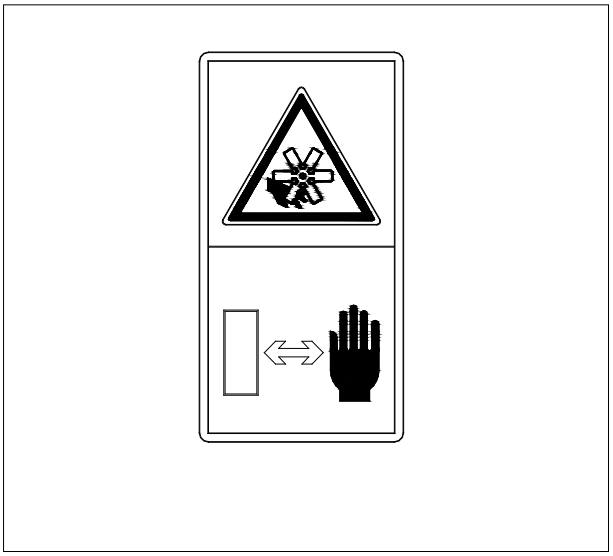


Fig.2-13

Tie-down point

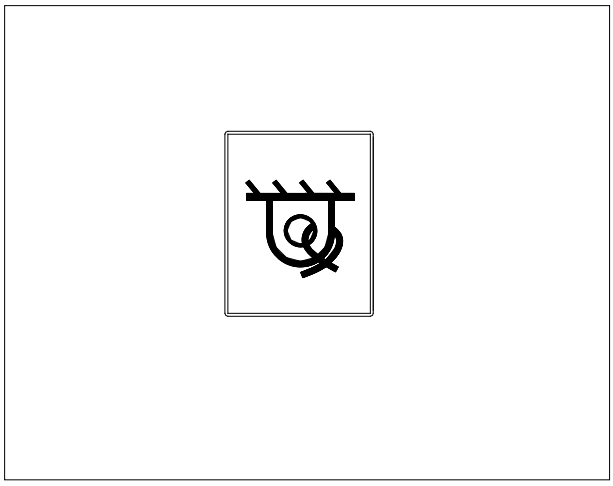


Fig.2-14

Indication of articulation lock

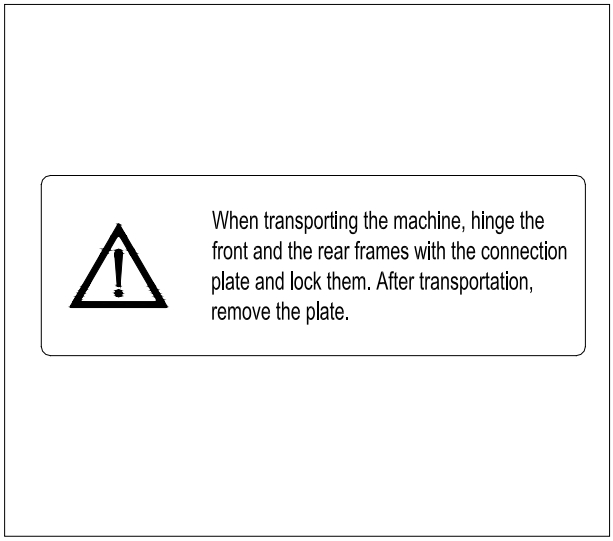


Fig.2-15

Hydraulic oil indication

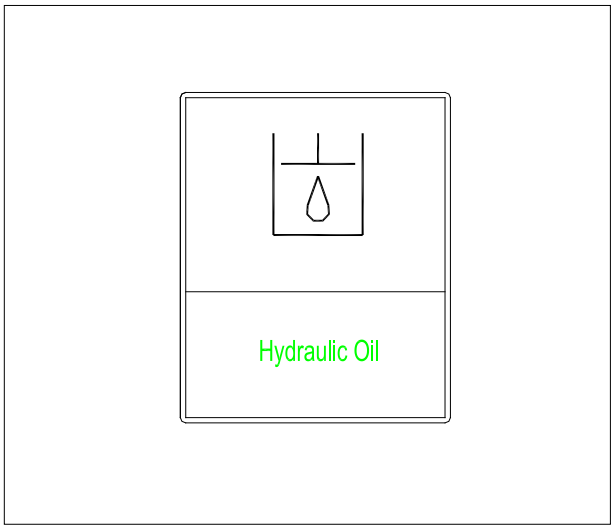


Fig.2-16

Engine coolant indication

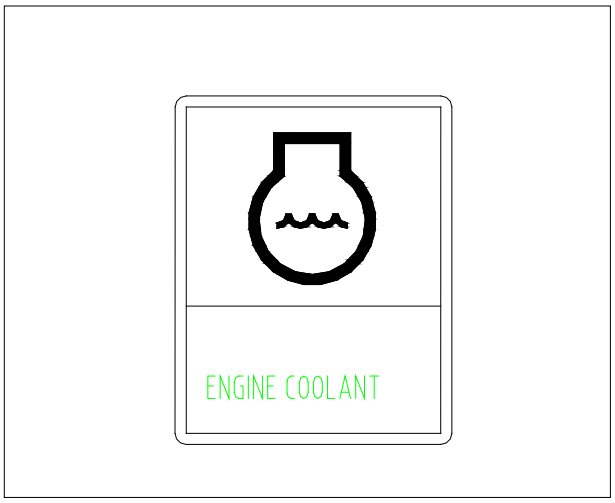


Fig.2-17

Lifting instruction

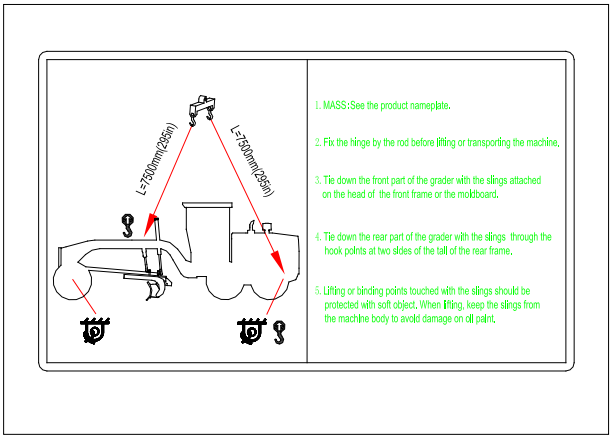


Fig.2-18

Danger of heat

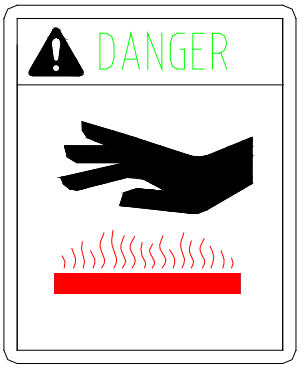


Fig.2-19

Danger of drive belt

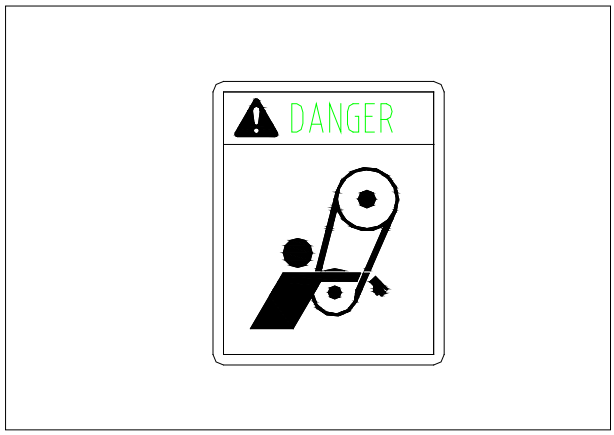


Fig.2-20

Power switch notice

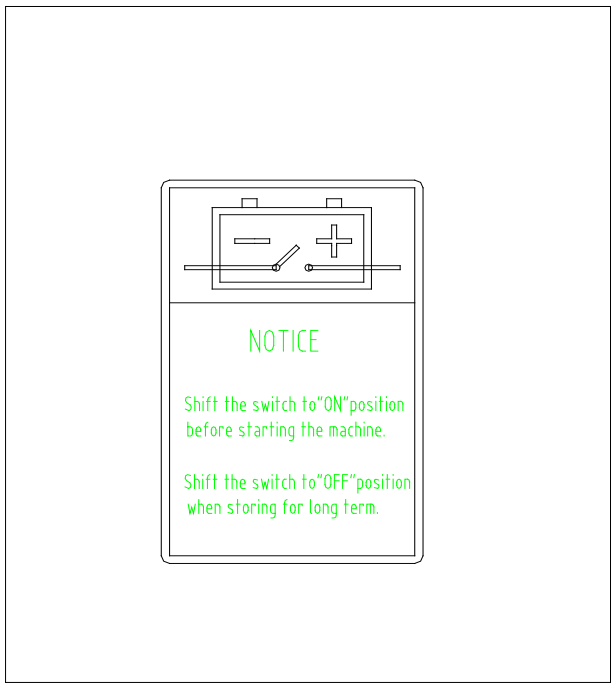


Fig.2-21

(17) Coolant outlet

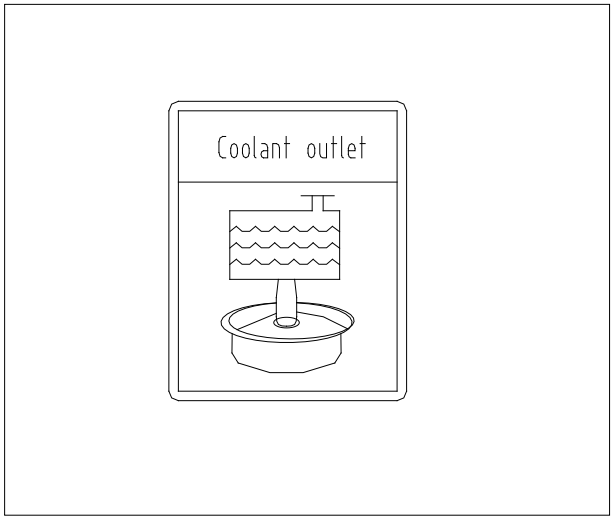


Fig.2-22

2.3 General Precautions

2.3.1 Safety rules

- Only trained personnel are allowed to operate and service the machine.
- Never operate the motor grader that has fault.
- Never operate the motor grader in a hazardous situation.
- All safety rules, precautions and instructions must be followed when operating and servicing the machine.
- Taking alcohol or drug could seriously impair one's ability in operating or repairing the machine, and it is hazardous for you and other persons.
- When working with another operator or worksite traffic signalman, be sure to make all people understand all gestures to be used.

2.3.2 Abnormal case

In case of any abnormalities found during operation and maintenance, such as noise, odor, incorrect gauge display, smoke, or oil leakage, you are obligated to inform your boss and take necessary measures. Never operate the machine before the faults are eliminated.

2.3.3 Safety devices

To protect yourself and other personnel, your machine may be equipped with the following safety devices. See that each item is securely in place and in operating condition.

- Headlights, rear lights
- Rearview mirror
- Windshield wipers & washers
- Horn&Buzzer
- Safety decals

2.3.4 Protective measures for personal safety

Wear all work clothes and personal safety devices issued to you or called for your job conditions. You may need:

- Hard hat
- Hearing protection
- Reflective clothing
- Protective gloves
- Safety shoes

If necessary, wear respirator or filter mask. Wear necessary equipment, and other safety equipment required by your employer, public and governmental administrations, laws and regulations. Never take a risk.

Fig.2-23

⚠ WARNING

- **Never wear loose fitting clothes and decorative ornaments, or you may easily get caught by the control lever or other protruding parts.**
- **Never let the long hair outside of the safety hat, or you may be entangled by rotating parts.**
- **If required, wear a hard hat, safety glasses, safety shoes, face mask and gloves when operating or maintaining the equipment.**
- **Check all protective devices for proper functioning prior to operation.**
- **Never listen to the radio or wear music earphones when operating, or it will easily attract your attention and cause accidents.**

Working in noisy environment for a long time will cause damage or failure to hearing. Please wear hearing protection device. This would reduce the damages to human ears.

2.3.5 Precautions against emergency

Fully read the operation regulations and local traffic laws, mastering the meaning of signal, gesture, symbol, and notification.

Know the locations of fire extinguisher, emergency apparatus, and alarm telephone as well.
Avoid commonsense accidents. If accident occurs, try to take effective measures rapidly. First of all, it is most important to guarantee the personal safety, and then, consider reducing losses of goods and materials.

2.3.5.1 Fire prevention and explosion prevention

⚠ WARNING

Fuel, oil, electrical and other flammable material can pose a serious hazard when using the motor grader on the jobsite, especially when working in areas where flammable debris could build up around hot engine systems. The following points can help reduce the chance of incidents of fire or explosion on your machine. Failure to be aware if these alerts could result in an unexpected fire or explosion causing possible injury or death.

- General safety

Fuel, oil, electrical and various types of substances are flammable. Always observe the following items:

(1) Remove all flammable materials such as fuel, oil, and debris from the machine. Do not allow any flammable materials to accumulate on the machine.
(2) Store any flammable material in properly marked container away from unauthorized persons.
(3) Keep open flames, airborne sparks or burning embers away from the machine. Do not operate the machine near any flame.
(4) Exhaust shields (if equipped) must be installed correctly to protect hot exhaust components from oil spray or fuel spray in case of a break in a line, in a hose, or in a seal. Do not weld or flame cut on lines or on tanks that contain flammable fluids. Use a nonflammable solvent instead. Check all electrical wires daily. Repair all wires that are loose or frayed before you operate the machine. Clean all electrical connections and tighten all electrical connections.

(5) Make sure that the lines and the hoses have adequate support and secure clamps. Inspect all lines and hoses for wear or for deterioration.

- Fuel and oil fires

Fuel and oil are particularly flammable and can be hazardous.

Fig.2-29

(1) Do not smoke or bring open flames or sparks near fuel or oil. Always stop the engine before refueling.

Fig.2-30

(2) Never use fuel or other unapproved cleaning solvents to clean the machine or parts.

(3) Never leave the machine while in the process of adding oils or fuel. Tighten all fuel and oil caps securely. Always inspect the machine for fuel or oil leakage during a pre-operational check. If any leakage is found, have it repaired immediately. Never operate a machine that is leaking fuel or oil.

(4) Be careful not to spill fuel or oil, especially not on hot parts, machine surfaces or electrical components. Clean up fuel or oil spills immediately.
(5) Never overfill the oil or fuel tanks. During operation, hot fuel or oil could be spewed out onto hot components, causing a fire or explosion.
(6) When adding fuel or oil to the grader, always perform these operations in a well-ventilated area.

- Hydraulic fires

(1) Excess oil accumulation, leaks or spurting hydraulic components can cause a fire on your machine. Always be aware of these situations and have them repaired immediately.
(2) Never weld, cut, drill or modify hydraulic components in any manner.
(3) When performing pre-operational checks, always inspect hoses and tubing clamps for leaks and proper security. If they are loose, they may vibrate during operation and rub against other parts. This may lead to damage to the hoses and cause high-pressure oil to spurt out, leading to fire damage or serious injury.
(4) Check the machine for oil leaks daily. Never operate a machine that is leaking oil in any manner. Doing so could cause an explosion or a fire.

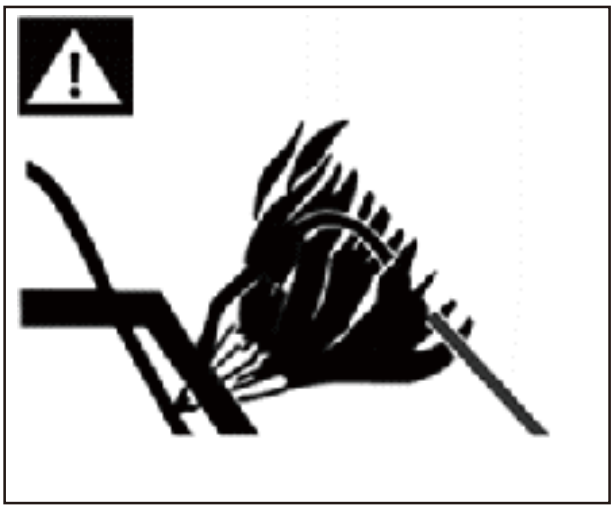


Fig.2-31

- Electrical fires and explosions

(1) Gasses from a battery can explode. Keep any open flames or sparks away from the top of a battery. Do not smoke in battery charging areas. **See Fig.2-32.**

Fig.2-32

(2) Never check the battery charge by placing a metal object across the terminal posts. Use a voltmeter or a hydrometer.
(3) Improper jumper cable connections can cause an explosion that can result in injury. Refer to the Operation Section of this manual for specific instructions.
(4) Do not charge a frozen battery. This may cause an explosion.
(5) Short circuits in the electrical system, damage or overcharging batteries can cause fires. Never use a welder or a machine of a higher voltage to jump-start your machine. Check the wiring on the machine for damage when doing a pre-operational check. Repair or replace any damaged wiring. Never install aftermarket electrical equipment without approval from your SANY distributor.

2.3.5.2 Evacuating in fire accident

The precautions shall be taken for the fire or other accidents:

- Prepare the first-aid kit nearby.
- Formulate the emergency guidelines against fire and other accidents.
- Stick the telephone numbers of the doctor, ambulance, hospital and fire brigade beside the telephone.

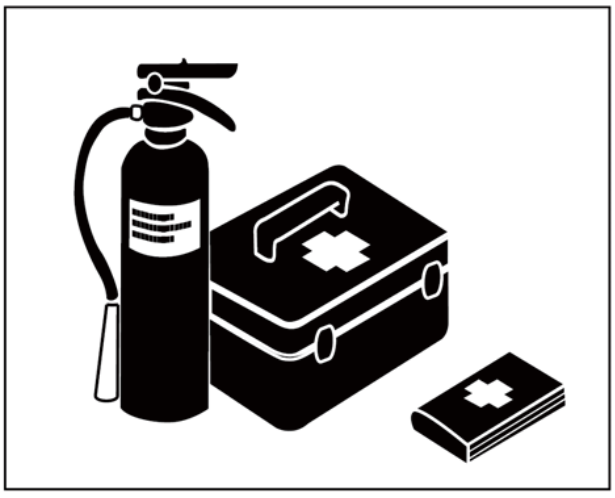


Fig.2-33

Evacuate from the machine by observing the following items in case of fire accident :

- If time is sufficient, move the transmission control lever to "P" position, turn the key switch to "P/O" position. Remove the key.

- Evacuate from the equipment. Use fire extinguisher.

If time is insufficient, turn the transmission control lever to "P" position and evacuate from the grader.Then use extinguishers or call fire fighters for help. Turn the key switch to "P/O" position. Remove the key.

Fig.2-34

2.3.5.3 Touching high-voltage lines

When working near high-voltage lines, the operator should take extreme care. If the grader touches them during traveling, take measures as follows:

- Never leave the operator's seat.
- Warn other people to stay away from the motor grader.
- If possible, drive the grader away from the dangerous area.
- Cut off the power supply of the motor grader.

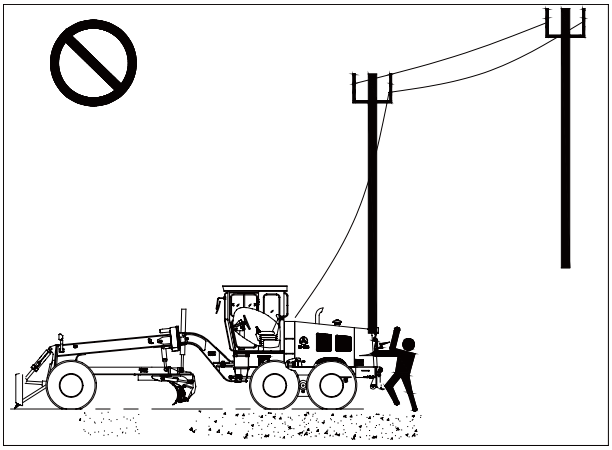


Fig.2-35

2.3.5.4 Electrical storm injury prevention

Never attempt to mount or dismount the machine when lighting is striking in the vicinity of the machine.

If you are in the operator's station during an electrical storm, stay in the operator's station. If you are on the ground during an electrical storm, stay away from the vicinity of the machine.

2.3.5.5 Lines, tubes and hoses

Do not bend high pressure lines. Do not strike high pressure lines. Do not install any lines that are bent or damaged.
Repair any lines that are loose or damaged. Leaks can cause fires. Consult your Sany dealer for repair or for replacement parts.
Check lines, tubes and hoses carefully. Do not use your bare hand to check for leaks. Use a board or cardboard to check for leaks. Tighten all connections to the recommended torque.
Replace the parts if any of the following conditions are present:
(1) End fitting are damaged or leaking.
(2) Outer covering are chafed or cut.
(3) Wires are exposed.
(4) Flexible parts of the hoses are kinked.
(5) Outer covering have embedded armoring.
(6) End fitting are displaced.

Fig.2-36

Make sure that all clamps, guards, and heat shields are installed correctly. During machine operation, this will help to prevent vibration, rubbing against other parts, and excessive heat.

2.4 Precautions During Operation

2.4.1 Safe starting

2.4.1.1 Safe mounting and dismounting

When you mount or dismount the machine:

- Falling is a main reason resulting in personal injury.
- When mounting or dismounting the machine, always keep 3-point contact with the ladder or handrail, and meanwhile, face the machine .
- Notice whether the platform, ladder or handrail is slippery when using the machine.

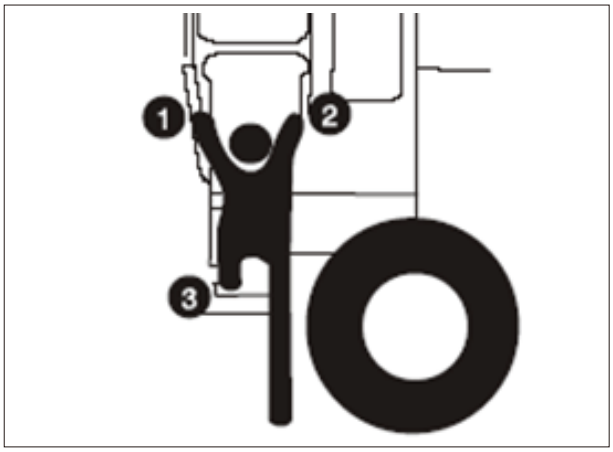


Fig.2-37

- Remove mud, oil or water on the footboards, handrail or shoes at any time.
- Don't mount on or dismount the moving machine. Never jump off the machine.
- Don't carry tools or other objects when mounting or dismounting the machine.
- When getting into or out of the cab, don't use any control lever or door handle in the cab as the handrail.

2.4.1.2 Seat adjusting

Fig.2-38

- Uncomfortable seat position can easily lead to operator fatigue and operating mistake.
- The seat position should be adjusted upon change of operator.
- Leaning against the backrest, operator shall be able to operate the control lever properly. Otherwise, the seat should be readjusted by moving it forward or backward.
- It is prohibited to adjust the seat of the operator during driving, for the seat may move towards an unexpected direction.

2.4.1.3 Seat belt

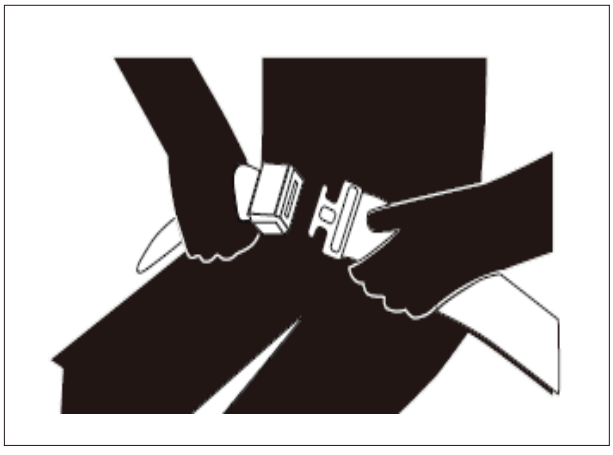


Fig.2-39

- If the overturn accident occurs, the operator would get hurt or thrown out of the cab, or get pressed by the overturning machine, causing severe fatal accident.
- Before operating the machine, check the safety belt carefully, to see if there's any broken or worn part in its belt, buckle and fastener. If there is, change the damaged part or the safety belt before operating the machine.
- When the machine is running, sit on the seat all the time with the safety belt fastened, to minimize the chance of getting hurt from accident.
- Change the safety belt every 3 years, despite of the the condition is.

2.4.1.4 Before starting the engine

Before starting your daily work, the following items are to be observed prior to start of the engine.

- Check the levels of engine oil, hydraulic oil and coolant.
- Check if the lubrication points are lubricated properly.
- Check air filter for blocking.
- Check wires for damage.
- Set the transmission lever to the "P" position and turn the key switch to the "P" positon.
- Adjust the seat to a position easy for operation; check seat belt and buckles for damage and wear.
- Adjust the rear view mirrors so as to see clearly from the driver's seat what is happening behind the motor grader.
- Clean the windows to ensure a good visibility.
- Clean the headlights and work lights, and check them for normal functioning.

2.4.1.5 Starting the engine

Before starting the engine, make sure there is nobody under or around the grader. Sound the horn for warning.

- Start or operate the grader on the operator's seat.
- No one is allowed to stay on the grader except the operator.
- Never start the engine if you think there could be a short circuit, which is dangerous and can cause damage to the grader.

In cold weather, sufficient engine warm-up is necessary. Incomplete engine warm-up may result in slow reaction and accidents.
Before starting, check the battery to see if the electrolyte is frozen or leaks. In case of frozen electrolyte, never charge the battery.

2.4.1.6 After starting the engine

Check the gauges after starting the engine and make sure they are functioning normally.

⚠ WARNING

Prior to operation, make sure you can properly control the speed, direction, steering, blade move. Grader out of control can cause serious injury or death.

Observe the pressure gauges, instrument and warning lamps to ensure they are properly functioning, with all readings within specific ranges.

2.4.2 Requirements on worksite

2.4.2.1 Working environment and construction conditions

Under normal conditions, the various purposes of the motor grader include: clearing the groundsill, fine level up, cracking old roads or hard grounds. If the motor grader is used for other purposes or under environments with potential dangers, such as, in areas like anoxic plateaus, inflammable or explosive environment, or areas with asbestos dust, special safety regulations should be obeyed, and the machine must be equipped with equipments applicable to equivalent purposes.

The motor grader is not applicable to underground working condition or poor-ventilated environment.

2.4.2.2 Surveying the worksite in advance

- Don’t use the machine on the ground not solid enough or with holes, nor use the machine along the channel or inclined road.

- The machine may roll over when working at the ditch edge or on road shoulder, which may result in serious injury or death. Check the worksite and road conditions in advance to prevent the machine from overturning, or even the ground, material stockpile or bank from collapse.

- If the road materials will induce dust, install ventilation devices, water the pavement or wear a gauze mask.

- Formulate a working plan. Reinforce the ground, ditch edge and road shoulder according to requirements. Use the machine applicable to the operation and worksite. The soft foundation shall be reinforced before the operation.

- Keep especially alert when working on an icy road, since the rise of the ambient temperature will make the foundation soft and slippery.

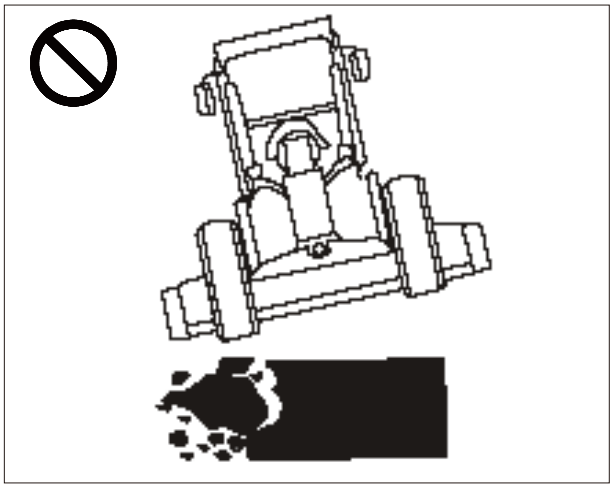


Fig.2-40

2.4.2.3 Falling object protection

- When working at the places where stone blocks or macadam can fall, the cab shall be equipped with a guard net.
- The operator should wear a safety helmet and protective goggles.

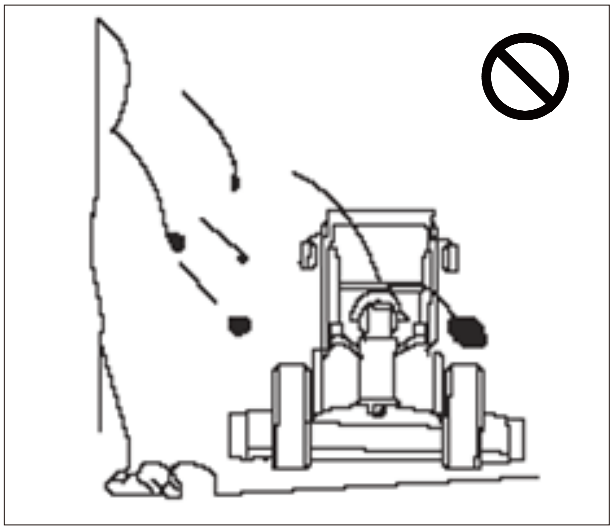


Fig.2-41

2.4.3 Before operation

Test the grader before operation.

- When conducting inspection, move the equipment to a spacious area without barriers and operate slowly. Any other person is not allowed to approach the machine.
- Check the grader for abnormality such as abnormal noise, vibration, smoke, odor or gauge reading and leakage.
- In case of any abnormality, stop operation and take corrective measures immediately.

⚠ WARNING

When hearing abnormal noise, first check the noise to see if it comes from inside. If it indeed comes from inside, shut down the grader immediately, or it may lead to more serious fault.

2.4.4 Safe traveling

When driving the grader, the operator should observe the following provisions:

- It's forbidden to carry people on the grader except the operator.
- It's forbidden to mount or jump off a moving grader.
- Operate the machine only on the operator's seat. Keep the seat belt fastened and the cab door closed during working.
- Do not adjust operator's seat when driving the machine.
- Sound the horn to warn the personnel during traveling.
- Drive the machine slowly at the recommended speed during abrupt turn.
- Follow traffic rules consistently when driving on public roads, i.e. turn on the headlamp and turn lamp (it is required to post the mark of "Slowly-driving Vehicle" at the rear end of the machine in some countries). Never exceed the allowable speed by the traffic rules and pay attention to the driving distance after braking.
- Turn on the front and rear headlamps when driving or working at night.
- Appoint a signalman on demand when working on a slope or on a road shoulder.
- For the multi-machine operation, use unified signals and appoint a signalman to organize the operation. In addition, make sure all the workers obey the guide of the signalman.

Fig.2-42

2.4.4.1 Avoiding other personnel entering into the working area

- Persons may be knocked down by the revolving working device, or shoved on other objects, hence resulting in serious personal injury or death.
- All the people except the operator should keep away from the working and revolving areas of the machine.

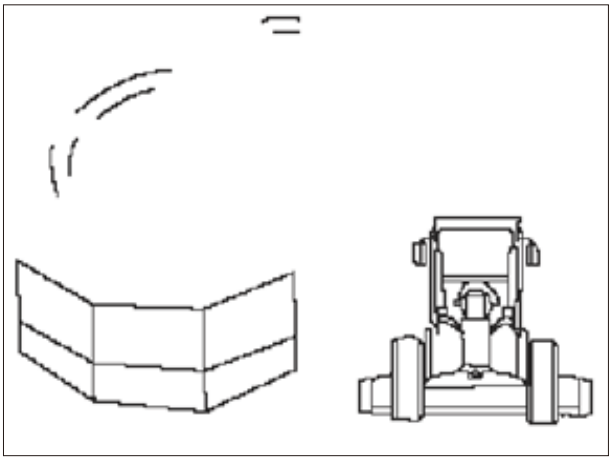


Fig.2-43

2.4.4.2 Preventing the machine from being out of control

If you try to climb on or block the traveling machine, severe peronal injury or death may occur. To prevent the machine from being out of control:

- Never park the machine on a slope. Park the machine on the level ground.
- Lower the blade, front dozer plate (optional) and rear scarifier (optional) to the ground.
- Idle the engine for 5 min to make the engine cool down.
- Stop the engine. Remove the key.
- Park the machine at an appropriate distance away from other machines.

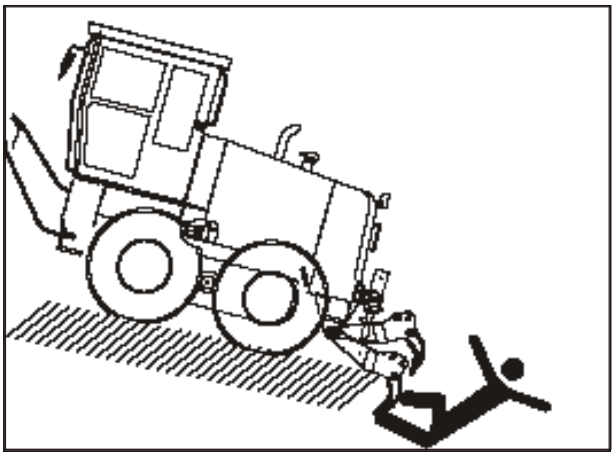


Fig.2-44

2.4.4.3 Safe reversing and blade turning

Make sure the machine is clear of people before reversing or turning the blade. Or it may cause severe personal injury or death.
In order to avoid accidents during the process of reversing and blade turning:

- Make sure the machine is clear of people before reversing.
- Keep the travel alarm (if equipped) in working state.
- Keep watch whether someone appears in the working area. Alarm bystanders by horn or other signals before moving the machine.
- When reversing, if the visibility is poor, a signalman is required.

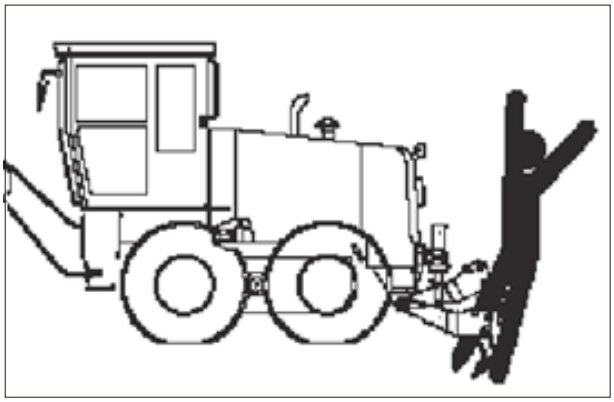


Fig.2-45

2.4.4.4 Avoiding overturning

- Don’t try to jump off the overturning machine, which may cause severe injury or death due to crushing.
- The overturning of the machine is quicker than your jumping.
- Fasten the seat belt securely.
- Overturning easily occurs during operating on the slope, which may result in serious accidents.

2.4.5 Safe parking

2.4.5.1 Requirements on parking area

When parking the grader, the operator should observe the following items:

- Try to park the grader on flat and solid ground.
- Try to park the grader indoors, avoiding insolation or drenching.

2.4.5.2 Parking rules

- Observe the following steps to park the grader:
- Park on a level ground. If it is necessary to park on a slope, chock the wheels securely.
- Press the pedal to the lowest position in order to slow the machine. Set the transmission lever to the P position.
- Lower all attachments such as the blade, the dozer plate and the scarifier to the ground.
- Stop the engine.
- Turn the key switch to "P/O" position. Remove the key.
- If the machine is to be stored for a long time, disconnect power switch of the the battery to avoid discharging. Battery short circuit or electrical leakage may lead to battery discharing.

In order to avoid accidents:

- Lower the blade, front dozer plate (optional) and rear scarifier (optional) to the ground.

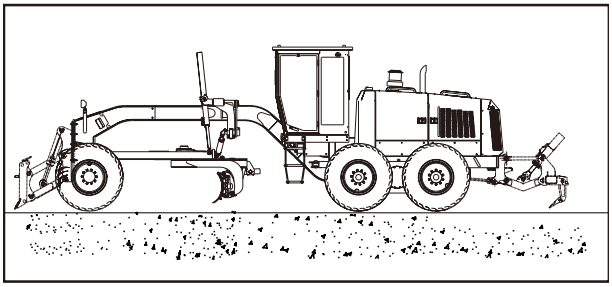


Fig.2-46

- When parking the machine on a slope, chock the front and rear tires with blocks to avoid slip.

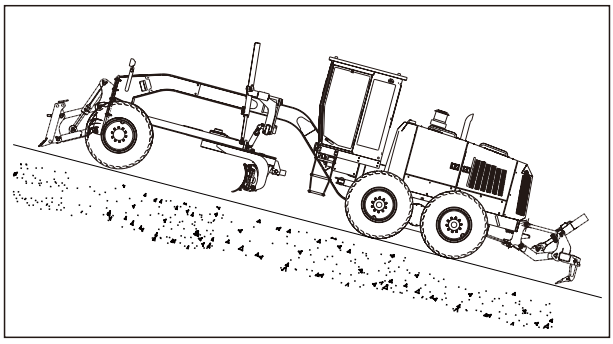


Fig.2-47

2.5 Precautions for Using the Blade

2.5.1 Bearing capacity of blade

Correctly choosing the slewing angle and scraping angle of blade is an important factor to affect the optimal efficiency of the motor grader. It is better to adopt a larger slewing angle, so as to achieve stronger excavation force in unit working width; the small scraping angle can reduce cutting resistance, while the large scraping angle can improve flatness and effect.

2.5.2 Moving the blade

- When the blade tips leftward and rightward for 90°, the left and right blade lift cylinders must act with the blade swing cylinder synchronously. It's prohibited to operate with force, or to allow one or two oil cylinders to arrive at their strokes while another oil cylinder hasn't acted, which may result in the interference between the oil cylinder and the frame and even damage to the oil cylinder.
- When sliding the blade leftward or rightward, if the blade is loaded with rigid objects, stop operating the blade. Or it may cause damage to the blade slide cylinder.

2.5.3 Placing the blade

Place the blade at a proper position which shouldn't exceed the left and right tires during traveling.

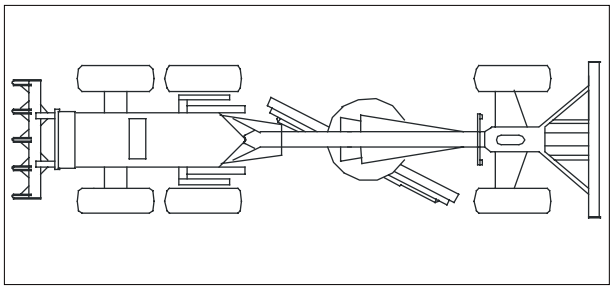


Fig.2-48

2.5.4 Dangerous obstacles

When sliding the blade leftward or rightward, if the blade is impacted by load, the blade slide cylinder, drive wheel tooth and circle tooth may be damaged.

2.5.5 Prohibited blade working range

When turning the blade 360°, operate the blade carefully to prevent the blade damaging the tire, frame and front axle steering tie rod.

2.6 Maintenance Precautions

2.6.1 Basic rules

- It is forbidden to use a damaged grader or the grader with potential troubles.
- Only the qualified and authorized maintenance staff can maintain the machine.
- Observe the maintenance regulations.

2.6.2 Lockout/Tagout procedures

NOTICE

Perform logout/tagout before maintenance and service. Never put the machine into use before finishing the maintenance work, which may cause damage to the machine.

Fig.2-49

If necessary, stick more caution plates on the machine.

2.6.3 Maintenance area

For maintenance work, select a spacious, clean and flat area with ample sunlight and good ventilation.Clean up the working area by removing fuel, lubricant and water, and covering slippery ground with sand or other absorptive materials.

2.6.4 Washing the machine

When washing the machine, always do as follows.

- Wear non-slip shoes to prevent yourself from slipping on the wet surface.
- When using high-pressure steam to wash the machine, always wear protective clothing. This will protect you from being hit by high-pressure water, and cutting your skin or getting mud or dust into your eyes.
- Never spray water directly onto the electrical system (sensors, connectors). If water gets into the electrical system, there is danger that it will cause defective operation and malfunction.

2.6.5 Self-protection

Wear protective clothing and shoes necessary for the job.

- Wear rubber apron and rubber gloves when handling corrosive materials. Wear heavy gloves when handling wooden materials, wire ropes or sharp-edged metals.
- Wear a face shield when disassembling spring or elastic parts, or adding acid to battery.
- Wear safety hat and goggles when you weld or cut with a torch.
- Never carry out grinding, flame cutting or welding without aspirator and ventilation equipment.

2.6.6 Using the tool properly

Use proper tools and use them correctly.
Using damaged, inferior, defective, temporary tools or using the tools incorrectly could lead to serious accidents.
Be careful when using the following kinds of tool.

- When using spanner to disassemble bolts and nuts, please refer to the torque table.
- When using instrument for measuring, please follow the instructions that the instrument demands.
- When using gas cutting or gas welding equipment, make sure that the work won't lead to explosion or reduce the precise parts precision.
- When using grinding wheel to burnish parts, it is prohibited to stay at the tangent of the grinding wheel.

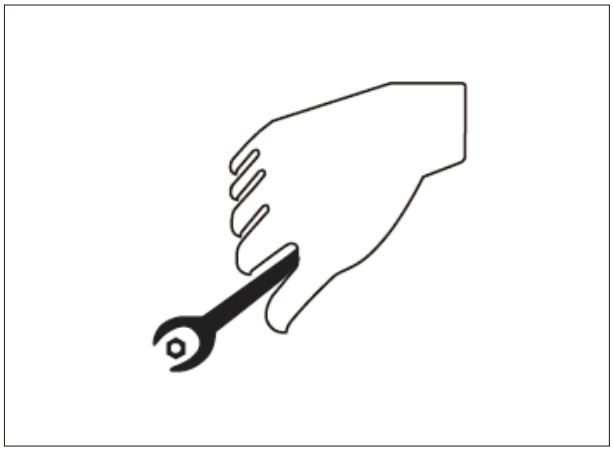


Fig.2-50

2.6.7 Maintenance with engine running

In most cases, the engine should be shut down prior to the maintenance work. If maintenance has to be done on a running engine, there should be at least two people handling the maintenance by observing the following items:

- One person should always be seated in operator's seat and ready to shut down the engine at any time. All personnel must keep in touch.
- Place the transmission lever to the neutral position. If the test is necessary, ask other personnel to leave the machine, and then operate the machine.
- Pay extreme attention to rotating parts like fan and belt, people may get caught by them.
- Never leave or insert any tool or other objects in fan or drive belt, which may cause the parts to break or fly.

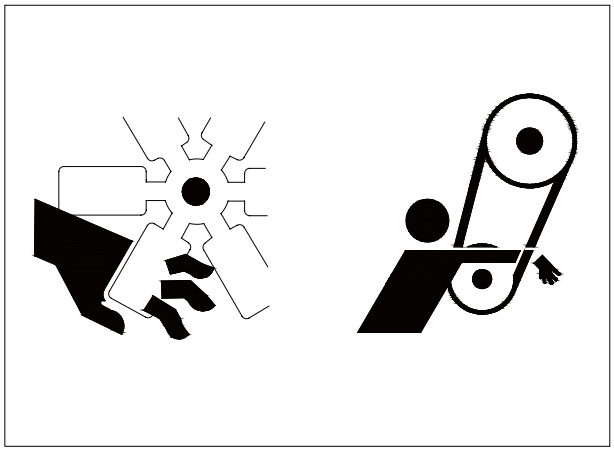


Fig.2-51

2.6.8 Maintaining under the grader

- No maintenance shall be carried out before the grader is well supported. Ensure that the the grader and attachments are safely, stably and reliably supported.
- Never use hollow bricks or wood chip to support the grader.
- Never use the device which may slide to support the grader.
- Never use slag bricks, hollow tires or shelves to support the grader, as they may collapse under continuous load.
- If the grader or the attachments must be raised up for maintenance, support the grader or work implemt with multiple jacks or iron columns.

Fig.2-52

2.6.9 Maintaining in noisy environment

If noise of the grader is too big, it will cause permanent or temporary hearing disability. When maintaining the engine, wear ear plug if you have to work in noise for a long time.

Fig.2-53

2.6.10 Removing paint before welding or heating

- Poisonous gas will be produced by paint heating during the fusion welding, soldering or gas torch application.
- Remove the paint outdoors or in well-ventilated area.
- If using sand paper or grinding wheels to remove the paint, wear a qualified respirator to protect yourself from inhaling dust.
- If the solvent or the rust remover is used, the paint and solvent shall be handled in a proper way. Wait for at least 15 minutes for volatilization of volatile gas before welding or heating.

2.6.11 Correct welding

The correct welding procedures must be used to protect the electronic control device and the bearings from being damaged. When carrying out welding on the grader equipped with the electronic control device, comply with the following procedures:

- Stop the engine. Turn the key switch to "O" position. Remove the key .
- Remove the negative cable of the battery. Never use the grounding point of electric spare part (including electric control modules or sensors) as the grounding point of the electric welder.
- Clip the components to be welded with the grounding wire clamp of the welder. Set the clamp near the welding point to make sure the current flow is away from the key components, such as transmission system bearing, hydraulic parts, electrical parts, and so on.
- Protect the wire harness from contacting scraps and splashes produced during the welding.
- Weld the materials together by following standard welding process.

⚠ WARNING

- **If weld near the oil tank, drain off the oil completely in the oil tank, and dry it as well. Or it may cause fire during welding, and endanger the worker's safety.**
- **Welding near the plastic and rubber material is forbidden, for toxic fume will be produced and it will do harm to the worker's safety.**

2.6.12 No heating beside hydraulic pipeline

- Heating beside the pressure pipe will produce combustible spray, which may cause the operator and the bystanders to be seriously burned.
- Fusion welding, soldering or usage of gas torch beside hydraulic pipeline or other combustible materials are not allowed.
- When the heat goes beyond the direct combustion area, the hydraulic pipeline may be cut off at any time. Establish a temporary fire protective sleeve when performing fusion welding or soldering to protect hoses or other materials.

Fig.2-54

2.6.13 No heating the pipes with combustible liquid

- Welding or gas cutting of the pipeline or hose with combustible liquid is not allowed.
- Remove the combustible liquid completely with noncombustible solvent before welding or gas cutting the pipeline.

2.6.14 Correctly operating the hydraulic system

- Periodical maintenance to the hydraulic system is very important. The hydraulic system of the motor grader works under high oil pressure, small damages and cracks at the rubber hose and the adaptor will cause disastrous results. As the hydraulic tube is made up of rubber, cracks will appear after a certain period; in any circumstances, if the service life of the rubber tube is uncertain, replace it with a new rubber hose provided by SANY.
- Never fill oil directly to the hydraulic oil tank, otherwise the cleanness of the hydraulic system may be affected, and the service life of the machine may be reduced! When filling the hydraulic oil tank, use a filtering equipment with a filtration precision of 10μm.
- Make sure the pressure control valve is set correctly. High pressure will result in hydraulic line leakage. Low pressure will result in difficult operation of the grader.
- Adjustment of the system pressure, main oil pump as well as assemble & disassemble or replace the valve block only can be done under the instruction of a hydraulic engineer or an after-sales engineer. Unauthorized persons are forbidden to adjust by themselves.
- As the rubber hose is an easily-corrosive product, do not store it for a long time.
- When dismantling the oil pipes, close the port and keep the hydraulic pipes clean.
- Check the filter element frequently.
- The hydraulic parts are essential to the system. Use the original hydraulic parts produced by our company.

2.6.15 Be care of high-pressure liquid

- The hydraulic system may still have pressure even when operation has been stopped;such liquid as diesel oil and hydraulic oil spurting out under pressure may penetrate the skin or eyes resulting in serious injury, blindness or even death.

Fig.2-55

- Release pressure before disassembling the hydraulic parts or other pipelines to avoid hazard posed by high-pressure liquid.
- Fasten all joints before the pressurizing.
- Wear protective goggles, masks and gloves when checking the hydraulic system. Use cardboard when checking for leaks.
- Protect your hands and body from contacting with high-pressure liquid. If the hydraulic liquid spatters onto the skin or into the eyes, seek medical care immediately.
- If any liquid jets into skin, remove it within several hours by surgical treatment from a professional surgeon.

2.6.16 Regularly replacing the rubber hoses

Rubber hoses with combustible liquid may break under pressure due to aging and excessive abrasion. The aging and abrasion of the rubber hoses are difficult to be judged only through check. Regularly replace the rubber hose.

2.6.17 Avoiding scald by high-temperature liquid

- After operation, the cooling water in the engine turns hot with pressure, and the water pipes of the engine and the radiator are full of hot water and vapor. Avoid scald by possibly jetting hot water. Hot water or vapor overflowed will result in serious scald.
- Before removing the radiator cover, stop the engine and let the system cool down. The radiator cover could only be removed after the cooling fluid has cooled down.
- The hydraulic oil tank is pressurized after operation. Release the pressure before removing the cover.
- The engine, gear and hydraulic oil will turns hot during operation; meanwhile, the engine, hose, pipeline and other parts will turn hot. Check or maintain the equipment after the oil and parts cool down.

Fig.2-56

2.6.18 Preventing battery from explosion

- The battery contains toxic and corrosive sulfuric acid. If the battery explodes, the electrolyte may spatter into eyes, which may cause blindness. Always wear goggles before checking the the electrolyte.

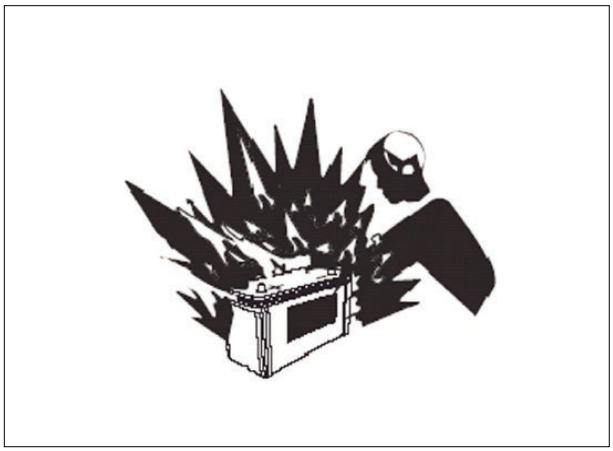


Fig.2-57

- Wear gloves when working on the battery. Battery electrolyte is strongly corrosive. If your clothing and skin are contaminated by electrolyte, flush immediately with large amount of water and then seek medical treatment immediately.

- Don’t charge a frozen battery, which may lead to explosion. Warm the battery to 16℃ at first.
- The gas which produced by the battery is easily explosive; if the battery is very close to open fire or sparkle, explosion will possibly occur.

2.6.19 Preventing components from flying out

- Do not remove the grease fitting or valve parts.
- Since the components may fly out, keep your body and face away from the valve body to avoid injury.

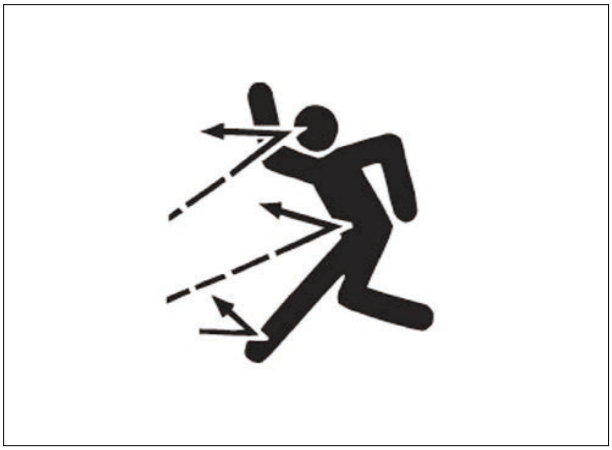


Fig.2-58

2.6.20 Safe storage of parts

- The stored parts may fall off, resulting in severe injury or death.
- Store the parts and instruments properly to prevent them from falling. Keep children and other persons away from the storage area.

Fig.2-59

2.6.21 Safe treatment of liquid

- No smoking when refilling the fuel tank.

Fig.2-60

- Stop the engine before refilling.
- Refill outdoors.
- Store the combustible liquid away from the places where fire easily bursts out.
- Don't burn or pierce the pressure container.
- Don't store the oily cloth for it is easily ignited or easily burns spontaneously.

2.6.22 Safe treatment of chemicals

- Contacting hazardous chemicals directly will cause serious personal injury. The chemicals used for this equipment include lubricant, coolant, paint and adhesive.
- Check and understand the hazardous character of the chemical before using it. Use recommended instrument in accordance with the regulations.

2.6.23 Proper disposal of wastes

The improper disposal of wastes will en-danger the environment and ecology. The toxic substances hidden in the equipment of SANY involve oil, fuel, coolant, brake fluid, filter and battery and so on.

- Use a leak-proof container to drain fluid. Never use the container used for food or drink.
- Never pour waste fluid on the ground, into the sewer or any water sources.
- Consult the local environmental protection or recycle center or your appointed distributor for correct recycle and disposal methods of wastes.

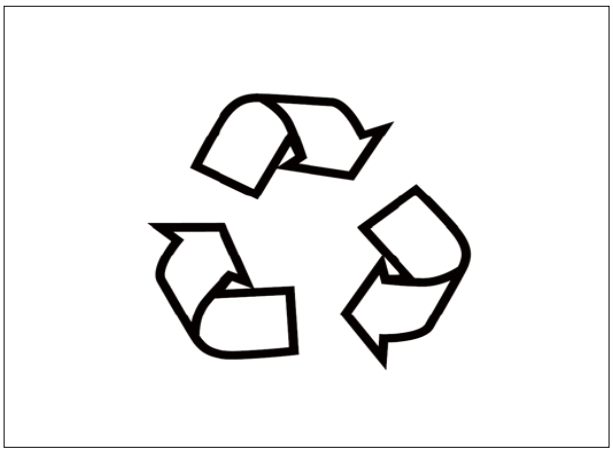


Fig.2-61

2.7 Keeping Away from Dangerous Area

- When adjusting or operating the work implement, never stay between the work implement and the cab. Or it may cause personal injury or death due to work implement rotation.

Fig.2-62

- The blade rotates or moves upward and downward. Keep away from the working area of the blade to prevent the feet from being crushed.

Fig.2-63

2.8 Safe Transportation

2.8.1 Load/Unload the grader

When loading or unloading the grader from the truck or platform trailer, the grader may overturn.
Provide a truck or platform trailer with suitable size and load to transport the grader.
Precautions during the loading/unloading of the grader.

- Choose the solid and level ground.
- Use a platform or access ramp.
- Assign a signalman to guide the loading/unloading of the grader.
- Since it is quite dangerous to steer on the access ramp, avoid steering downhill or uphill. If necessary, drive the grader back to the ground and correct the direction before driving on the access ramp.
- Carefully drive over the connection between the access ramp and the platform.

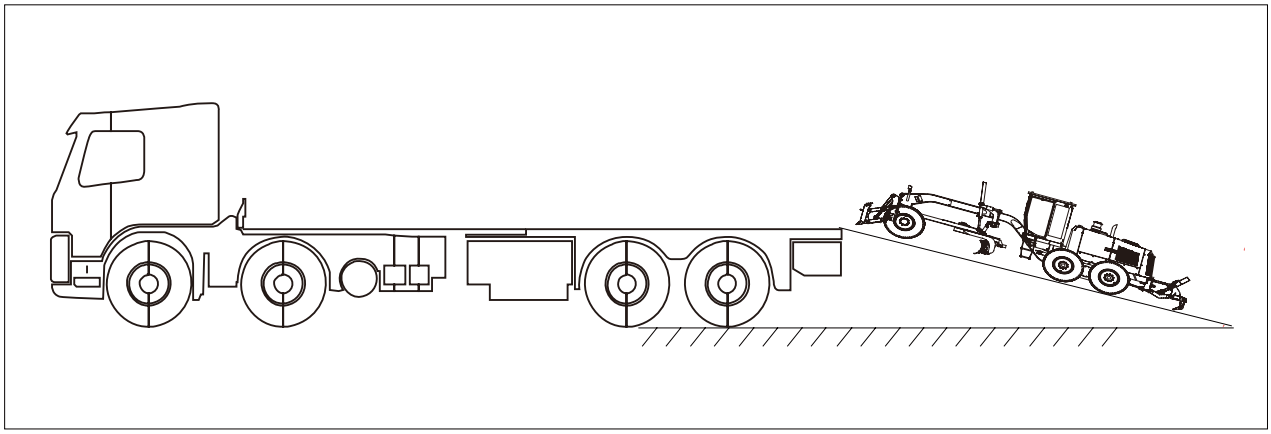


Fig.2-64

2.8.2 Transporting the grader

- Observe the local laws and regulations when transporting the machine by road.
- Chock the wheels with triangle wood blocks and fasten the grader with wire rope during the transportation by sea and by road.
- Drain the water tank of the diesel engine, reserve some fuel for loading, unloading and transportation, and then disconnect the circuit between the battery and the frame.
- The locks securing the front and the rear articulation frames must be applied.

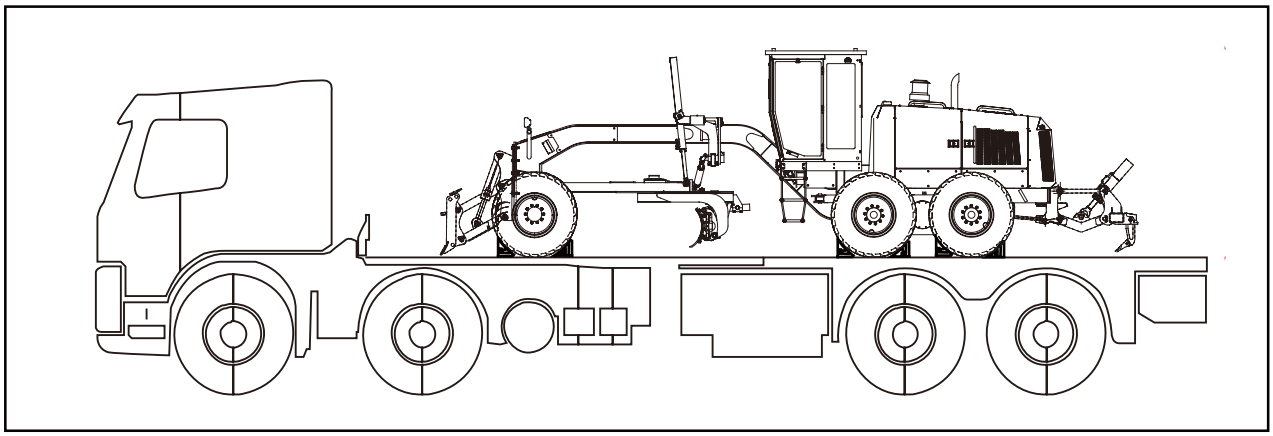


Fig.2-65

2.9 Hoisting the Grader

- Before the hoisting or transporting the grader, fasten the front and the rear articulation steering with tie rods. The machine has hoisting holes. Adopt qualified hooks and ropes, and adjust the crane to a proper position, lifting the machine horizontally.

NOTICE

Before hoisting, wrap the hoisting holes on the frame with cloth to avoid damage to the machine.

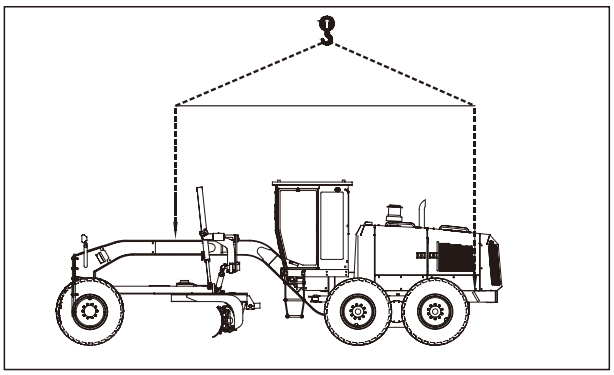


Fig.2-66

- The total weight of the grader is marked on the hoisting label. When hoisting the machine, check the weight on the label and work in consistence with the safety regulation of the crane.

- When tying down the front part of the machine, thread the rope through the draw hook on the front frame (or front dozer plate).

- When tying down the rear part of the machine, reeve the rope through the draw hook on the rear frame.

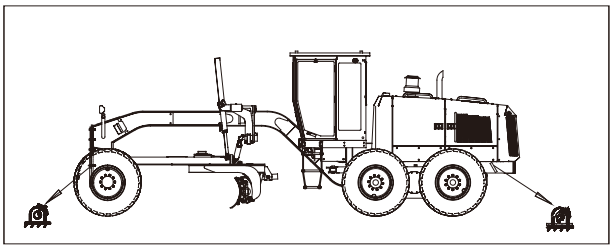


Fig.2-67

SANY

System Functions

3 System Functions

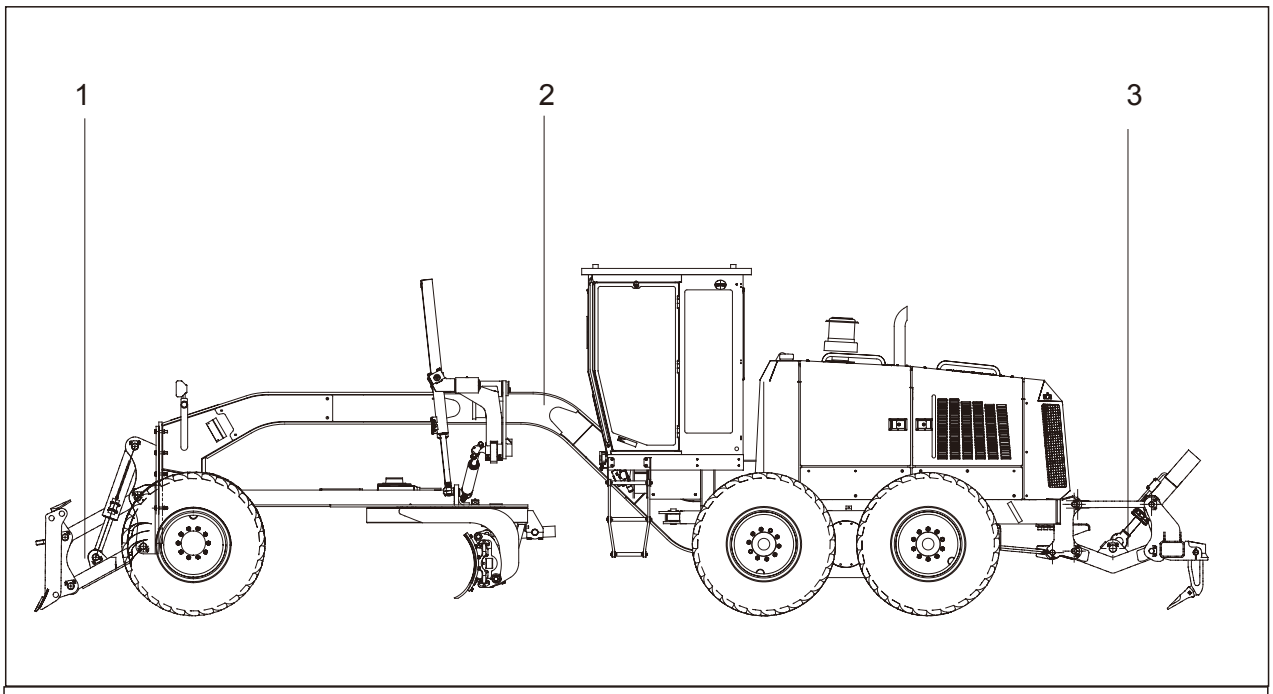
⚠ WARNING

Read and understand all safety precautions and instructions in this manual before reading any other manuals provided with this machine and before operating or servicing the machine. Failure to do this can cause property damage, personal injury or death.

3 SYSTEM FUNCTIONS

3.1 General structure

The Sany motor grader uses power shift transmission and full automatic electrical control with compact overall structure and reasonable configuration, mainly comprising main body, optional attachments and auxiliary parts and tools. Optional attachments include front dozer plate and scarifier, which are provided depending on the demands of the customer.



1-Dozer plate 2-Main body of SMG200 3-Scarifier

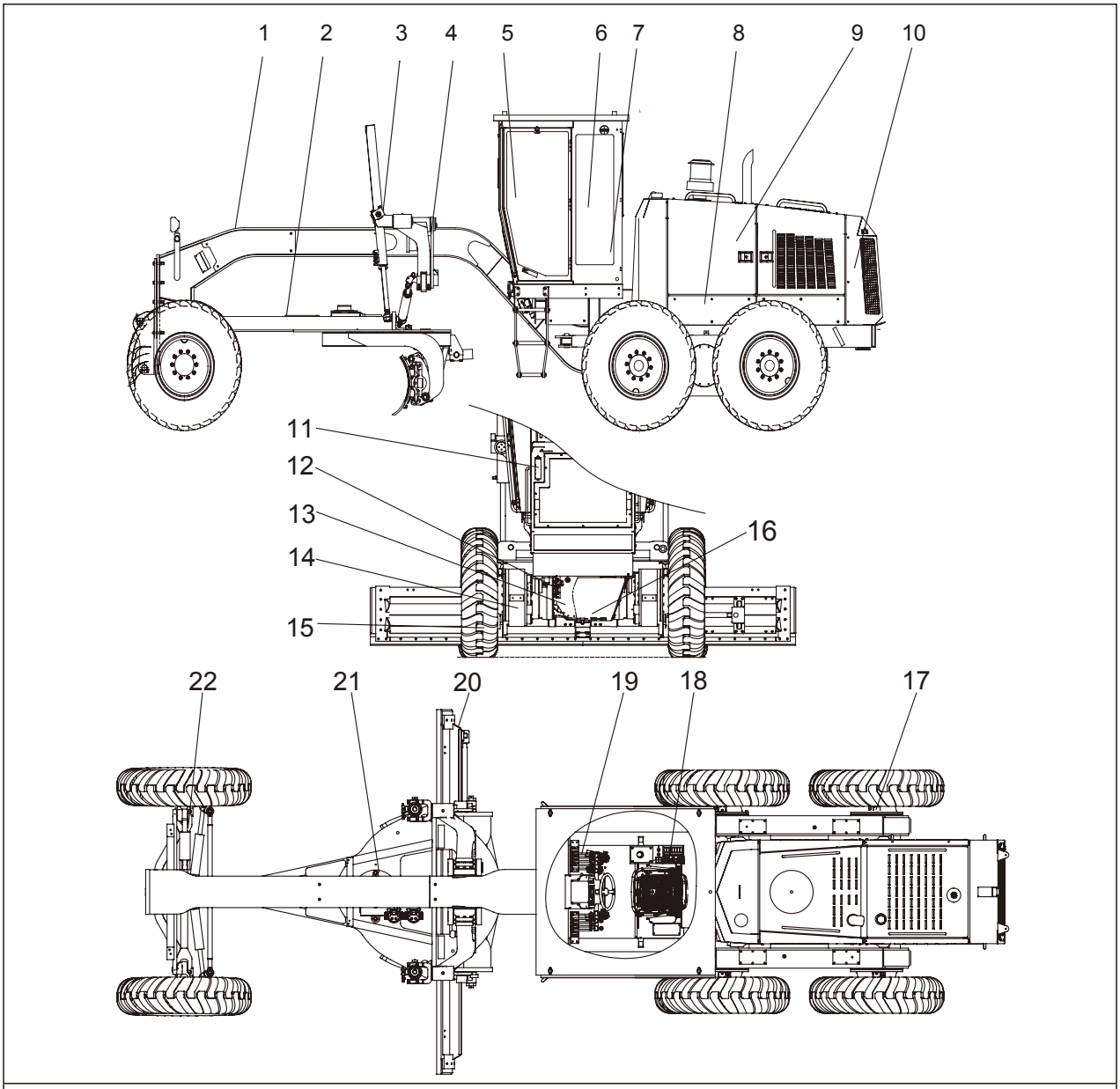
Fig.3-1

Main technical characteristics

- Direct dirve powershift transmission provides with smooth shifting, rapid response and high efficiency.
- With the ease of operation, load sensing hydraulic system and intelligent fan cooling system reduce energy consumption and noise.
- Highly-reliable work implement with high operation precision.
- Luxury operator's compartment provides the operator with comfort and ease of operation.
- User-friendly interface makes the operation easy.
- High-speed computer monitors the machine automatically, and alert the operator of any fault through a display and perform primary self-diagnosis. This feature reduces machine downtime and prolongs the service life of the machine.

3.1.1 Main body

As shown in Fig. 3-2, main body is mainly composed of power system, work implement, hydralic system, controller, electrical system and basic structural parts.



1-Frame 2-Work implement 3-Steering hydraulic system 4-Swing support 5-Console 6-Cab 7-A/C 8-Nameplate 9-Power system 10-Engine hood 11-Electrical system 12-Hydraulic power control system 13-Transmission case 14-Tandem drive case 15-Wheels 16-Protection cover for rear axle 17-Fan brake hydraulic system 18-Cab assembly parts 19-Control levers 20-Blade 21-Gear box 22-Front axle

Fig. 3-2

3.1.1.1 Frame

As shown in Fig. 3-3, frame **(see callout 1 in Fig.3-2 on page 3-3)** mainly comprises front frame (1) and rear frame (2). The front frame and rear frame are hinged by upper pin shaft (3) and lower pin shaft (4).

The frame is the main support and stressed member, and also the mounting foundation of all parts.

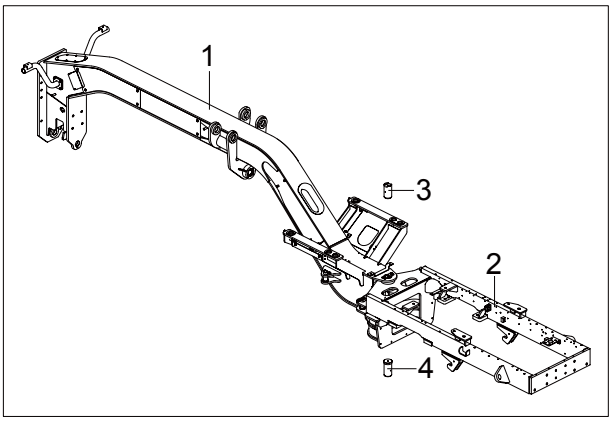


Fig. 3-3

3.1.1.2 Swing support

As shown in Fig. 3-4, swing support (**see callout 4 in Fig.3-2 on page 3-3**) is mounted on the middle of the front frame. It is mainly composed of fork assembly (1), connection components (2), left swing arm (3), right swing arm (4) and sleeves (5) (6).

The main functions of the swing support are as follows:

- As shown in Fig.3-5, support the work implement. Left blade lift cylinder (7), right blade lift cylinder and blade swing cylinder (8) are mounted on the swing support.

- Swing support could swing in order to make the blade turn over 90° at most.

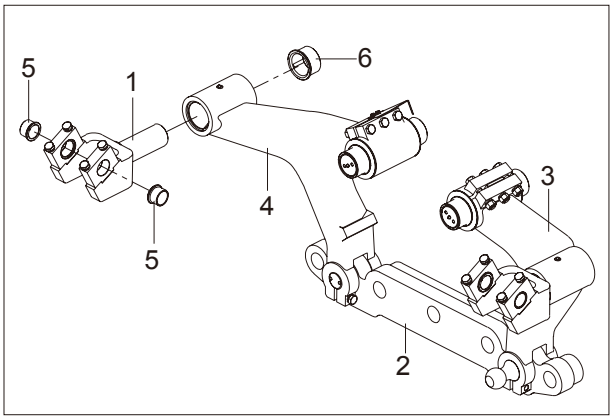


Fig. 3-4

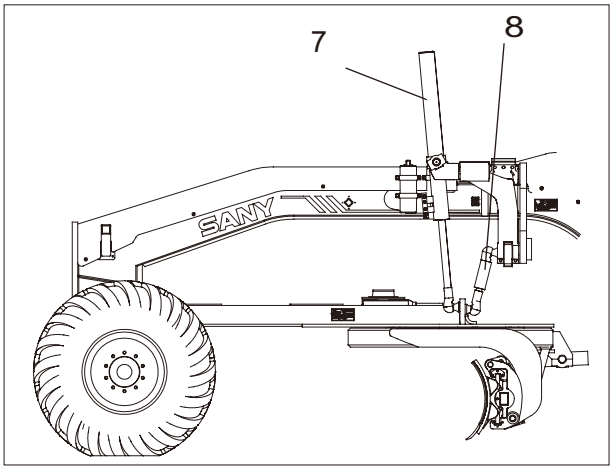


Fig. 3-5

3.1.1.3 Tandem drive case

As shown in Fig.3-6, tandem drive case (**see callout 14 in Fig.3-2 on page 3-3**) is mounted on the lower of the rear frame.
The functions of the tandem drive case are as follows:

- Reduction and torque transfer; Drive the rear wheals;
- Support the rear part of the machine;
- Balance the dirve force;
- Increase the operation precision of blade.

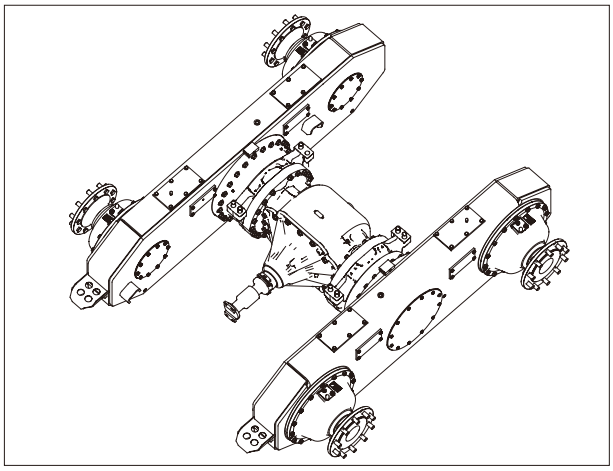


Fig. 3-6

3.1.1.4 Transmission

As shown in Fig.3-7, transmission (**see callout 13 in Fig.3-2 on page 3-3**) is mounted on the rear of the rear frame, which comprises powershift transmission (1), transmission mounting base (2) and damper (3).
The functions of the transmission are as follows:

- Transfer the engine output to the tandem drive case;
- Gear shifting;
- Transfer the engine power to the pump, in order to provide power source to the hydraulic system.

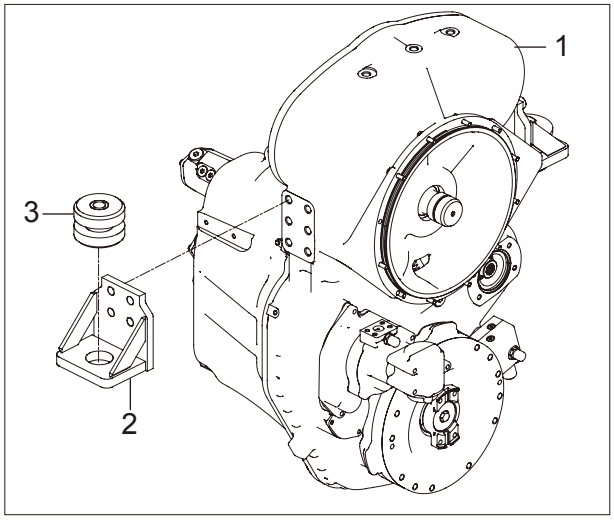


Fig. 3-7

3.1.1.5 Front axle

As shown in Fig.3-8, front axle (**see callout 22 in Fig.3-2 on page 3-3**) is mainly composed of axle frame (1), steering tie rod (2), left steering knuckle (3), right steering knuckle (6), left wheel tilt angle knuckle (5) and right wheel tilt angle knuckle (4).

The front axle is mainly used to transfer the force and motion from the steering hydraulic system to the steering knuckles (3) and (4) on the both sides of the front axle, which makes the front wheels lean or steer so as to reduce wheel slippage.

If the front axle lean is required in special condition, operate the control lever to lean the two front wheels leftward or rightward.

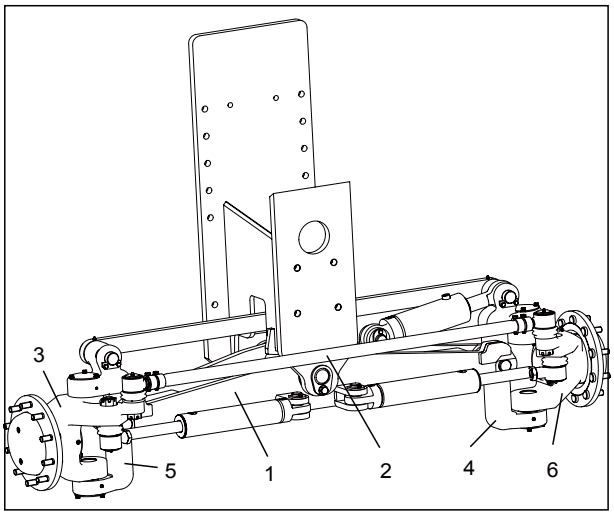


Fig. 3-8

3.1.1.6 Work implement

As shown in Fig. 3-9, work implement (**see callout 2 in Fig.3-2 on page 3-3**) are mainly composed of drawbar (1), circle (2), and left blade carrier (3), middle blade carrier (4) and right blade carrier (5).

- Drawbar is used to connect the blade and the circle with the frame, and transfer the power from the frame to the circle, then to the blade.
- Circle is used to turn the blade.
- Blade carriers are used to fix the blade, and control blade angle throught the cylinders.

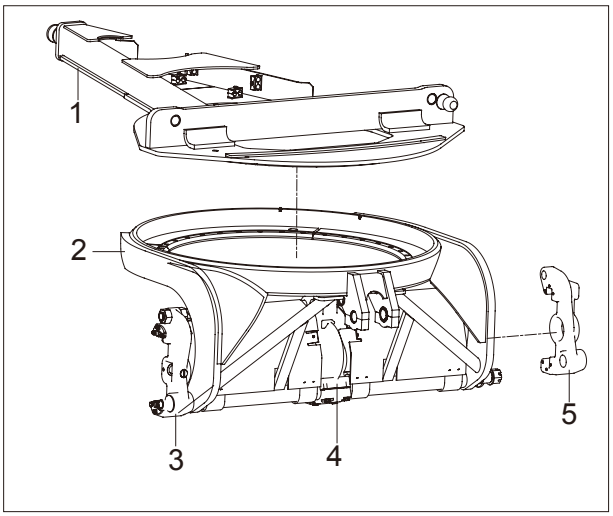


Fig. 3-9

3.1.1.7 Engine

The engine is mounted on the rear frame. Refer to your Deutz engine manual for complete details of the engine.

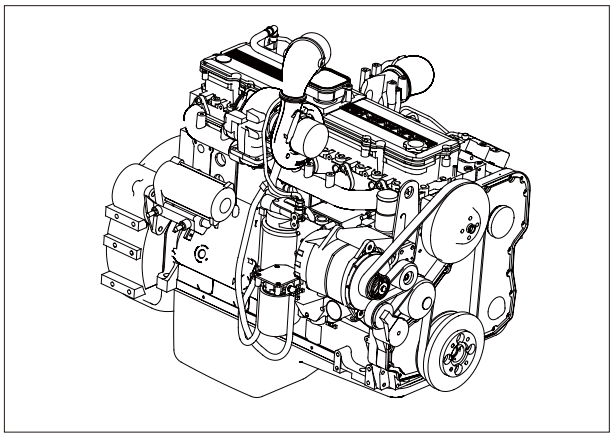


Fig. 3-10

3.1.2 Optional attachments

The optional attachments of motor grader include front counterweight, dozer plate, scarifier, harrow and so on, which are provided depending on the demands of the customer.

3.1.2.1 Dozer plate

As shown in Fig.3-12, dozer plate (**see callout 1 in Fig.3-1 on page 3-1**) is mainly used to push a small quantity of sand and assist the blade operation.

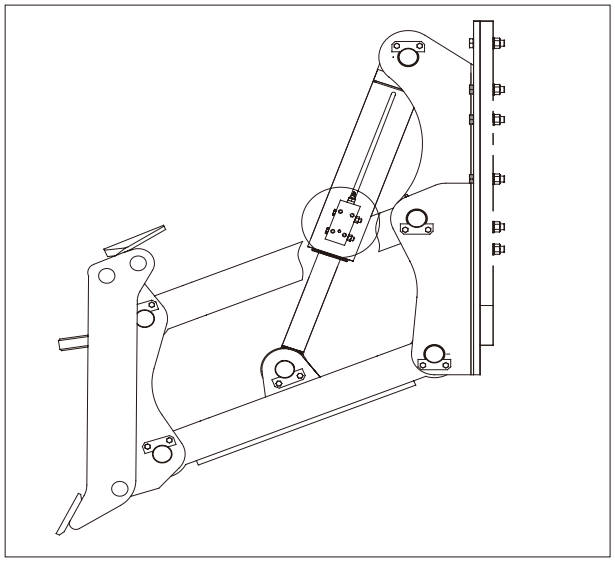


Fig. 3-11

3.1.2.2 Scarifier

As shown in Fig.3-12, scarifier (**see callout 6 in Fig.3-1 on page 3-1**) is mainly used to rip the solid soil.

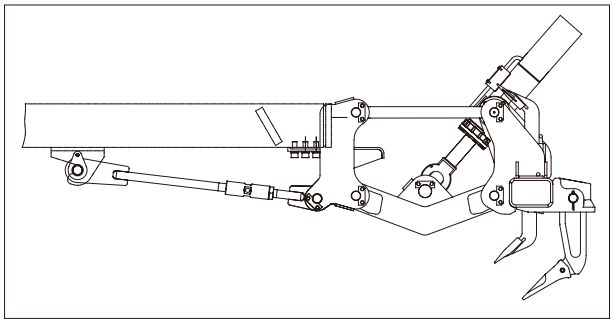
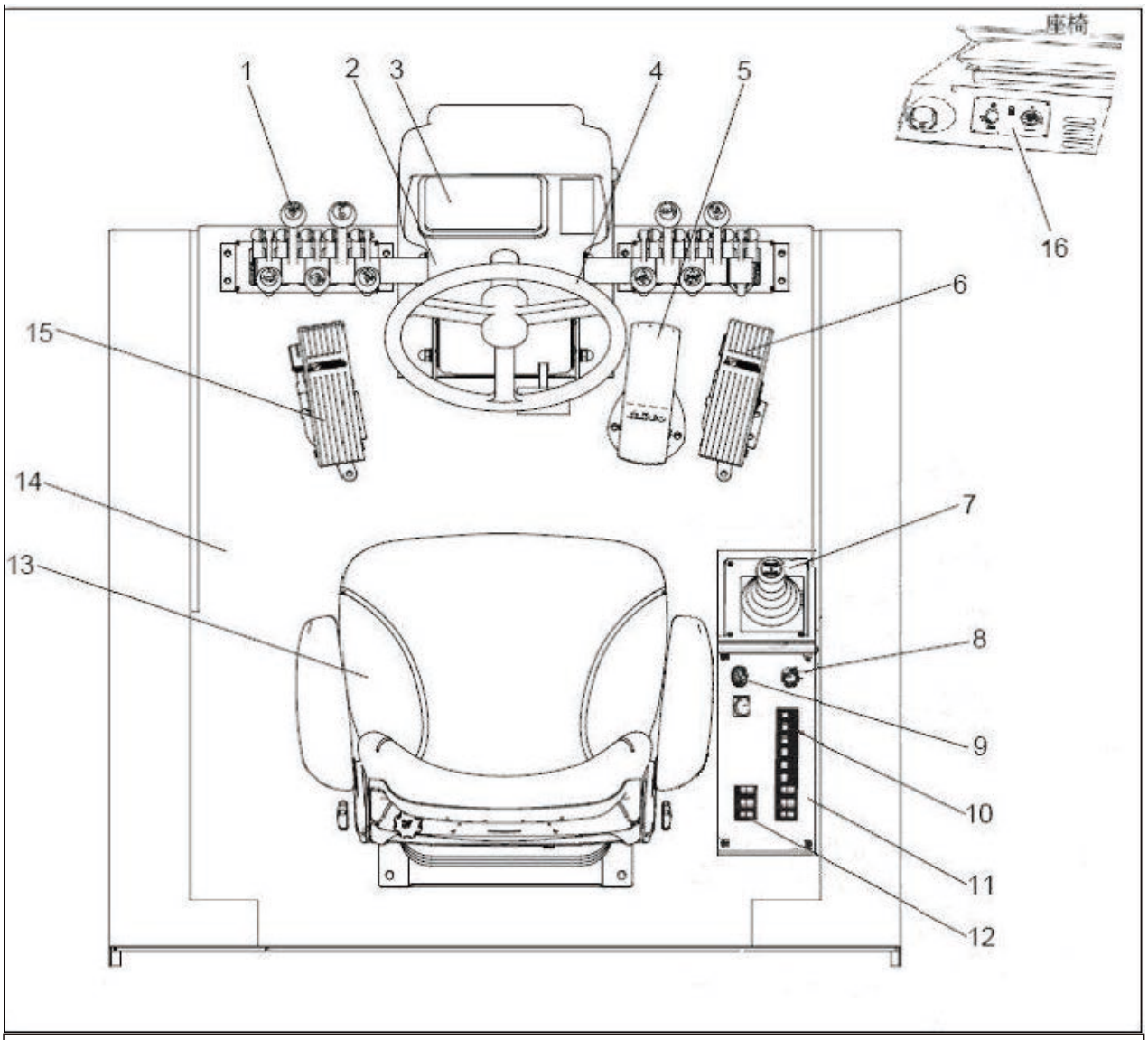


Fig. 3-12

3.2 Cab Configuration and Control Panel

See Fig.3-13 for the locations of controller and control panel.

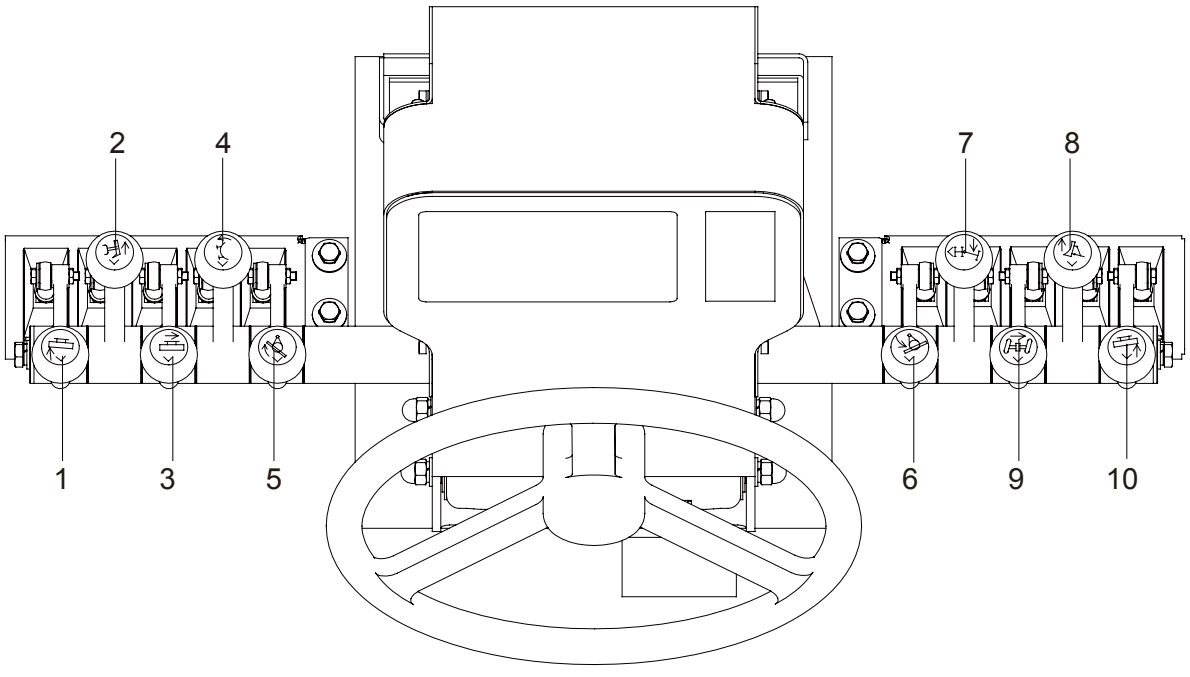


1-Control lever 2-Control console 3-Front panel 4-Steering wheel 5-Service brake pedal
6-Throttle pedal 7-Gear selector 8-Ignition switch 9-Battery socket 10-Right switch group
11-Control box 12-Electronic throttle 13-Seat 14-Cab floor
15-Inching pedal 16-Air conditioning panel

Fig. 3-13

3.2.1 Control lever

The locations of the control levers are shown in the Fig. 3-14.



1-Left blade lift control lever 2-Rear scarifier control lever 3-Moldboard sideshift control lever
4-Moldboard hitch control lever 5-Circle turn control lever 6-Drawbar centershift control lever
7-Articulation steering control lever 8-Dozer plate control lever
9-Front wheel lean control lever 10-Right blade lift control lever

Fig. 3-14

3.2.1.1 Left blade lift control lever

As shown in callout 1 in Fig.3-14 on Page 3-10, left blade lift control lever is located on the left of the steering wheel column.

Left blade RAISE (1) – Pull the lever backward in order to raise the left end of the moldboard. When you release the lever, the lever will return to the HOLD position. The moldboard height will remain in the selected position.

HOLD (2) – When you realse the lever from the lift or lower position, the lever will return to the HOLD position. The moldboard height will remain in the selected position.

Left blade LOWER (3) – Push the lever forward in order to lower the left end of the moldboard. When you release the lever, the lever will return to the HOLD position. The moldboard height will remain in the selected position.

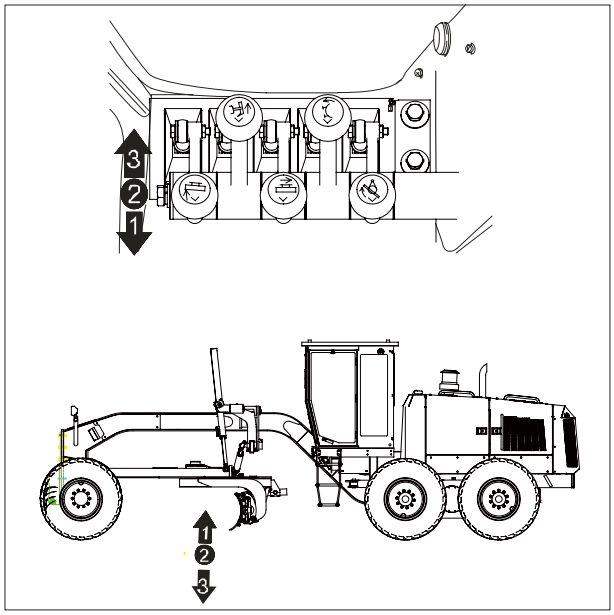


Fig. 3-15

3.2.1.2 Rear scarifier control lever

As shown in callout 2 in Fig.3-14 on Page 3-10, rear scarifier (if equipped) control lever is located on the left of the steering wheel column.

Rear scarifier RAISE (1) – Pull the lever backward in order to raise the rear scarifier. When you release the lever, the lever will return to the HOLD position. Rear scarifier will remain in the selected position.

HOLD (2) – When you realse the lever, the lever will return to the HOLD position. The rear scarifier will remain in the selected position.

Rear scarifier LOWER (3)–Push the lever forward in order to lower the rear scarifier. When you release the lever, the lever will return to the HOLD position. Rear scarifier will remain in the selected position.

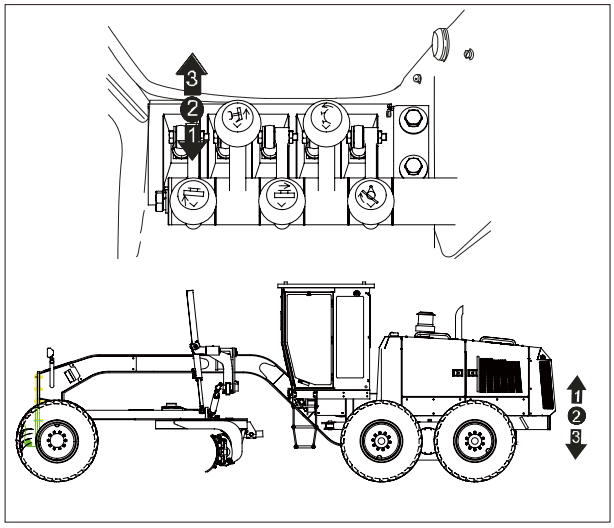


Fig. 3-16

3.2.1.3 Moldboard side shift control lever

As shown in callout 3 in Fig.3-14 on Page 3-10, moldboard side shift control lever is located on the left of the steering wheel column.

Moldboard side shift RIGHT (1) – Pull the lever backward in order to side shift the moldbard to the right. When you release the lever, the lever will return to the HOLD position. The moldboard will remain at the selected position.

HOLD (2) – When you realse the lever, the lever will return to the HOLD position. The rear scarifier will remain in the selected position.

Moldboard side shift LEFT (3) – Push the control lever forward in order to side shift the moldboard to the left. When you release the lever, the lever will return to the HOLD position. The moldboard will remain in the selected position.

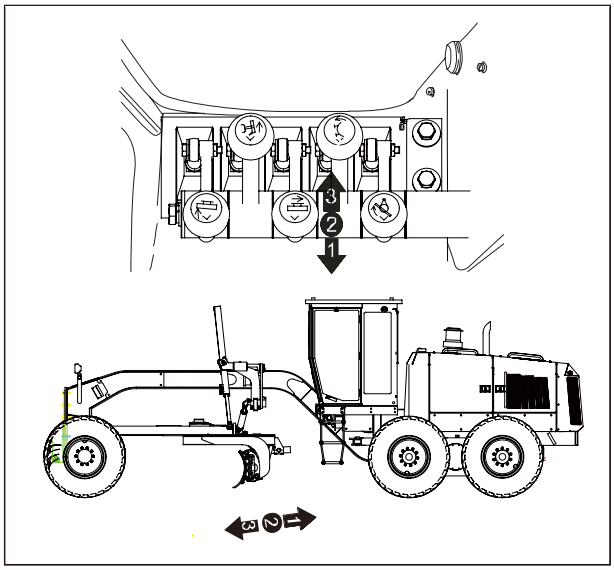


Fig. 3-17

3.2.1.4 Moldboard hitch control lever

As shown in callout 4 in Fig.3-14 on Page 3-10, moldboard hitch control lever is located on the left of the steering wheel column.

Moldboard pitch BACKWARD (1)– Pull the control lever backward in order to pitch the moldboard backward, when you release the lever, the lever will return to the HOLD position. The moldboard pitch will remain in the selected position.

HOLD (2) – When you realse the lever, the lever will return to the HOLD position. The moldboard pitch will remain in the selected position.

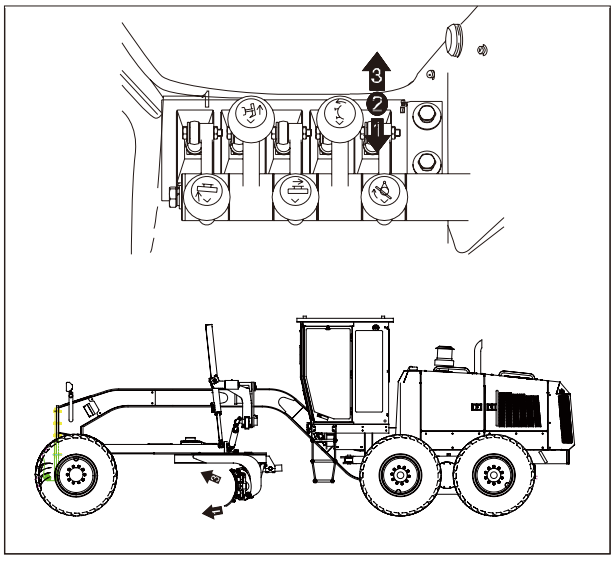


Fig. 3-18

Moldboard pitch FORWARD (3) – Push the control lever forward in order to pitch the moldboard forward, when you release the lever, the lever will return to the HOLD position. The moldboard pitch will remain in the selected position.

3.2.1.5 Circle turn control lever

As shown in callout 5 in Fig.3-14 on Page 3-10, circle turn control lever is located on the left of the steering wheel column.

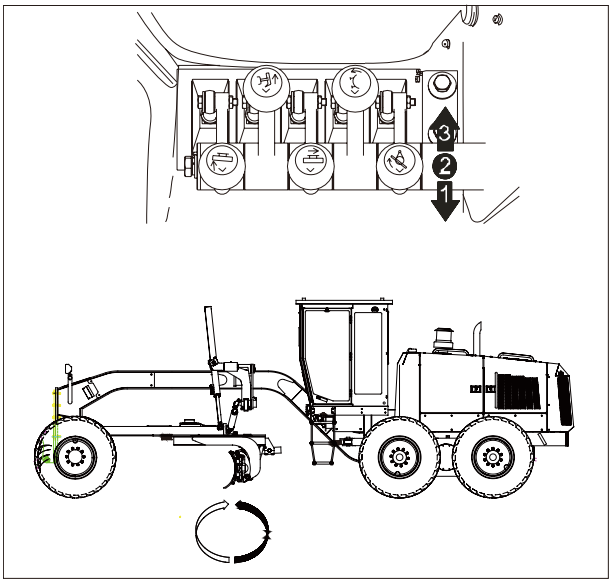


Fig. 3-19

Circle turn CLOCKWISE (1) – Pull the lever backward in order to rotate the moldboard in a clockwise direction. When you release the lever, the lever will return to the HOLD position. The moldboard circle will remain in the selected position.

HOLD (2) – When you realse the lever, the lever will return to the HOLD position. The moldboard circle will remain in the selected position.

Circle turn Counterclockwise (3)– Push the lever forward in order to rotate the moldboard in a counterclockwise direction. When you release the lever, the lever will return to the HOLD position. The moldboard circle will remain in the selected position.

3.2.1.6 Drawbar center shift control lever

As shown in callout 6 in Fig.3-14 on Page 3-10, drawbar center shift control lever is located on the right of the steering wheel column.

Drawbar center shift RIGHT (1)– Pull the lever backward in order to move the drawbar to the right. When you release the lever, the lever will return to the HOLD position. The drawbar will remain in the selected position.

HOLD (2) – When you realse the lever, the lever will return to the HOLD position. The drawbar will remain in the selected position.

Drawbar center shift Left (1)– Push the lever forward in order to move the drawbar to the left. When you release the lever, the lever will return to the HOLD position. The drawbar will remain in the selected position.

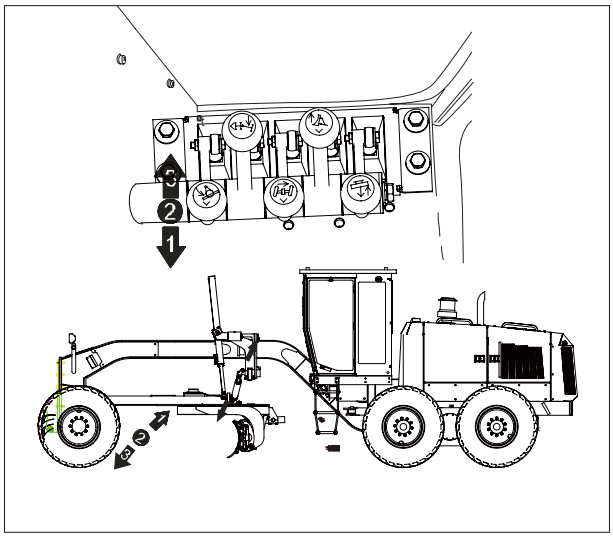


Fig. 3-20

3.2.1.7 Articulation steering control lever

As shown in callout 7 in Fig.3-14 on Page 3-10, articulation control lever is located on the right of the steering wheel column.

Articulation RIGHT (1)– Pull the lever backward in order to move the rear of the machine to the right. When you release the lever, the lever will return to the HOLD position. The machine articulation will remain in the selected position.

HOLD (2) – When you realse the lever, the lever will return to the HOLD position. The machine articulation will remain in the selected position.

Articulation LEFT (3)– Push the lever forward in order to move the rear of

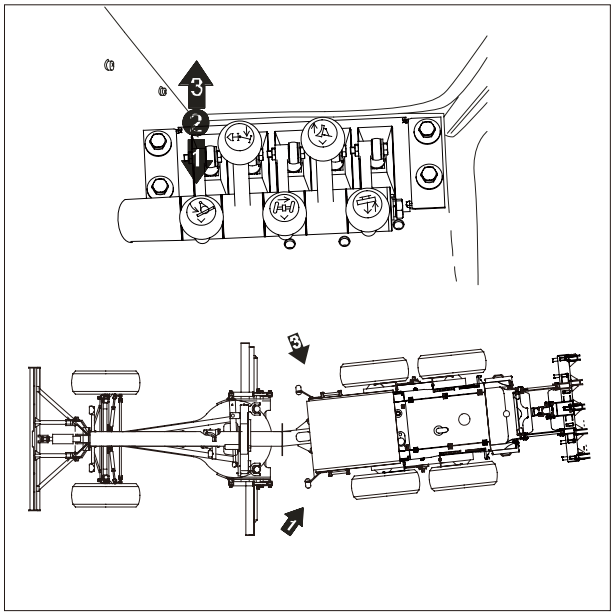


Fig. 3-21

the machine to the left. When you release the lever, the lever will return to the HOLD position. The machine articulation will remain in the selected position.

3.2.1.8 Dozer plate control lever

As shown in callout 8 in Fig.3-14 on Page 3-10, dozer plate (If equipped) control lever is located on the right of the steering wheel column.

Dozer plate RAISE (1)– Pull the lever backward in order to raise the dozer plate. When you release the lever, the lever will return to the HOLD position. Dozer plate will remain in the selected position.

HOLD (2) – When you realse the lever, the lever will return to the HOLD position. The dozer plate will remain in the selected position.

Dozer plate LOWER (3)– Push the lever forward in order to lower the dozer plate. When you release the lever, the lever will return to the HOLD position. Dozer plate will remain in the selected position.

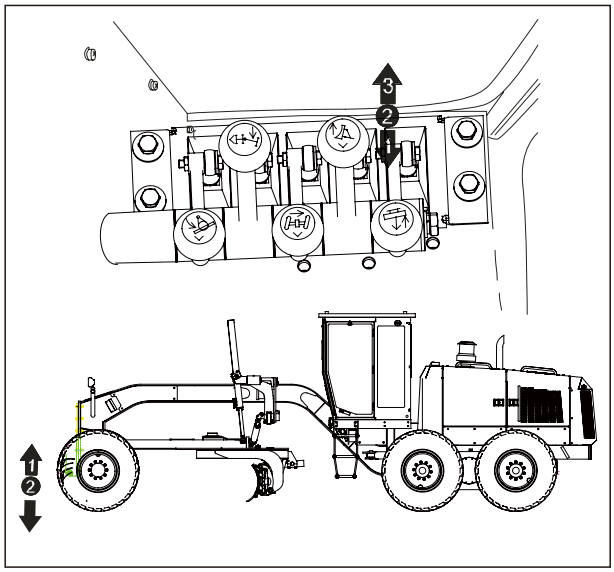


Fig. 3-22

3.2.1.9 Front wheel lean control lever

As shown in callout 9 in Fig.3-14 on Page 3-10, front wheel lean control lever is located on the right of the steering wheel column.

Front wheel lean RIGHT (1)– Pull the lever backward to lean the wheels to the right, when you release the lever, the lever will return to the HOLD position. The wheel lean will remain in the selected position.

HOLD (2) – When you release the lever, the lever will return to the HOLD position. The front wheel will remain in the selected position.

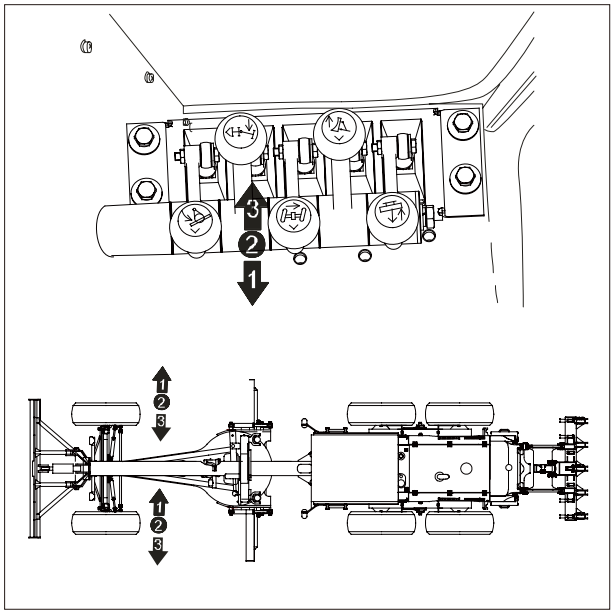


Fig. 3-23

Front wheel lean LEFT (3)– Push the lever forward to lean the wheels to the left, when you release the lever, the lever will return to the HOLD position. The front wheel will remain in the selected position.

3.2.1.10 RIght blade lift control lever

As shown in callout 10 in Fig.3-14 on Page 3-10, right blade lift control lever is located on the right of the steering wheel column.

Right blade RAISE (1)– Pull the lever backward to raise the right end of the blade. When you release the lever, the lever will return to the HOLD position. The moldboard height will remain in the selected position.

HOLD (2) – When you realse the lever from the RAISE or LOWER position, the lever will return to the HOLD position. The moldboard height will remain in the selected position.

Right blade LOWER (2)– Push the lever forward to lower the right end of the blade. When you release the lever, the lever will return to the HOLD position. The moldboard height will remain in the selected position.

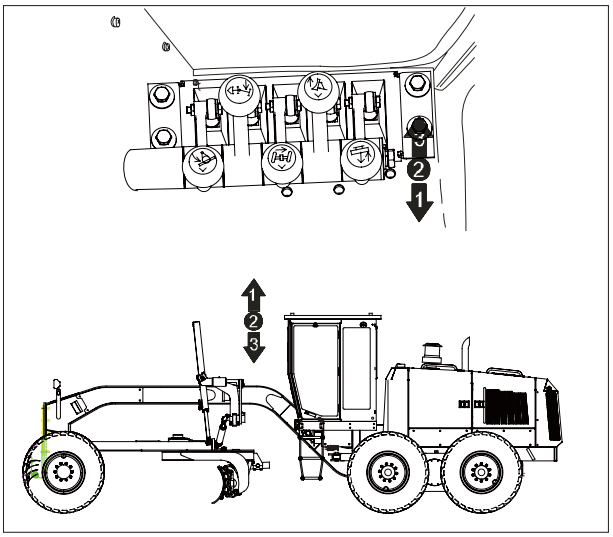


Fig. 3-24

3.2.2 Front control panel

As shown in Fig.3-25, front control panel consists of SANY display (1) and switch group (2).

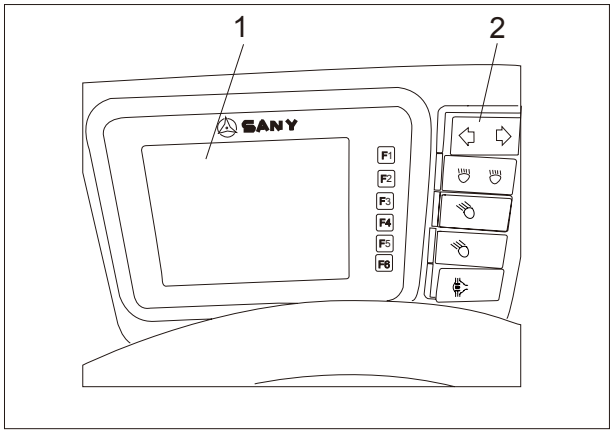


Fig. 3-25

For more information on the display, **see: chapter 3.3 Display on page 3-34.**

Front switch group locates on the right of the display, including turn light switch, differential lock switch, auto gear switch (option) and service light switch.

3.2.2.1 Turn light switch

Turn light switch (1) is used to turn on the turn light (2) to alert people in steering. The locations of the turn lights are shown in Fig. 3-26. One turn light locates on the left and the other locates on the right.

The turn light switch has three positions:

- Left position: Left turn light flickers.
- Middle position: Turn off the light.
- Right position: Right turn light flickers.

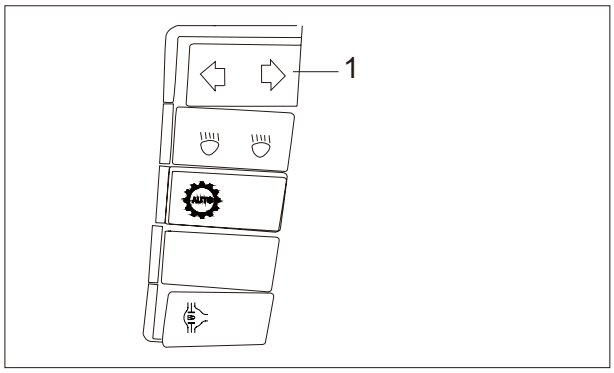


Fig. 3-26

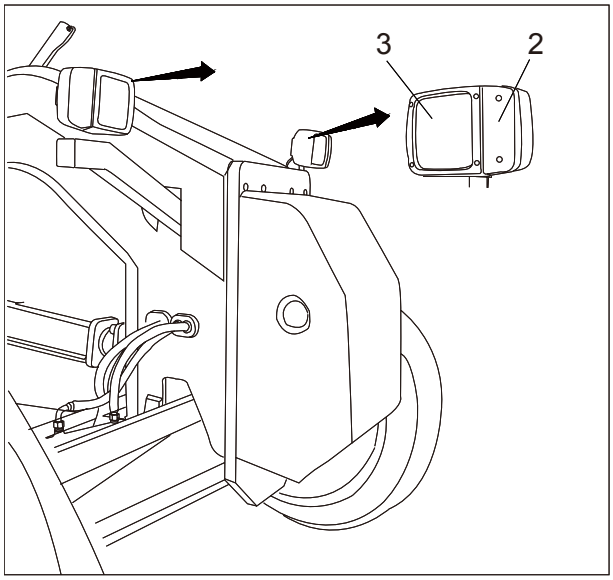


Fig. 3-27

3.2.2.2 Headlight switch

The headlight switch (1) (2) is used to turn on or turn off the headlight (**See callout 3 in Fig.3-27**). One headlight is on the left and the other is on the right.

The headlight switch has three positions:

- Left position: Turn on the dipped beam headlight.
- Middle position: Turn off the headlight.
- Right position: Turn on the high beam headlight.

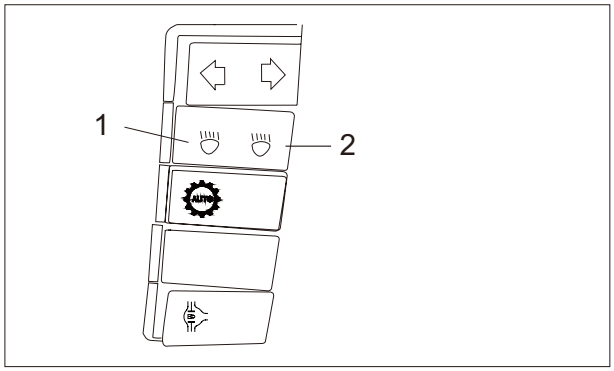


Fig. 3-28

3.2.2.3 Auto gear switch (option)

Auto gear switch (1) is used to shift gears automatically. The gear control level only can control running directions rather than gear shifts. The system can choose the optimum gear according to the consitions of the machine.

- Left position: Turn on the auto gear switch.
- Right position: Turn off the auto gear switch.

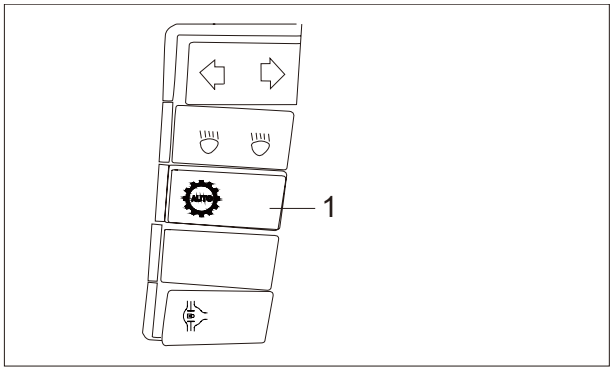


Fig. 3-29

3.2.2.4 Differential lock switch

Differential lock switch (1) is used to open or close the differential lock of rear axle. Open the differential lock to lock the speed of left, right rear wheels and prevent a side of wheel track slip.

- Left position: Open the differential lock.
- Right position: Close the differential lock.

NOTICE

Differential lock is only used when traveling straightly. When traveling, if it is necessary to turn, please close the differential lock to prevent the machine from being damaged.

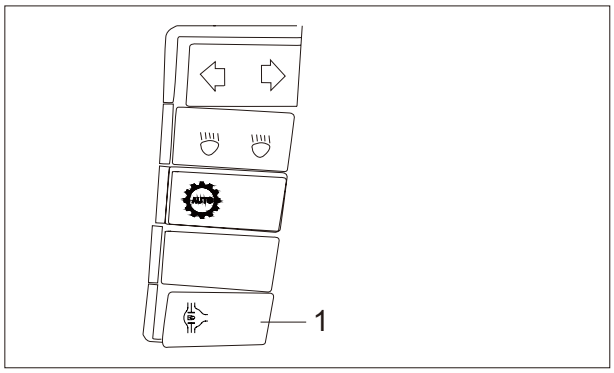


Fig. 3-30

3.2.3 Display

The display is mounted on the front console in the cab, which is used to display the operation inforamtion of the machine and provide operation menu (**For the main pages of the display, see: chapter 3.3.2 "Main menu' on page 3-35**).

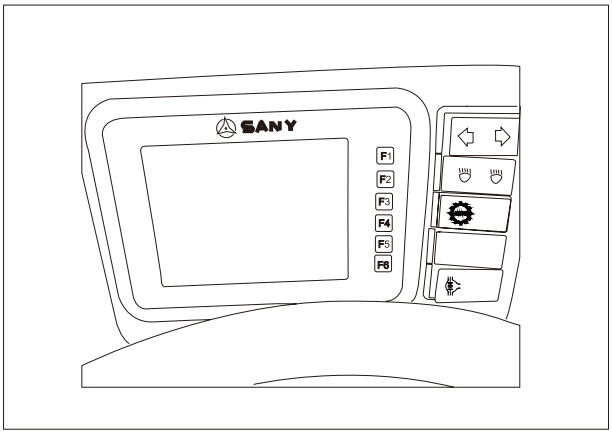


Fig. 3-31

3.2.4 Steering wheel

Steering wheel (1) controls the steering of the machine. The steering of the machine is the same as the steering wheel turning.

- Turn left: Turn the steering wheel counterclockwise, and the machine will turn left. More quickly the steering wheel turns counterclockwise, more abruptly the machine turns left.
- Turn right: Turn the steering wheel clockwise, and the machine will turn right. More quickly the steering wheel turns clockwise, more abruptly the machine turns right.

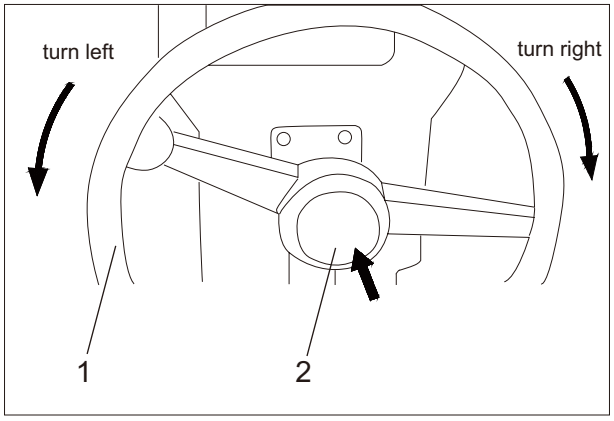


Fig. 3-32

The steering gear has the emergency steering function:
Front-wheel steering could be realized when the engine is not started.
Process: Turn the steering wheel, the steering wheel could suck oil from hydraulic oil tank to front wheel steering cylinder to realized front-wheel steering.

3.2.5 Horn switch

The location of the horn switch (2) is shown in **Fig.3-32 on page 3-20**.

- Press the switch: Sound the horn to alert people around.
- Release: Stop sounding the horn.

Note:
Observe the local traffic law and regulations when driving the motor grader on the no-tooting section.

3.2.6 Service brake pedal

As shown in callout 6 in Fig.3-16 on Page 3-9, the service brake pedal (1) is mounted on the right lower of the steering wheel.

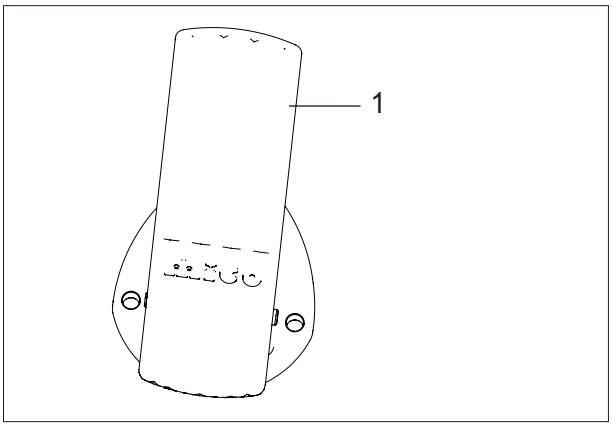


Fig. 3-33

In case of the following conditions, depress the service brake pedal:

- Decrease the speed
- Stop the machine

Release the service brake pedal to stop braking.

Brake system has emergency brake function. Depress the brake pedal with the engine shutoff to realize emergency brake.
Process: The operator depresses the service brake pedal and the accumulator provides pressure oil to the four brakes through the brake valve in order to brake. The set pressure of accumulator is 159bar. Charge the accumulator once, and emergency brake could be realized at least for five times.

3.2.7 Throttle pedal

As shown in callout 7 in Fig.3-16 on Page 3-9, the throttle pedal (1) is mounted on the right of the brake pedal (**For the location of brake pedal, see: chapter 3.2.6 "Service brake pedal" on Page 3-21**).

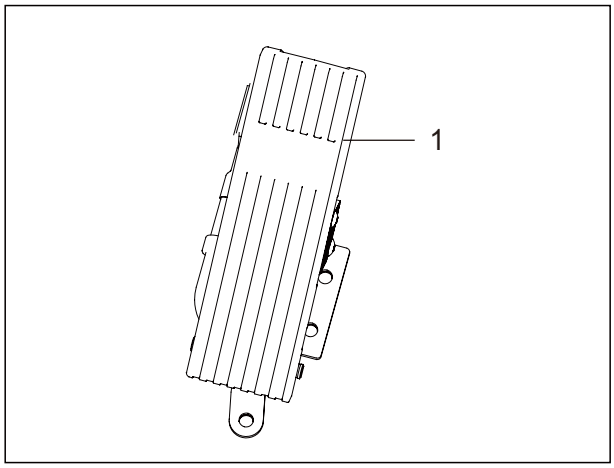


Fig. 3-34

The functions of the throttle pedal are as follows:

- Increase the engine speed: Depress the throttle pedal in order to increase the engine speed. The engine will return to the setting of the throttle control when you release the throttle pedal.
- Decrease the engine speed: Release the throttle pedal to decrease the engine speed.

3.2.8 Right console

As shown in Fig.3-35, the right console is composed of the following parts:

- Gear selector (1)
- Ignition switch (2)
- Power socket (3)
- Right switch group (4): including parking light switch, service light switch, washer switch and front wiper switch.
- Electronic throttle (5)

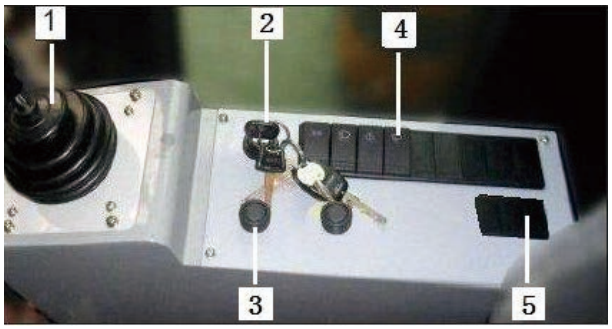


Fig. 3-35

3.2.8.1 Transmission control lever

As shown **in Fig.3-36 on page 3-23**, the transmission control lever has four positions: forward, neutral, parking and reverse.

F **FORWARD –** From the NEUTRAL position, push the transmission control lever forward to move the machine forward. Lean the lever right to upshift the transmission to the desired forward speed. Lean the lever left to downshift the transmission to the desired speed.

NEUTRAL – Move transmission control lever to the MIDDLE position in order to place the transmission in NEUTRAL.

PARKING: The engine could be started only when the transmission control lever is at the PARKING position.

When transmission control lever is at the NEUTRAL position, move the lever right to move the machine in the PARKING position and the shift lever will be locked at the PARKING position. Raise the lever lock switch to unlock and shift to the NEUTRAL position. The transmission control lever can only be locked in the PARKING position.

REVERSE: From the NEUTRAL position, pull the transmission control lever backward to move the machine reverse, Lean the lever right to upshift the transmission to the desired reverse speed. Lean the lever left to downshift the transmission to the desired reverse speed.

NOTE: If the backup cam is installed, push the level from the neutral position backwards to make the grader reverse, and the image of the rear area will be on the display.

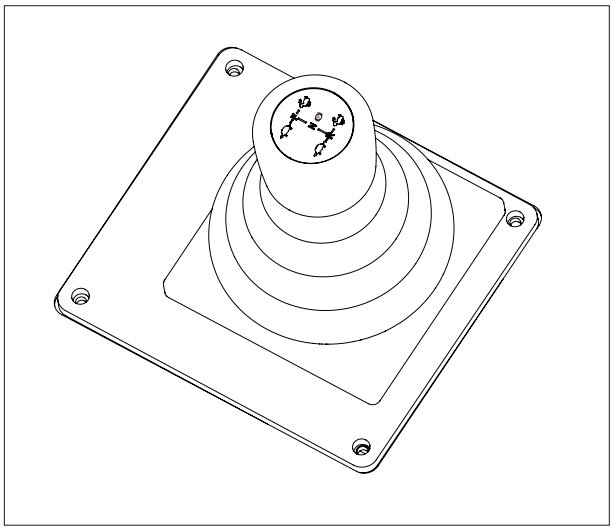


Fig. 3-36

NOTICE

Pull up to release parking brake. Barbarous operation is forbidden.

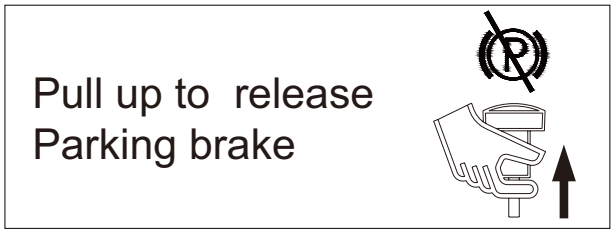


Fig. 3-37

Changing Direction

(1) Make sure that throttle pedal (**see: chapter 3.2.7 on page 3-22**) is at the LOW IDLE position.

(2) Apply transmission modulator control (inching pedal) (**see: chapter 3.2.13 on page 3-31**)

(3) Apply service brake pedal (**see: chapter 3.2.6 on page 3-21**).

(4) Achieve the following condition: The transmission control lever (**see: chapter 3.2.8.1 on page 3-22**) is in the NEUTRAL position.

(5) Use transmission control lever in order to select the desired direction.

(6) Release the service brake control.

(7) Release the transmission modulator control (inching pedal).

(8) Depress the throttle pedal until the desired speed is attained.

(9) Lean the transmission lever (**see: chapter 3.2.8.1 on page 3-22**) right in order to upshift one speed at a time. Increase engine speed, as required.

(10) Lean the transmission lever left in order to downshift one speed at a time.

(11)To change the machine's direction of travel, slow the machine by using the service brakes. Engage the transmission modulator control (inching pedal) in order to stop the machine. Use transmission control lever in order to select the desired direction. After you select the desired direction, release the service brake control and the transmission modulator control (inching pedal).

3.2.8.2 Ignition switch

As shown in Fig.3-38, turn the ignition key, and the ignition switch has five positions.

Turn the ignition key to "P" "O" position, and the power supply is disconnected; turn the ignition key to "I" position, the power supply is connected; turn the ignition key to "III" position in order to start the engine. The ignition key could return to "I" position. Start the engine only when the transmission control lever at the PARKING position.

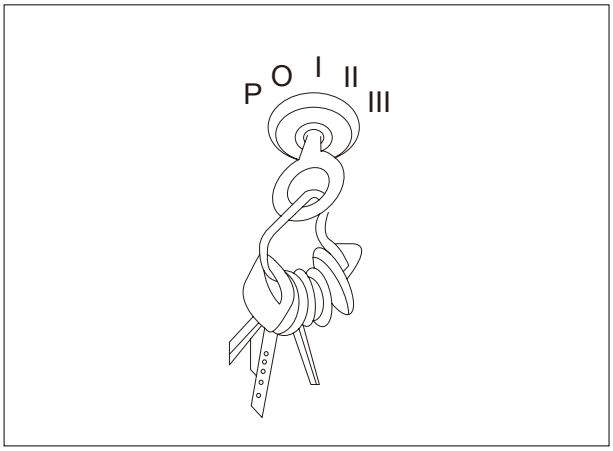


Fig. 3-38

3.2.8.3 Throttle set/accelerate switch

As shown in Fig.3-39, the two switches locate in the right switch group.

When the throttle mode switch (1) is on, the cruise mode is on; When the switch is off, the pedal will work. If the brake or the throttle is applied, the cruise mode will be cancelled. You need to turn on the switch again to enter the cruise mode.

The throttle set/accelerate switch (2) is used to increase or decrease the cruise speed. Press once to increase or decrease speed by 20rpm.

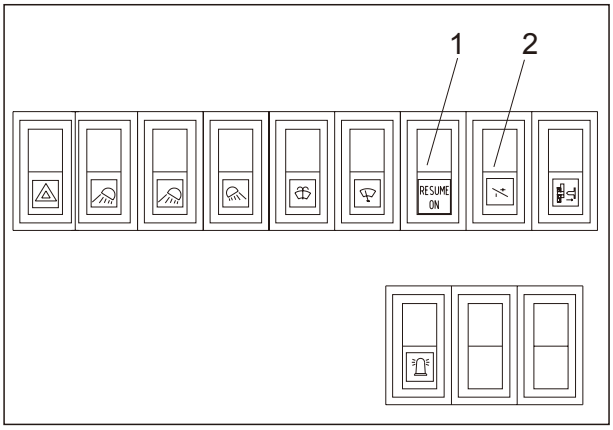


Fig. 3-39

3.2.8.4 Cigar lighter (optional)

As shown in Fig.3-40, the cigar lighter locates on the right of the right console.

Press down the cigar lighter, and draw the cigar lighter to use it after the cigar lighter bounces automatically. It is also used as 24V power supply adapter to provide 5A current.

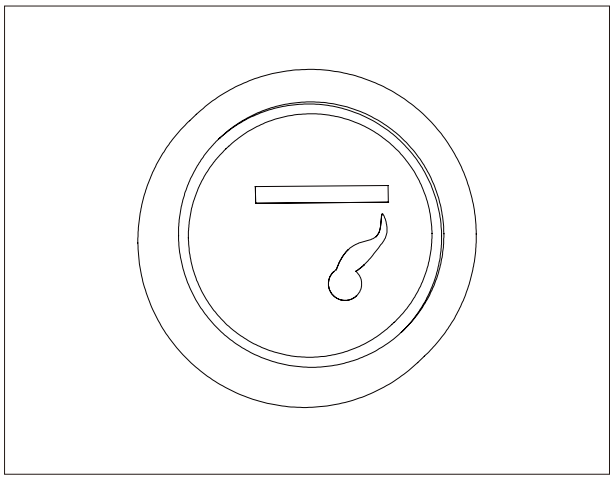


Fig. 3-40

3.2.9 A/C control panel

The A/C system is mainly composed of evaporator, condenser, compressor, heat exchange valve and control panel. It can be used for cooling and warming. The control panel is at the left front side of the cab seat, as shown in Fig.3-42.

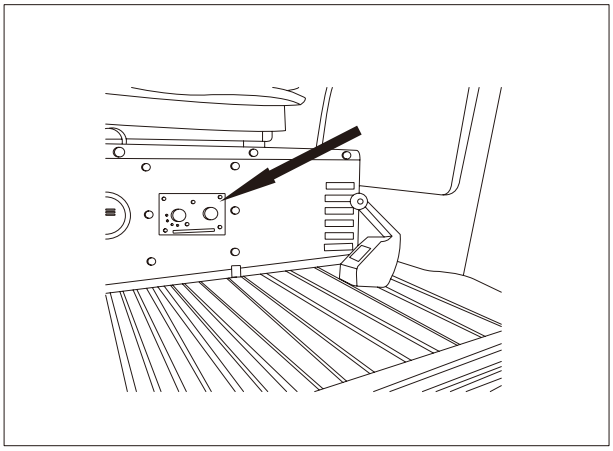


Fig. 3-42

Fan speed control switch (1): Adjust the fan speed.

- Position (O) : Off.
- Position (L) : Low fan speed.
- Position (M) : Medium fan speed.
- Position (H) : High fan speed.

Temperature control switch (3): Turning it can adjust the cooling temperature.

- Rotate clockwise: Reduce temperature.
- Rotate anticlockwise: Increase temperature.

Indicator (2): When it is on, it indicates the compressor has been started and the cooling system is working.

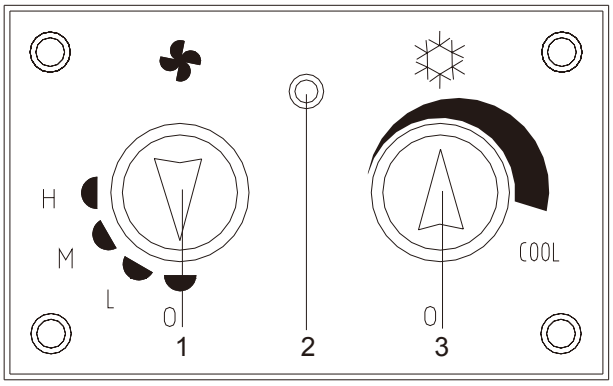


Fig. 3-43

Four air vents are installed in the rear of the cab. Operate the switches on air vents to control the direction of air outlets.

Cooling

1. Start the engine.
2. Turn the fan speed control switch to the "H" position for about 5 min.
3. Turn the temperature control switch to the "COOL" position.
4. When the temperature drops to the desired value, turn the temperature control switch anticlockwise slowly until the indicator goes off and the compressor stops. Now, the cabin temperature is the set temperature.
5. When the cab temperature exceeds this temperature, the indicator is lit up, the compressor starts automatically and the system starts cooling again until the set temperature is reached.

NOTICE

When start the air conditioner for refrigeration in summer, first turn off the hot water valve on the engine. Failure to do so may affect the refrigeration.
When using air conditioner, never turn the temperature control switch to the COOL position with the wind control switch turned to the L position, preventing the evaporator from frosting, which may affect the refrigeration.

Warming

NOTICE

Because the heating system connects with water tank of engine, when the ambient temperature is below 0℃ , drain the water tank with the engine stopped, or add antifreeze fluid into the water tank. Ensure antifreeze fluid couldn't freeze below -30℃ to prevent frost crack of heating system radiator.

- First turn off the temperature control switch.
- Turn on the hot water valve on the engine.
- Turn on the air volume control switch to send out warm air.
- When the desired temperature is reached, turn off the air volume control switch. When the room temperature is lower than the desired temperature, turn on the air volume control switch) again.

3.2.10 Front wiper switch

NOTICE

When you use the wiper, press the washer switch to spray some detergent in order to prevent damage to the wiper due to friction.

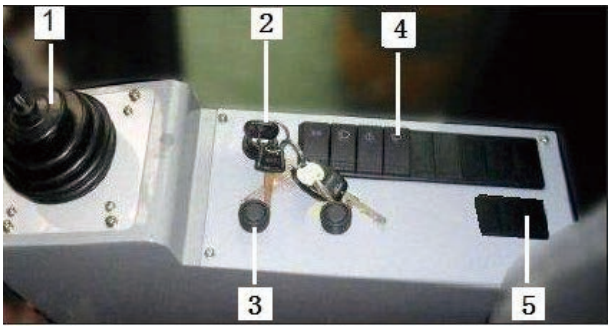


Fig. 3-44

When it is raining or the front window is dirty, you can press the switch to activate the windshield wiper.

- Press the switch (4) upwards and the front windshield wiper will start working.
- Press the switch (4) downwards and the front windshield wiper will stop working.

3.2.11 Door release lever

The location of the door release lever (1) is shown in Fig.3-45. Pull the lever in order to release the door from the locked position. There are two levers on the right and left door.

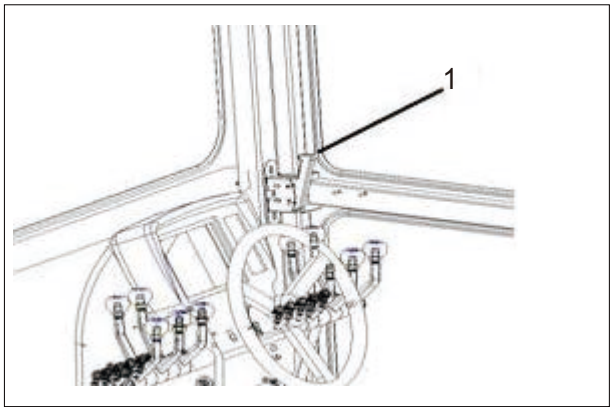


Fig. 3-45

3.2.12 Seat

The operator's seat can be adjusted as follows.

(A) Forward and backward adjustment

Pull the lever (1) upward, slide the seat to the desired position, and release the lever.

(B) Height adjustment

The seat can be raised by 30 mm when you hear a "click" sound, and another 30 mm at the second "click". The seat can be lowered to the minimum height if you continue to lower it.

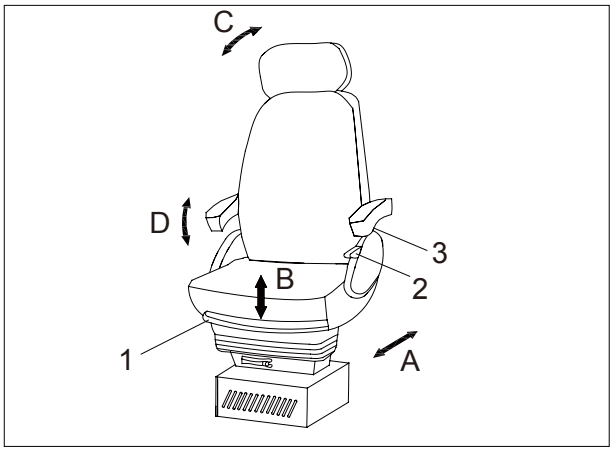


Fig. 3-46

(C) Backrest adjustment

Lift lever (2), move the backrest to an optimum position at where operation can be easily conducted, and release the lever (2).

(D) Armrest angle adjustment

Turning the plate (3) beneath armrest can adjust the angle of armrest to desired position. The armrest can be placed vertically so that the operator could leave the seat easily. 3-30 Adjustable angle:40°.

3.2.13 Inching pedal

As shown in **callout 15 Fig.3-13 on Page 3-15**, the inching pedal (1) is mounted on the left of the front console in the cab. The inching pedal disengages the power to the wheels.

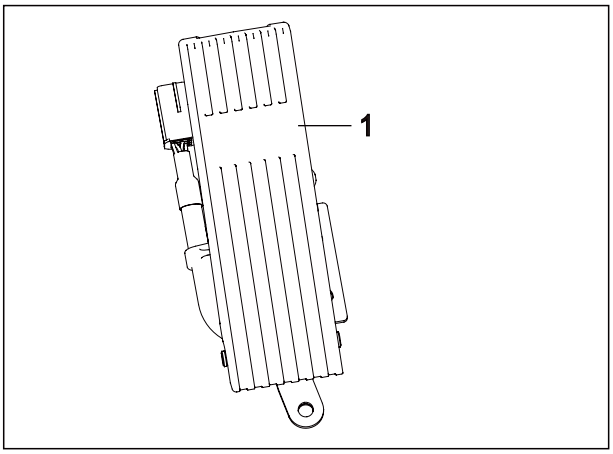


Fig. 3-47

Depress the inching pedal in order to decrease the power to the wheels. A sensor will monitor the position of the inching pedal. As the pedal is depressed, the hydraulic pressure to the direction clutches will vary. When the pedal is depressed completely, the power to the rear wheels will be disengaged.

Depress the inching pedal completely under the following conditions:

- Start the machine and stop the machine.
- Change the direction of the machine.

3.2.14 Battery disconnect switch

Battery disconnect switch locates on the right rear side of the engine compartment, which connects with the positive pole of the power supply.

As shown in the Fig.3-48, the battery disconnect switch has two positions:

ON (1) – To activate the electrical system, turn the battery disconnect switch clockwise. The battery disconnect switch must be turned to the ON position before you start the engine.

OFF (2) – To deactivate the electrical system, turn the battery disconnect switch counterclockwise to the OFF position.

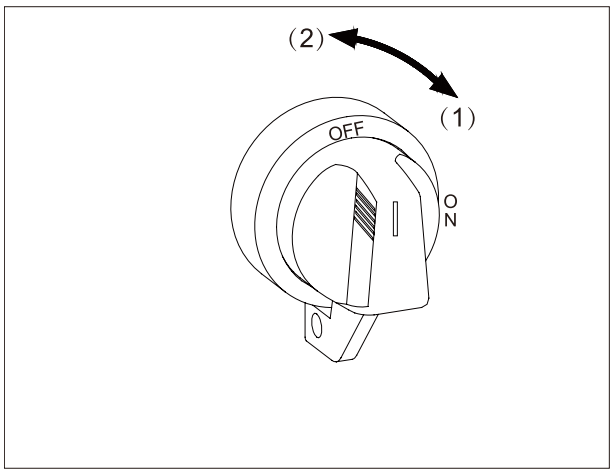


Fig.3-48

The battery disconnect switch operates differently than the engine start switch. When the battery disconnect switch is in the OFF

position, the electrical system is disabled. When the engine start switch is turned to the OFF position and the battery disconnect switch is turned to the ON position, the battery remains connected to the entire electrical system.

Turn the battery disconnect switch to the OFF position when you service the electrical system or other components on the machine.

Turn the battery disconnect switch to the OFF position after you operate the machine. This will prevent the battery from being discharged. The following problems can cause battery discharge:
(1) Short circuits
(2) Current draw via some components
(3) Vandalism

NOTICE

Never move the battery disconnect switch to the OFF position while the engine is operating. Serious damage to the electrical system could result.

3.2.15 Reverse alarm

As shown in Fig.3-49, the reverse alarm is on the rear of the machine at the right side of the machine.

The alarm sounds when the transmission control lever is at the REVERSE position. The alarm alerts the people behind the machine that the machine is reversing.

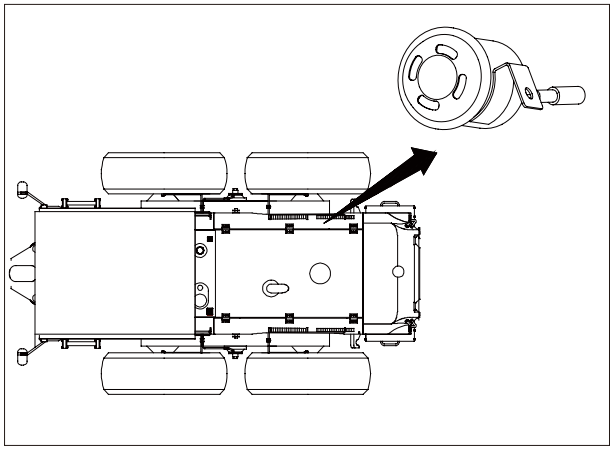


Fig.3-49

3.2.16 Cab flood light

Cab flood light is used to illuminate in the cab, which is mounted on the front of the ceiling. The location of the cab flood light switch (1) is shown in Fig.3-50.

- Press down the left: Turn on the left/right cab flood light.
- Press down the right: Turn off the cab flood light.

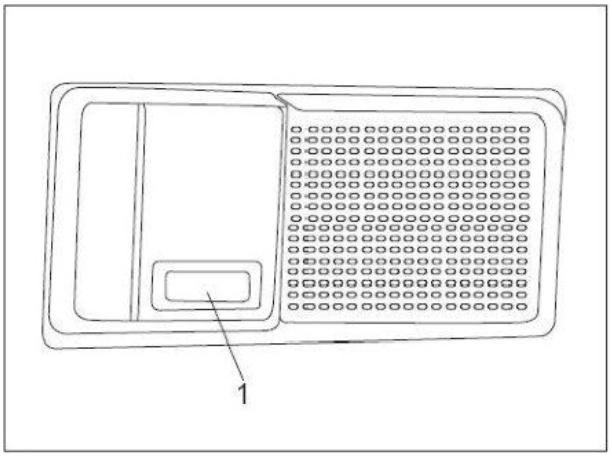


Fig.3-50

3.3 Display

The display is on the front console.

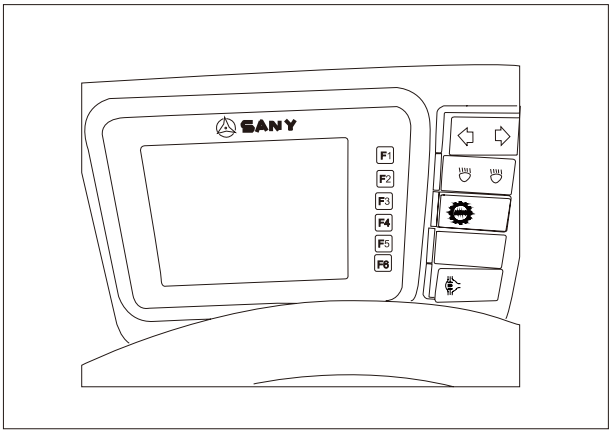


Fig.3-51

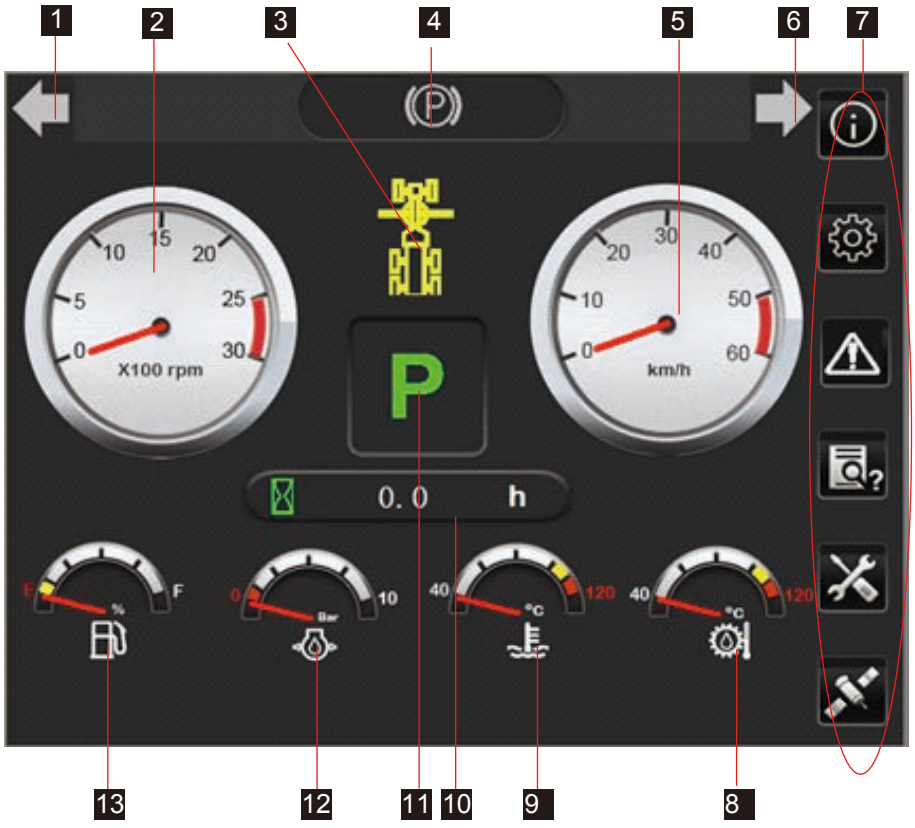
3.3.1 Initial page

Power on. Display shows a welcome interface As shown in Fig. 3-52, after initialization for a few seconds, go to the main interface. (**For more inforamtion, see: chapter 3.3.2 on page 3-35**).

Fig.3-52

3.3.2 Main menu

As shown in Fig.3-53, after initialization for a few seconds, go to the main menu.



1-Left turn indicator 2-Engine tachometer 3-Articulation angle indicator
4-Low parking brake pressure alarm 5-Running speed gauge 6-Right turn indicator 7-Function keys
8-Transmission gear oil temperature indicator 9-Coolant temperature gauge 10-Hourmeter
11-Gear indication 12-Engine oil pressure gauge 13-Fuel level gauge

Fig.3-53

3.3.2.1 Left turn indicator

Left turn indicator indicates status of left turn light: green is on, and gray is off.

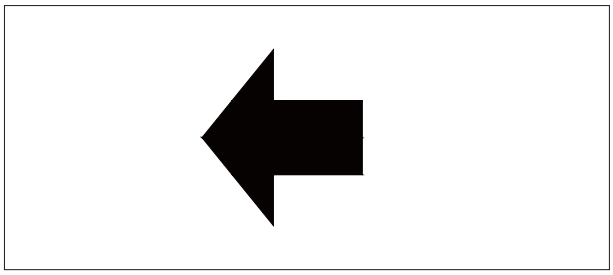


Fig.3-54

3.3.2.2 Engine tachometer

After engine start-up, show the engine's speed. The unit is 1000rmp/min.

- White section is the normal engine speed.
- The value 25 in yellow section refers to 2500rmp/min engine speed.
- Red is exceeding the rated engine speed greatly. Once the cursor comes into the red section, please brake immediately. Find out the fault cause and eliminate.

Fig.3-55

3.3.2.3 Articulation angle indicator

- When the frames are not articulated, the icon turns green.
- When the frames are articulated leftward or rightward, the icon turns yellow.

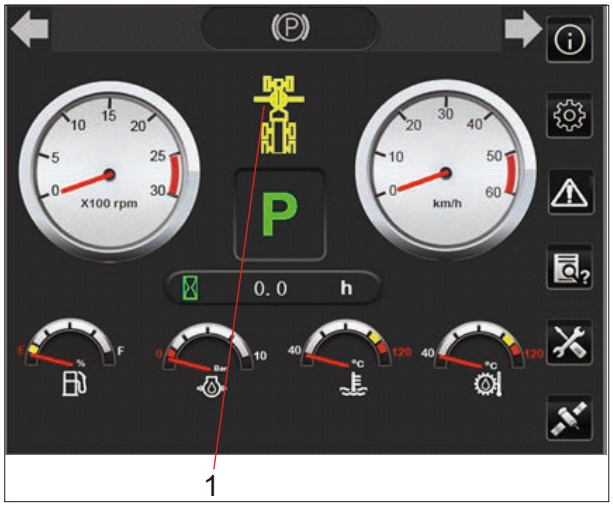


Fig.3-56

3.3.2.4 Parking brake pressure indicator

Parking brake pressure indicator indicates the parking brake pressure:

- Grey: This indicates normal working.
- Red: When the parking brake pressure is low, the parking brake pressure indicator is flickering with the buzzer sounding.

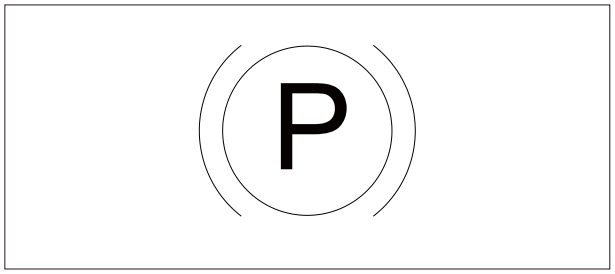


Fig.3-57

3.3.2.5 Engine tachometer

It shows the running speed in 1000 km/h.

- White section is the normal running speed.
- Red is exceeding the rated engine speed greatly. Once the cursor comes into the red section, please brake immediately.

Fig.3-58

3.3.2.6 Right turn indicator

Right turn indicator indicates status of right turn light: green is on, and gray is off.

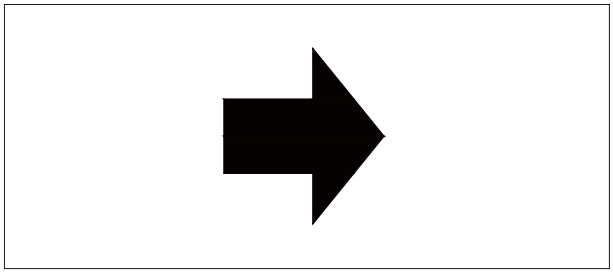


Fig.3-59

3.3.2.7 Function keys

The function keys are appointed with different functions according to the functional pages. Functions of the keys on the main interface:

System information icon(1) for shifting to the system information page.

Parameter setting icon(2)for shifting to the system setting page.

System fault icon (3) for shifting to the fault page. The number in red is the quantity of current faults.

System check icon (4) for shifting to the system check page.

Maintenance icon (5) for shifting to the maintenance list page.

GPS check icon (6) for shifting to the GPS check page.

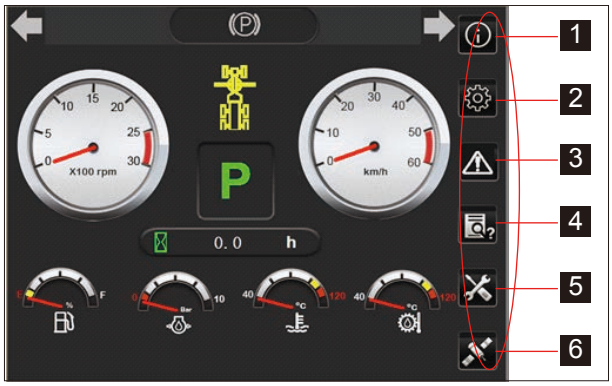


Fig.3-60

3.3.2.8 Transmission gear oil temperature gauge

Transmission gear oil temperature gaug shows the oil temperature of transmission gear within 40 ℃ to 120 ℃ .

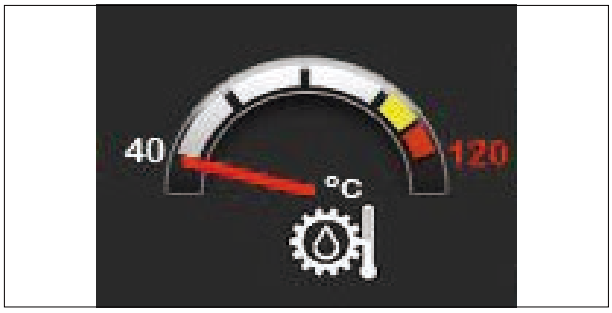


Fig. 3-61

3.3.2.9 Coolant temperature gauge

Coolant temperature gauge shows the coolant's temperature within 80℃ ~110℃ . When coolant temperature is above 105 ℃ , coolant temperature icon displays red and flickers. You must stop operating the machine, reduce the engine speed to idle, and operate it again after alarm is released. If alarm continuously occurs for several times, please inspect the engine for radiator system failure.

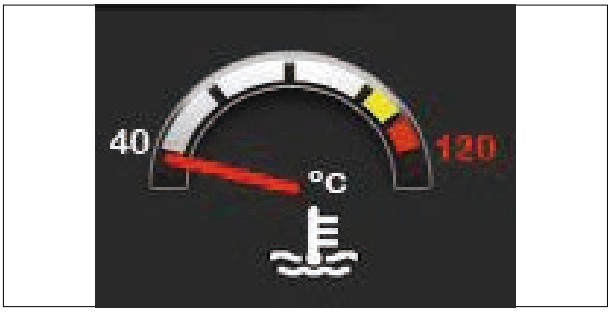


Fig. 3-62

3.3.2.10 Working hours and gear indication

Working hours (2) : Show the accumulative working hours of the machine. Unit: hour.

Gear indication (1): Show 16 kinds of gears: **P, N, F1, F2, F3, F4, F5, F6, F7, F8, R1, R2, R3, R4, R5, R6.**

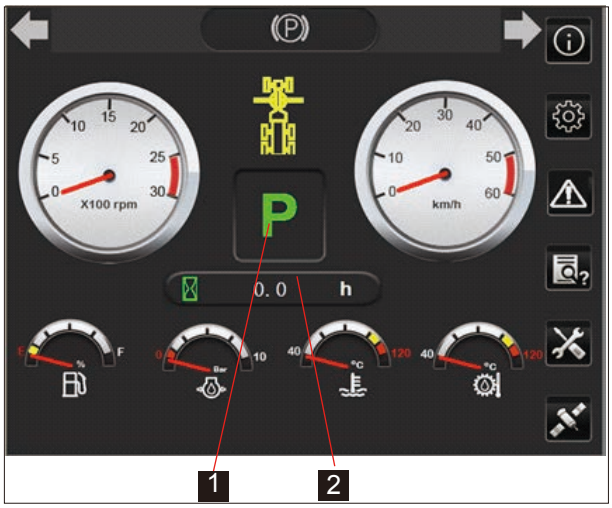


Fig. 3-63

3.3.2.11 Engine oil pressure gauge

The engine oil pressure gauge indicates the engine oil pressure on a real time basis withiin the range of 0-10 bar. Its center mark has three states:

- Yellow: Normal level.
- Red: The engine is not started or the engine speed is 0rpm.
- Flashing: The engine oil pressure is below 1bar after engine startup. There is a safety hazard, and you should stop the machine for check.

Fig.3-64

3.3.2.12 Fuel level gauge

Fuel level gauge shows fuel quantity in fuel tank.

Red section is 0~5%. When fuel is less than 5%, the icon will flicker. Please refuel in time.

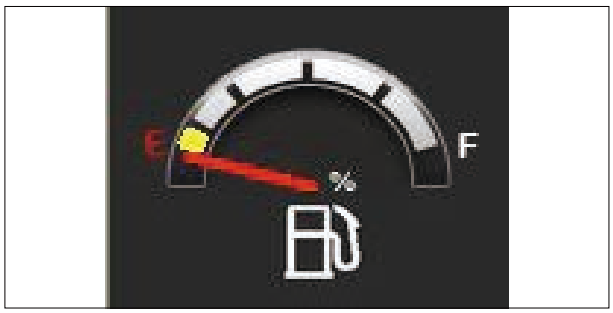


Fig.3-65

3.3.3 System information page

Press F1 on the homepage into the system information page. This page displays respective information of SYMC, SYCD and SYMT modes, including serial number, hardware version, software version and locations.

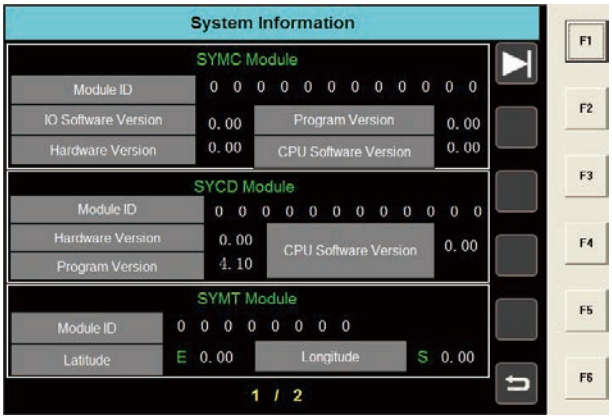


Fig. 3-66

Functions of keys:
- F1:For shifting to another page;
- F6:Return to the previous page.

This page shows the software versions of the display and the controllers after SYCD and controllers are successfully connected.

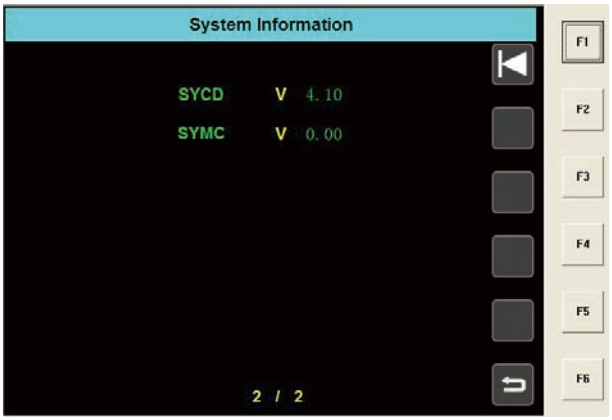


Fig. 3-67

3.3.4 System Setting page

Press F2 on the homepage into this page.
Functions of keys:
- F1: For item shift upward.
- F2: For item shift downward.
- F5: For confirmation.
- F6: To return to the homepage.

Contents of this page:
- Configuration setting: parameters of power train and model of sensors
- Articulation setting
- Language selection: four types of languages such as Chinese, English and etc.

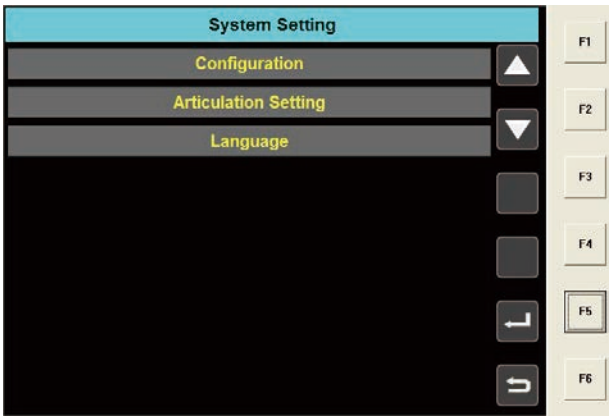


Fig. 3-68

3.3.4.1 Model configuration page

Press F1 or F2 to choose the item of model configuration page on the system setting page and enter the page. Press F5 to enter the specific page. See Fig.3-69.

For power train setting, it includes serial number, model, engine model.

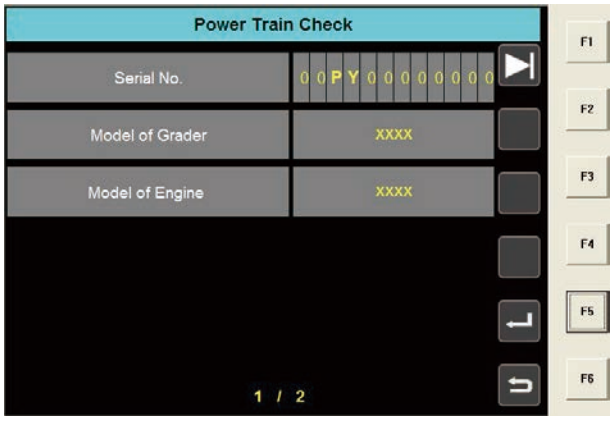


Fig. 3-69

Procedure of configuration modification:
Press F5 to enter this page. See Fig.3-70. Press F1 or F2 to choose "YES" and then press F5 to enter the password page. See Fig.3-70. If you are unwilling to revise the modification information, choose "NO" or directly press F6 to cancel to back to the previous page.

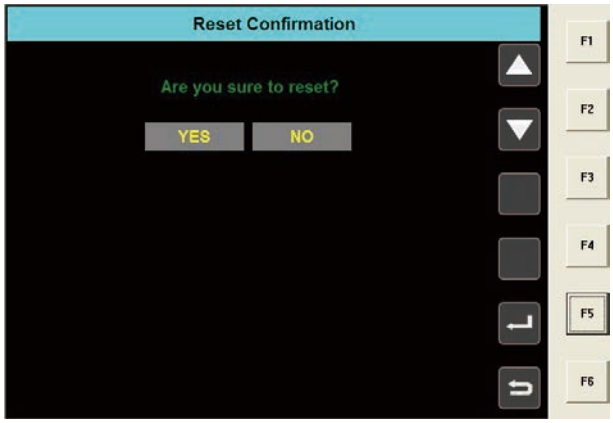


Fig. 3-70

The password is generated according to the guidance code. Record the guidance code and contact with relative personnel to get the password for modification. The configuration modification is prohibited except replacement of major parts.

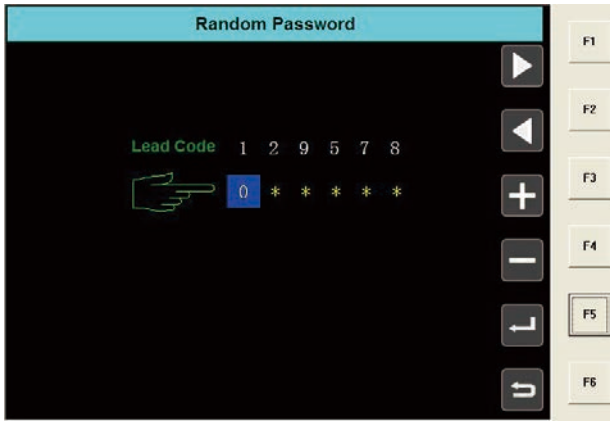


Fig. 3-71

Input to the correct password to enter this revision page. Press F2 to choose the desired item. Press F3 or F4 to choose the parameter or the model. Press F5 to confirm. Wait for 2-3s to check if the modification is done. See Fig.3-72.

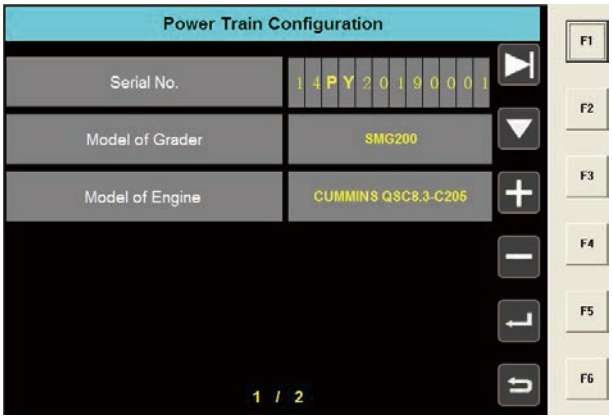


Fig. 3-72

Press F1 on the power train setting page to shift to the sensor model page. Take the same steps of the configuration modificartion to revise sensor models.

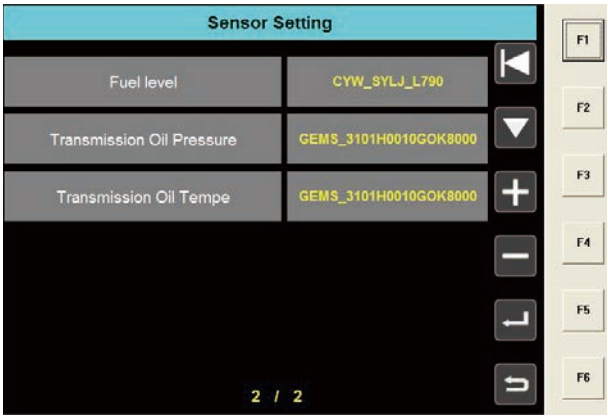


Fig. 3-73

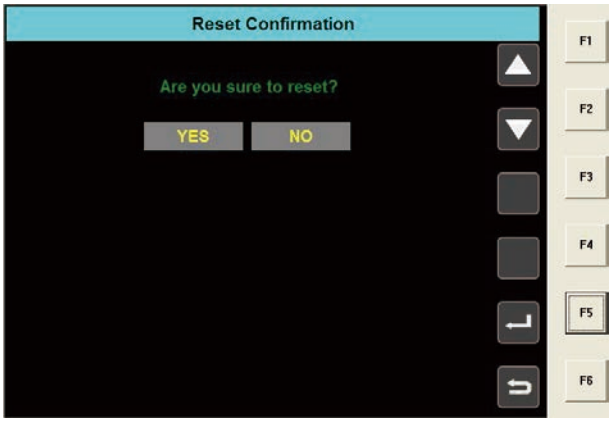


Fig. 3-74

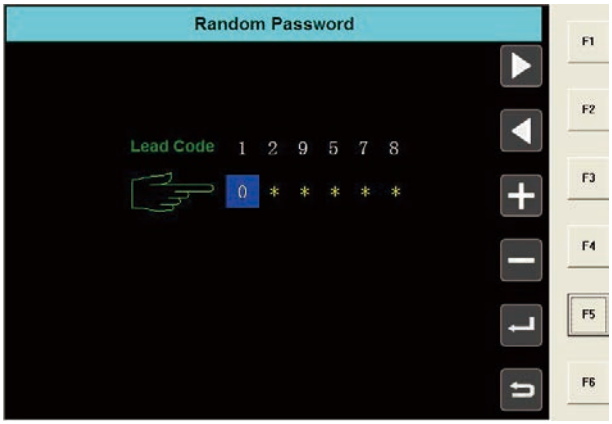


Fig. 3-75

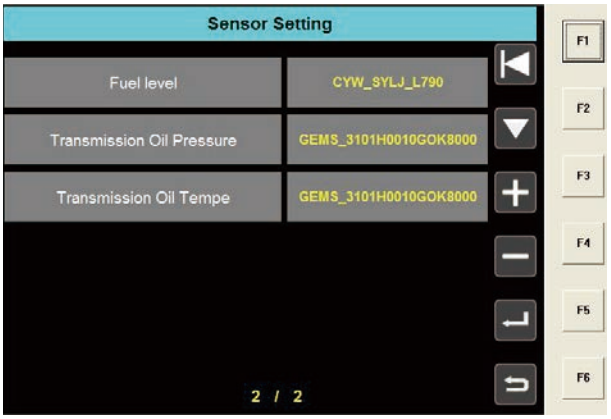


Fig. 3-76

3.3.4.2 Articulation setting page

Press F1 or F2 to choose the item of articulation setting page on the system setting page and enter the page. Press F5 to enter the specific page. See Fig.3-77.

Procedure of articulation setting:

- Move the cursor downwards and press F2 to choose the item of left articulation setting. Turn the articulation to the leftmost position and then press F5 for confirmation.
- Move the cursor downwards and press F2 to choose the item of right articulation setting. Turn the articulation to the rightmost position and then press F5 for confirmation.
- Press F6 back to the previous page.

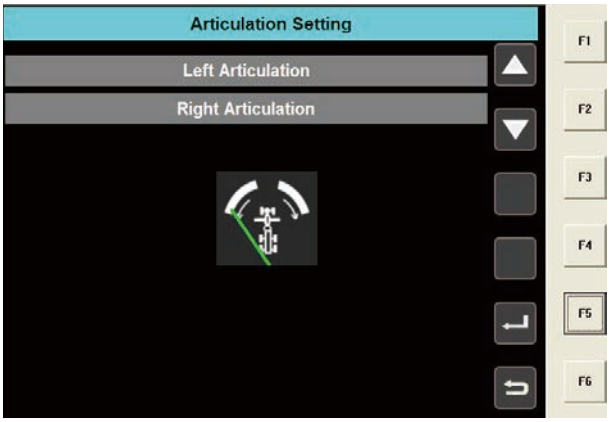


Fig. 3-77

3.3.4.3 Language selection page

On the “System Menu”, press F1 or F2 , the cursor moves to “Language Selection”, press F5 to enter this page. See Fig.3-78. System has 4 languages for the user to choose. The default is Chinese. Press F1 or F2, the cursor moves to choose the desired item. Press F5 amd the display language has been changed. Press F6 back to the previous page.

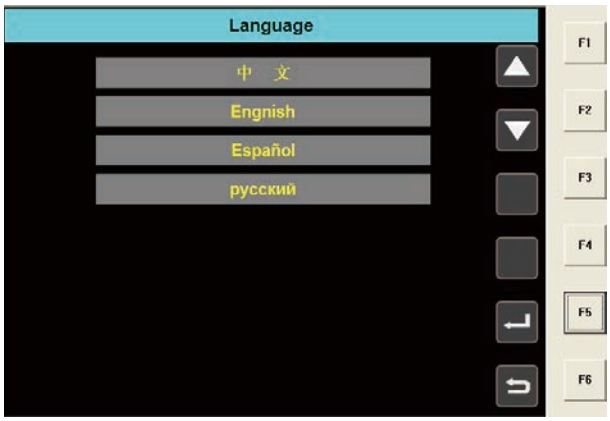


Fig. 3-78

Function of keys:

F1: For shifting to the next language.

F2: For shifting to the previous language.

F5: For shifting to the previous language.

F6: For returning to the previous page.

3.3.5 Fault diagnosis page

This page includes intelligent diagnosis and troubleshooting instructions. Press F3 on the homepage to enter the menu.

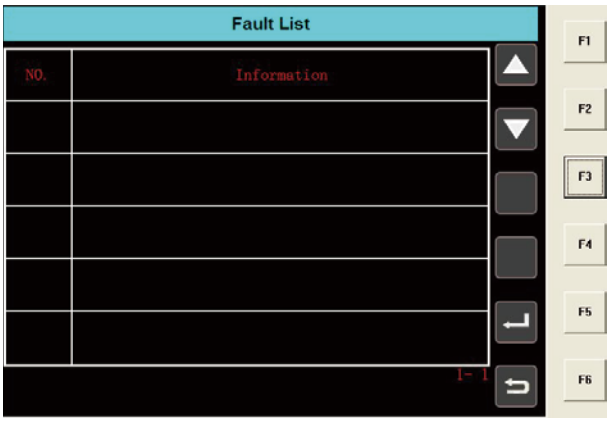


Fig. 3-79

Press F5 to enter the troubleshooting instructions page. See Fig.3-80. Press F6 to return to the previous page.

Fig. 3-80

3.3.6 System check page

This page is used to check the parameters of status of the system. Press F4 on the homepage to enter the menu.

It includes:status check, analog check, digit check and engineer check. Press F1 or F2 to check the desired item. Press F5 to enter the menu.

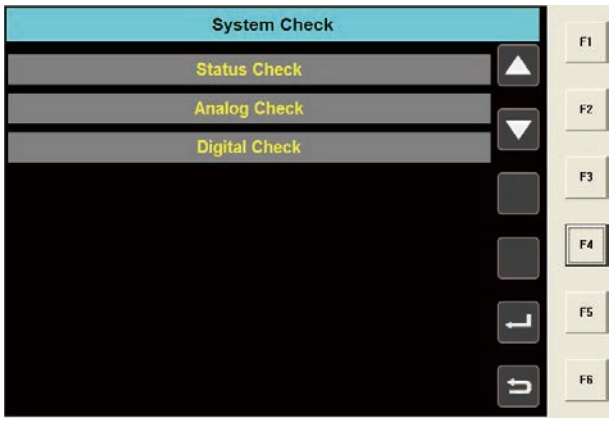


Fig.3-81

3.3.6.1 Status check

Press F1 or F2 on the system function page to choose the item of status check. Press F5 to enter the menu.

On the page, you can view the main parameters of the system, including gear position, running speed, PWM of valves and feedback current.

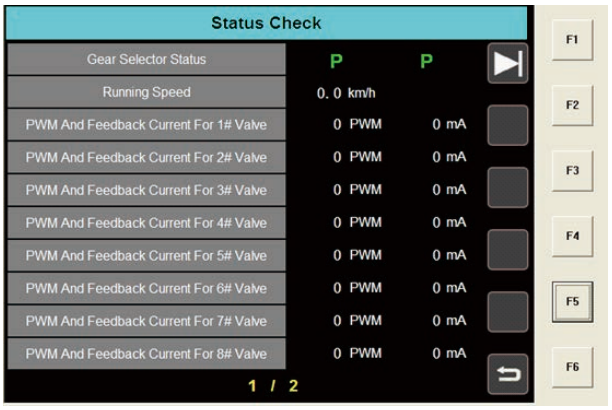


Fig.3-82

3.3.6.2 Analog check

Press F1 or F2 on the system function page to choose the item of analog check. Press F5 to enter the menu.

On the page, you can view fuel level, engine oil pressure, gear oil temperature and coolant temperature. Press F6 to return to the previous page.

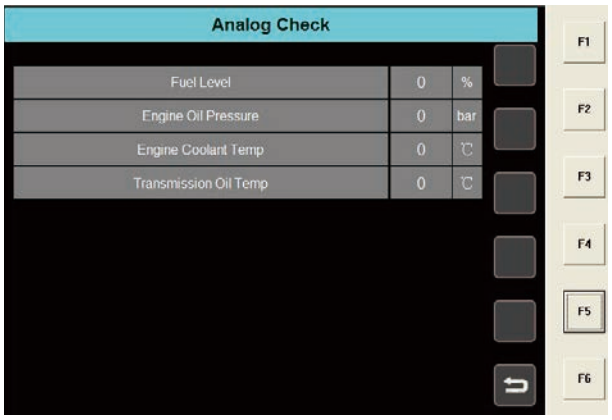


Fig.3-83

3.3.6.3 Digit check

Press F1 or F2 on the system function page to choose the item of digit check. Press F5 to enter the menu.

On the page, you can view brake signal, brake pressure signal, parking signal, charging signal, forward control signal, startup control signal and valve signal. Press F6 back to the previous page.

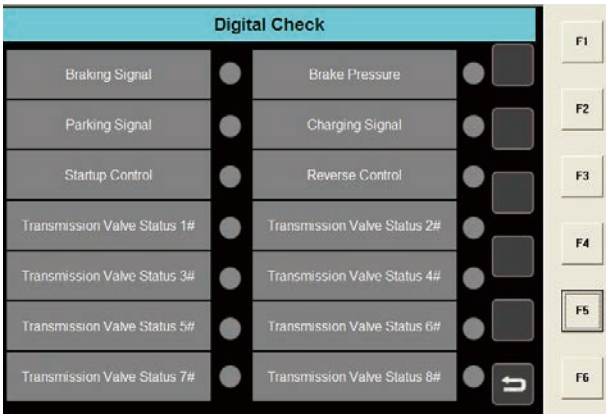


Fig. 3-84

3.3.7 Maintenance instruction page

This page includes mechanical, hydraulic and electical maintenance instructions to guide you to maintain or repair the machine at a certain interval. Press F5 on the homepage to enter this menu.

It includes check maintenance contents, check maintenance history, maintenance comfirmation and password revision.

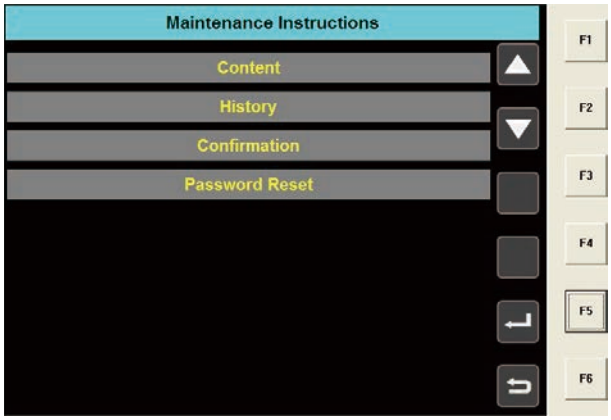


Fig. 3-85

3.3.7.1 Check maintenance content

Press F1 or F2 on the system function page to choose the item. Press F5 to enter the menu. Press F6 to return to the previous page.

On the page, you can review all maintenance contents at all intervals, including daily check, 50h maintenance, 250h maintenance, 500h maintenance, 1000h maintenance. Press F1 or F2 to shift pages.

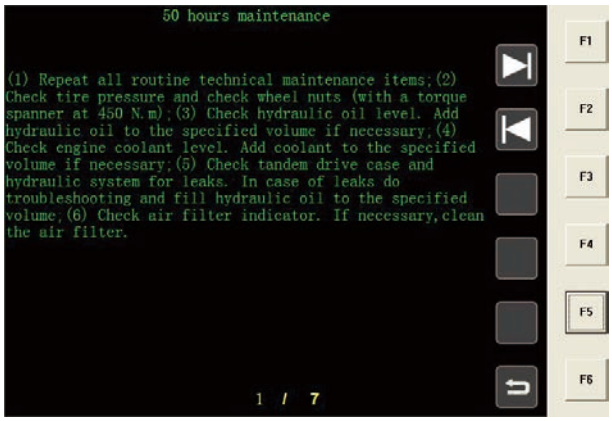


Fig. 3-86

3.3.7.2 Check maintenance history

Press F1 or F2 on the system function page to choose the item. Press F5 to enter the menu. Press F6 to return to the previous page.

On the page, you can review maintenance history. The symbol " √ " means the maintanance has been confirmed. The symbol "?" means the maintanance has not been confirmed or the operational hours has not up to the respective interval. Press F6 to return to the previous page.

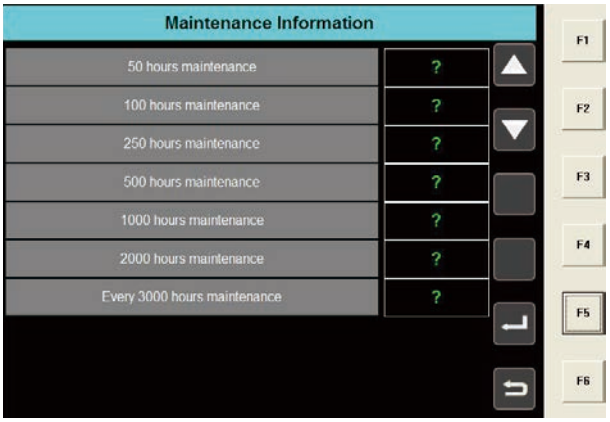


Fig. 3-87

3.3.7.3 Maintenance confirmation

Press F1 or F2 on the system function page to choose the item. Press F5 to enter the menu. Press F6 to return to the previous page.

On the page, you can conform maintenance operation. Press F1 or F2 to choose the desired item. Press F5 to confirm. Press F6 to return to the previous page.

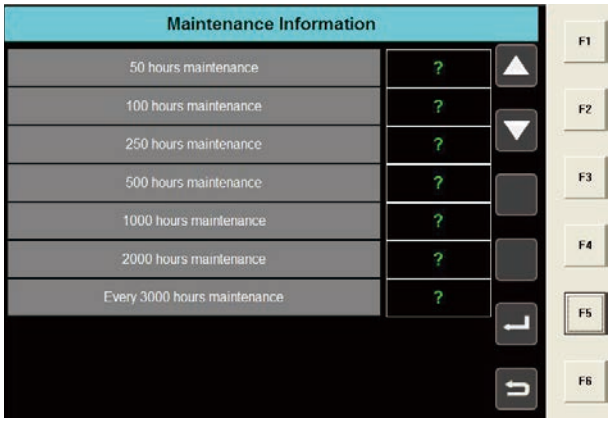


Fig. 3-88

3.3.7.4 Password revision

Press F1 or F2 on the system function page to choose the item. Press F5 to enter the menu. Press F6 to return to the previous page. On the page, you can revise the password. The initial password is 8318.

Functions of keys:

- F1: For shifting to the desired item.
- F2: For shifting to the position of the value (ones, tens, hundreds and thousands).
- F3 or F4: For increasing or decreasing the value (within the cycle of 0~9).
- F5: For saving the revised password.
- F6: For returning to the maintenance instruction page.

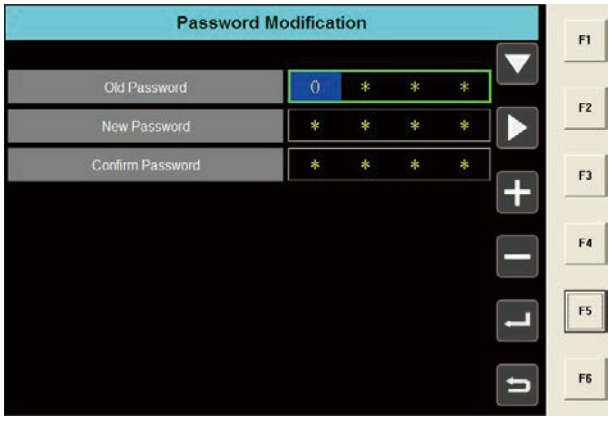


Fig. 3-89

3.3.8 GPS information page (option)

Press F6 on the system function page to enter the menu. This page includes GPS and remote locking status.

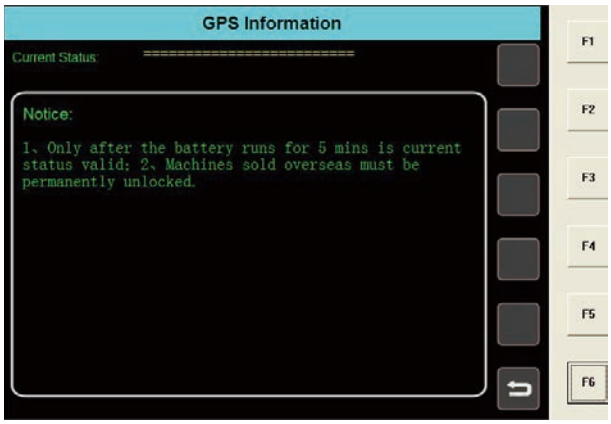


Fig. 3-90

Status has four:

- Forbidden for local lock and remote lock.
- Forbidden for remote lock, but local lock.
- Forbidden for local lock, but remote lock.
- Allowable for local lock and remote lock.

Generally, as for the machines sold in China, it is allowable for local lock and remote lock. As for the machines sold overseas, it is forbidden for local lock and the remote lock. Press F6 to return to the previous page.

3.4 Ground Refuelling System (Option)

3.4.1 Function

As shown in Fig.3-91, ground refuelling system is mainly composed of fuel tank (1), controller (2), three-way valve (3), oil pump (4), and oil pipe (5) of external oil source. The fuel tank capacity is 35.6L, which is used to store fuel. Ground refuelling could be realized due to the low mounting position of the ground refuelling system.

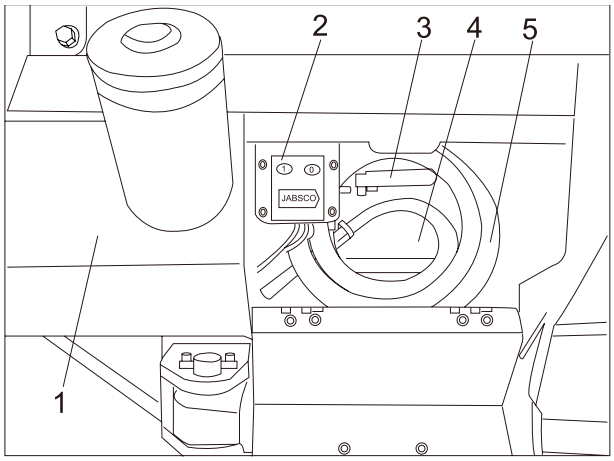


Fig. 3-91

There are a green button (1) and a red button (0) on the controller. Press the green button to start the oil pump. Press the red button to stop the oil pump.

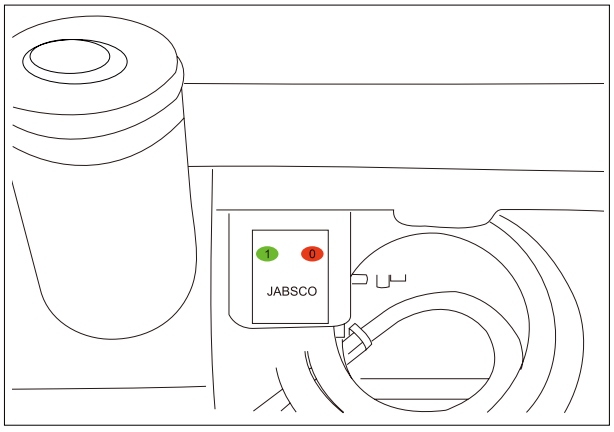


Fig. 3-92

3.4.2 Instruction for use

As shown in Fig.3-93, when the three-way valve handle is at the position (B), the ground fuel tank connects with the machine fuel tank. Press the button (A) of the controller in order to make the fuel flow from the ground fuel tank to the three-way valve, to the oil pump and into the machine fuel tank.

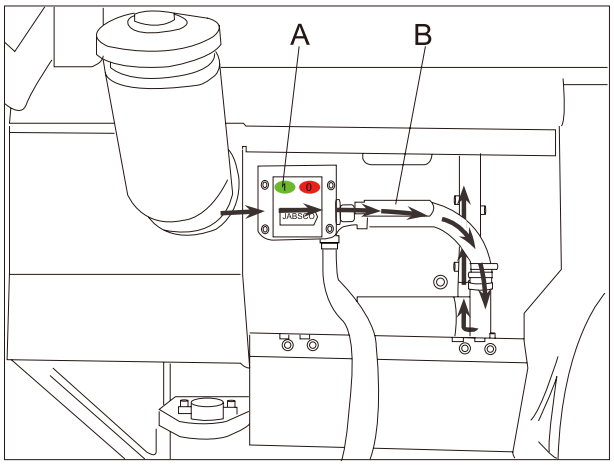


Fig.3-93

As shown in Fig.3-94, when the three-way valve handle is at the position (B), external oil source connects with the machine fuel tank. Press the button (A) of the controller in order to make the fuel flow from external oil source to the three-way valve, to the oil pump and into the machine fuel tank.

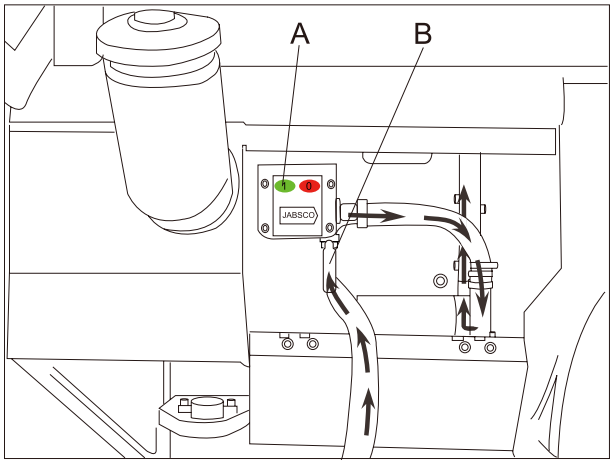


Fig.3-94

SANY

Operation

4 Operation

⚠ WARNING

Read and understand all safety precautions and instructions in this manual before reading any other manuals provided with this roller and before operating or servicing the roller. Failure to do this can cause property damage,personal injury or death.

4 OPERATION

4.1 Check before Starting the Engine

4.1.1 Check (walk-around)

- Make sure there is no person on or around the machine to avoid injury.
- Remove the lock pin of rear frame articulation steering tie rod and fix the tie rod at the release position by the lock pin to facilitate the twist of the machine body. See Fig. 4-1.
- Check the conditions around and under the machine. Check for loose bolts, dirt, oil stains, coolant leakage and broken/worn parts.
- Check the equipment and hydraulic parts.
- Check the battery.
- Check the tire pressure. If necessary, inflate the tires.
- Check the oil level and coolant level.
- Remove the trash and debris. Before operating the machine, perform all necessary repairs.

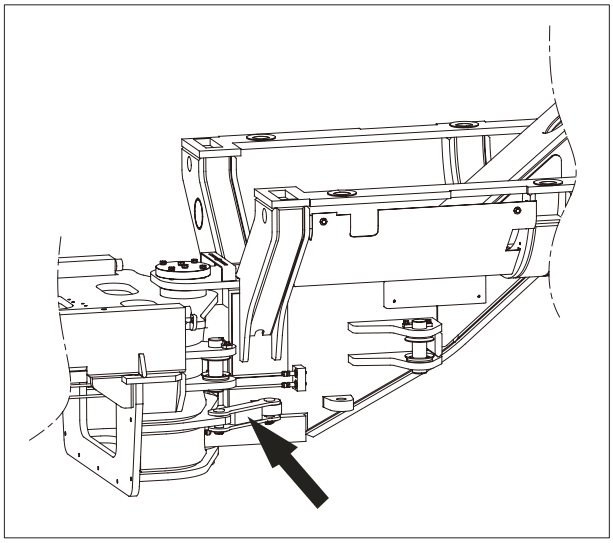


Fig. 4-1

4.1.2 Check before starting

4.1.2.1 Check the engine oil level

⚠ WARNING

Check the engine oil level after the engine has been stalled for 10mins, or it will cause serious damage to the human body.

1. Take out oil dipstick (A) and wipe the oil off the dipstick with clean cloth. See Fig.4-2.

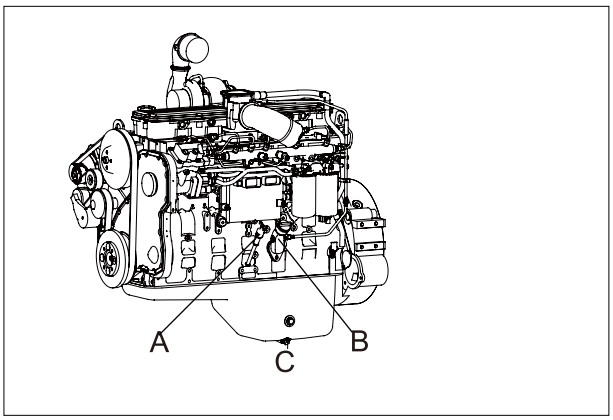


Fig. 4-2

2. Insert the dipstick (A) to bottom and then pull it out.
3. Oil level should be between the ADD and FULL marks on dipstick. Add required engine oil (**See: Table 5-1 on page 5-6**) through filler opening (B) if oil level is below the ADD mark.

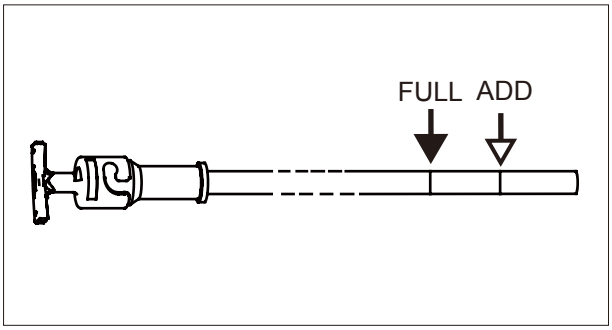


Fig. 4-3

4. If oil level is above FULL mark, open the screw plug (C) on the engine sump to drain rebundant engine oil.

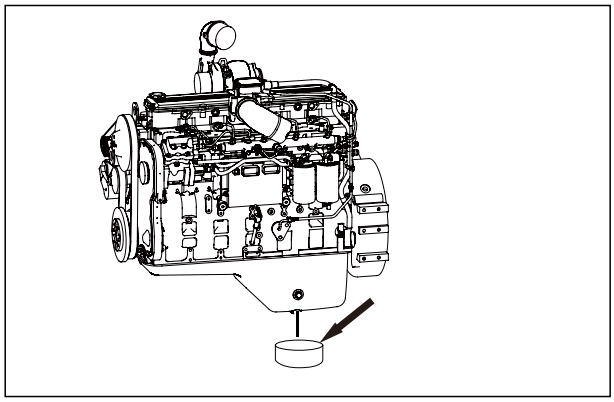


Fig. 4-4

⚠ CAUTION

If the engine has been just shut down, it's forbidden to touch the engine parts and oil immediately. Otherwise you may be burned seriously. Please don't operate the engine until the oil cools down.

4.1.2.2 Check the coolant level of the engine

⚠ CAUTION

If the engine has been just shut down, the temperature of coolant is too high and the radiator is in high pressure state. You may be burned to remove the pressure cap of expansion water tank and check the coolant level. Before removing the pressure cap, wait for the engine to cool down, rotate the pressure cap to release the pressure inside.

Fig. 4-5

Check coolant level at sight glass in the expansion water tank. Normally, the coolant level should stay about at 2/3 of the sight glass, otherwise refill or drain coolant. Use only designated coolant. **(See: Table 5-1 on page 5-6)**

4.1.2.3 Check the oil water separator

⚠ WARNING

Fire hazard! When working on the fuel system do not use open fire, do not smoke and do not spill any fuel. There is a possibility of catching fire.

1. Unlock the left engine hood door and open it. The oil water separator (A) is on the middle bracket of the engine chamber.
2. In case of water or sediment built up at bottom, place a vessel under drain hoses (C) to receive drainage.
3. Open drain valves (B) under the oil water sepatator bowl to discharge water.
4. When fuel is seen coming out of the drain hoses (C), close the drain valves (B) immediately.

Besides, check the hoses and pipe connector for looseness to avoid the air going into the pipeline. (**See: Fig. 4-2 on page 4-1** for specified maintenance of the oil water separator)

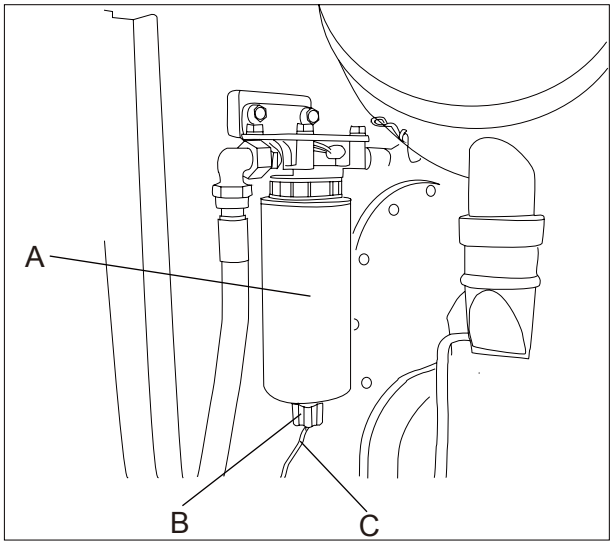


Fig. 4-6

NOTE: When the drain valves (B) have been removed during cleaning, the O-rings must be greased and the valves must be tightened to the bottom.

4.1.2.4 Check the hydraulic oil level

⚠ WARNING

- **Components and oil are still hot and can cause burning after the engine has been just shut down. Wait for them to cool down before working on them.**
- **When removing the oil filter for oil filling, turn it slowly to release internal pressure before removing it.**

1. As shown in Fig. 4-7, park the machine on flat ground and set the front wheel straight forward. Lower all blades and attachments to the ground. Set the machine articulated parts straight and lock the front and rear frames by the lock pin of frame articulation steering tie rod. Apply the parking brake and shut down the engine.

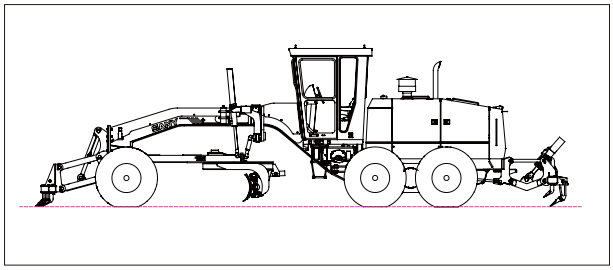


Fig. 4-7

2. Within 15 seconds after stopping the engine, operate the control levers in all directions in order to release internal pressure.

3. Open left rear engine access door in order to check the oil level gauge (A). Oil level should be maintained between the middle and upper mark "H".

When the level is lower than the mark "L", take the following steps to refill hydraulic oil:

1. Slowly open the oil filler cap (B) to release the pressure .
2. Remove the filler cap (B) and refill the tank with appointed hydraulic oil (**See: Table 5-1 on page 5-6**) through the oil filler.
3. Clean and fit the filler cap.

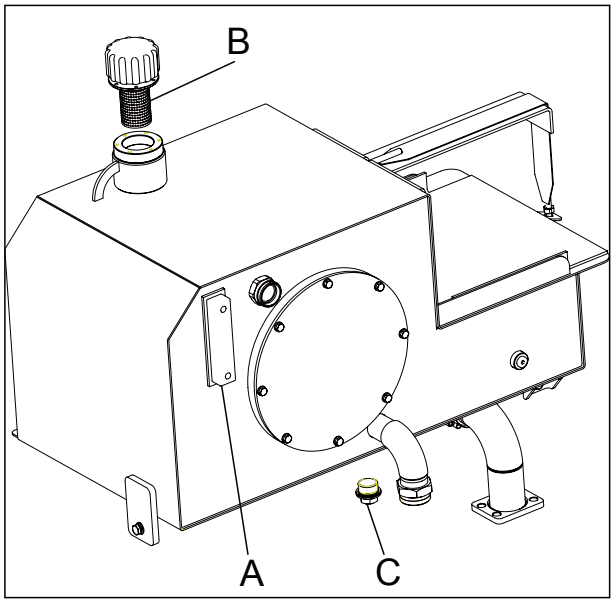


Fig. 4-8

When the level is higher than the mark "H", take the following steps to drain the hydraulic oil:

1. Place a container (volume should be more than 220L) under the oil drain port.
2. Open the screw plug (C) to drain the hydralic oil.
3. When the level is about 2/3 of the level gauge, stop draining.

NOTE: The oil level will change after starting the engine, check the level again before operation.

NOTE: The oil level may change as the oil temperature varies. While in operation, keep the oil level about 2/3 of the level gauge.

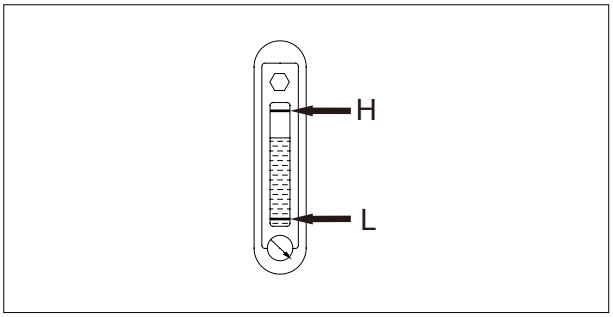


Fig. 4-9

4.1.2.5 Check the air filter

Take the following steps to remove the dirt and dust.

1. Open the left engine access door.
2. As shown in the Fig.4-10, press the dust nozzle in the direction shown by the arrows to get rid of the dust.

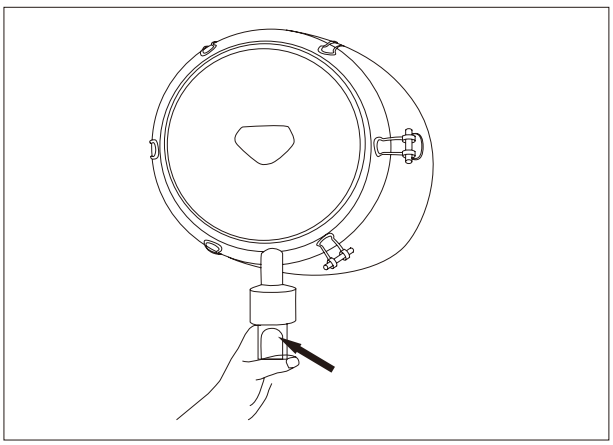


Fig. 4-10

3. Clean the dust nozzle regularly.
4. Press the upper part of the dust nozzle to get rid of the dust.

4.1.2.6 Check the engine air intake pipeline system

1. Check the T clamp (B) in air intake pipeline for looseness. In case of loose clamp, tighten it.
2. Check the intake pipe (A) for damage or leakage. If any, replace them.

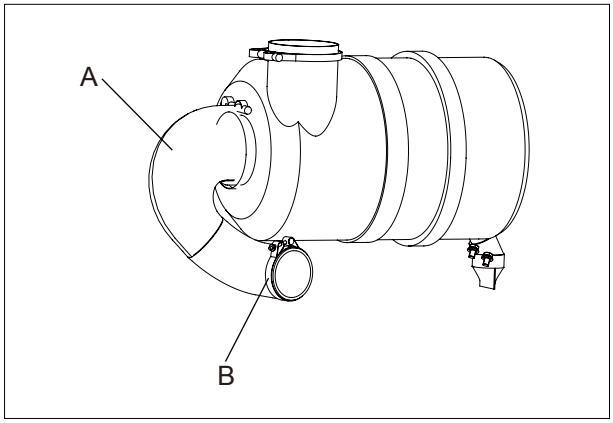


Fig. 4-11

4.1.2.7 Check the tire pressure

Check the tire pressure with a pressure gauge. Generally, tire pressure is within 0.237MPa-0.275MPa. When the tire pressure is less than 0.237MPa , you have to inflate the tire.

NOTICE

The tire pressure will increase if the tire is exposed to the sun. Too much inflation pressure will cause the tire to blow up.

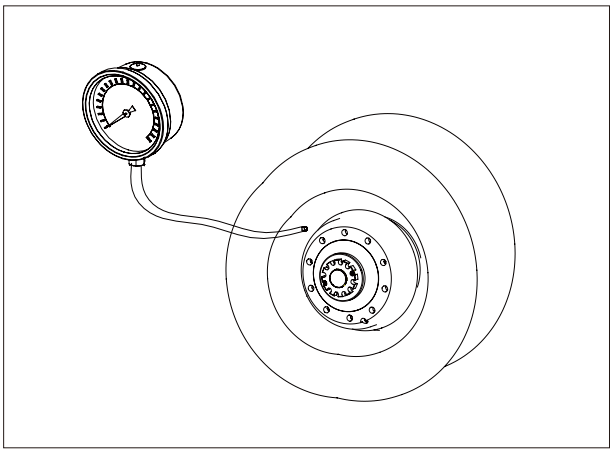


Fig. 4-12

4.1.2.8 Check the cables

NOTICE

If any fuse burns frequently or any cable shows the sign of short circuit, contact Sany dealer to find the cause and eliminate the trouble. Or it may affect the control system chronically.

Check the fuse for damage; whether the fuse with proper capacity is used; whether any wire connection is poor. Fix it if any.

Moreover, pay extreme attention to cables when checking battery, engine, start motor and alternator. Make sure to check for flammable materials around battery. Immediately remove them if any.

4.2 Adjustments Prior to Start-up

4.2.1 Seat adjustment

Before operation, the operator should adjust the seat for optimum position to reduce fatigue. All adjustments should be done only when the operator is seated. **See: Section 3.2.12 on page 3-30.**

4.2.2 Rear view mirror adjustment

Adjust the rear view mirror for optimal visibility behind the motor grader.

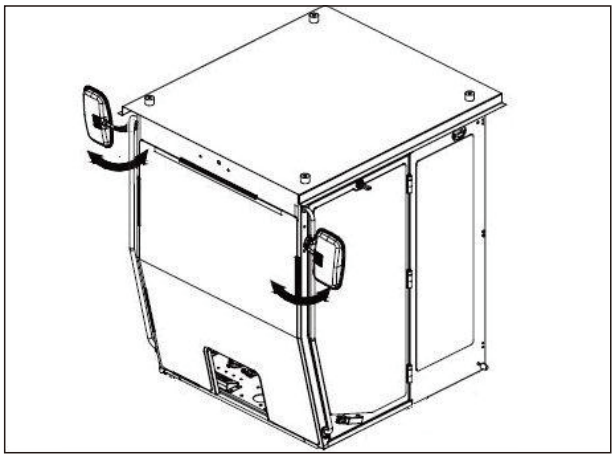


Fig. 4-13

4.3 Operation Prior to Start-up

Before starting up the engine, you need to check the instrument to see whether they are in normal condition or not.

4.3.1 Activate the control system

In order to check the instrument, first you have to activate the control system by observing the following steps:

1. Turn the master switch of power supply to "on" position.

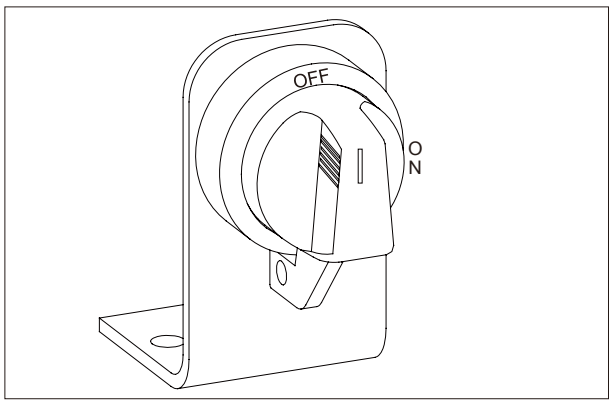


Fig. 4-14

2. Insert the key, and turn to position "I". So the control system will be activated. And the SYLD will be initialized.

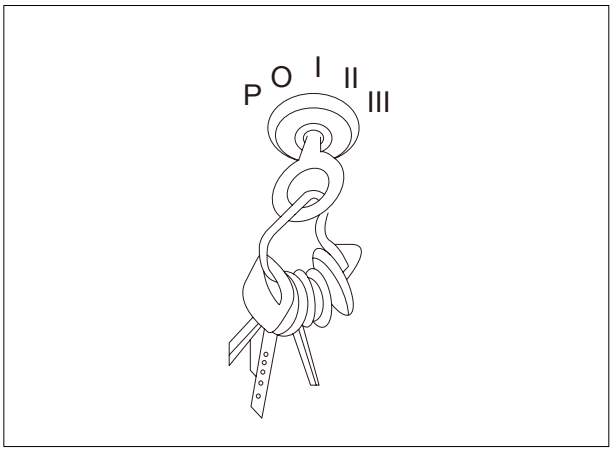


Fig. 4-15

3. After initialization, display screen will show the current status of the system.

Fig. 4-16

Check the system for abnormality. Check the gauge and indicator lights:

- Fuel gauge: indicates the actual oil level.
- Left/right turn indicator: goes out.
- Charging system indicator: illuminates without the buzzer alarming.
- Service brake pressure indicator:illuminates without the buzzer alarming.
- Parking brake indicator: illuminates without the buzzer alarming.
- Engine air cleaner indicator:goes out.
- Oil water separator indicator: goes out.

4.3.2 Check the fuel level

If fuel level indicator (A) flashes red, it indicates the fuel is less than 10% and going to use up. You have to refill the fuel tank with appropriate fuel .

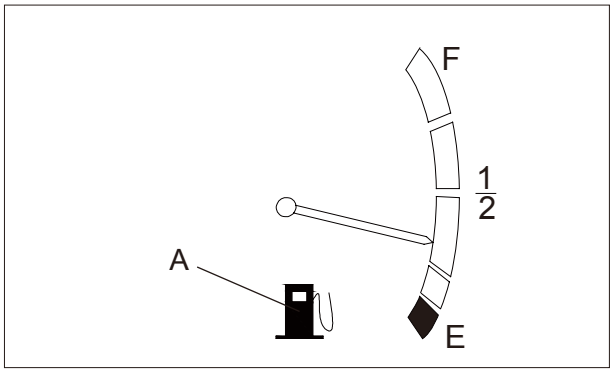


Fig. 4-17

The fuel tank (A) is installed between engine hood and cab. Take the following steps to refill the fuel tank:

1. Select a well-ventilated place to refill.
2. Clean the dust around the filler.
3. Remove the filler cap, and refill the fuel tank with required fuel (**See: Table 5-1 on page 5-6**) through the filter net.

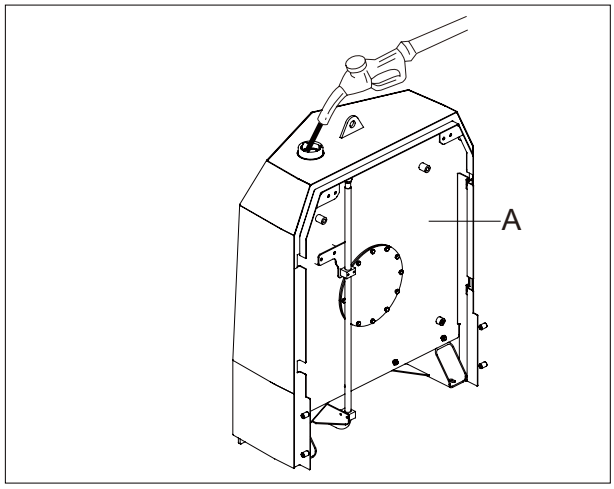


Fig. 4-18

⚠ WARNING

When operating on the fuel tank, never smoke. There is a great potential to catch fire!

4. When the fuel level pointer leaves the "E" area, the fuel level indicator goes out. When the fuel level pointer gets the point that you want, stop refilling.
5. Install the filler cap.

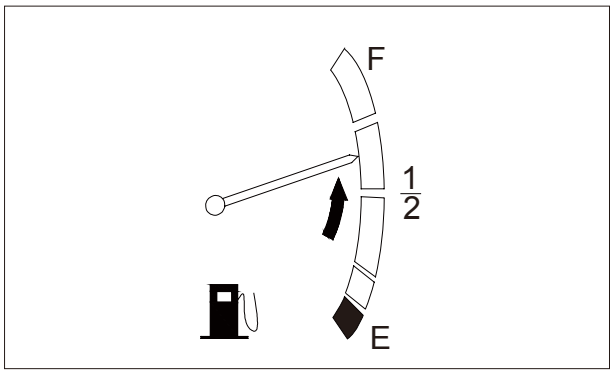


Fig. 4-19

4.3.3 Check the transmission control lever

Before starting the engine, move the transmission control lever to "N" postion, or else the engine can't start up.

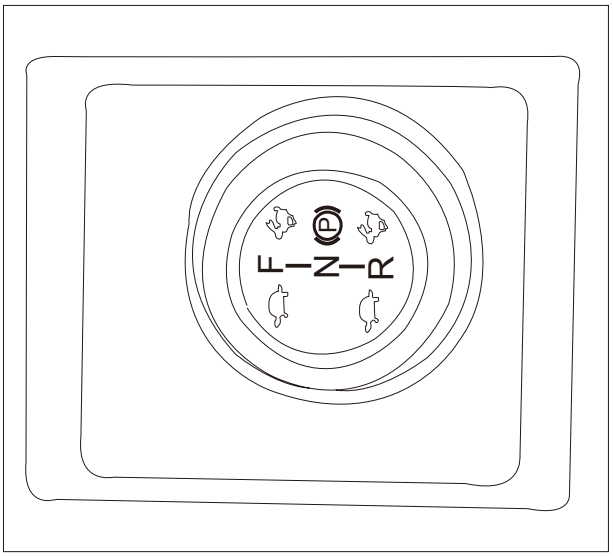


Fig. 4-20

4.3.4 Check the parking brake

Check the parking brake pressure indicator. After confirming the parking brake pressure indicator is gray without the buzzer alarming, start the engine.**(See: Section 3.3.2.4 on page 3-37.)**

Fig. 4-21

4.3.5 Check the service brake

Check the service brake pressure indicator. After confirming the service brake pressure indicator is gray without the buzzer alarming, start the engine.

4.3.6 Check the switches

Before starting the engine, check the switches, indicators and work implement for abnormality. In case of any abnormality, repair it immediately.

Fig. 4-22

- Front switch group

It includes turn light switch (1), headlight switch (2), front frame working light (3), cab lower working light (4) and differential lock switch (5) in Fig.4-23.

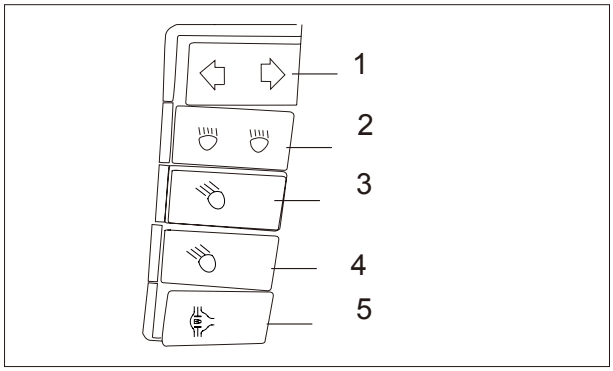


Fig. 4-23

- Right switch group

It includes parking light switch (1), washer switch (2), rear working light switch (3) and front wiper switch (4).

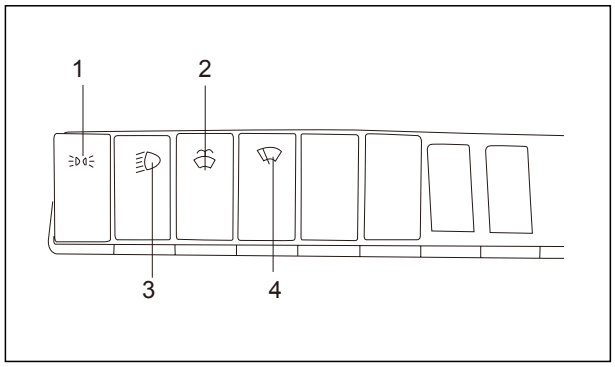


Fig. 4-24

4.3.7 Check the horn

The horn sounds immediately when the horn button is pressed. Make sure that the horn sounds normally. In case of dead horn or abnormal sound, please repair in time.

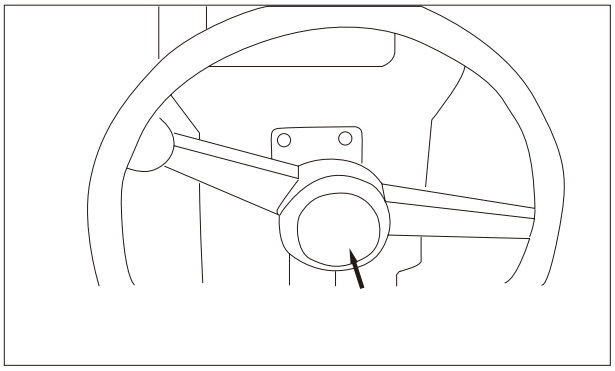


Fig. 4-25

4.4 Engine Start-up

4.4.1 Normal start-up

1. Rotate the key to position "III".
2. Keep the key at the position for several seconds.
3. Release the key immediately after the engine is started. The key will return to position "I" automatically.

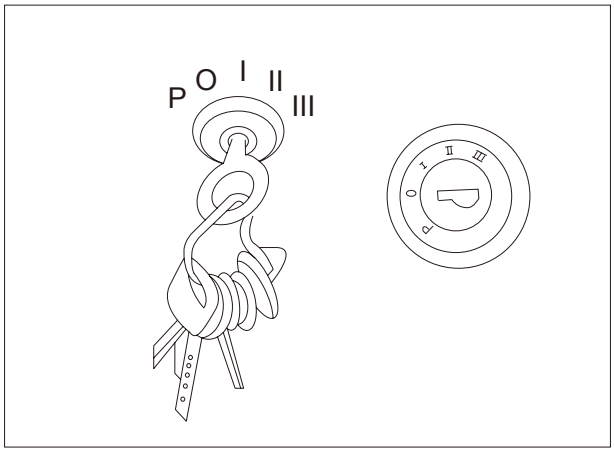


Fig.4-26

NOTICE

- **The engine exhaust gas includes combustion products. They are harmful to physical health.**
- **It is necessary to start and run the engine at a well-ventilated place. Otherwise, the exhaust gas should be exhausted to the outside.**

NOTICE

- **The starting time should not exceed 15s each time. To protect the battery, wait for 1-2min for the next start.**
- **In case of low engine temperature, avoid high-speed running.**
- **The transmission control lever should be set at P position before engine start-up. Otherwise, the engine cannot be started.**
- **If the ambient temperature is 20℃ or below, you should idle the engine for 3~5min after start-up.**

4.4.2 Jump-start

If the batteries are short of energy, you can start up the engine according to the steps as follows.

- Using jumper cable to start engine requires two persons working together (One is seated at the operator's seat and the other handles the battery).

- Wear rubber gloves before starting the engine with jumper cable.

- When jumper cable is used to connect a normal grader with a faulty one, the battery voltage of normal grader should be the same with that of faulty one. Make sure that the two graders never contact each other.

- In connection of jumper cable, connect the positive (+) first. When disconnecting jumper cable, disconnect the grounding negative (-) (the grounding side) first.

NOTICE

Ensure that all jumper cables are clamped to their connections securely. Failure to observe and follow this notice may result in equipment damage or poor starting.

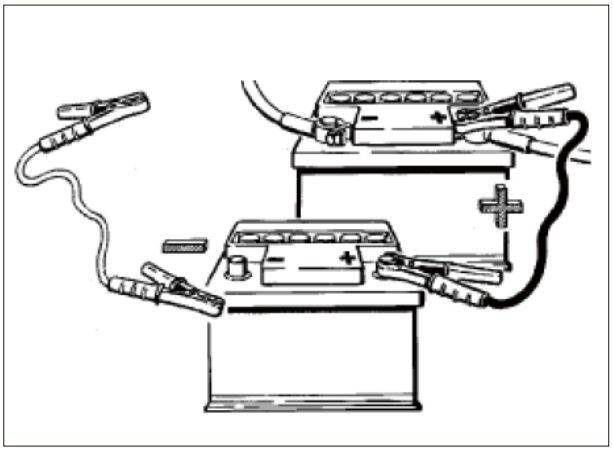


Fig.4-27

- When removing the jumper cable, pay attention to keeping the clips of jumper cable from touching each other or from touching the grader.

NOTE: The batteries for Sany motor grader are composed of two serial maintenance-free batteries. The total voltage is 24V.

4.4.3 Engine warm-up

⚠ WARNING

- **Do not operate any control lever or pedal suddenly when hydraulic oil remains at low temperature. Make sure to warm up the machine till temperature of hydraulic oil rises to a suitable point.**
- **If the machine has not been preheated completely, it may fail to respond or move suddenly and quickly during operation, and cause serious accidents. Complete warm-up is especially necessary in cold region.**

Do not operate the machine immediately after starting the engine. Proceed and check the following items:

1. If the ambient temperature is below 20°C, idle the engine for 3~5 min after start-up.

2. Operate all control levers cyclically to make the hot hydraulic oil flow into each hydraulic cylinder and hydraulic oil tube.

3. If the hydraulic system acts slowly, longer idling is required to warm it up.

4. When the machine is running, observe the meters frequently. Continue to preheat the machine if coolant temperature (see display) and hydraulic oil temperature (50~70℃) fail to reach normal values.

5. Check exhaust color, noise or vibration for abnormality. Repair it if any.

4.4.4 Engine shut-down

1. Run the engine at idle speed for about five minutes to cool it down gradually.
2. Turn the start switch key to position "0" to shut down the engine.
3. Remove the key from the start switch.

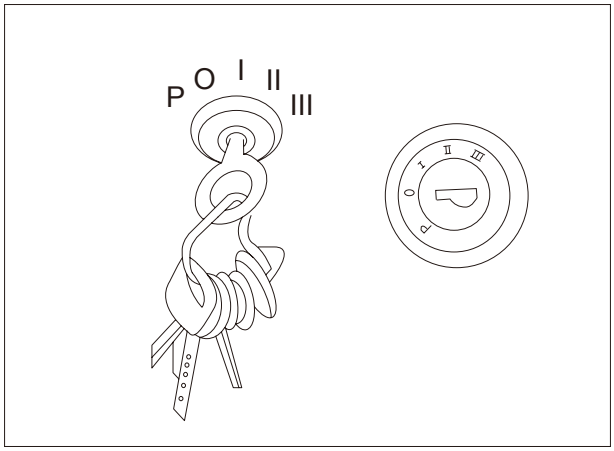


Fig.4-28

NOTE: Shutting down the engine suddenly may reduce service life of the components.

NOTE: Do not shut down the engine suddenly except for emergency.

NOTE: Do not shut down the engine suddenly if the engine is too hot. Run the engine at low idle in order to let it cool down gradually. Stop the engine.

4.5 Check the transmission

4.5.1 Check oil level

Check the oil level before the grader starts. Check the oil level as follows:

1. Park the grader on level ground. Chock the wheels with brake blocks to avoid rolling for safety.
2. Place the control level at the N position.
3. Keep the working temperature of the transmission within the normal range.
4. Keep the engine run at low idling speed.
5. Pull out the oil dipstick from the auxiliary oil tank and clean the oil dipstick.
6. Insert the oil dipstick into the auxiliary oil tank. And then pull it out after it reaches the bottom.

7. Operate as step 5 and 6 at least 2 times to ensure accuracy of measurements.

8. When the temperature of oil is up to 40℃, the oil level should be higher than 10mm above the lower scale mark of the oil dipstick. Or when the temperature of oil is up to 80℃, the oil level should be between the upper and the lower scale marks of the oil dipstick.

4.5.2 Check oil temperature

- The normal working temperature of the transmission is within -20 ℃ ~110 ℃. The favorable working temperature is within 80℃ ~90℃.

- When the transmission is working, observe the working temperature of oil shown on the display screen in the cab at any time. If there is no fault under the normal working conditions, it is impossible that the temperature of oil could become higher. If the temperature of oil exceeds the values above, it means the system has faults. Stop the grader to do troubleshooting.

4.5.3 Check main pressure

- The normal range of the main pressure of the transmission is within 2.4~3.0MPa.

- When the transmission is working, observe the main pressure shown on the display screen in the cab at any time. After the working pressure oil runs through the clutch, if the oil pressure is lower than the minimum pressure, stop the grader to do troubleshooting (except that the oil pressure decreases instantaneously during gearshifts).

- Too low control oil pressure can result in burning of the friction disc and the steel plate, for that inadequate pressing force will make the clutch glide and overheat.

4.5.4 Check high pressure filter

- Check the indicator (1) of the high pressure filter before the grader works. If the indicator turns green, it means the filter is normal. If the indicator turns red, it means the filter (2) is blocked. Stop the grader and replace the high pressure filter.

- If the high pressure filter element is replaced, pay attention not to let oil stain and impurities into oil lines.

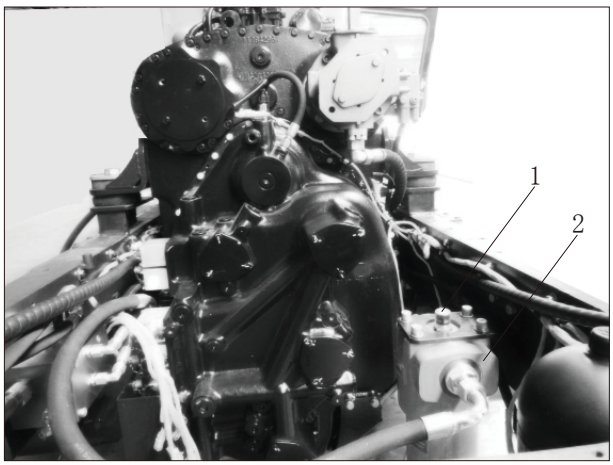


Fig.4-29

NOTICE

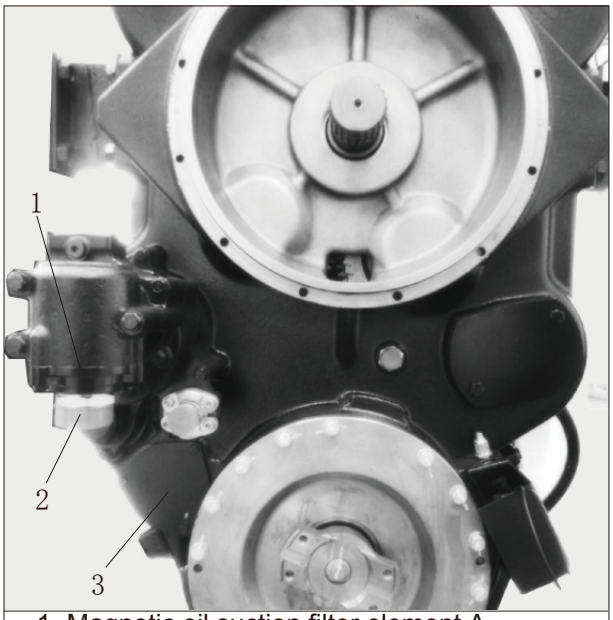
Never use damaged high pressure filter element.

4.5.5 Check magnetic oil suction filter element

Regularly clean or replace the magnetic oil suction filter element (see Fig.4-30). When the filter element is cleaned or replaced, pay attention not to let oil stain and impurities into oil lines.

NOTICE

Never use damaged magnetic oil suction filter element.



1- Magnetic oil suction filter element A
2-Port I of working pump of duplex gear pump
3-Magnetic oil suction filter element B

Fig.4-30

4.6 Running in the Machine

Overall check and adjustment has been performed to the machine before delivery. If the machine is initially put into use under harsh condition which may shorten the service life of the machine, the components like engine, tandem drive case, pump, motor and valve are needed to be run in for a certain period. After running-in period, the machine may obtain longer service life and optimal efficiency. Therefore, 50-hour's running-in period is required for initial use. Observe the following items in running-in period:

- After starting the engine, idle the engine for 5 min for warming up the engine.
- Never start the engine suddenly when warming up the engine.
- Never suddenly start, accelerate, turn and brake except for emergency.
- In running-in period, run in forward gears 1~8, and reverse gears 1~6.
- Never operate the motor grader with full load during running-in period. The travel speed couldn't exceed 70% of the maximum travel speed.
- Check the machine for lubrication. Change or add lubricant as required.
- Perform overall check to the machine after 10-hour's running-in and 50-hour's running-in period.

4.7 Move the Machine

4.7.1 Precautions for moving the machine

- Make sure there is no person around the machine to avoid injury.
- Always keep the machine under control to avoid injury.
- Fasten seat belt properly.
- Lift all work implements (like blade, front dozer plate, front harrow, rear scarifier) to pass obstacles.

4.7.2 Move forward

Take the following steps to move forward.

1. Sound the horn, and release the paking brake.

2. Push the transmission control lever forward. Set the transmission control lever at any gear in forward gears 1~4.

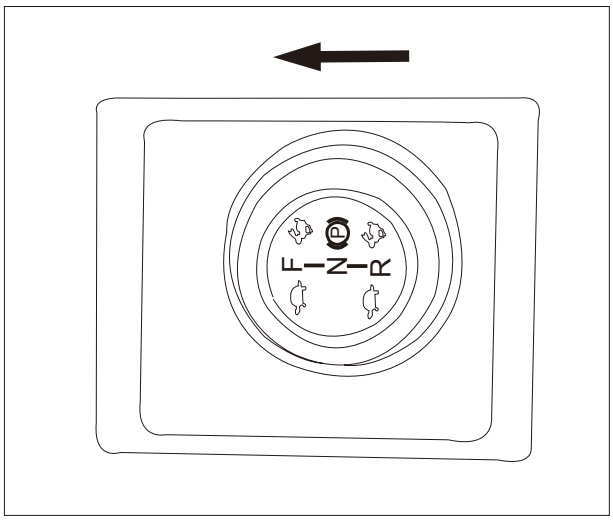


Fig.4-31

3. Depress the throttle pedal. Then, the motor grader will start moving forward.

4. If traveling at high speed is required, speed up and shift from gear 5 to gear 8 gradually.

⚠ CAUTION

- **It is prohibited to travel at high speed when driving the machine on the slope or the road in poor condition.**
- **Select proper gear before driving the machine downhill. Never shift gear during moving the machine downhill.**

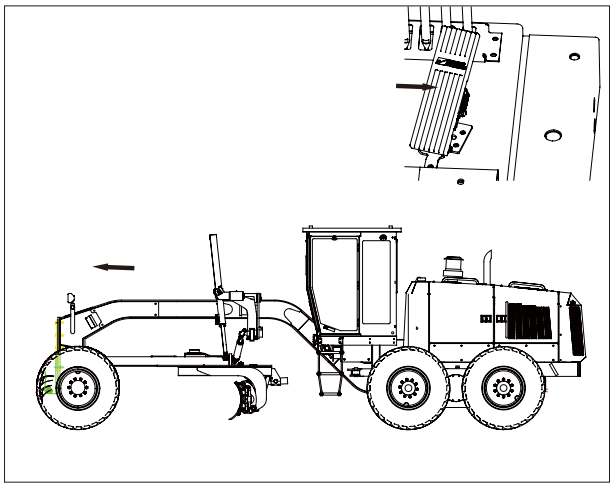


Fig.4-32

4.7.3 Move backward

Make the same settings as moving forward.

1. Sound the horn, and release the paking brake.

2. Push the transmission control lever. Set the transmission control lever at any gear in reverse gears 1-3

3. Depress the throttle pedal. Then, the motor grader will start moving backward.

4. If traveling at high speed is required, shift gear from gear 4 to gear 6 gradually.

⚠ CAUTION

- **It is prohibited to travel at high speed when driving the machine on the slope or the road in poor condition.**
- **Select proper gear before driving the machine downhill. Never shift gear during moving the machine downhill.**

4.7.4 Auto/Manual gear control

Operation of the transmission control lever:

1. Hold the gear selector with your right hand. Pull the neutral gear lock mechanism upward.

2. Release the neutral gear lock mechanism.

3. Push the transmission control lever forward to upshift from automatic forward gear to forward gears. Pull the transmission control lever backward to upshift from automatic reverse gear to reverse gears with the back-up buzzer alarming.

Observe the following items when shifting:

- Shifting should be performed gradually. Never skip to shift.

- Be careful when shifting. Never shift abruptly. Or it may cause damage to the transmission control lever.

- Gear and speed information is displayed on the display screen.

4.7.5 Steering

Take turning left forward for example.

1. Take the same setting as moving forward.

2. Turn on the left turn light.

3. Push the transmission control lever forward from the neutral position, and turn the steering wheel leftward.

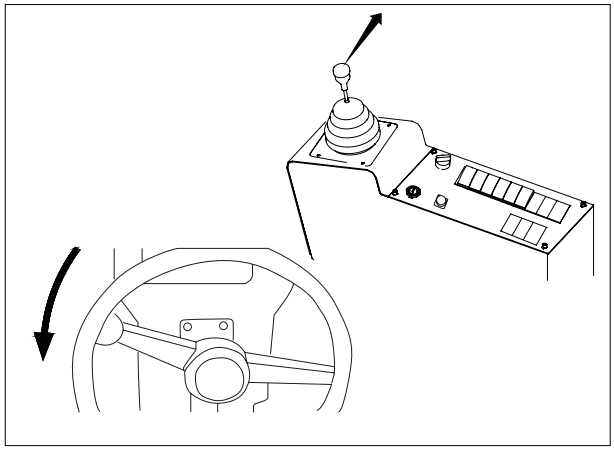


Fig.4-33

4.8 Machine Operation

4.8.1 Blade operation

4.8.1.1 Turning over the blade leftward

⚠ WARNING

- **When removing the lock pin of swing support, the blade may move suddenly, which may cause personal injury.**
- **Make sure the blade is clear of people before removing the lock pin. Furthermore, set the circle and the blade properly to be at the center under the machine. Straighten the frame and lower the blade to the ground.**

Take the following steps to turn over the blade leftward:

1. Operate the left lift cylinder control lever **(See: Section 3.2.1.1 on page 3-11)** to retract the piston rod (C) fully.

2. Operate the swing cylinder control lever to retract the piston rod (B) fully.

3. Operate the circle turn control lever **(See: Section 3.2.1.5 on page 3-13)** to form an angle of 55 ~60 degrees between the blade and the front beam.

4. Operate the blade sideshift cylinder **(See: Section 3.2.1.3 on page 3-12)** control lever to shift the blade to the left end.

5. Operate the left lift cylinder control lever **(See: Section 3.2.1.1 on page 3-11)**, slowly extend the left lift cylinder piston(A) to make the outmost side of the blade contact with the ground slightly.

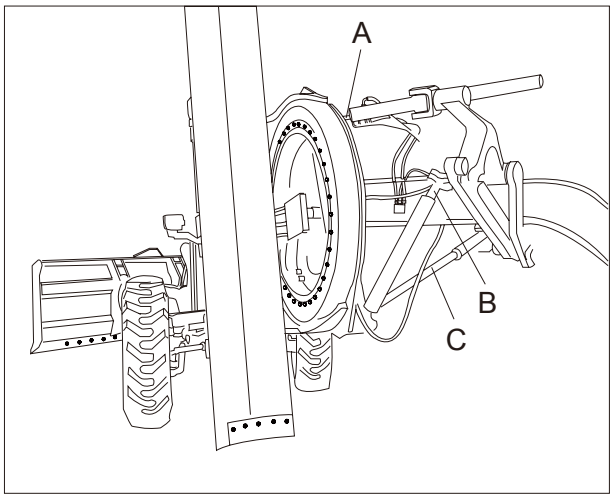


Fig.4-34

6. Operate the centershift cylinder rocker switch on the right switch group at the right side of the driver's seat to make the centershift cylinder piston rod recede from the hole on the swing support. At the same time, observe the indicator for lock-pin connection lights up.

7. Slowly extend the left lift cylinder piston(C) and rotate the swing support to align the centershift cylinder piston with the proper hole on the swing support.

8. Operate the centershift cylinder switch to insert the centershift cylinder piston into the corresponding hole on the swing support. At the same time, observe the indicator for lock-pin connection turns grey.

9. Shift the drawbar laterally to the position where the ground to be graded. Use the blade lift cylinder to determine the slope angle for grading.

4.8.1.2 Turning over the blade rightward

1. Operate the left lift cylinder control lever **(See: Section 3.2.1.1 on page 3-11)** to retract the piston rod (C) fully.

2. Operate the swing cylinder control lever to extend the piston (B) fully.

3. Operate the circle turn control lever **(See: Section 3.2.1.5 on page 3-13)** to form an angle of 55~60 degrees between the blade and the front beam.

4. Operate the blade sideshift cylinder control lever **(See: Section 3.2.1.3 on page 3-12)** to shift the blade to the right end.

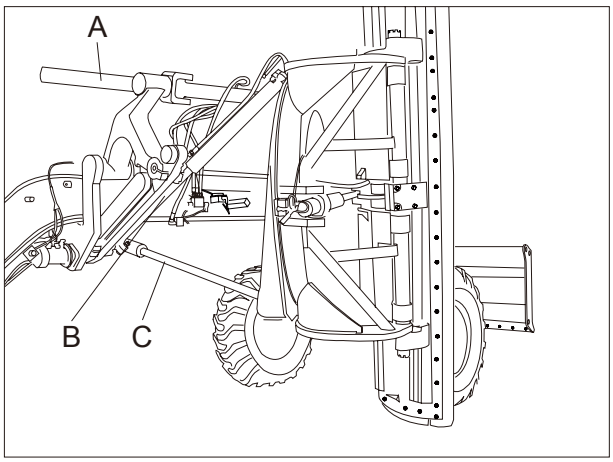


Fig.4-35

5. Operate the right lift cylinder control lever **(See: Section 3.2.1.10 on page 3-16).** Slowly extend the right lift cylinder piston (A) to make the outmost side of the blade contact with the ground slightly.

6. Operate the lock-pin cylinder rocker switch on the right switch group at the right side of the driver's seat to make the centershift cylinder piston rod recede from the hole on the rocker support. At the same time, the indicator for lock-pin connection lights up.

7. Slowly extend the right lift cylinder piston (A) and rotate the rocker to align the centershift cylinder piston with the proper hole on the swing support.

8. Operate the centershift cylinder switch to insert the centershift cylinder piston into the corresponding hole on the swing support. At the same time, the indicator for lock-pin connection turns grey.

9. Shift the drawbar laterally to the position where the ground to be graded. Use the blade lift cylinder to determine the slope angle for grading.

4.8.2 Retreating from a steep slope or a ditch

1. Shut down the machine and lift the blade.

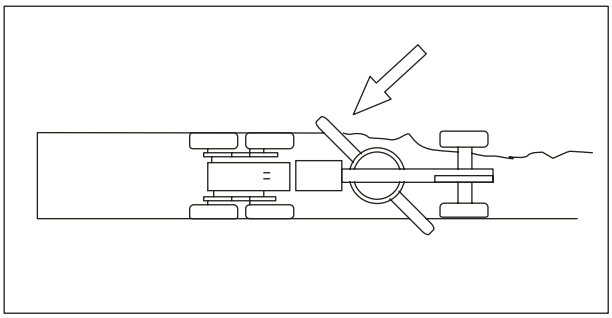


Fig.4-36

2. When reversing the machine slowly, make the rear frame twist to the road center.

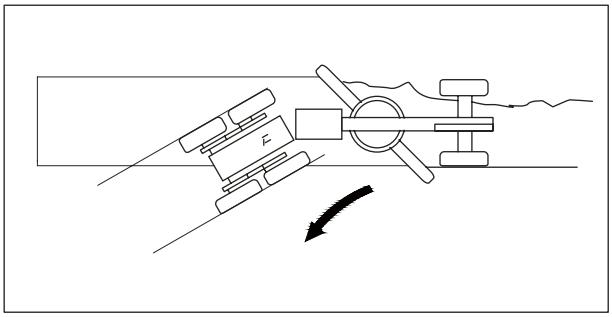


Fig.4-37

3. When reversing the machine slowly, set the front wheels towards the traveling direction.

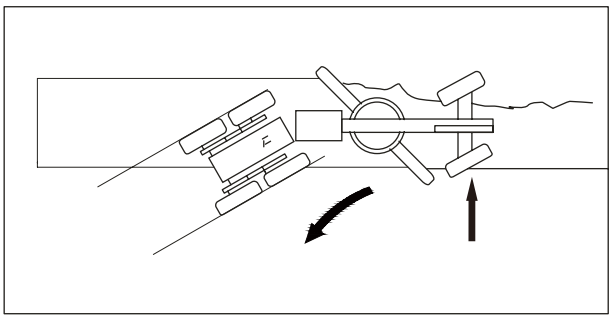


Fig.4-38

4. Continue to reverse the machine until it retreats from the deep slope or ditch.

4.8.3 Grading ground around an obstacle

1. Grade the ground near the obstacle.

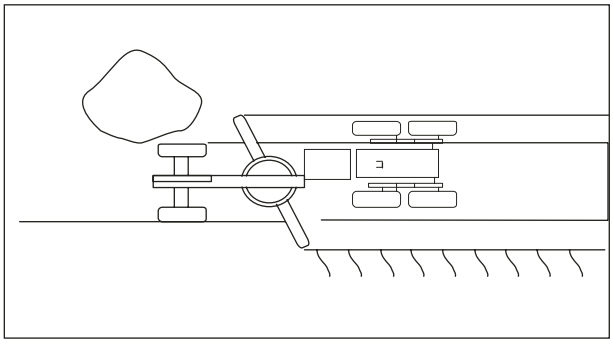


Fig.4-39

2. Move the blade along the profile of the obstacle.

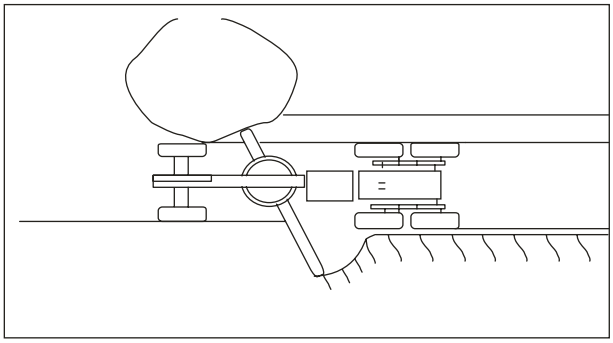


Fig.4-40

3. After the machine passes the obstacle, make the blade return to the original position.

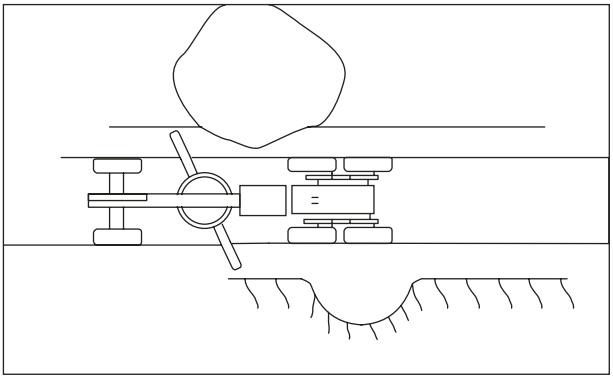


Fig.4-41

NOTE: For ground grading, move the blade as close as possible to the obstacle to reduce manual clearing work.

4.8.4 Grading ground in S shape

⚠ WARNING

To avoid puncturing the tire, prevent the cutting edge from contacting with any tire when the machine twists.

1. Twist the machine leftwards. Shift the blade to right side.

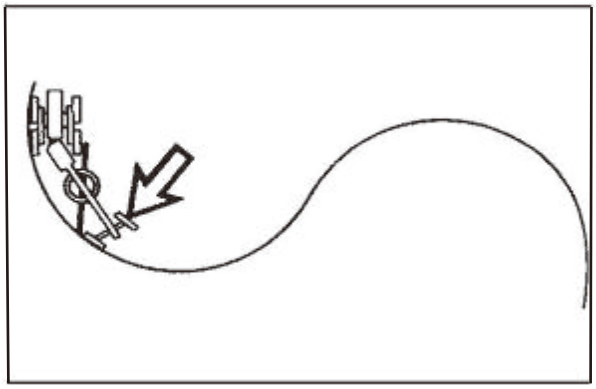


Fig.4-42

2. Straighten the wheels. Shift the blade laterally as required.

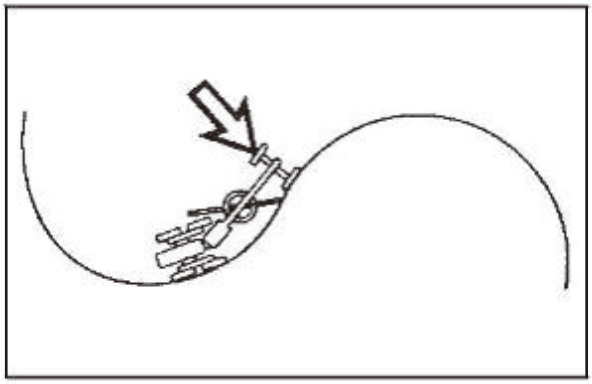


Fig.4-43

3. Twist the machine rightward. Shift the blade to left side.

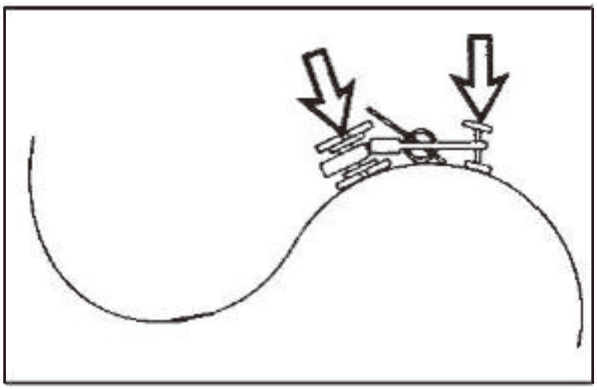


Fig.4-44

4.8.5 Grading the left ground

1. Release the swing support centershift cylinder. Rotate the link rod rightward by 1~2 holes by operating the swing cylinder control lever and lift cylinder control lever. Lock the swing support.

2. Set the blade properly. Make the scraped earth be pushed outside the right wheels.

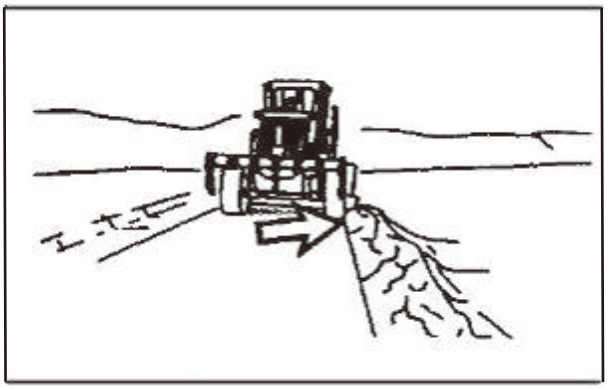


Fig.4-45

3. Lower the blade to the target cutting depth. Make the front wheels lean rightwards to offset the side drifting.

Fig.4-46

4. According to the earth to be scraped, properly adjust the blade pitch angle. Adjust the moldboard top to make it 100 mm ahead of the cutting edge.

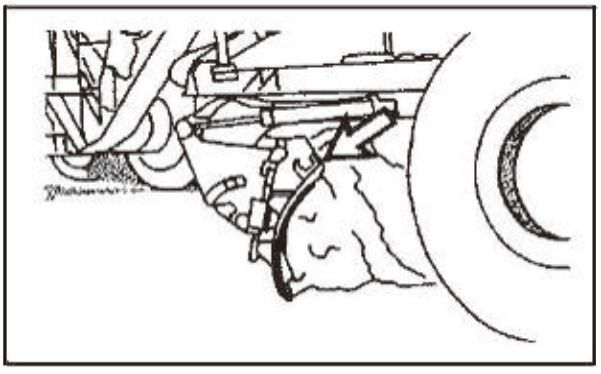


Fig.4-47

5. Under good conditions, ground grading can be performed from one side to the other side.
6. Pave the scarified earth on the road until the road surface gets flat.

Normally, straighten the machine body to grade ground horizontally. Twisting the machine body is mainly to offset the side drifting caused by the load when cutting deep. Turn the tandem driven front wheels to the rear end bit.

In case of wheel slip, turn the front wheels away from the rear end bit. This can reduce the scraping width and the machine load.

In normal grading, the scraped earth is pushed outside the rear wheels. This is to make the ground under the rear wheels flat.

4.8.6 Grading the right ground

1. Release the swing support centershift cylinder. Rotate the link rod leftwards by 1~2 holes by operating the swing cylinder control lever and lift cylinder control lever. Lock the swing support.

2. Set the blade properly. Make the scraped earth be pushed outside the left rear wheels.

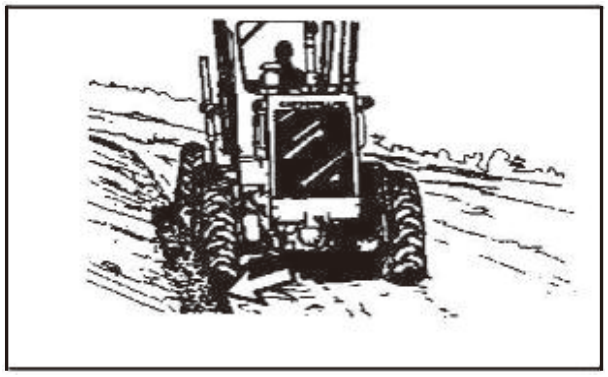


Fig.4-48

3. Lower the blade to the target cutting depth. Make the front wheels lean leftwards to offset the side drifting.

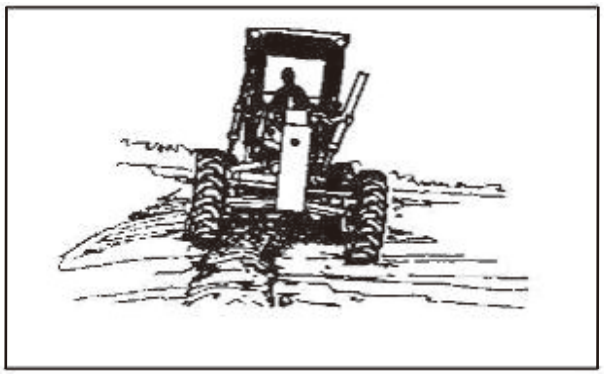


Fig.4-49

4. According to the earth to be scraped, properly adjust the blade pitch angle. Adjust the moldboard top to make it 100 mm ahead of the cutting edge.

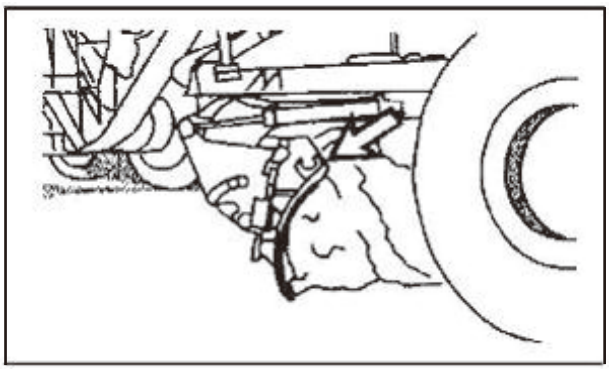


Fig.4-50

5. Under good conditions, ground grading can be performed from one side to the other side.

6. Pave the scarified earth on the road until the road surface gets flat.

Normally, straighten the machine body to grade ground horizontally. Twisting the machine body is mainly to offset the side drifting caused by the load when cutting deep. Turn the tandem driven front wheels to the rear end bit.

In case of wheel slip, turn the front wheels away from the rear end bit. This can reduce the scraping width and the machine load.

In normal grading, the scraped earth is pushed outside the rear wheels. This is to make the ground under the rear wheels flat.

4.8.7 Cutting a V-ditch at left side

⚠ WARNING

If the machine twists, the tire side may press the backslope to destroy the side wall and make dust enter the gap between the tire and the rim to deflate the tire.

⚠ WARNING

- **When removing the lock pin for swing support, the blade may move suddenly, which may cause personal injury.**
- **Before removing the lock pin for swing support, make sure the blade is clear of person. Furthermore, set the circle and the blade properly to be at the center under the machine. Straighten the frame and lower the blade to the ground.**

1. Adjust the position of the swing support to align its centershift cylinder piston rod with the hole on the swing support. Press the switch to lock the swing support.

2. Set the blade to make its left end bit swing to the position level with the outer edge of the left front wheel. Tip the blade forwards to make the upper part of the moldboard slightly ahead of the cutting edge.

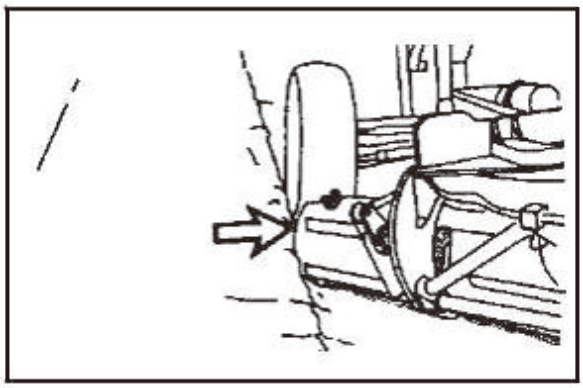


Fig.4-51

3. Lift the right blade to the upmost position. Adjust the blade angle to make the scraped earth be stacked inside the right rear wheels.

4. Lower the left blade to make the end bit fall to the desired cutting depth.

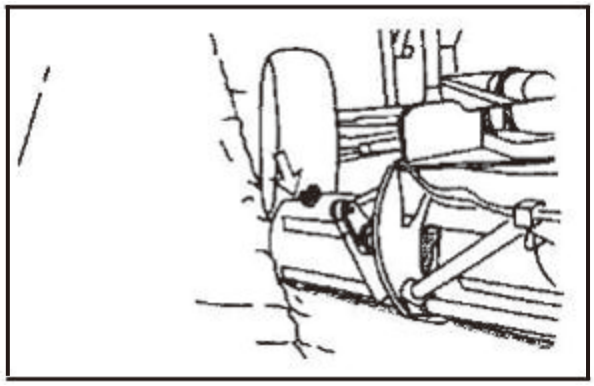


Fig.4-52

5. Make the front wheels lean to right side. Cut a thin layer of earth with a thickness of 50 -100 mm.

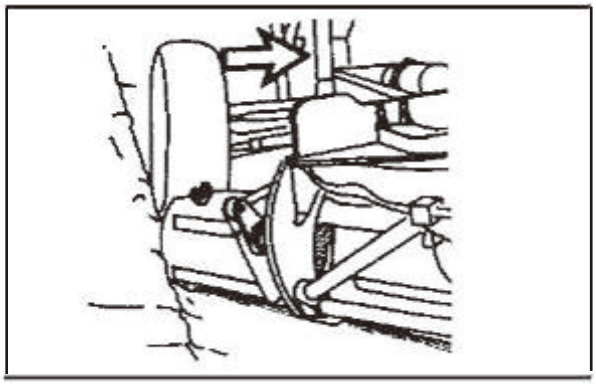


Fig.4-53

6. Keep the left front wheel at the bottom of the ditch and continue to cut the ditch to the desired depth.

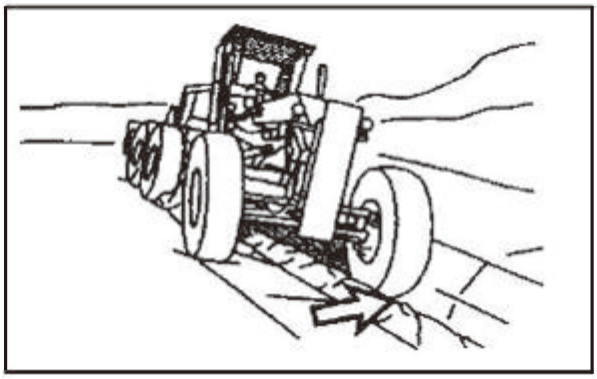


Fig.4-54

4.8.8 Cutting a V-ditch at right side

⚠ WARNING

If the machine twists, the tire side may press the backslope to destroy the side wall and make dust enter the gap between the tire and the rim to deflate the tire.

⚠ WARNING

- **When removing the lock pin for swing support, the blade may move suddenly, which may cause personal injury.**
- **Before removing the lock pin for swing support, make sure the blade is clear of person. Furthermore, set the circle and the blade properly to be at the center under the machine. Straighten the frame and lower the blade to the ground.**

1. Adjust the position of the swing support to align its centershift cylinder piston rod with the hole on the swing support. Press the switch to lock the swing support.

2. Set the blade to make its right end bit swing to the position level with the outer edge of the right front wheel. Tip the blade forwards to make the upper part of the moldboard slightly ahead of the cutting edge.

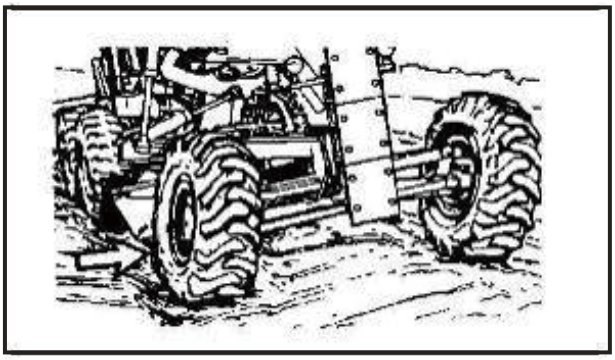


Fig.4-55

3. Lift the left blade to the upmost position. Adjust the blade angle to make the scraped earth be stacked inside the left rear wheels.

4. Lower the right blade to make the end bit fall to the desired cutting depth.

Fig.4-56

5. Make the front wheels lean to left side. Cut a thin layer of earth with a thickness of 50 -100mm.

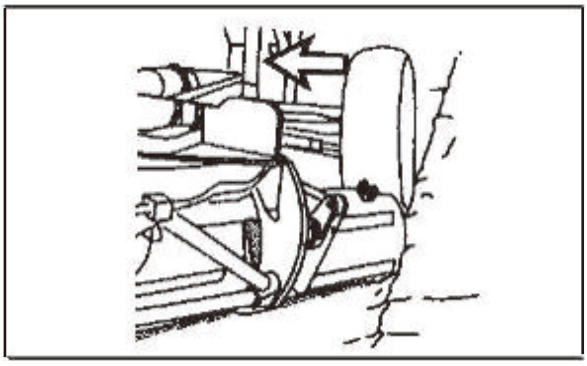


Fig.4-57

6. Keep the left front wheel at the bottom of the ditch and continue to cut the ditch to the desired depth.

4.8.9 Cutting a flat-bottom ditch

⚠ WARNING

If the machine twists, the tire side may press the backslope to destroy the side wall and make dust enter the gap between the tire and the rim to deflate the tire.

⚠ WARNING

- **When removing the lock pin for swing support, the blade may move suddenly, which may cause personal injury.**
- **Before removing the lock pin for swing support, make sure the blade is clear of person. Furthermore, set the circle and the blade properly to be at the center under the machine. Straighten the frame and lower the blade to the ground.**

If there is no V-ditch, cut one whose depth is that of the required flat-bottom ditch.

The slope of the road shoulder should be flatter than that of general road shoulder. The shoulder slope should be continuous till the end of the road shoulder.

1. Tip the blade forwards.

2. Adjust the position of the swing support properly to align the centershift cylinder piston rod with the hole on the swing support. Operate the switch to lock the swing support.

3. Have the right front wheel on the bottom of the V-ditch.

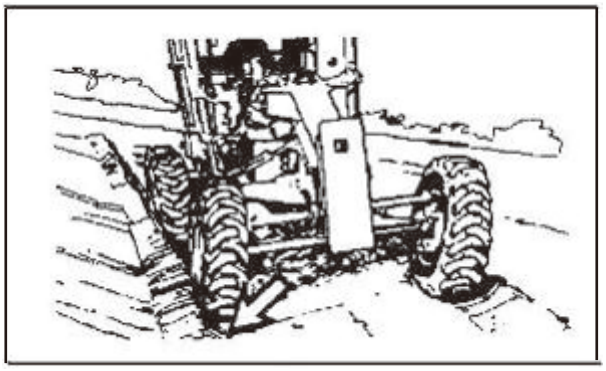


Fig.4-58

4. Place the left front end bit of the blade at the track of right front wheel and allow the required flat-bottom ditch width to be obtained in one step.

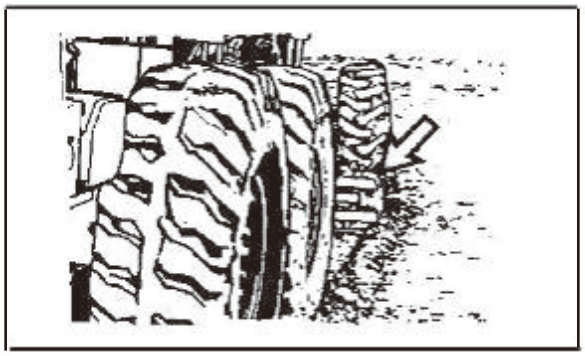


Fig.4-59

5. Lower the right end bit to the target depth.

6. Lift the left end bit and swing it to the desired slope gradient of the road shoulder.

7. Make the front wheels lean to the left side.

8. When cutting another V-ditch, make it slightly deeper than or as deep as the first one.

9. Remove the earth to the road center.

10. Lower the right end bit to the target depth.

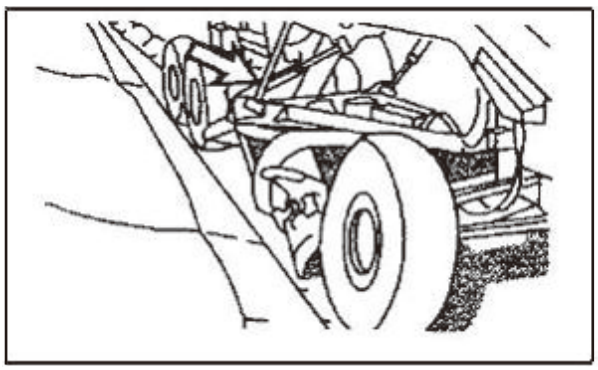


Fig.4-60

11. Lower the left end bit to the target depth.

12. Adjust the position of swing support properly to align the centershift cylinder piston rod with the hole on the swing support. Operate the switch to lock the swing support.

13. At the beginning, have the right front wheel on the bottom of the first V-ditch.

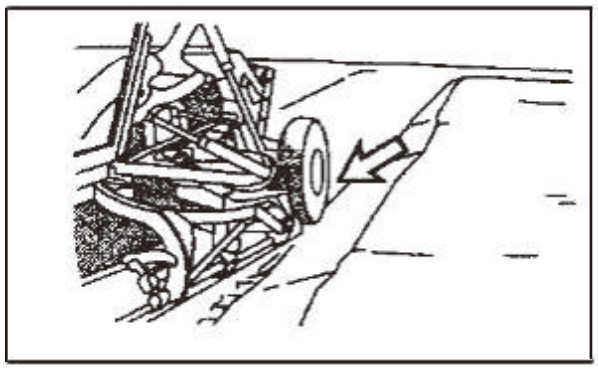


Fig.4-61

14. Swing the right end bit to the bottom of the backslope.

15. Lower the right end bit and straighten the cutting edge on the cut slope.

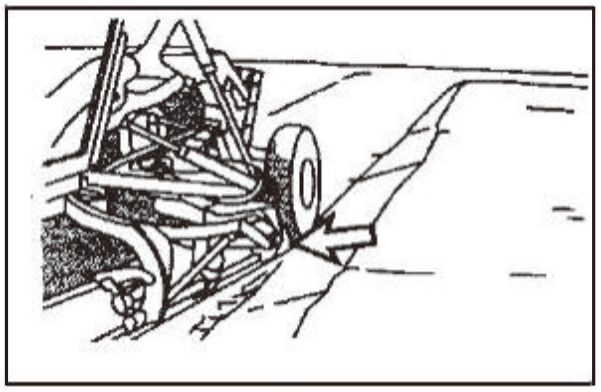


Fig.4-62

16. Lower the left end bit to the target depth and make the front wheels lean to the left side.

17. Set the blade at a very small angle and remove the earth to the ditch backslope.

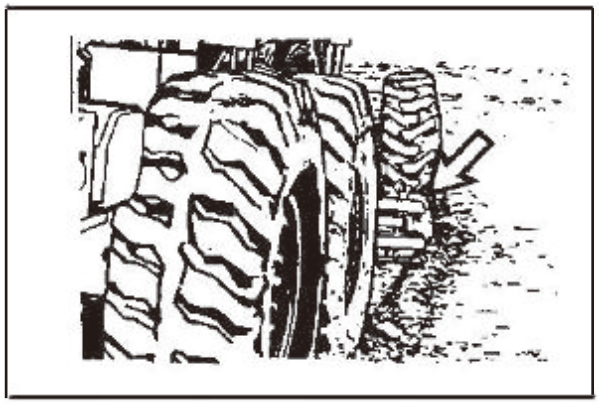


Fig.4-63

18. Level the mounds of earth to finish grading.

4.8.10 Cleaning a left ditch

⚠ WARNING

If the machine twists, the tire side may press the backslope to destroy the side wall and make dust enter the gap between the tire and the rim to deflate the tire.

⚠ WARNING

- **When removing the lock pin for swing support, the blade may move suddenly, which may cause personal injury.**
- **Before removing the lock pin for swing support, make sure the blade is clear of person. Furthermore, set the circle and the blade properly to be at the center under the machine. Straighten the frame and lower the blade to the ground.**

1. Adjust the position of the swing support properly to align the centershift cylinder piston rod with the hole on the swing support. Operate the switch to lock the swing support.

2. Swing the left end bit to the place behind the left front wheel.

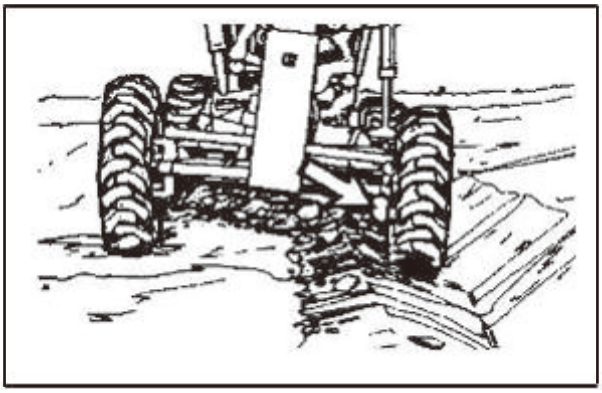


Fig.4-64

3 Lower the left blade to set the cutting depth.

4. Set the position of the right blade to make the scraped earth be stacked on the slope between the tandem wheels at both sides.

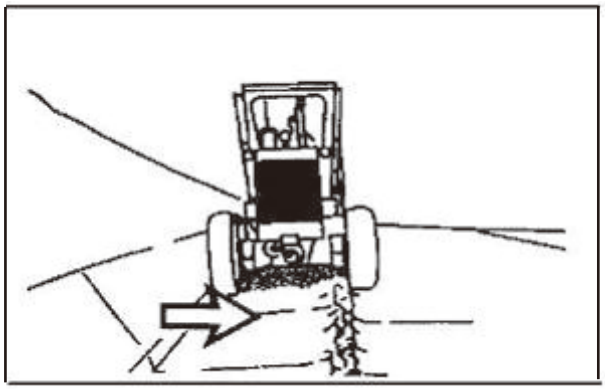


Fig.4-65

5. Make the front wheels lean to the right side slightly.

6. Perform another scraping. Make the scraped earth be paved on the slope and road shoulder. Level the mounds of earth for final grading.

4.8.11 Cleaning a right ditch

⚠ WARNING

If the machine twists, the tire side may press the backslope to destroy the side wall and make dust enter the gap between the tire and the rim to deflate the tire.

⚠ WARNING

- **When removing the lock pin for swing support, the blade may move suddenly, which may cause personal injury.**
- **Before removing the lock pin for swing support, make sure the blade is clear of person. Furthermore, set the circle and the blade properly to be at the center under the machine. Straighten the frame and lower the blade to the ground.**

1. Adjust the position of the swing support properly to align the centershift cylinder piston rod with the hole on the swing support. Operate the switch to lock the swing support.

2. Swing the right end bit to the place behind the right front wheel.

Fig.4-66

3. Lower the right end bit to set the cutting depth.

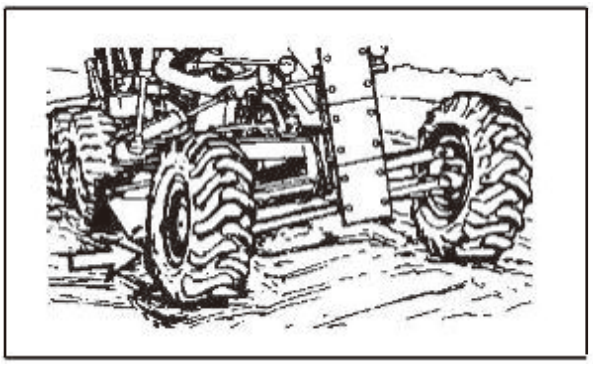


Fig.4-67

4. Set the position of the left blade to make the scraped earth be stacked on the slope between the tandem wheels at both sides.

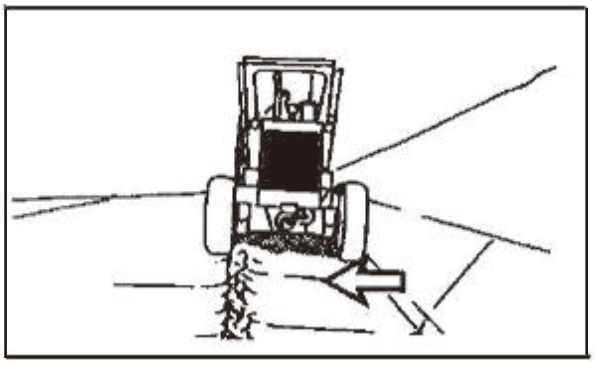


Fig.4-68

5. Make the front wheels lean to the left side slightly.

6. Perform another scraping. Make the scraped earth be paved on the slope and road shoulder. Level the mounds of earth for final grading.

4.8.12 Cleaning a left road shoulder

⚠ WARNING

If the machine twists, the tire side may press the backslope to destroy the side wall and make dust enter the gap between the tire and the rim to deflate the tire.

⚠ WARNING

- **When removing the lock pin for swing support, the blade may move suddenly, which may cause personal injury.**
- **Before removing the lock pin for swing support, make sure the blade is clear of person. Furthermore, set the circle and the blade properly to be at the center under the machine. Straighten the frame and lower the blade to the ground.**

1. Adjust the position of the swing support properly to align the centershift cylinder piston rod with the hole on the swing support. Operate the switch to lock the swing support.

2. Swing the left end bit to the position level with the outer edge of the left wheels. The earth must be removed from the space between the two wheels.

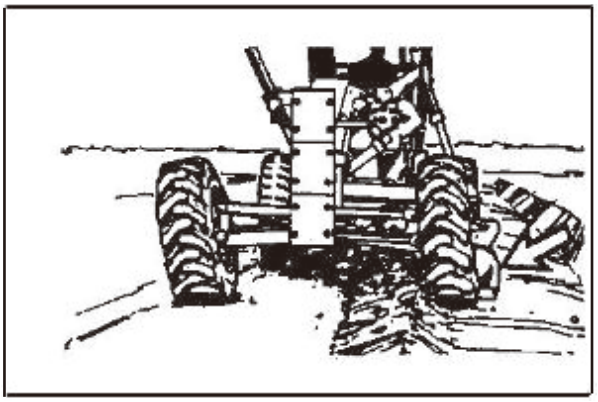


Fig.4-69

3. Lower the blade horizontally and let it fall to the target cutting depth.

4. Make the front wheels lean to the right side slightly.

4.8.13 Cleaning a right road shoulder

⚠ WARNING

If the machine twists, the tire side may press the backslope to destroy the side wall and make dust enter the gap between the tire and the rim to deflate the tire.

⚠ WARNING

- **When removing the lock pin for swing support, the blade may move suddenly, which may cause personal injury.**
- **Before removing the lock pin for swing support, make sure the blade is clear of person. Furthermore, set the circle and the blade properly to be at the center under the machine. Straighten the frame and lower the blade to the ground.**

1. Adjust the position of the swing support properly to align the centershift cylinder piston rod with the hole on the swing support. Operate the switch to lock the swing support.

2. Set the blade to make its right end bit level with the outer edge of the right wheels. The earth must be removed from the space between the two wheels.

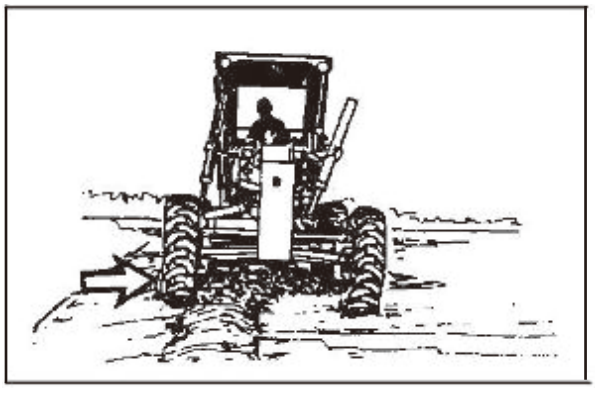


Fig.4-70

3. Lower the blade horizontally and let it fall to the target cutting depth.

4. Make the front wheels lean to the left side slightly.

4.8.14 Scraping a wet ditch

Twist the machine to make its front wheels and blade in the ditch. Turn with the front wheels.

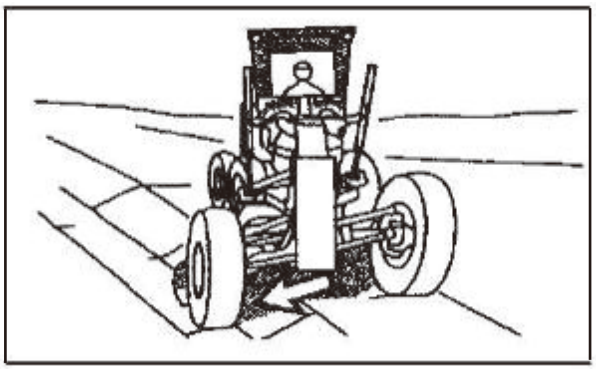


Fig.4-71

The wet mud and loose earth will make the wheels slip. Hold the rear wheels on the road shoulder to avoid slip.

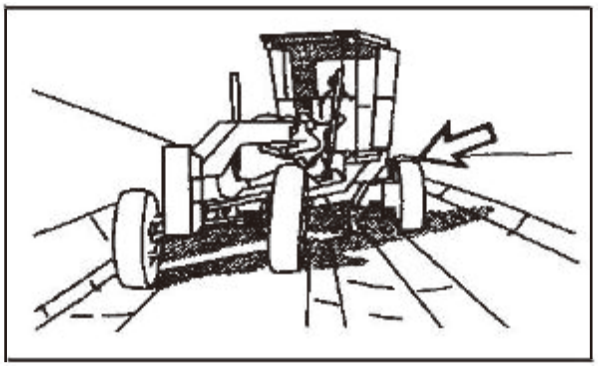


Fig.4-72

NOTE: There may be such obstacles as branches and stones in old ditches. For cleaning, you can use the following methods to bypass the obstacles.

4.8.15 Grading on a slope

⚠ WARNING

- **To work on a steep side slope, it is necessary to be very familiar with the machine performance.**
- **When operating the machine uphill or on a very steep slope, do not twist the machine body excessively.**
- **In case of working on a very steep side slope, the machine may tip over, resulting in personal injury or death.**

1. On a very steep slope, make a turn by twisting the machine. This method can make the rear of the machine hold at the bottom of the cutting surface. To obtain the maximum stability, twist the machine body for balance compensation.

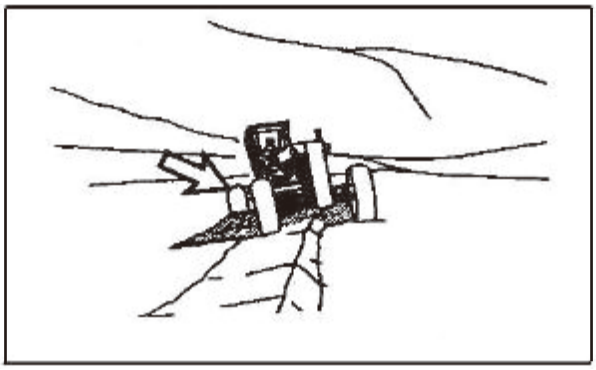


Fig.4-73

2. When the machine head deflects as the blade is subject to heavy load, make a turn by twisting the machine.

NOTE: On steep slope, operate the machine at low speed.

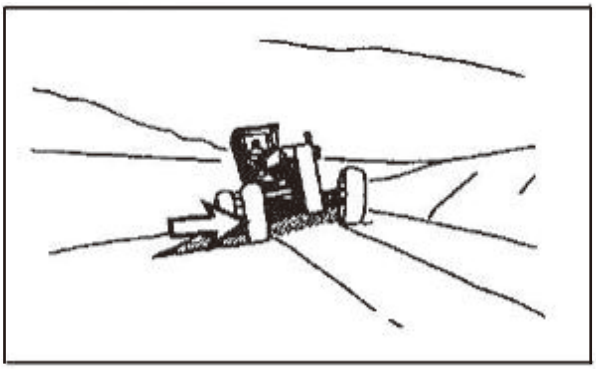


Fig.4-74

4.8.16 Scraping a right side slope

⚠ WARNING

- **When removing the lock pin for swing support, the blade may move suddenly, which may cause personal injury.**
- **Before removing the lock pin for swing support, make sure the blade is clear of person. Furthermore, set the circle and the blade properly to be at the center under the machine. Straighten the frame and lower the blade to the ground.**

The following procedures are for the right-side mounds of earth. Swing the blade to the other side and the procedures can be also used for treating the left-side mounds of earth.

1. As subgrade, the cut roadbed surface should be uniform.

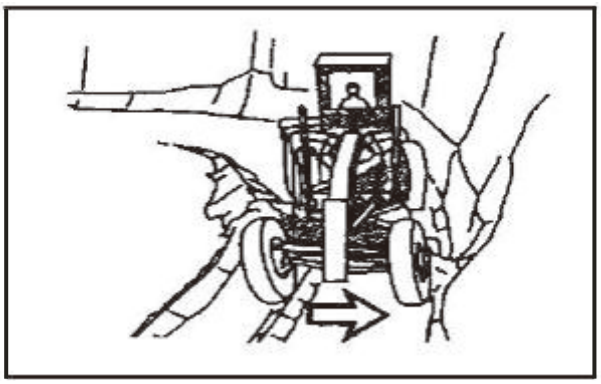


Fig.4-75

2. In case of a hard mound of earth, provide the subgrade with a slope towards the mound of earth to prevent the machine from sliding away from the mound of earth during working.

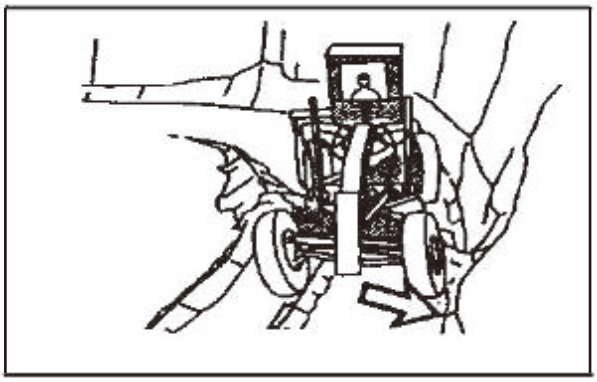


Fig.4-76

3. Tip the blade forwards to 3/4 of the full range or fully tip it forwards.

4. Adjust the rear frame to a proper position and lock it.

5. Shift the blade to the right side. **See: Section 4.8.1.2 on page 4-25.**

6. Rotate the circle clockwise and lower the left end bit at the same time.

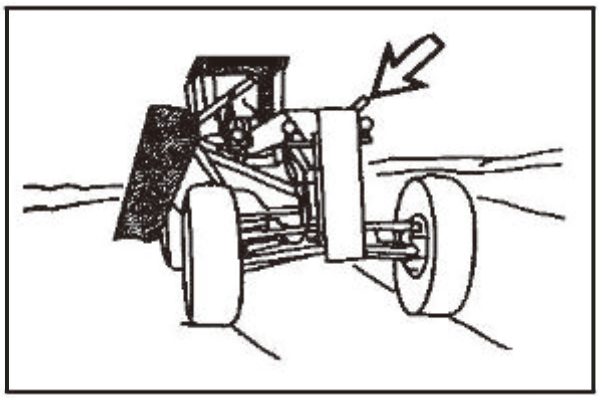


Fig.4-77

7. Place the rear end bit at the bottom of the slope. Swing it to the place level with the outer side of the rear wheels.

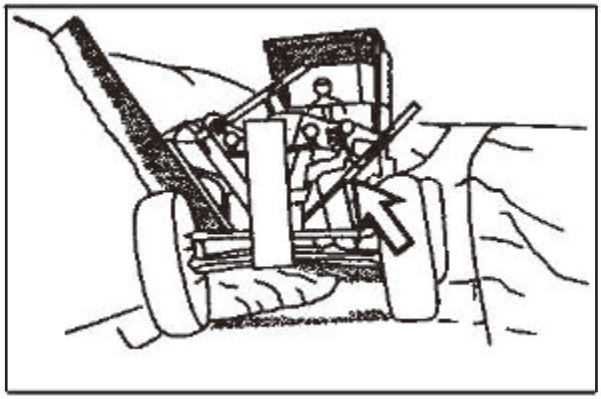


Fig.4-78

8. Set the right rear wheels to the base of the slope formed by the V-ditch.

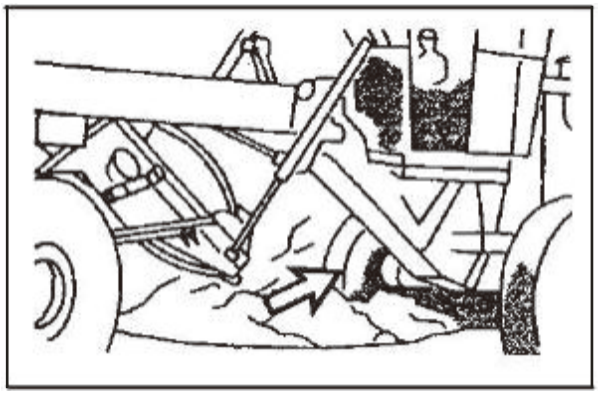


Fig.4-79

9. Lower the right blade to enable it to cut the target slope.

10. Gradually move to the cutting surface.

NOTE: Normally, the wheels should be nearly vertical to the ground.

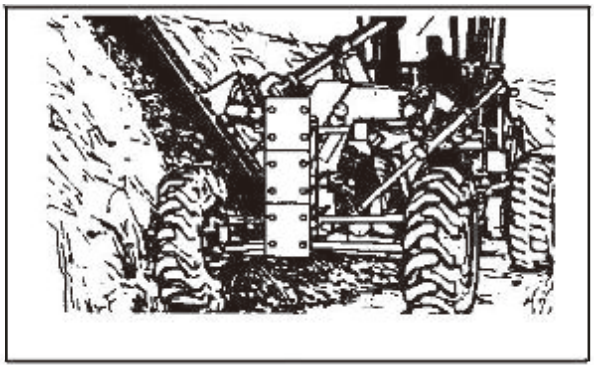


Fig.4-80

11. In case of deep cutting, lean the front wheels towards the slope.

12. In case of shallow cutting, make the front wheels lean away from the slope. The earth is removed from the slope to the outside of the rear wheels.

4.8.17 Operating the scarifier (if equipped)

NOTICE

- **When operating the scarifier, place the machine straight.**
- **If equipped with the scarifier, raise the scarifier to the highest position.**
- **When steering, raise the scarifier to avoid damage to the scarifier tips.**

1. Big tooth (A) of the scafifier is used to scarify rigid soil and small tooth (B) of the scarifier is used to scarify soft soil.

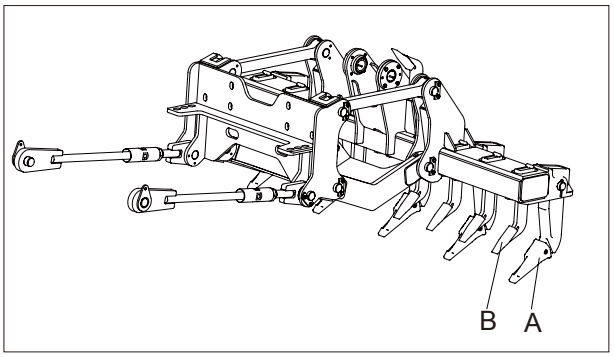


Fig.4-81

2. When moving straight, push the scarifier control lever forward to dig the teeth of the scarifier into the soil.

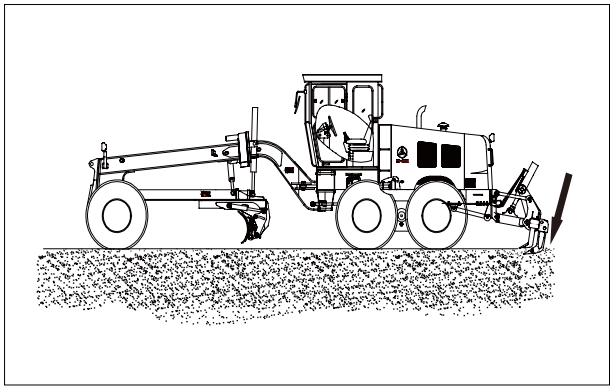


Fig.4-82

3. Dig the teeth into the soil deeper at a speed matching with the work load.

4. Pull the scarifier control lever backward to raise the scarifier to the highest position.

5. Clean the soil left on the scarifier.

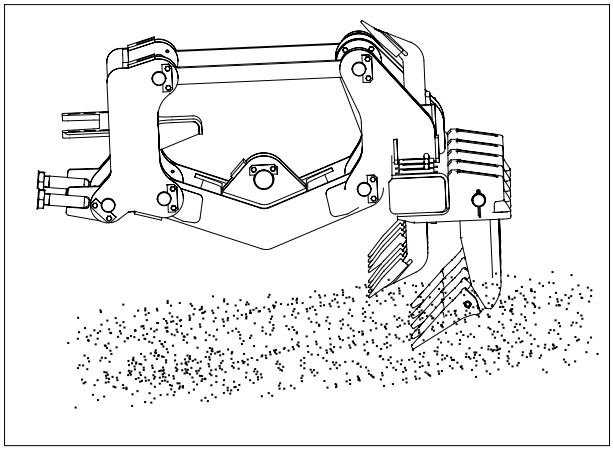


Fig.4-83

4.8.18 Operating the dozer plate (if equipped)

Operate the dozer plate control lever to raise or lower the dozer plate. For more details, **see: Section 3.2.1.8 on page 3-15.** The lift height and cutting depth of the dozer plate depend on the stroke of the operating cylinder. Make the dozer plate operate with full load.

- Never overload the machine.
- Avoid excessive tire slippage.

When operating the dozer plate, it is easier to control the dozer plate with full load than the dozer plate without full load.

4.8.19 Operating the centershift cylinder

There are five holes for the centershift cylinder on the front frame.

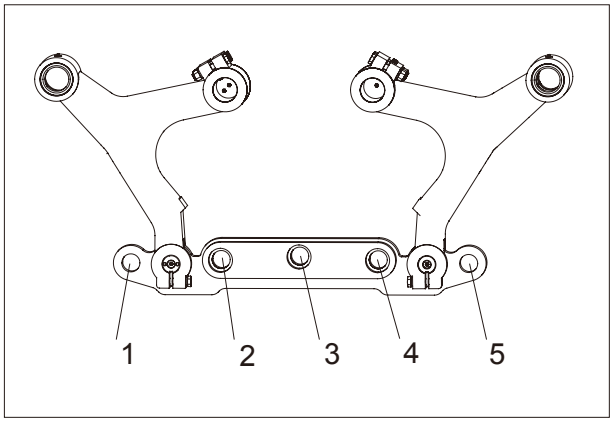


Fig.4-84

When the working state of the swing support is shown in Fig.4-83, insert the lock pin of the centershift cylinder into the third hole on the left.

As shown in Fig.4-83, when turning over the blade leftward or rightward, lock the swing support at position 5 and position 1 respectively.

If necessary, adjust the position of the swing support. Operate the centershift cylinder by observing the following procedures:

1. Press the centershift cylinder switch to make the lock pin come out of the center hole of the swing support.

2. Operate the left and right lift cylinder to lower the left of the blade to the ground. Operate the left lift cylinder to extend the left lift cylinder, and the swing support rotates clockwise till the lock pin of the centershift cylinder aligns with the center hole of the swing support.

3. Press the centershift cylinder switch to insert the lock pin into the center hole of the swing support. So the swing support is locked.

4. Repeat step 2 through step 3 to lower the right of the blade to the ground. Operate the right lift cylinder to rotate the swing support counterclockwise.

⚠ WARNING

- **When removing the lock pin of swing support, the blade may move suddenly, which may cause personal injury.**
- **Make sure the blade is clear of people before removing the lock pin. Furthermore, set the circle and the blade properly to be at the center under the machine. Straighten the frame and lower the blade to the ground.**

4.8.20 Inflating the tire

4.8.20.1 Inflation procedures

Take the following procedures to inflate tires:

- Check the tire valve before inflation. Wipe out the dust on the valve hole and do not loosen the valve core. If the valve hole and valve core are not fit flatly (e.g., bulgy or concave phenomenon or other defects), do not carry out inflation or pressure measurement.

- Keep the valve core clean during inflation. The air inflated into the tire should be free of water or oil, or the rubber of tube may be deteriorated and damaged. We recommend nitrogen for inflation, as it can greatly reduce the oxidation of tire.
- Never inflate the tire to a pressure highly over the standard value and then deflate it. Do not inflate the tire to a high pressure either. Excessive inflation pressure will make the cord over-extended, the tire adhesion force reduced, the tire damaged at an early stage, and the life time of tire shortened.
- After inflation, you can coat some soap water on the valve cock to check for air leakage (little bubble). Fit the valve hole and cap together firmly to prevent the valve hole from sands.

Table 4-1 Tyre specifications

Model	Tire Size	Front /Rear Wheel Pressure	Wheel Nut	Tightening Torque
SMG200	17.5-25 12PR	0.25MPa	M20	550N•M

NOTICE

- **Take care during inflation. Check the tire pressure with a pressure gauge from time to time to avoid the explosion of tire as a result of incorrect inflation pressure. Check the pressure gauge regularly to ensure the accuracy of tire pressure inspection.**
- **Check the tire pressure at least once a month. The check must be done when the tire is cold. If the tire needs to be inflated after working for a period, you must wait till the tire cools down. This is because the tire pressure measurement is incorrect when the tire is very hot.**

4.8.20.2 Tire shipping pressure

Pressures for each application may need to be varied from the pressures that are shown. The pressures should always be obtained from the tire supplier. As shown, the tire inflation pressure is cold inflation shipping pressure.

Table 4-2 Tire Shipping Pressure for SMG200

Size	Ply rating or strength index	Shipping pressure	
		kPa	psi
14.00-24 (1)	12	303	44
17.50-25	12	291	42

4.8.20.3 Tire shipping pressure adjustment

Always obtain the proper tire inflation pressure and maintenance recommendations for the tires on your machine from your tire supplier. The tire pressure in a warm shop area 18 ℃ to 21 ℃ (65°to 70°F) will significantly change when you move the machine into freezing temperatures. If you inflate the tire to the correct pressure in a warm shop, the tire will be underinflated in freezing temperatures. Low pressure shortens the life of a tire.

4.8.21 Operation and gearshift for the transmission

- Please strictly observe the operational regulations to operate the transmission and shift gears. Before the engine starts, place the control level at the parking brake position. After the engine starts, release the parking brake, and pull the control level at the desired gear and towards the desired travel direction.

- When the grader is gliding on the slope, the rotating speed of the engine must be above 750r/min to ensure lubrication and cooling of the transmission.

- The grader is not allowed to run and work on the slope whose gradient is above 42%.

4.9 Parking the Machine

4.9.1 Stopping the machine

Park on a level ground. If it is necessary to park on a slope, chock the wheels securely.

- Release the throttle pedal to decrease the engine speed.
- Apply the service brakes in order to slow the machine. Apply the transmission control lever to stop the machine.
- Place the transmission control lever in the P position.
- Lower the blade to the ground. Apply a slight downward pressure.

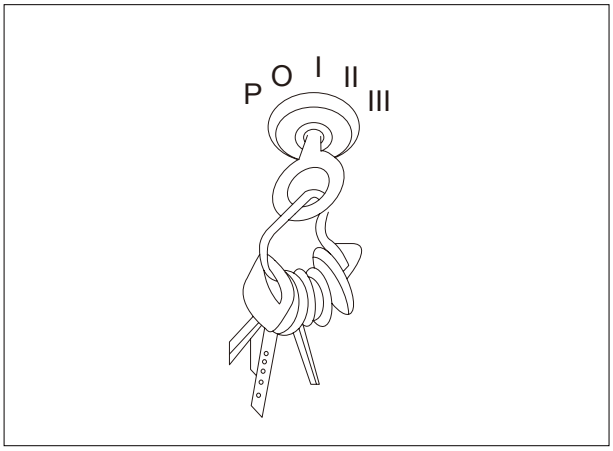


Fig.4-85

4.9.2 Stopping the engine

- Stop the engine. **See: Section 4.4.4 on page 4-17.**
- Move all the hydraulic levers forward and backward to release the pressure in the hydraulic system. Reset the hydraulic lever to the fixed position.

NOTICE

- **In case of loaded operation, immediate engine stall will cause overheating and accelerate the wear of engine parts. You should idle it for 1-2min.**
- **For temporary parking, if the machine is at an unsafe place, turn the key switch clockwise to position “I” and turn on the parking alarm lamp switch. The alarm lamp will flash. This can prevent accidents.**

4.9.3 Stopping the engine in the event of electrical malfunction

When turning the engine start switch to the OFF position, if the engine doesn't stop, follow the procedure below:

- Turn the engine start switch to the OFF position. Remove the key.
- Open the front access door of the engine chamber on the right side of the machine.
- Disconnect master switch of power supply to the OFF position.
- Close the access door of the engine chamber on the right side of the machine.

Fig.4-86

4.9.4 Leaving the machine

- Use the steps and the handholds when you dismount. When you dismount, face the machine and use both hands.
- Inspect the engine camber for debris. Clean out any debris in order to avoid a fire hazard.
- Remove all flammable debris from the front bottom guard through the access doors in order to reduce a fire hazard. Discard the debris properly.
- Turn the battery disconnect switch to the OFF position.

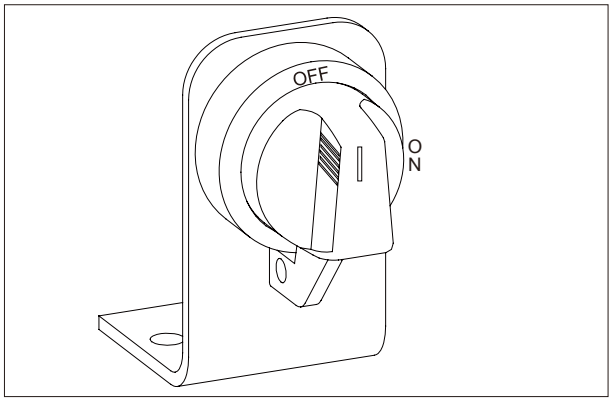


Fig.4-87

- Lock all access doors and compartments.

4.9.5 Towing the machine

In case of the engine malfunctions, the motor grader needs to be towed. Perform the following work before towing the machine.

This machine is equipped with parking brakes that are applied by springs. The brakes are released by hydraulic pressure. The parking brake must be disengaged before towing the machine. If the parking brake is engaged, the machine cannot be moved.

NOTICE

After the engine stops, towing of a disable machine may cause transmission damage.

These towing instructions are for moving a disabled machine for a short distance at low speed. Move the machine at a speed of 2 km/h or less to a convenient location for repair. These instructions are only for emergencies. Always haul the machine if long distance moving is required.

Take the following steps to tow the machine:

- Chock tires at their front or rear with wooden wedges.
- Remove the drive shaft connecting the transmission and the rear axle.
- Connect the tailer and the towed machine with hooks and ropes.
- Remove the wooden wedges for tires.
- Tow the machine slowly with the tailer. It is required that the driver controls the steering wheel and applies emergency steering function to control traveling directions.
- Tow the machine to the nearest maintenance station.

4.10 Machine Transportation

4.10.1 Preparation before loading

- Perform warm-up operation before loading/unloading the machine in cold weather. See: Section 4.4.4 "Warm up the engine"on page 4-17.
- In case of shipping, measures against sea water, salt mist and corrosion shall be taken. For example, applying wax on paint; applying antirust oil on machined surfaces and cylinder piston rods and then wrapping them in oiled paper.

4.10.2 Check before loading

- Check the length, width, height and weight of the trailer for loading the machine.
- Check whether the ground is solid and flat. Check whether there is a certain safety distance between the machine and the road edge.
- Check whether stoppers are set under the wheels.
- Check whether the access ramp is wide and strong enough to support the machine. Check whether the gradient of the access ramp is less than 15°.

4.10.3 Loading

- Lift the blade, dozer plate and scarifier to the highest positions. Operate them to the traveling position.
- Align the center line of the machine with that of the trailer.
- Drive the machine onto the slope slowly.
- After correcting the machine position, straighten the articulation frame, adjust the front wheels to be vertical, lower the blade to the required position for traveling, lower the dozer plate and scarifier, and underlay them with rubber or soft wood.
-

- Stop the engine and take down the key.
- Lock the cab window and close the engine hood.

4.10.4 Transportation

- Fix the four machine corners and work implements onto the trailer with chains or cables. Connect the chains or cables to the frame. They shall not cross or press on the hydraulic pipeline or hose.
- Fix the articulation steering with the pull rod. Wedge the wheels with triangle timber blocks. Take other measures to fix the motor grader firmly.
- Keep the coolant in the engine water tank. Reserve some fuel for delivery.
- Disconnect the battery.

4.10.5 Unloading

- Lift the work implement. Move the machine slowly. The junction of flatbed rear end and slope is protuberant. Take care to pass it.
- When the machine moves to the slope, lower the machine carefully until it leaves the slope completely (prevent possible hydraulic cylinder damage and severer collision between the blade and ground).

4.10.6 Container transportation

4.10.6.1 Packing requirements

- To prevent rust of electrical elements in cab, put a bag of dryer into the control box. Remove the outer plastic film. Put the whole bag of dryer in the control box. Do not put it near any electrical element. Afterwards, wrap up the control box with bubble film and fix it with tape. Make sure it will not loosen during transportation.
- Record and identify the removed parts. Pack them in accordance with the requirements of container transportation.

- Protect the painted surfaces during loading/unloading and transportation. Avoid bruise and scratch.
- Fix the supporting bracket and wood wedges firmly. Fasten the motor grader body, parts and attached spare parts to the container reliably. This is to prevent the jolt and vibration during transportation from damaging the painted surfaces and body.

4.10.6.2 Removing and Packing the machine

1. Removal of extra-wide or extra-high parts:
Remove the exhaust tail pipe.

- Remove the cab. Disconnect the cab harness (scrubber pipe and electrical connector). Remove the connection bolts connecting the cab body and the cab floor. Remove the king pins connecting the front frame. Lift the cab down. Place the parts box on the cab bracket and fix it with iron wires. Put the cab into the container and fix it with bolts on the cab bracket.
- Remove the air pre-filter.
- Remove rear view mirrors at two sides of cab.
- Remove tires and install steel wheels instead.
- Disconnect ball cups on the left/right lift cylinder and the drawbar, and fix cylinders on the rocker arm with iron wires wrapped in rubber hose. Lift and install the drawbar with wires on the left/right rocker arm.

2. Removal of optional parts:

- Front dozer plate, counterweight, scarifier are optional based on customers' needs. During packing, adjust positions of heavy parts for safety based on actual situations.
- When front dozer plate is equipped, remove the mounting seat of front dozer plate. Then lift and install the front dozer plate beneath the front axle frame and the

drawbar. Chock the dozer plate under its bottom with wooden block to prevent the dozer plate from wobbling.

- When front counterweight is configured, remove mounting seats of front counterweight and dozer plate. Then place them close to two sides of the cab in the container and fix them with wooden blocks.
- When scarifier is congifured, remove the scarifier, keep its bracket on the rear frame, and place other parts under the tire bracket in the container.

3. Protection of extra-wide or extra-high parts:

- Preparing the parts box—A standard Sany parts box underlaid with a layer of air bubble film.
- Packing screws—Coat mounting screws of dozer plate, mounting washers of tire, mounting bolts of front counterweight and scarifier with antirust oil, and wrap them tightly with air bubble film in the parts box.
- Packing rear view mirrors—Wrap them with air bubble film and put them in the parts box.
- Packing the exhaust tail pipe—Wrap it with air bubble film and put it on the cab floor.
- Packing the air pre-filter—Wrap it with air bubble film and put it in the parts box.
- Packing cylinders of scarifier and dozer plate—Remove cylinders and wrap them with air bubble film, and place them on the side of cab bracket in the container, and fix them well.

4. Incasement:

- Unloading empty containers—Place all containers towards the same direction, open their doors and label containers on destination address and specfic configurations.

- Loading tires—Six tires are fixed on bracket. Use a forklift to carry the bracket in the front end of the container. Wedge them with two wood wedges. Take up wood wedges inward with iron wires and fix the bracket by hooks and iron wires.
- Loading main body of scarifier—Use a forklift to carry the main body of scarifier into the container, and put it underneath the bracket on the container floor. Jack up the main body to contact the bracket, and fix them by hooks and iron wires.
- Loading main body of grader—Strengthen articulation frame. Make the center of front wheel group match that of the machine together and adjust steel wheels to be vertical. Drive the machine into the container at low speed and make it jack up tires and scarifier at its front. Before the machine starts, fix articulation steering with pull rod, and place wooden block at door sill.
- Fixing basic machine—After the basic machine is driven into the container, fix the blade by hooks and iron wires. Underlay the blade and front dozer plate with compound wooden block or rubber board. Tense hooks and holes on steel wheel by iron wires, protect traction hole with wear resistant cloth. Chock connection joint between the front part of front wheel, rear part of rear wheel and the container floor with wood wedges. Nail wedges by round steel nails.
- Loading main bodies of front counterweight and dozer plate—Use a forklift to carry main bodies of front counterweight and dozer plate into the container. Place counterweight at left side of tail and main body of dozer plate under the cab bracket. Place common rubber board at the bottom. Fix them by hooks and iron wires, protect them with wodden blocks around. Nail them with round steel nails.

- Loading the cab—Load the parts box and cab together into the container. Protect contact part between the auxiliary frame of cab and the scarifier. Fix them by iron wires and nail the frame with round steel nails.
- After loading the grader and its parts into the container, see Layout Drawing in Container.

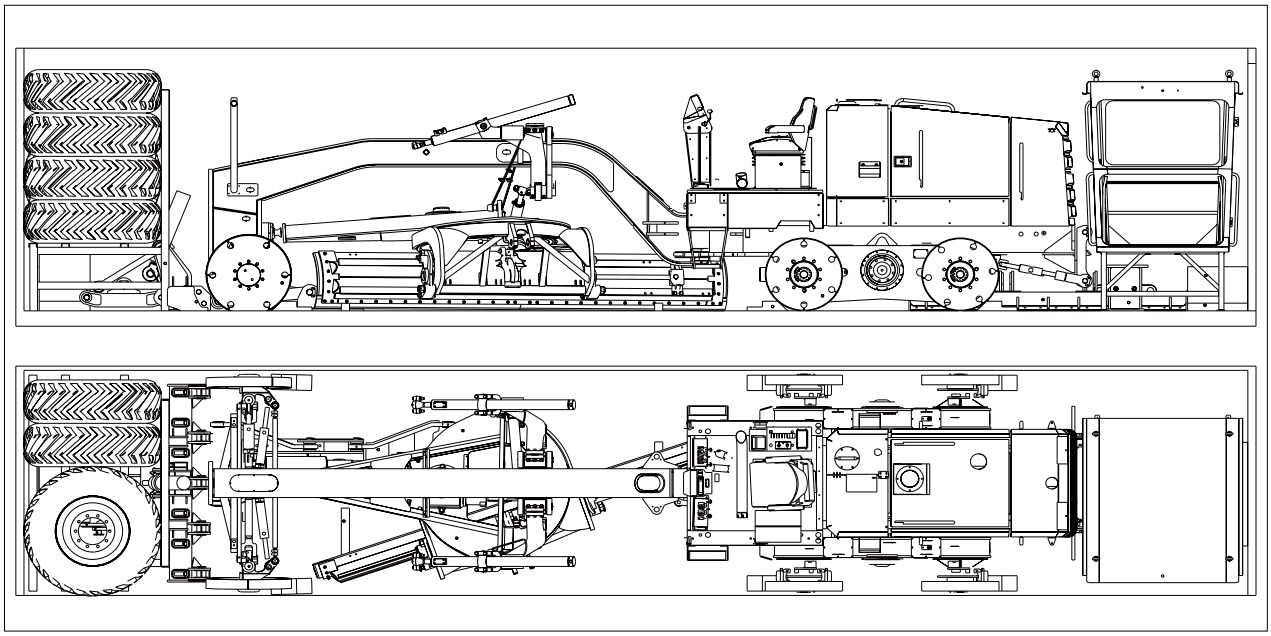


Fig.4-88

5. Protection after load:

- Check before protection—Before protection, ensure its coating is qualified and dry, its surface is clean, dry, free of dust, water, oil and rust. Make sure to take antirust treatment on fasteners connecting parts, and screw up them.
- Protection flow: cleaning—antirust treatment on external uncoated parts—protection of engine—protection of overall coating—drying—protection of parts—packing.
- Cleaning—Clean external uncoated parts like light cover, fasteners, connectors with solvent gasoline or paint thinner. Ensure tools like cloth or paint brush is clean. After cleaning, the machine should be clean and free of dust, rust and other foreign materials. Blow them with compressed air or wipe them with clean soft cloth and polishing paper. Wait for 5-10 min and then take protective treatment.
- Antirust treatment on external uncoated parts—Coat external plated parts, aluminium parts like connectors, hydraulic valves and screws, diesel engine parts (connection disc seat, primary filter bracket, fine filter bracket) and hydraulic valve blocks with antirust oil 377-HF. Cover the cylinder piston rod with a shield. After coating, remove the shield and wipe these parts with clean cloth dipped by thinner. Coat antirust oil 377-HF evenly after thinner evaporates, wrap them with air bubble film and band them with transparent adhesive tape. Lubricate each lubrication fitting, front axle bearing and tray-type circle with lithium grease Shell NLG12. See Schematic Diagram of Lubricating Points for Grader for specific lubricating parts.
- Protection of engine—Refer to Item 5.5 in Standard Q/SY 042 025-2008 Specifications on Protection of

Construction Machinery Export to coat protective coating AP1520 on surfaces of engine and covering parts.

- Protection of overall coating—Refer to Item 5.7 in Standard Q/SY 042 025-2008 Specifications on Protection of Construction Machinery Export to coat protective wax AP585 on the cab, front frame, rear frame, blade, working implements, covering parts, hydraulic elements, connectors, plated parts and parts like stainless steel, copper, nickle, chrome without antirust oil.
- Drying—Refer to Item 5.8 in Standard Q/SY 042 025-2008 Specifications on Protection of Construction Machinery Export to dry overall coated machine.
- Protection of parts— ① Requirements for protection of the control box: wrap the control box with air bubble film and transparent adhesive tape, and place silica-gel drier inside. ② Requirements for protection of console: wrap console with air bubble film and transparent adhesive tape, and place silica-gel drier inside. ③ Requirements for protection of air filter interface: wrap air filter interface with air bubble film and transparent adhensive tape.

6. Shipping:

- Reach staker locks containers. Lift and carry each container smoothly. Drive a flatcar under the container, keep the staker stationary and low the container smoothly until it lands on the flatcar. Then fix the container.
- After the Quality Assurance Department has checked the container, lock it.

4.10.6.3 Moving the machine out of container

Take the following steps to move the machine out of container:

1. Open the container door. Release the restraints positioning the cab, basic machine and tires: iron wires, positioning wood wedges, steel nails, etc. Remove the bubble film on the control box. Take out the dryer.

2. Use a forklift to take out the cab together with the bracket.

3. Pry out the nails fixing the parts box. Take out the parts box and attached objects.

4. Make sure all restraints have been removed and there is no obstacle. Next, operate according to the following procedures:

- After sufficient ventilation, get the ignition key, start the engine and turn on the illuminating light.
- Lift the blade until the height above the ground exceeds 60mm (pulling back the handles at left and right ends). Lift the scarifier to the highest position (pulling back the left fourth handle counted from outside to inside).
- Engage reverse gear 1 (pulling back the gear control lever for 2 positions) to accelerate slowly. Control the direction to travel straight. Prevent any wheel from touching the container wall.
- Set a crosstie at the sill of the container for transition. Thus, the basic machine can pass the sill stably. Drive it to a proper place for reassembly.

4.10.6.4 Reassembly

1) Cab

- Adjust the seat and console to move toward the cab center .
- Lift and install the cab.
- Connect the wires, water pipes, bolts and pins against side dumping.
- Readjust the seat and console.

2) Tires

Install the tires. Check the tire pressure. If insufficient, inflate them. See: Section 4.8.19 "Inflating the tire" on page 4-50.

3) Dozer plate (if equipped)

Align the mounting hole of the dozer plate with the screw hole on the front beam. Use bolts, nuts and washers, spring washers. Unscrew the plugs of the upper and lower oil tubes. Connect with the corresponding balance valve connector.

4.10.6.5 Site transfer

1. After construction at one worksite, transfer the machine to another worksite by short-distance road traveling, see: Section 4.7 "Move the machine" on page 4-20.

2. Observe the local traffic laws and regulations.

SANY

Maintenance

5 Maintenance

⚠ WARNING

Read and understand all safety precautions and instructions in this manual before reading any other manuals provided with this machine and before operating or servicing the machine. Failure to do this can cause property damage, personal injury or death.

5 Maintenance

5.1 Maintenance Information

Read all safety information, warnings and instructions when you service the machine. Correct maintenance will increase the reliability of machine and prolong the service time of essential components.

5.1.1 Precautions on engine performance

The proportion of combustion air and fuel injection of the diesel engine has been adjusted, which determines engine performance and temperature, and the quality of exhaust gas.
Contact SANY or contact the service center of engine manufacturer if the engine is to be used with full load in high-altitude area.

5.1.2 Precautions on fuel system

- The lifetime of diesel engine mainly depends on the fuel cleanness.
- Make sure the engine is free of dirt and water, or the fuel injection elements may be damaged.
- Never use a galvanized iron barrel to store fuel.
- Before sucking the fuel from a barrel, leave the barrel aside for a long time.
- Gently use the fuel suction pipe to avoid stirring up the sediments at the bottom of the barrel.
- Do not suck the fuel from the bottom of the barrel.
- The residual fuel in the barrel can only be used for cleaning rather than used in engine.

5.1.3 Precautions on hydraulic system

Keep the hydraulic system from being contaminated. Make sure no dirt or any other dirty substance enters the system, as even tiny particles may scratch the valve, which may cause the hydraulic pump to be seized, and restrictor or guide hole to be blocked or seized, resulting in high maintenance cost.

- If the oil level drops during the daily check, check all pipelines and hydraulic elements for leaks.
- Seal the external leaking point immediately. If necessary, contact the after-sales service center for repair.
- Do not leave the hydraulic oil barrel in the open air. The water may enter the barrel through the oil-drain port.
- Use an oil filling and filtering device to fill hydraulic oil. This device is equipped with a fine filter that can filter the hydraulic oil and prolong the lifetime of the filter.
- Unless it is necessary, do not leave the oil filler of the hydraulic oil tank open. Otherwise, the dirt may enter the oil tank.

5.2 Requirements on use of oil & fluids

5.2.1 Introduction of functional oil & fluids

5.2.1.1 Engine oil

Choose engine oil according to the function and type. Other engine oil meeting the required specifications also can be chosen.

As the viscosity of engine oil varies with the temperature, the local ambient temperature is extremely important for the selection of viscosity grade.

If the ambient temperature is occasionally lower than the applicable temperature limit (for example, using SAE 15W/40 engine oil at -15℃), only the engine cold start capability but not the engine will be affected.

The multi-grade oil does not require frequent oil change according to the temperature change. The synthetic oil is better since it can be used under higher temperature and it is more reliable.

The maximum allowable duration for the engine oil is 1 year. If the oil change intervals exceed 1 year, the oil shall be changed at least once a year.

The engine oil used by this machine shall be changed every 250 working hours. This change interval is only applicable for engine adopting diesel oil with sulfur content below 0.5% and in temperature above -10°C.

When the sulfur content is 0.5%~1% or the temperature is below -10°C, the oil change interval should be shortened half. If the sulfur content is 1~1.5%, the engine oil shall contain TBN, 12 times more sulfur content, with the change interval shortened half.

5.2.1.2 Fuel

⚠ WARNING

- **Do not mix diesel with gasoline, alcohol or mixture of gasoline and alcohol, otherwise explosion will be caused.**

NOTICE

- **Fuel quality should be controlled strictly, otherwise the water and impurities in the fuel system will cause serious damage to engine pump and nozzle.**

Regular diesel oil meeting national and local emission standard is recommended.

The diesel oils below are permitted:

- GB252
- DINEN590
- BS 2869: A1 and A2
- ASTM D 975-78: 1-D and 2-D
- NATO Code F-54 and F-75

Refill the tank to avoid running out of oil. Otherwise, the lube filter and injection lines need to discharge.

Only commercially available diesel fuel can be used. Ensure that the sulfur content is less than 0.5% and no contamination when filling in. Higher sulfur content has negative effect on oil change intervals.

To avoid blocking caused by paraffin, only winter diesel fuel can be used in temperature below 5 ℃. The mixture of diesel oil and proper additive can also be used.

5.2.1.3 Lubricant

Lubricant includes engine oil, gear oil, transmission oil, hydraulic oil, etc.

The proper viscosity grade is determined not only by the minimum outside temperature when the machine is started, but also by the maximum outside temperature while the machine is operated.

Parts that are continuously operated should use the oil with higher viscosity in order to maintain the highest possible oil film thickness.

5.2.1.4 Grease

Use lithium-based high pressured saponified grease.

5.2.1.5 Coolant

Antifreeze of organic acid technology (OAT) is adopted.

NOTICE

- **Do not mix coolant with additives of different types.**
- **The protective agent of cooling system must be disposed environmentally.**

5.2.2 Oil & Fluids Selection

5.2.2.1 General requirements

1. SANY special oil and fluids are recommended.

2. Select oil and fluids with proper quality grade, technical specifications and viscosity as per latest standard of related authorities according to this manual.

3. Failing to use the oil and fluids according to this manual, machine performance may be affected and fault may be caused to relevant parts.

4. To ensure machine performance, oil and fluids of different brands should not be mixed; otherwise, sediments or layers may be caused, which lead to performance degradation or failure, even fault of machine and parts.

5. Disposal of oil and fluids should comply with local laws and regulations.

6. Viscosity selection

a. Ambient temperature

Ambient temperature refers to the air temperature surrounding the machine. Do check the local temperature and possible air temperature before selection.

Generally, viscosity selection is based on the higher temperature in the standard. When the machine starts, the max. allowable viscosity under ambient temperature could be selected. In extreme cold area, it's better to use parts heating system and oil and fluids of higher viscosity.

b. Viscosity grade

Proper viscosity depends on the min. ambient temperature, which is the temperature for machine startup and operation.

To determine proper viscosity grade under the min. ambient temperature for startup and operation, refer to the “Min. Temp.” in the following tables. To determine proper viscosity grade under the max. ambient temperature for startup and operation, refer to the “Max. Temp.” in the following tables. Unless specially specified, the max. allowable viscosity grade under ambient temperature should be selected for machine startup.

For long-term operation, oil and fluids of higher viscosity should be selected for transmission and differential, so as to maintain the thickest film.

7. Oil and fluids used under low temperature.

a. Before start-up of the machine, ensure engine oil, transmission oil, hydraulic oil and other fluids are fully flowing. Take out the dipstick, check that the oil or fluid flows down the dipstick easily. Oil or fluid diluted by kerosene is prohibited.

b. If different oil or fluid is replaced under low temperature, the filter element should be replaced too. Otherwise, the filter element and housing will be solidified. Drain the oil and fluids in hydraulic cylinder and pipelines. After replacement, run the machine to circuit the oil and fluid.

c. Select proper viscosity according to this manual.

d. In case of change of temperature, change proper oil and fluids according to this manual.

5.2.2.2 Requirements of oil and fluids

Table 5-1 Engine Oil Under Different Ambient Temperature

Part/System	Type, quality grade & technical spec. of oil & fluids	Viscosity grade of oil & fluids	Ambient temp.（℃）	
			Min. Temp	Max. Temp.
Engine crankcase	Diesel Engine Oil • API CI-4 • GB 11122	SAE 0W-20	-40	10
		SAE 0W-30	-40	30
		SAE 0W-40	-40	40
		SAE 5W-30	-30	30
		SAE 5W-40	-30	40
		SAE 10W-30	-20	40
		SAE 10W-40	-20	50
		SAE 15W-40	-15	50
	Note： 1. Unless specially specified, this machine adopts Diesel Engine Oil CI-4 15W-40 when delivery. It is specially used for SANY machine with applicable temperature of -20℃ to 50℃ . 2. For engine with emission of China Ⅱ or Euro Ⅱ standard for off-road machine, API CH-4 or lubricant of higher grade should be used. 3. For engine with emission of China Ⅲ or Euro Ⅲ standard for off-road machine, API CH-4 or lubricant of higher grade should be used. 4. For engine with emission of Euro Ⅳ standard for off-road machine, API CJ-4 or lubricant of higher grade should be used.			
Transmission with hydraulic torque converter (Advance/ZF transmission for motor grader)	Diesel Engine Oil • API CI-4 • GB 11122	SAE 0W-20	-30	10
		SAE 0W-30	-30	30
		SAE 0W-40	-30	40
		SAE 5W-30	-25	30
		SAE 5W-40	-25	40
		SAE 10W-30	-20	40
		SAE 10W-40	-20	50
		SAE 15W-40	-15	50
	Note: 1. Unless specially specified, this machine adopts Diesel Engine Oil CI-4 15W-40 when delivery. It is specially used for SANY machine with applicable temperature of -20℃ to 50℃ . 2. When ambient temperature is below -30 ℃ , oil for transmission should be heated above -30℃ before startup.			

Table 5-2 Automotive Gear Oil Under Different Ambient Temperature

Part/System	Type, quality grade & technical spec. of oil & fluids	Viscosity grade of oil & fluids	Ambient temp.（℃）	
			Min. Temp	Max. Temp.
Rear axle	Heavy-duty Automotive Gear Oil • API GL-5 • GB 13895	SAE 75W-90	-40	30
		SAE 80W-90	-20	40
		SAE 85W-90	-15	40
		SAE 85W-140	-10	50
		SAE 90	0	40
Note	1. Unless specially specified, this machine adopts Heavy-duty Automotive Gear Oil GL-5 80W-90 when delivery. It is specially used for SANY machine with applicable temperature of -25 ℃ to 40℃ .			

Table 5-3 Coolant Under Different Ambient Temperature

Part/System	Type, quality grade & technical spec. of oil & fluids	Viscosity grade of oil & fluids	Ambient temp.（℃）	
			Min. Temp	Max. Temp.
Cooling system (Engine radiator)	Antifreeze • OAT • GB 29743	-35	-30	50
		-45	-40	50
Note	1. Unless specially specified, this machine adopts Antifreeze OAT -45 when delivery. It is specially used for SANY machine with applicable temperature of -40℃ to 50℃ .			

Table 5-4 Transmission Oil Under Different Ambient Temperature

Part/System	Type, quality grade & technical spec. of oil & fluids	Viscosity grade of oil & fluids	Ambient temp.（℃）	
			Min. Temp	Max. Temp.
Power shift transmission (Two-gear/ eight-gear transmission for motor grader)	Transmission Oil • CATERPILLAR TO-4	SAE 0W-20	-40	10
		SAE 0W-30	-40	20
		SAE 5W-30	-30	20
		SAE 10W	-20	10
		SAE 20	-15	20
		SAE 30	0	35
		SAE 40	5	45
		SAE 50	10	50
Power shift transmission (DANA transmission for motor grader)	Transmission Oil • DEXRON Ⅲ	ATF	-30	40
	Transmission Oil • CATERPILLAR TO-4	SAE 0W-20	-30	20
		SAE 10W	-20	10
		SAE 20	-15	20
		SAE 30	0	35
		SAE 40	5	45
		SAE 50	10	50
Tandem with wet multi-disc brake (GA20 Tandem for motor grader)	Transmission Oil • API GL-4 • CATERPILLAR TO-4	SAE 0W-30	-40	20
		SAE 5W-30	-30	20
		SAE 20W-40	-15	40
		SAE 50	10	50
Note	Unless specially specified, this machine adopts the following fluids: 1. Two-gear/ eight-gear transmission for motor grader: Transmission Oil TO-4 SAE 30. It is specially used for SANY machine with applicable temperature of -30℃ to 40℃. 2. DANA transmission for motor grader: Transmission Oil ATF (DEXRON Ⅲ). It is specially used for SANY machine with applicable temperature of -40℃ to 40℃. 3. GA20 Tandem for motor grader: Transmission Oil SAE 20W-40. It is specially used for SANY machine with applicable temperature of -20℃ to 40℃.			

Table 5-5 Hydraulic Oil Under Different Ambient Temperature

Part/System	Type, quality grade & technical spec. of oil & fluids	Viscosity grade of oil & fluids	Ambient temp.（℃）	
			Min. Temp	Max. Temp.
Hydraulic system	Normal Temperature Hydraulic Oil HM / L-HM Anti-wear Hydraulic Oil • AFNOR NF E 48-603 HM • ISO 11158 L-HM • CINCINNATI P68、P69、P70 • EATON-VICKERS M-2950 S、I-286 S • PARKER-DENISON HF-0、HF-1、HF-2 • Q/SH303 0550 • GB 11118.1	32	-20	5
		46	-20	10
		68	-15	50
	Wide-temperature Hydraulic Oil HV / L-HV Low-temperature Hydraulic Oil • AFNOR NF E-48-603 HV • ISO 67434/4 HV • DIN 51524 P3 HVLP • CINCINNATI P68、P69、P70 • EATON(VICKERS) M-2950 S、I-286 S • Q/SH303 0661 • GB 11118.1	32	-30	10
		46	-30	15
		68	-25	50
	Aircraft hydraulic oil • SH 0358 • Q/SH PRD0476	10#	-40	5
Note	1. Unless specially specified, this machine adopts Normal Temperature Hydraulic Oil HM 68/L-HM Anti-wear Hydraulic Oil when delivery. It is specially used for SANY machine with applicable temperature of -15 ℃ to 50℃ .			

Table 5-6 Grease Under Different Ambient Temperature

Part/System	Type, quality grade & technical spec. of oil & fluids	Speed with load	NLGI grade	Ambient temp.（℃）	
				Min. Temp	Max. Temp.
Grease lubricated parts	EP Lithium-based Lubricating Grease • ISO 6743-9: L-XBCEB 1 • DIN 51502: KP1K-30	High	1	-30	40
	EP Lithium-based Lubricating Grease • ISO 6743-9: L-XBCEB 2 • DIN 51502: KP2K-25 • GB/T 7323	High	2	-25	50
		Mid	2	-20	40
		Low	2	-25	40
	Tank Lithium-based Lubricating Grease GJB 4364	/	2	-50	50
Note	1. Unless specially specified, this machine adopts Extreme Pressure Lithium-based Lubricating Grease 2#. It is specially used for SANY machine with applicable temperature of -25℃ to 50℃ .				

Table 5-7 Diesel Oil Under Different Ambient Temperature

Part/System	Type, quality grade & technical spec. of oil & fluids	Grade of oil (as per condensation point)	Ambient temp.（℃）	
			Min. Temp	Max. Temp.
Fuel system (Diesel engine)	Regular diesel oil GB 252	Diesel Oil 5#	8	50
		Diesel Oil 0#	4	50
		Diesel Oil -10#	-5	50
		Diesel Oil -20#	-14	50
		Diesel Oil -35#	-29	50
		Diesel Oil -50#	-44	50
Note	1. Unless specially specified, this machine adopts Diesel Oil 0# when delivery. 2. Regular diesel oil meeting national and local emission standard is recommended.			

5.2.3 Filling capacity

Table 5-2 Refill Capacity

Compartment or System	Liters	US gal	Imp gal
Engine Crankcase	18	4.8	4
Transmission	55	14.5	12.1
Differential	44	11.6	9.7
Hydraulic system	110	29.1	24.2
Cooling system	49.2	13	10.8
Fuel tank	380	145	120.8
Tandem drive case(one side)	72	19	15.8
Circle drive	6.5	1.7	1.4

5.3 Maintenance

The grader maintenance contains routine maintenance and regular maintenance.
The intervals regulated in regular maintenance are the same with those specified in the Engine
User's Guide.
The time for regular maintenance is calculated from the engine start.

5.3.1 Routine maintenance

(1) Clean the grader.

- Remove the mud, sands and gravels on the moldboard, guide bar and cutting edge.
- Remove the sands and mud on the circle.
- Remove the sands on the tires.
- Remove the sands and mud on the front axle frame, tilting joint and steering knuckle
- Remove the sands and mud on the tandem drive case and covering parts.
- Clean the air filter.

(2) Check the machine parts for tightness.
Especially check the connection bolts on the following parts for looseness and breakage.

Tighten or replace the loose or broken bolts:

- Rim bolt;
- Rear axle mounting bolts;
- Fixing bolts for engine and transmission;
- Connection bolts for engine and transmission;
- Blade fixing bolts;
- Drive axle fixing bolts.

(3) Check for oil leaks

- Check the pump, motor, multi-way valve, valve body, hose, flange and other connections for leaks.
- Check the engine, tandem drive case and turbine case for leaks.
- Check the A/C lines for leaks.

(4) Check electrical circuit

- Frequently check the harness connectors for water and oil. Keep them clean.
- Check the connectors and nuts at lamps, sensors, horn and brake pressure switch for looseness.
- Check the wire harness for short circuit, open circuit and damage. Keep the wire harness in good condition.
- Check the indicator for the high pressure filter (**see:section 4.5.4 Check high pressure filter on page 4-19**). If the indicator turns red, stop the grader and replace the high pressure filter.

(5) Check oil level and water level

- Check the level of lubricant, fuel and hydraulic oil. Fill fuel/oil up to the specified mark.
- Check the water level in radiator, and fill water to the required volume.
- Check the oil level in the transmission. **See: section 4.5.1 Check oil level on page 4-17.** If the oil level is lower than required value, add it. **See: section 5.3.8.1 Transmission oil-change on page 5-41.**

5.3.2 Regular technical maintenance intervals

Before the next maintenance interval, finish all maintenance items for the current maintenance interval.

When Required

Seat Belt - Replace

Blade Lift Cylinder Socket - Check/Adjust/Replace

Brake Accumulator - Check

Centershift Cylinder Socket - Check/Adjust/Replace

Circle Drive Oil Level - Check

Condenser (Refrigerant) - Clean

Cutting Edges and End Bits - Inspect/Replace

Engine Air Filter Primary Element - Clean/Replace

Engine Air Filter Secondary Element - Replace

Engine Overheating

Engine Power Loss

Fuel System - Fill

Fuses - Replace

MoldboardWear Strip - Inspect/Adjust/Replace

Oil Filter - Inspect

Radiator - Clean

Radiator Core - Clean

Receiver Dryer (Refrigerant) - Replace

Ripper Tip - Inspect/Replace

Scarifier Teeth - Inspect/Replace

Scarifier Teeth - Inspect/Replace

Window Washer Reservoir - Fill

Window Wiper - Inspect/Replace

Every 10 Service Hours or Daily

Brakes, Indicators and Gauges - Test

Circle Drive Pinion Teeth - Lubricate

Cooling System Coolant Level – Check/Add

Engine Oil Level - Check

Fuel System Water Separator - Drain
Seat Belt - Inspect
Transmission and Differential Oil Level - Check
Tires and Rims - Check
Articulation Bearings - Lubricate
Axle Oscillation Bearings - Lubricate
Tandem Breather – Clean
Engine Crankcase Belt - Inspect/Adjust
AC compressor Belt - Inspect/Adjust

Initial 50 Service Hours (first Engine oil change)

Engine Oil and Filter - Change
Fuel System Secondary Filter - Replace

Every 100 Service Hours or 2 Weeks

Blade Lift Cylinder Socket - Lubricate
Cab Air Filter - Clean/Replace
Centershift Cylinder Socket - Lubricate
Centershift Lock Bar - Clean/Lubricate
Drawbar Ball and Socket - Lubricate
Circle bearing (between Drawbar & Circle) - Lubricate
Fuel Tank Water and Sediment - Drain
Hydraulic System Oil Level - Check
Steering Cylinder Ends and Tie Rods -Lubricate
Tandem Oil Level - Check
Tire Inflation - Check
Wheel Bearing Oil Level (Front) - Check
Wheel Lean Bearings - Lubricate
Wheel Lean Cylinder Bearings - Lubricate
Wheel Bearing (Front) - Lubricate
Drive shaft - Lubricate

Initial 250 Service Hours (first transmission oil change)

Transmission Oil Filter and Screens -Replace/Clean
Transmission and Differential Oil - Change

Every 250 Service Hours

Engine Oil and Filter - Change

Fuel System Secondary Filter - Replace

Battery or Battery Cable - Inspect/Replace

Radiator core - Clean

Every 500 Service Hours or 3 Months

Fuel System Primary Filter (Water Separator) Element - Replace

Fuel Tank Cap and Strainer - Clean

Engine Air Filter Primary Element - Clean/Replace

Every 1000 Service Hours or 1Years

Transmission l Oil - Change

Transmission Filter and Screens -Replace/Clean

Hydraulic System Oil - Change

Hydraulic Oil Filter (Implement Controls(Brake Controls) - Replace

Every 2000 Service Hours or 2 Years

Battery or Battery Cable - Inspect/Replace

Circle Drive Oil - Change

Crankshaft Vibration Damper - Inspect

Differential Oil - Change

Tandem Drive Oil - Change

Cooling System Coolant - Change

5.3.3 Maintenance for long-time stored grader

If the grader is to be stored for 3 months or even longer, maintain it in accordance with the following instructions:

- Perform the maintenance for long-time storage and rust-proof treatment in accordance with the Engine User's Guide.
- Clean the grader. Park it in the garage if available or at a well-ventilated place in the open air and cover it with canvas.
- Fix the front and rear frames by articulation lock.

- Apply lubricant to the fittings.
- Remove the battery and charge in once a month.
- Seal the air filter, dust port and exhaust pipe outlet with plastic or paper tape to keep the engine free of moist air.
- Fill up the fuel tank to avoid condensation and rust.
- Fill the hydraulic oil tank to the mark “Max”.
- Fill the transmission, rear axle and tandem drive case with oil of same type.

5.3.4 Engine maintenance

5.3.4.1 Engine oil-check/refill/change

For the information on engine oil check/refill, **see: chapter 4.1.2.1 on page 4-1.**

Change the engine oil by observing the folllowing procedures:

1. Park the engine or machine on flat and solid ground.

2. Start the engine to warm up. When coolant temperature of the engine shown on the display rises to 60°C, shut down the engine.

Fig.5-1

⚠ WARNING

The engine oil is hot. Avoid the engine oil spilling onto your skin. Or it may lead to severe scald.

NOTICE

Never start the engine when draining the engine oil. Otherwise it will cause damage to the engine.

3. Place an container under the engine.

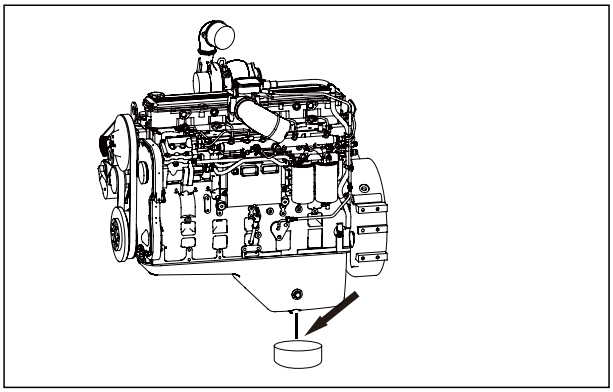


Fig.5-2

4. Remove oil-drain plug.
5. Drain the oil.
6. Install the oil-drain plug.
7. Refill new engine oil(**See Table 5-1 on page 5-6**).
8. Check the oil level.
9. Start the engine to check for leaks.

5.3.4.2 Engine oil filter - change

1. Thoroughly clean the outside of the filter.
2. Use a proper tool (belt spanner) to clamp the filter element.
3. Remove the filter element.

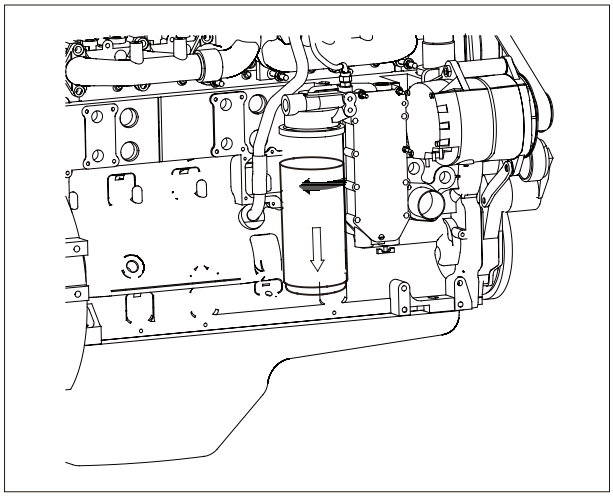


Fig.5-3

⚠ WARNING

The engine oil is hot. Avoid the engine oil spilling onto your skin. Or it may lead to severe scald.

NOTICE

Never start the engine when the engine oil filter is removed. Otherwise engine oil will flow from the pipeline and cause the engine lack of lubricating.

4. Collect the oil with a container.
5. Clean the sealing face on the filter carrier.
6. Fill engine oil into the new engine oil filter element.
7. Slightly apply oil on the rubber seal on the new filter.
8. Tighten the new filter element until the seal contacts the washer properly.
9. Tighten the filter element properly. Tighten the bolt.
10. Check the filter catridge for leaks.

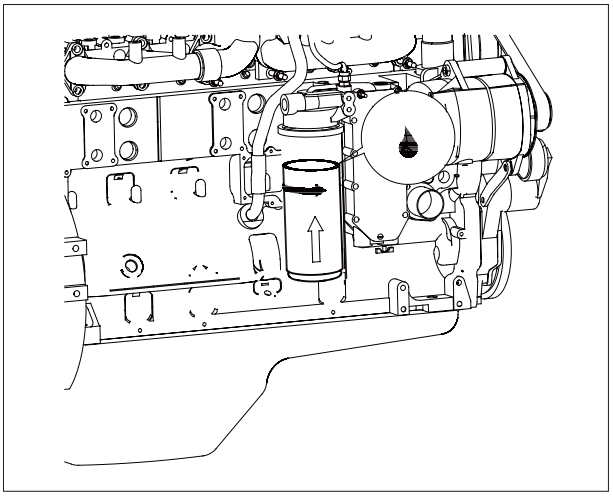


Fig.5-4

5.3.4.3 Fuel-check/refill/change

For the information on fuel level check/refill, **see: chapter 4.3.2 on page 4-10.**

⚠ WARNING

Fire hazard! When working on the fuel system do not use open flame or smoke. Fuel leaked or spilled onto hot surface or electrical components can cause a fire.

NOTICE

The engine must be shut down before changing the fuel! Or insufficient fuel supply will cause the engine to work inefficiently or even shut down, which will shorten the service life of the engine.

Change the fuel by observing the following steps:

1. Blow the outside of tank with compressed air to remove the dust or dirt.

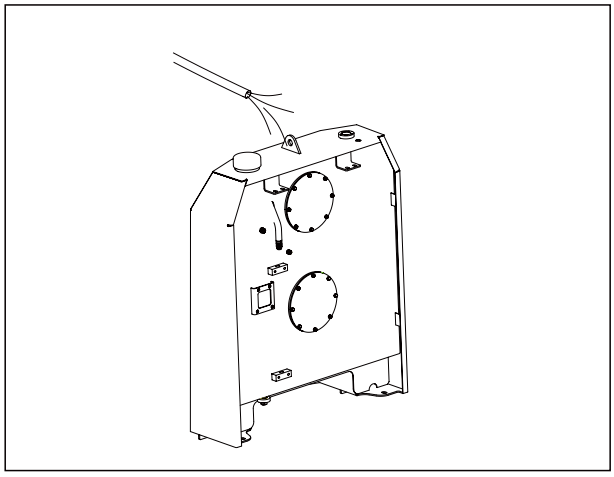


Fig.5-5

NOTICE

The purity of the fuel should be guaranteed. Otherwise the impuritiy such as dust will make the oil water separator to invalidate more easily and bring high resistance of fuel suckion.

2. Place a container under the drain port of the fuel tank. Remove the oil-drain plug at the bottom of tank to drain the dirty oil.

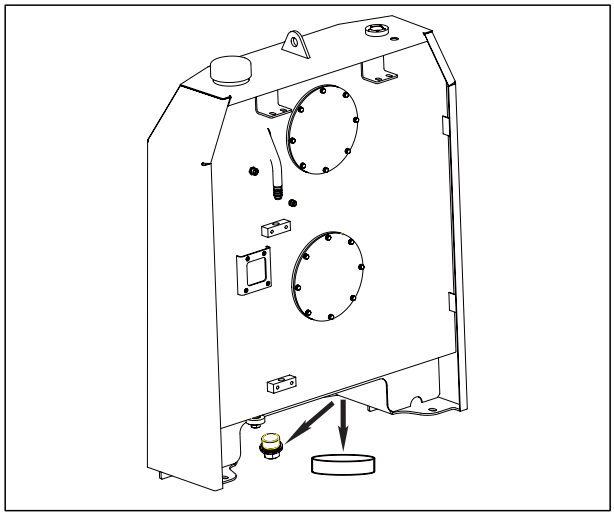


Fig.5-6

3. Open the cover plate on the front of the tank. Blow the residual oil and particles left in the fuel tank with compressed air.

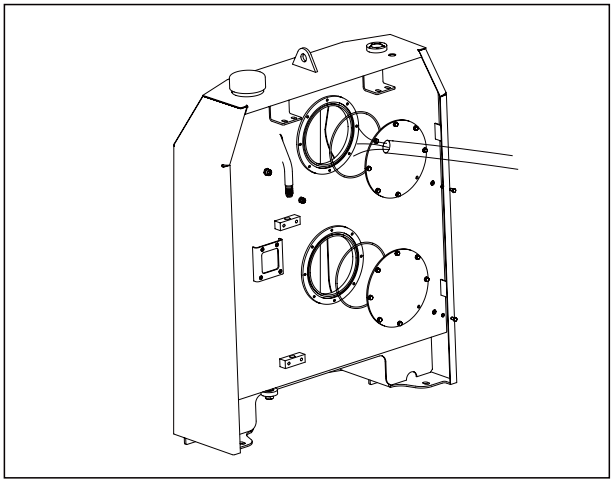


Fig.5-7

4. Refill an appropriate amount of clean diesel oil (or kerosene) into the fuel tank. Use a new brush to clean the tank. When the oil gets dirty, change it with new oil and continue cleaning till no dirt and sediment are found on the wall and bottom of tank.
5. Install the oil-drain plug securely, and Install the cover plate.
6. Refill the tank with specified fuel (**See Table 5-1 on page 5-6**). Install the filler cap securely.

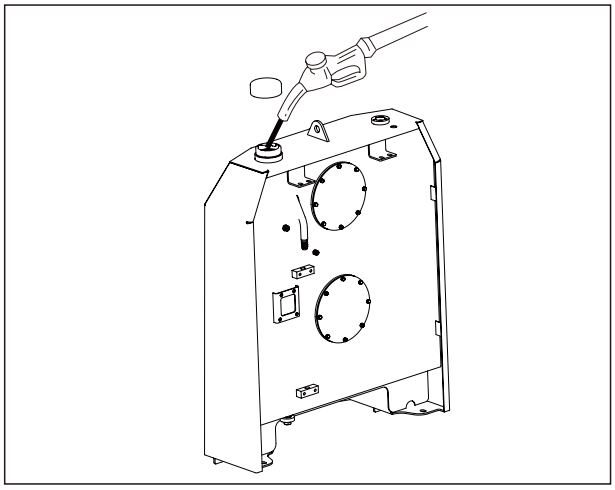


Fig.5-8

7. Turn on the igition switch to run the oil delivery pump for 30s, and then turn off the ignition switch. Repeat the steps for 3~4 times to cycle oil delivery pump the before engine starts.

5.3.4.4 Oil water separator - check/drain

For the detailed information on oil water separator check/drian, **see: chapter 4.1.2.3 on page 4-3.**

⚠ WARNING

Never use open flame or smoke when working on the oil water separator. Fuel leaked or spilled onto hot surface or electrical components can cause a fire.

5.3.4.5 Oil water separator - change

⚠ WARNING

Fire hazard! When working on the fuel system do not use open flame or smoke. Fuel leaked or spilled onto hot surface or electrical components can cause a fire.

NOTICE

The engine must be shut down before changing the oil water separator! Or insufficient fuel supply to the engine will cause the engine to work inefficiently or even shut down. This will shorten the service life of the engine.

As shown in Fig. 5-9, oil water separator (1) is inside the engine compartment on the left of the machine.

Change the oil water separator by observing the following steps:

1. In order to drain the oil water separator, open drain valve (3) on water separator bowl (2). The water separator bowl is under primary fuel filter (1). Catch the fuel in a suitable container.

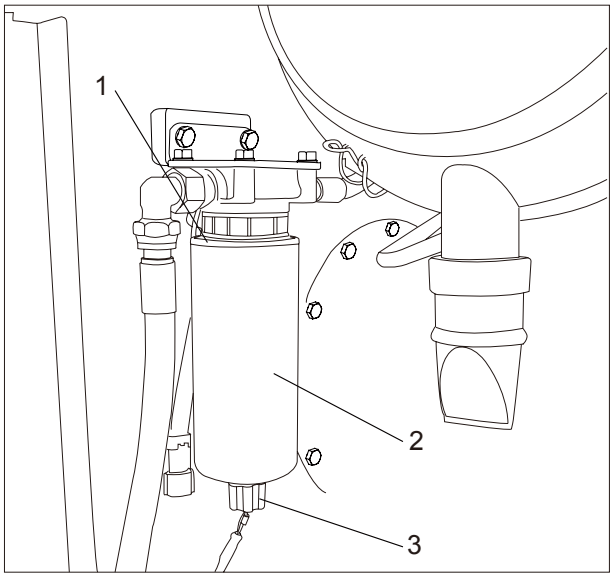


Fig.5-9

2. Remove primary fuel filter (1) and water separator bowl (2). Clean the filter housing base.
3. Remove the oil water separator bowl (2) from the primary fuel filter (1).
4. Lubricate the water separator bowl and clean the groove for the O-ring with clean diesel fuel or motor oil. Place the O-ring in the groove on the water separator bowl (2).
5. Install the clean water separator bowl (2) onto a new filter by hand.
6. Apply clean diesel fuel to the seal of the new filter.
7. Install the new filter tightly until the seal of the filter contacts the filter mounting base. Note the position of the index marks on the filter in relation to a fixed point on the filter mounting base.

NOTICE

There are rotation index marks on the filter that are spaced 90 degrees or 1/4 of a turn away from each other. When you tighten the filter, use the rotation index marks as a guide.

8. Tighten the filter according to the instructions that are printed on the filter. Use the index marks as a guide for tightening the filter.
9. For the information on priming the fuel system, **see: chapter 5.3.4.3 on page 5-15.**
10. Start the engine and check for leaks.
11. Close the access door.

5.3.4.6 Duplex fuel filter - change

⚠ WARNING

Fire hazard! When working on the fuel system do not use open fire or smoke. Fuel leaked or spilled onto hot surface or electrical components can cause a fire.

NOTICE

The engine must be shut down before changing the duplex fuel filter! Or insufficient fuel supply to the engine will cause the engine to work inefficiently or even shut down. This will shorten the service life of the engine.

Change the duplex fuel filter by observing the following steps:

1. Remove secondary fuel filter with proper tool.
2. Apply clean diesel fuel to the seal of the new filter.
3. Fill the new filter up with diesel fuel.
4. Install the new filter by hand until the filter contacts the seals.
5. Tighten the new filter by a haft turn until the seal of the filter contacts the base properly.
6. Turn on the igition switch to run the oil delivery pump for 30s, and then turn off the ignition switch. Repeat the steps for 3~4 times to cycle oil delivery pump the before engine starts.
7. Check the filter for leaks.

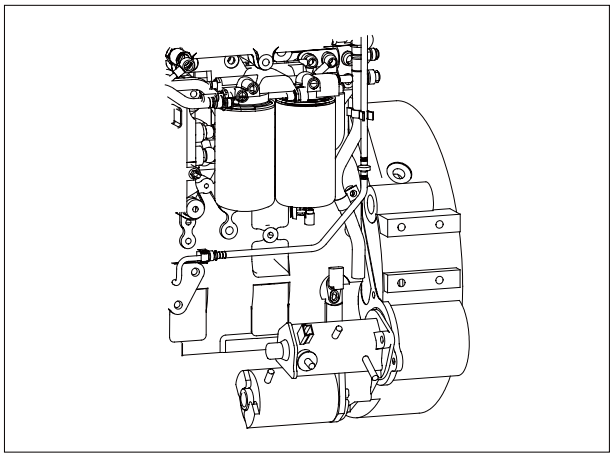


Fig.5-10

5.3.4.7 Radiator - check/clean

⚠ CAUTION

Perform cleaning work only after the engine has cooled down and with the engine stopped. Otherwise people could easily be burned by the radiator.

- Check the radiator fins daily and clean radiator fins regularly. It is recommended to clean every 200 working hours. Remove the dust, weeds, insects and other foreign substances between the radiator core and radiator fins.

- When the radiator fins are blocked by foreign substances, if the air from the air outlet of the radiator is relatively even but the foreign substances are loosely adhered on the radiator, clean the foreign substances on the surface at first, and then repeatedly flush the air inlet and air outlet of the radiator by compressed air till all dust, weeds, insects and other foreign substances are blown off and the air from the air outlet is even. After that, the radiator may work normally.

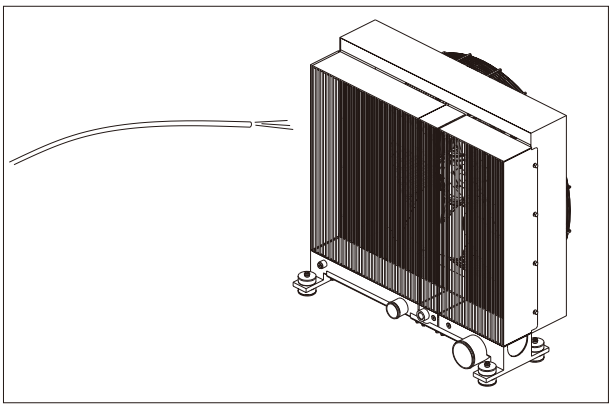


Fig.5-11

- If the foreign substances are tightly adhered on the radiator, or you can't feel any air when you put your hand on the air outlet of the radiator (the engine is running at rated rotation speed), clean the radiator assembly, hydraulic oil radiator and engine coolant radiator separately, and then reassemble them.

- When cleaning the radiator core (fins), the pressure of the compressed air should be not more than 0.2 MPa, the distance between the air outlet face and the radiator core should be not less than 50 mm, the pressure of the high-pressure water should

be not more than 0.27 MPa, and the distance between the high-pressure water outlet face and the radiator core should be not less than 100 mm.

NOTICE

When cleaning the radiator core with compressed air and high-pressure water, keep the air/water outlet vertically instead of moving it horizontally. Otherwise, the radiator fins will be blown down and the radiation performance will be affected.

- During the cleaning process, do not spray water directly to the generator, cables and electrical parts. After cleaning, start the engine after the moisture is evaporated.

5.3.4.8 Coolant - check/change

NOTICE

Check the coolant to prevent the engine from being damaged by corrosion, cavitations or freezing.

Take the following steps to change the coolant:

1. Unscrew the water cap (3).

⚠ WARNING

Change the coolant only after the engine cools down. Otherwise people could easily be burned by the hot coolant spilled from radiator.

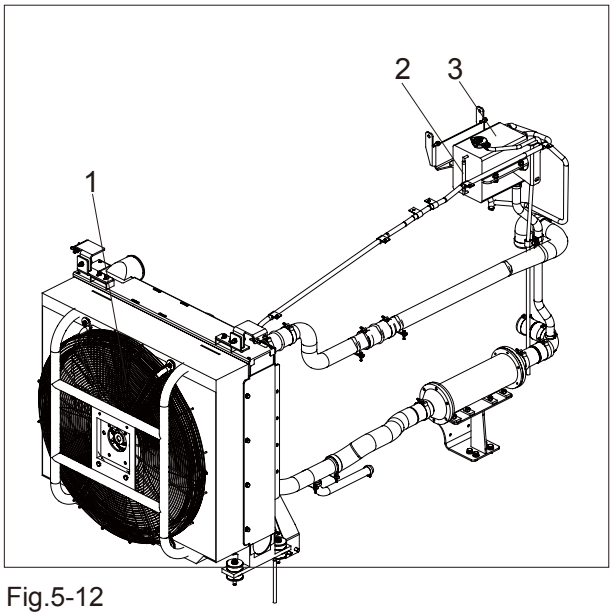


Fig.5-12

2. Open the drain plug (at the bottom of the radiator water tank). Allow the coolant to drain into a suitable container.

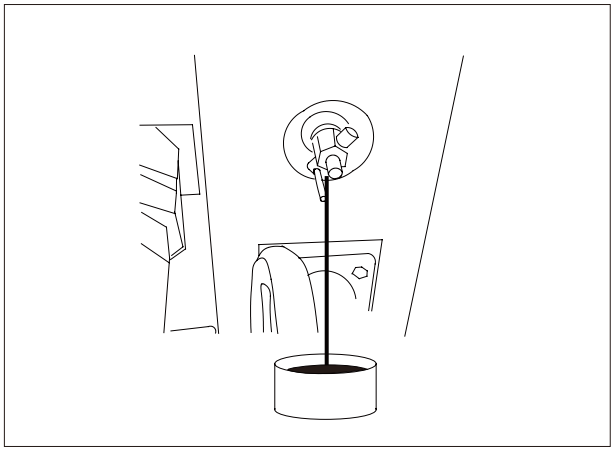


Fig.5-13

3. Close the drain valve.

4. Refill the specified coolant. Screw the water tank cap (3).

5. Start the engine. When water temperature of the engine shown on SYLD rises to 60°C-83°C, shut down the engine.

6. Allow the engine to cool down, then check the coolant level. Add coolant if the level is below the appointed mark. (**See: chapter 4.1.2.2 on page 4-3**)

5.3.4.9 Belt - check/adjust/replace

⚠ WARNING

Work on the V-belt must only with the engine shut down. Or it may cause severe personal injury.

Check the condition of the belt (1) (crankshaft - fan- generator -belt tensioner) for damage. In case of damage, replace the belt at once.

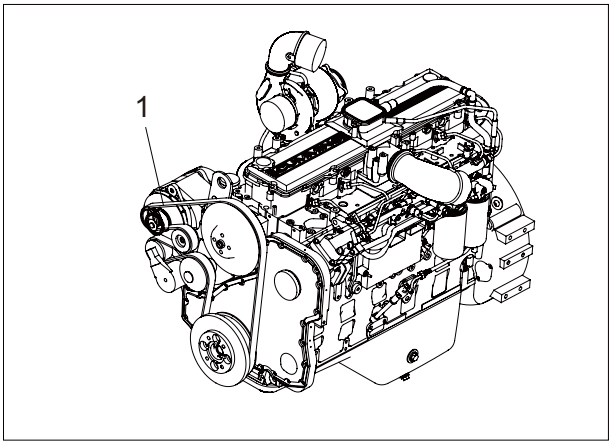


Fig.5-14

Install the new belt. Check the belt tension after 15 minutes of operation by using a V-belt tension gauge (the gauge is available from SANY).

Check the belt tension by the following steps:

1. Place the indicator arm (A) into the gap of the gauge.
2. Place the gauge on the belt on the middle of the pulleys. Make sure the flange on the bottom of the gauge contacts the belt.

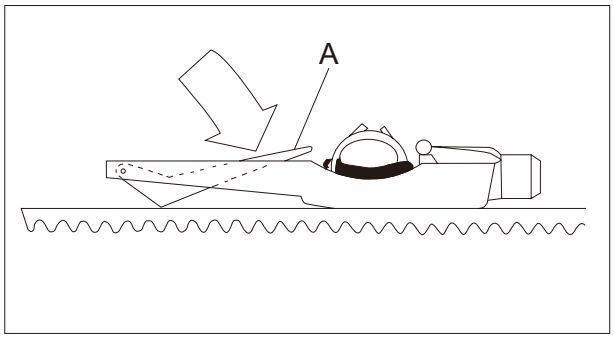


Fig.5-15

3. Slowly press B until the spring is locked.

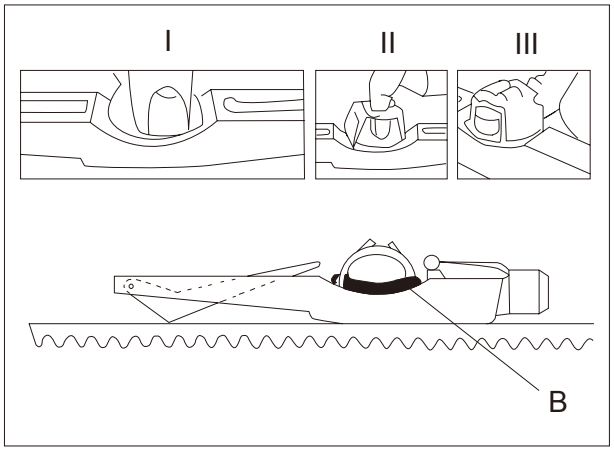


Fig.5-16

4. Remove the gauge without moving the indicator arm.
5. Read the reading of the indicator arm.
6. If necessary, tension the belt and measure again.

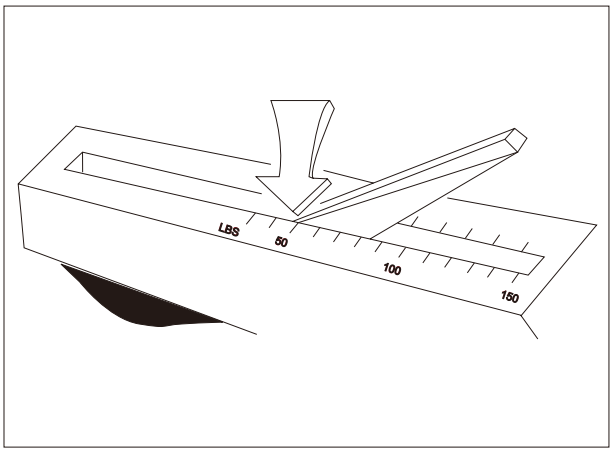


Fig.5-17

Take the following steps to tension/replace the V-belt A (crankshaft - fan- generator - belt tensioner):

Tension the Belt:

1. Loosen the bolt A with the ratchet spanner (1).
2. Pry the belt tensioner in a counterclockwise direction.
3. Tighten the bolt A.

Replace the Belt:

1. Loosen the bolt A with the ratchet spanner (1).
2. Pry the belt tensioner in a clockwise direction to release the belt.
3. Replace the belt and tension it.
4. Tighten the bolt A.

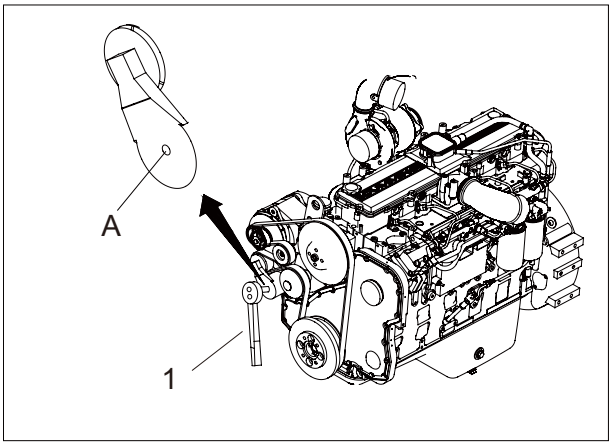


Fig.5-18

NOTICE

Prying the tensioner in a incorrect direction may cause damage to the tensioner.

5.3.4.10 Air filter element - maintain/ change

NOTICE

Service the air filter only with the engine stopped. Never start the engine after the air filter is removed. Otherwise dust will enter into the engine, which will shorten the service life of the engine greatly.

When the engine is in operation, if the air filter indicator light on the display flickers, you should service the air filter. As shown in Fig. 5-23, the air filter alert indicator is on the outlet of the air filter.

Fig.5-19

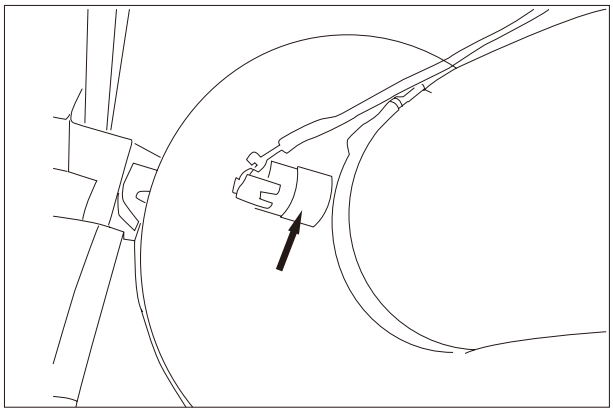


Fig.5-20

Service the air filter by observing the following steps:

1. Unlock the access door on the left of the engine hood and open it.

2. Loosen the snap ring on the air filter. Remove the end cover of the filter.

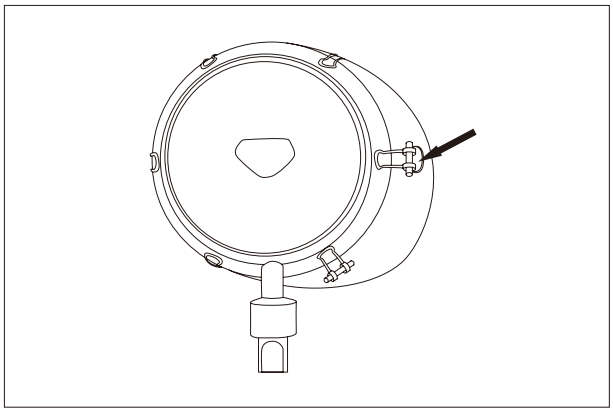


Fig.5-21

3. Clean the end cover and the dust bag.

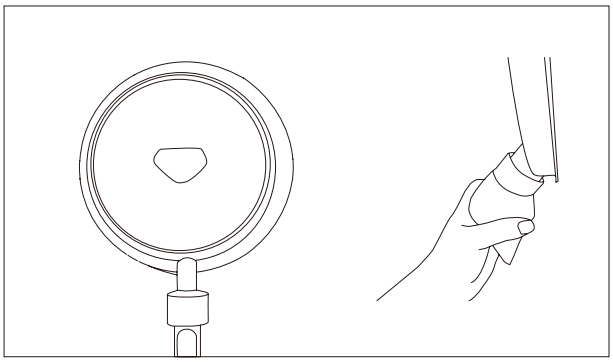


Fig.5-22

4. Be care in cleaning the air filter primary element.
   The air filter primary element is on the air inlet passage. Be care in removing the primary element to avoid touching the air filter secondary element and air filter housing, which may casue dusts enter the secondary element and the housing. Gently pull the primary element up and down, leftward and rightward, or rotate it. After pulling out the primary element, remove the dusts from the housing.

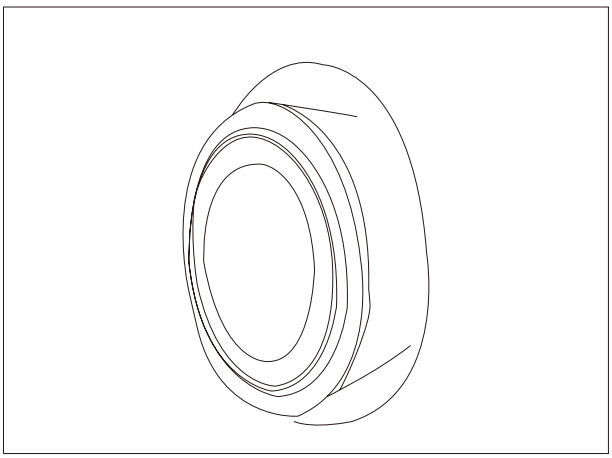


Fig.5-23

5. Check the primary element for damaged pleats, gaskets or seals. Dirt entering the engine will cause damage to engine components.
6. Use dry low-pressure compressed air in order to remove the dust from the primary element. Air pressure must not exceed 6.25 kPa (0.91psi). Direct the air flow up the pleats and down the pleats from the inside of the primary element. Take extreme care in order to avoid damage to the pleats. It's forbidden to remove dust from the air filter secondry element.

NOTICE

Do not clean the air filter primary element by bumping or taping. This could damage the seals.

7. It's advised to change the air filter primary filter element if it has been cleaned for three times. Meanwhile the air filter secondary element should be changed as well. If the primary filter element is damaged, filter element and safety element must be replaced regardless the number of cleanings.
8. Install the end cover. Make sure the dust bag is set vertically downward.

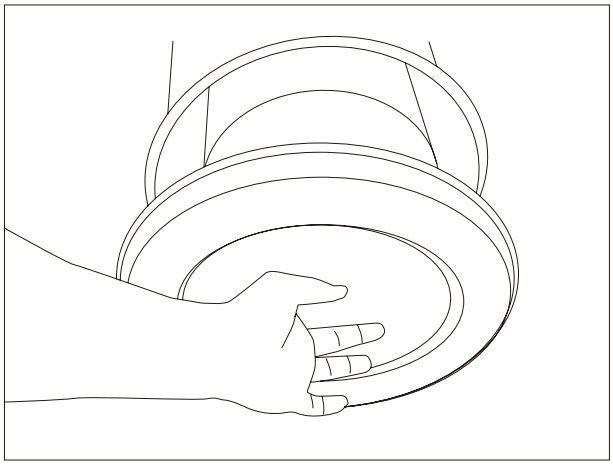


Fig.5-24

NOTE: Sany recommends certified air filter cleaning service available at Sany service people. The Sany cleaning process uses proven procedures to assure consistent quality and sufficient filter life. Any damage to the engine due to user's improper maintenance to the air filter will be assumed by the customer.

5.3.4.11 Air filter primary element - store

If a air filter primary element that passes inspection will not be used, the primary air filter element can be stored for future use.

Do not use paint, a waterproof cover, or plastic as a protective covering for storage. An air flow restriction may result. To protect against dirt and damage, wrap the primary air filter elements in Volatile Corrosion Inhibited (VCI) paper.

Place the air filter primary element into a box for storage. For identification, mark the outside of the box and mark the air filter primary element. Include the following information:

- Date of cleaning
- Number of cleanings

Store the box in a dry location.

5.3.4.12 Engine base mounts - check

- Tighten the fastening screws on the intake and exhaust pipes on the cylinder head.
- Check the connection and clamps between air filter, exhaust turbocharger and intake pipe, and the lubricant pipeline for looseness and leakage.
- Tighten the fastening screws on the engine oil sump and engine base.

5.3.4.13 Engine -store

If the engine will not be used for a long time, we recommend storing the engine according to the following procedures to prevent corrosion.

- Clean the engine including the cooling system with cold detergent and water gun.
- Run the engine until the moisture on the surface is evaporated.
- Drain the engine oil and fill anti-corrosion oil.
- Drain the coolant. Add antifreeze and then fill coolant.
- Drain the fuel in the fuel tank, mix it with anti-corrosion oil at a ratio of 10:1 and then fill the mixture into the tank again.
- Run the engine for 10 min till the mixture enters all pipelines, filters, pumps and nozzles and the new engine oil is distributed to all parts.
- Turn the engine crankshaft (the engine not started) for several times to make the mixture injected into the combustion chamber .
- Remove the belt, spray anti-rust oil into the belt groove and loosen the belts of alternator, cooling fan and A/C compressor. Remvoe all anti-rust oil before restarting the engine.
- Seal the air filter inlet and engine exhaust port. Reopen the inlet and exhaust port before re-starting the engine.

5.3.5 Hydraulic system maintenance

5.3.5.1 Hydraulic oil - check/refill/change

For the hydraulic oil level check and refill, **see: chapter 4.1.2.4 on page 4-4.**

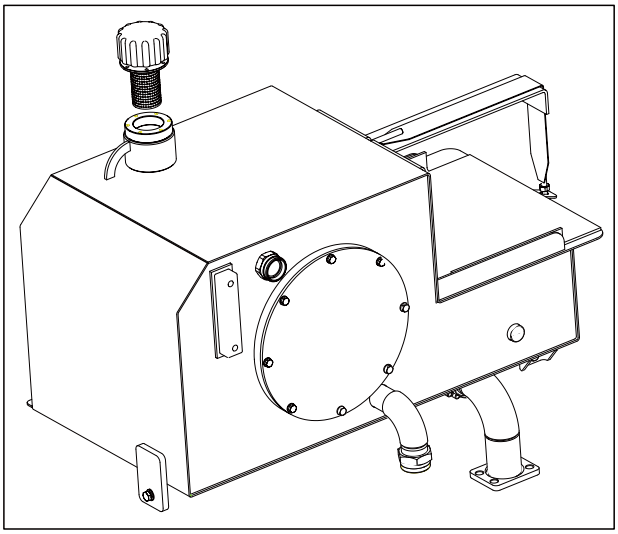


Fig.5-25

NOTICE

Change the hydraulic oil under the working temperature. Otherwise some impurity may not be drained out with the hydraulic oil. This will cause severe damage to the hydraulic components.

NOTICE

Change the hydraulic oil regularly. You should also change the hydraulic oil after overhaul to the hydraulic system. Or it may cause damage to the hydraulic components.

⚠ WARNING

Hot hydraulic oil can cause personal injury. Do not allow hot hydraulic oil to contact skin.

Change the hydraulic oil by observing the following steps:

1. Start the engine till the hydraulic oil temperature rises up to the working temperature.
2. Gently remove the filler cap of the hydraulic oil tank.
3. Place a suitable container under the oil drain port. Remove the oil drain plug at the bottom of the hydraulic oil tank. Drain the hydraulic oil.

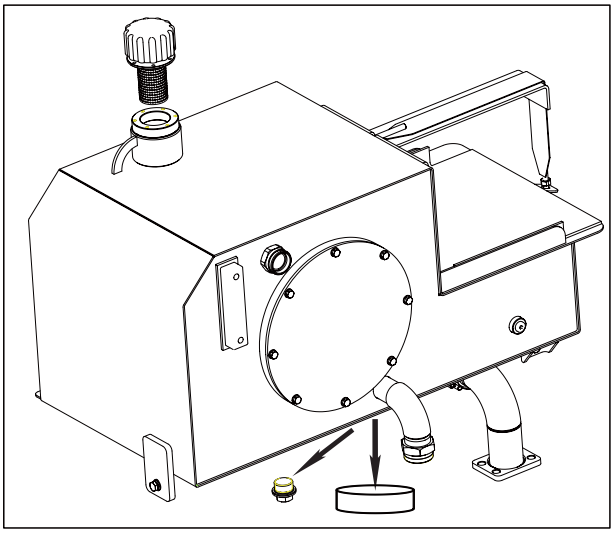


Fig.5-26

⚠ WARNING

Never start the engine when draining the hydraulic oil. Otherwise it will cause severe damage to the hydraulic system.

4. Remove the filter screen on the filler tube of the oil tank. Wash the filter screen in clean nonflammable solvent and dry it in the air.
5. Clean and install the oil drain plug.
6. Install the filter screen.
7. Fill specified hydraulic oil (**See: Table 5-1 on page 5-6**). Refill capacity: 120 L.
8. Check the gaskets at the filler cap. Replace the damaged filler cap.
9. Install the filler cap.
10. Start the engine and run the engine for 5 min.
11. The oil level should be between the middle and MAX marks on the gauge. If necessary, fill hydraulic oil through the oil filler hole.

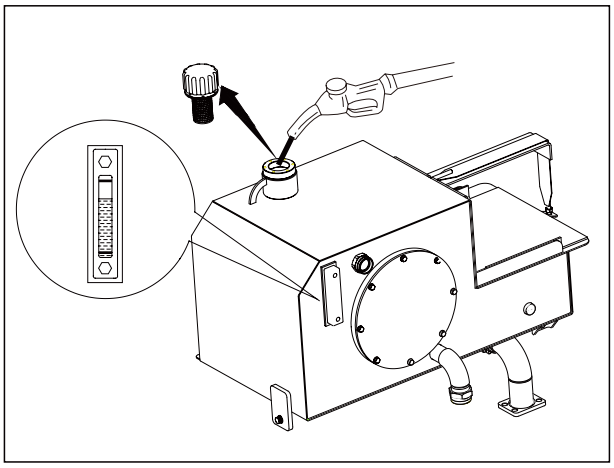


Fig.5-27

NOTE: There should be no bubbles in the oil. Bubbles in the oil indicates that there is air in the hydraulic system. In this case, check the suction hose and hose hoop.

12. Shut down the engine.
13. If necessary, tighten the loose hose hoop and connector. Replace the damaged hose.

5.3.5.2 Hydraulic oil filter - replace

The hydraulic oil filters are at the bottom of the cab and the left side of the rear frame.
The procedures of replacing the hydraulic oil filter at the bottom of the cab are as follows:

1. Remove the filter bowl and remove the filter element.
2. Check the filter element surface for visible dirt.

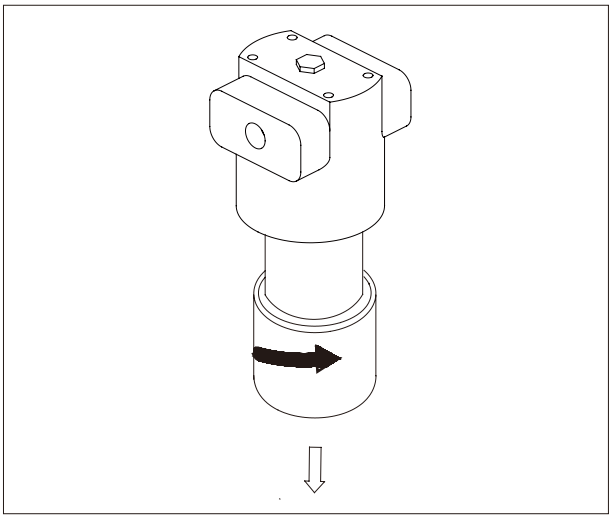


Fig.5-28

NOTICE

- **The visible dirt indicates potential faults in hydraulic system elements and key elements. In case of visible dirt, you should rectify the fault and replace or repair the defective element. If they are ignored, the hydraulic system may suffer overall damage.**
- **Do not reuse filter element that have been cleaned.**

3. Clean the filter bowl and its threads.
4. Install the filter bowl along with a new filter element. Check the seal rings and replace them if necessary.
5. Check the filter for leaks after trial run.

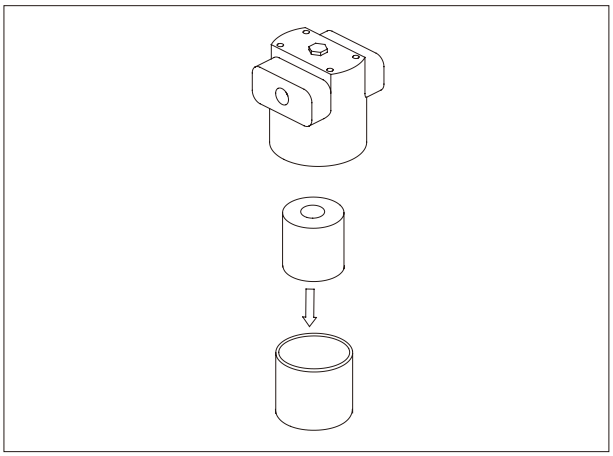


Fig.5-29

⚠ WARNING

Caution! Hot!
There is a risk of scald by hot hydraulic oil when removing the filter.

NOTE: In any case, the filter element can only be replaced after the hydraulic oil is changed and trial run is completed. Do not reuse the hydraulic oil in the filter bowl.
Change the filter element after changing the hydraulic oil and overhaul.

5.3.6 A/C maintenance

5.3.6.1 Instructions for using the A/C

In order to keep good performance, reliability and prolong the service life of the A/C, pay attention to the following items when using the A/C.

- Maintain the A/C according to the instructions.
- Before turning on the A/C, first you have to start the engine. Wait a few minutes until the engine works smoothly. Start the A/C and choose fan speed and temperature.
- Close the window and doors when using the A/C.
- If the machine is stored for a long time, start the engine once every two months and run the A/C system for 5~10 min.

NOTICE

Daily cleaning should be done to keep the cooling capacity of the A/C in dusty conditions. Otherwise it will affect the performance of the A/C.

NOTICE

Never use hot water to clean the pipeline of A/C, which can lead to crack in the pipeline.

5.3.6.2 A/C maintenance interval

(a) Compressor

- Check and maintain it once every two years generally. Mainly check the inlet and outlet pressures and the fasteners for looseness and air leak.
- Disassemble the compressor to check the inlet and outlet valves for damage and distortion. If any, repair or replace the valve.
- Replace the seal ring and oil seal after the compressor is disassembled and repaired. Otherwise, it may cause leakage at the seals.

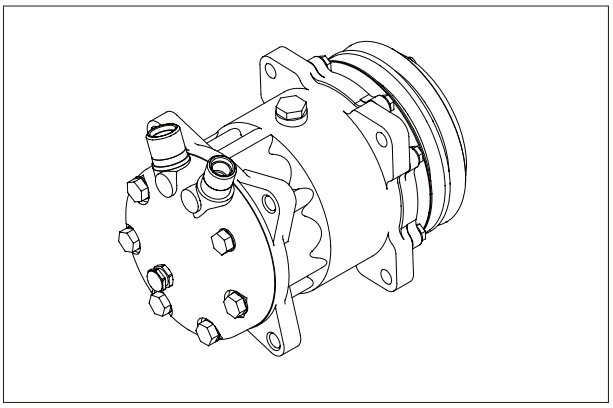


Fig.5-30

(b) Condenser and cooling fan

- Check and maintain them once a year. Remove the dirt and dust from the surface of the condenser. Rectify and repair the radiating fin on the condenser by a pair of flat-nosed pliers. Check the condenser surface for abnormity. Check for refrigerant leakage with a leak detector.
- Recoat the antirust paint in case of peeling-off to prevent leak due to rusting and perforation.

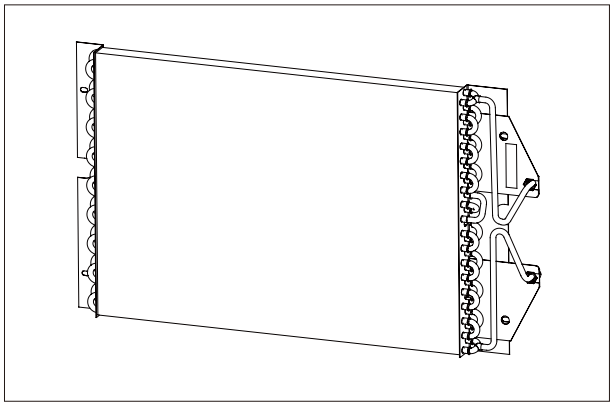


Fig.5-31

(c) Evaporator

- Check it for leaks once a year.
- Open the cover and clean the inside and the air duct.

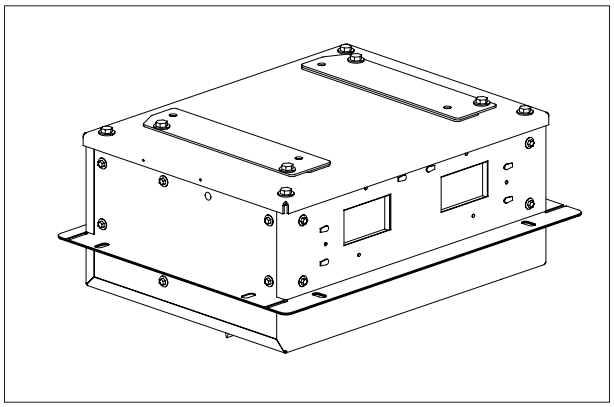


Fig.5-32

(d) Refrigerant reservoir

Check the refrigerant level:

1. Start the engine.
2. Turn on the A/C for cooling. Turn on the temperature control switch to check if the air is cool.
3. Check the refrigerant level through the sight glass.

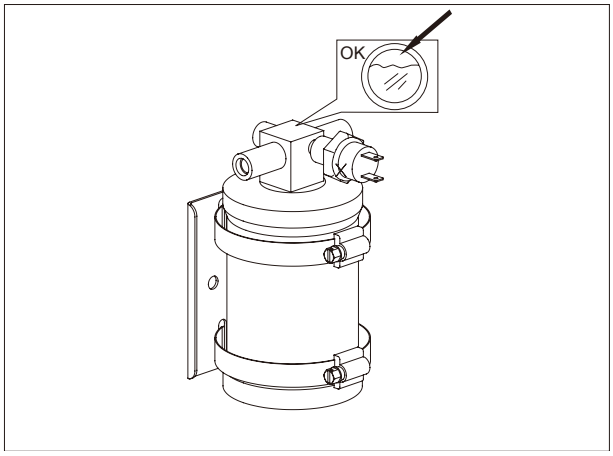


Fig.5-33

If there are bubbles in the refrigerant, it indicates the refrigerant is insufficient. Contact the service center to add refrigerant.

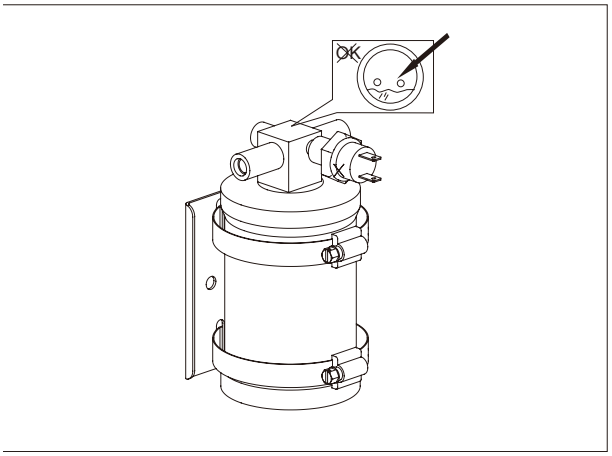


Fig.5-34

If there is oil in the refrigerant, replace the reservoir.

4. Replace the reservoir once a year.

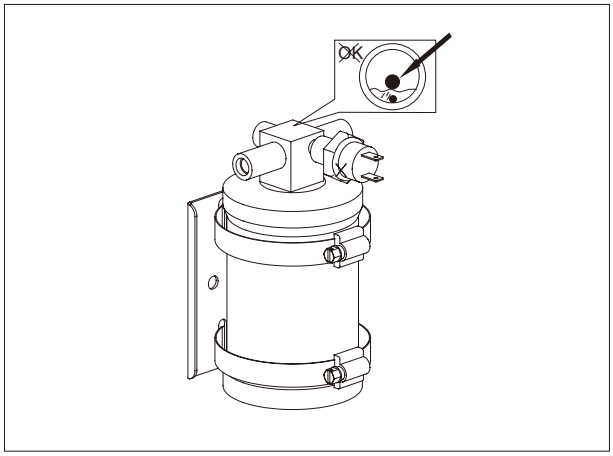


Fig.5-35

NOTICE

Before starting operation every year, contact the service center to replace the reservoir. Otherwise it will affect the performance of the A/C.

⚠ WARNING

In case of corrosion or damage, replace the reservoir immediately in order to avoid explosion and further damage.

(e) Cooling pipeline

- Pipe connectors: Check them once a year. Check the seals with a leak detector.
- Pipes: Check them in order to prevent them from rubbing against other parts; Check the rubber hoses for deterioration and crack. Replace the rubber hoses every 3~5 years.

Table 5-3 A/C Maintenance Interval

No.	Item	Maintenance	Interval
1	Pipeline connector	Check the lock nuts for looseness; check the rubber hoses and connectors for refrigerant leakage and oil stain; check the rubber hoses and pipes for crack, deterioration, embrittlement, and crush.	Once/month
2	Condenser	Check the fin for distortion and make it in order if necessary; check the core for blockage and clean it if necessary.	Once/month
3	Evaporator	Clean the air inlet and air outlet ducts for foreign matter.	Once/month
4	Reservoir	Check the drain pipe for blockage.	Once/month
5	Refrigerant quantity	Check the refrigerant level through the sight glass for bubbles when the A/C is in operation. In case of bubbles, add refrigerant.	Once/month
6	Compressor	Check the fastening bolts for looseness.	Once/month
		Check the fitting surface and the seals of main shaft for refrigerant leakage and oil stain.	Once/month
		Check the compressor belt for wear and replace it if necessary.	Once/month
		Check the belt for tension and tension it if necessary.	Once/month
		Start and run the A/C for a few minutes in the seasons when the A/C is not used.	Once/month

5.3.6.3 Compressor belt- check/tension/ replace

⚠ WARNING

Work on the compressor belt only with the engine stopped. Or it may cause severe personal injury.

Check the belt:

1. Check the belt for damage or crack. In case of damage or crack, replace it immediately.
2. Check if the belt can be depressed by 10~15 mm (0.4– 0.6 inches) with a belt tension gauge. If necessary, tension it.

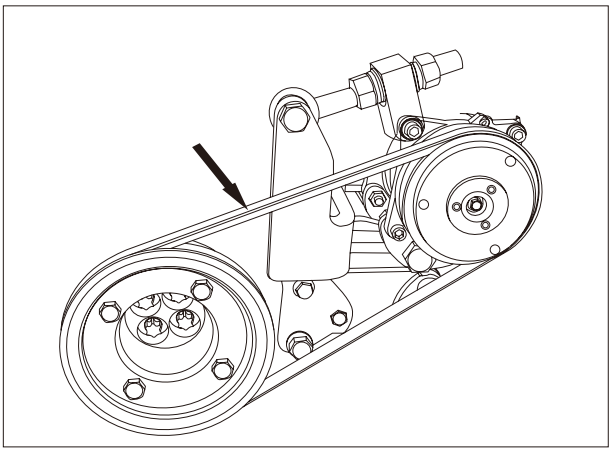


Fig.5-36

Tension the belt:

1. Slightly slacken fastening screws (1), (2), (3), (4). **See Fig.5-37 on page 5-39**.
2. Press the compressor in direction of arrow, until the correct V-belt tension is reached.
3. Retighten all fastening screws.

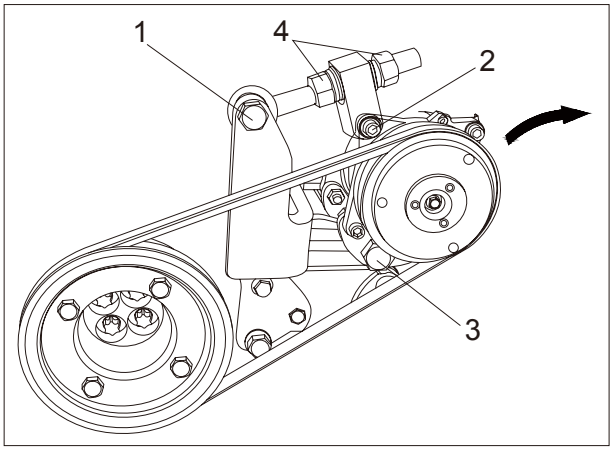


Fig.5-37

Change the belt:

1. Slightly slacken fastening screws (1), (2), (3), (4).
2. Press the compressor against the direction of arrow completely against the engine.
3. Take the old V-belt off.
4. Fit the new V-belt to the V-belt pulleys.
5. Tension the V-belt as previously described.
6. Check the V-belt tension after a running time of 30 minutes.

5.3.7 Tandem drive case maintenance

5.3.7.1 Tandem drive case oil - change

Park the machine at a level ground and stop the engine in order to check the oil level every 500 working hours:

Check the oil level in rear axle housing:
Remove the adapter (1) of oil filler pipe. Check the oil level in the rear axle housing through the oil filler hole. If the oil level is more than 1cm below the oil filler hole, add oil.
Change the lubricant every 2000 working hours.
Place a container under the oil drain port when changing the lubricant.

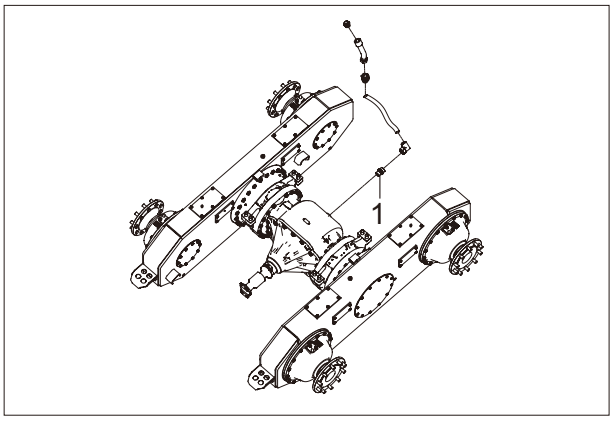


Fig.5-38

1. Drain the oil:
Tandem drive case:
(1) Remove the filler plug (1).
(2) Remove the oil drain plug (3) and drain the lubricant.
(3) Install the oil drain plug (3).

Rear axle housing:
(1) Remove the oil drain plug (5) and drain the lubricant.
(2) Install the oil drain plug (5).

NOTICE

Dispose of the waste oil according to local regulations and mandates.

2. Refill the oil:

Tandem drive case:
(1) Refill new lubricant in the left and right tandem drive cases throught the oil filler hole (1) till the oil level reaches the middle position through the sight glass (about 72 L for each tandem drive case).
(2) Install the filler plug (1) and tighten it securely.

Rear axle housing:
Open the access door on the left side of the engine hood. Fill new lubricant in the oil pipe of rear axle (about 44 L).

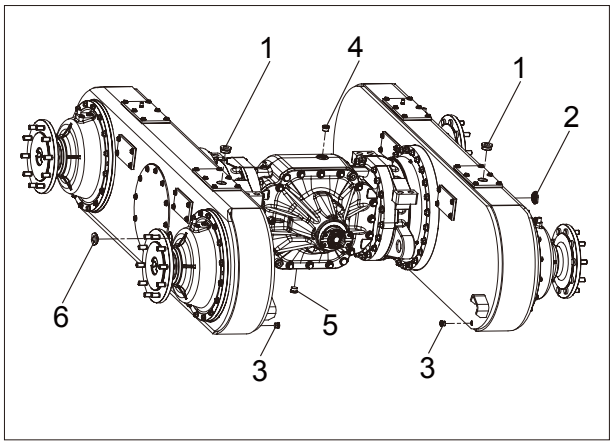


Fig.5-39

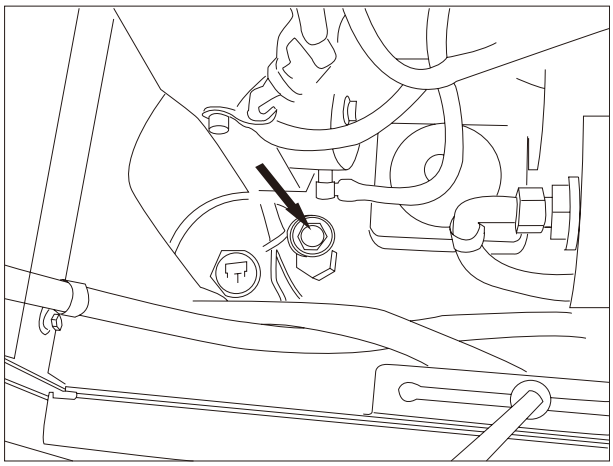


Fig.5-40

5.3.7.2 Tandem breather-Clean/replace

1. Remove a plate from the walkway that is located on top of the tandem drive housings. This must be done in order to access breathers on the top of the tandem drive housings.
2. Clean the area around the breathers of any dirt or debris. This must be done before the breathers are removed.
3. Remove breather (1) from both tandems.
4. Wash the breathers in clean, nonflammable solvent.
5. Use pressure air to dry the breathers.
6. Install the breathers in both tandems.

NOTE: Replace the breathers if the breathers are damaged.

7. Install the plate to the walkway.


Fig.5-41

5.3.8 Transmission case maintenance

5.3.8.1 Transmission oil - change

Transmission oil change interval: 500 working hours for the two times; 1000 working hours or one year after inital change.

⚠ WARNING

Hot oil and hot components can cause personal injury. Do not allow hot oil or hot components to contact skin.

NOTICE

Care must be taken to ensure that fluids are contained during performance of inspection, maintenance, testing, adjusting and repair of the product. Be prepared to collect the fluid with suitable containers before opening any compartment or disassembling any component containing fluids.

NOTICE

Dispose of all fluids according to local regulations and mandates.

Clean the area around the drain plug and the oil filler hole on the transmission case.

Operate the engine until the transmission oil are warm. Park the machine on a level surface and engage the parking brake. Lower the blade and apply slight down pressure to the blade. Shut down the engine.

Drain the transmission case while the oil is warm. This allows waste particles that are suspended in the oil to drain. As the oil cools, the waste particles will settle to the bottom of the case. The particles will not be removed by

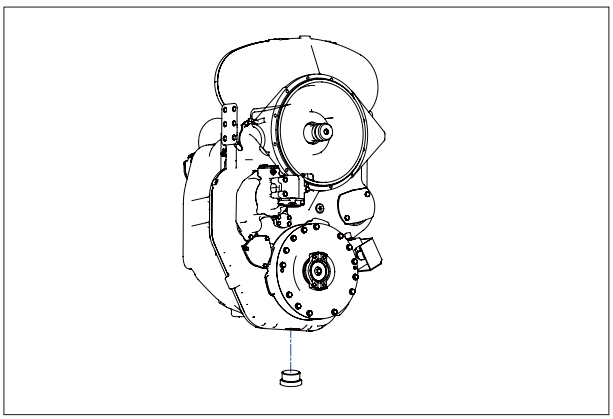


Fig.5-42

draining the oil and the particles will recirculate in the lubrication system with the new oil.
Replace the transmission oil by observing the following steps:

1. Remove transmission drain plug and remove drain plug of auxiliary oil tank (**see Fig.5-43**). Drain the oil into a suitable container.

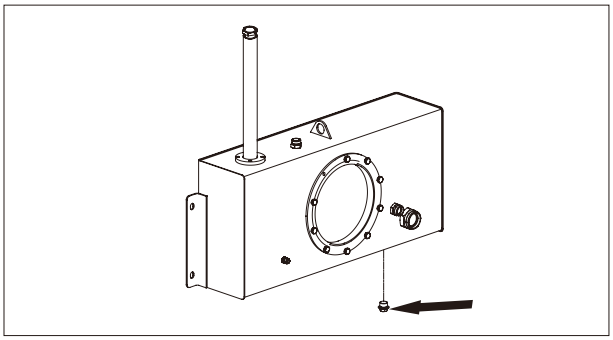


Fig.5-43

2. Change the filter element (**see: chapter 5.3.4.10 on page 5-26**) and clean the screens.
3. Clean the drain plugs and install the drain plugs.
4. Open the left front access door.
5. Fill the transmission case and auxiliary oil tank with oil by using the oil filler tube (45L). For the brand, see **Table 5-1 on Page 5-6**.

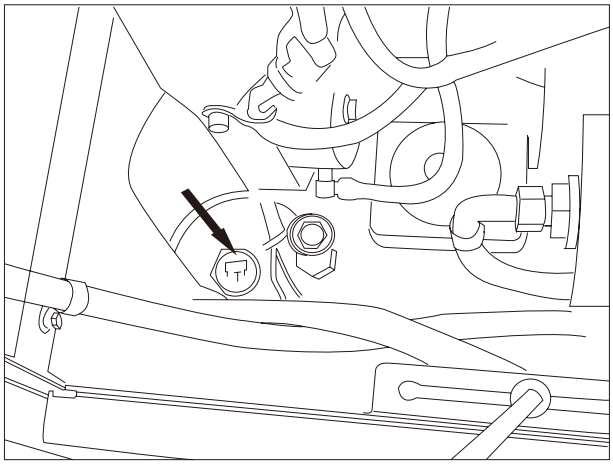


Fig.5-44

6. Start the engine and run the engine at low idle speed. Check the transmission components for leaks.
7. Engage the inching pedal. Slowly operate the transmission in order to circulate the oil.
8. With the engine at low idle, transmission control level at NEUTRAL position and transmission oil temperature at 50°C, maintain the oil level between the MAX and MIN marks on the oil level dipstick (**see Fig.5-45**). If necessary, add oil through oil filler hole.
9. Stop the engine.
10. Close the access door.

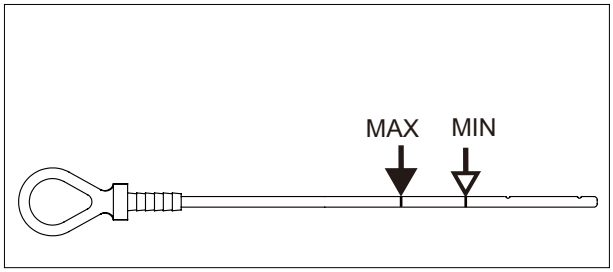


Fig.5-45

5.3.8.2 Transmission oil filter screen - clean

Clean the transmission oil filter screen by observing the following steps:

1. As shown in Fig. 5-48, remove 3 bolts (1). Remove oil filter cover (2) from transmission oil filter housing. Allow the oil to drain into a suitable container.
2. Remove the transmission oil filter screen (4).
3. Remove dirt or foreign matter on the screen and magnet.
4. Repeat step 3 to remove screen (8).
5. Clean the screen and oil filter covers (2) and (6) with a clean, nonflammable solvent. Dry them.
6. Insert a new filter element into the transmission oil filter housing.
7. Check the seals (3) and (7) of the cover for damage. In case of damage, replace them.
8. Install the screen, seal ring and cover. Tighten the bolts.

For replacing the high pressure filter element of the transmission, **see: section 5.3.5.2 Hydraulic oil fitler-replace on page 5-33.**

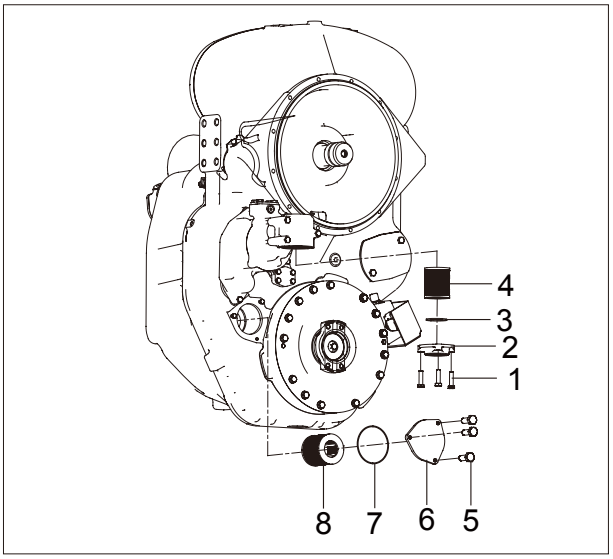


Fig.5-46

5.3.8.3 Transmission oil level - check

Check oil level in the transmission by observing the following steps:

1. Open the left front engine door.
2. Clean the area around the oil filler of the auxiliary oil tank.
3. Take off the oil dipstick (**See Fig.5-45 on page 5-42**) when the engine runs at the idle speed, the transmission is in the neutral position and the oil temperature of the transmission is at about 50℃ . The oil level should be between Max and Min. If necessary, fill it throught the oil filler.
4. Shut down the engine.

5.3.9 Circle drive and circle bearing maintenance

5.3.9.1 Circle drive pinion teeth and circle bearing teeth - lubricate

NOTICE

Sany recommends the use of 5% molybdenum grease for lubricating the circle drive pinion teeth and circle bearing teeth.

Lubricate the circle drive pinion teeth by observing the following steps:

1. Park the machine on a level surface and engage the parking brake.
2. Lower the blade and attachments to the ground. Stop the engine.
3. Clean the fitting.
4. Apply appropriate lubricant to the circle drive pinion teeth and circle bearing teeth.
5. Start the machine, activate the circle drive in order to swing the circle for lubricating the engaged teeth.

Lubricate the circle bearing teeth by observing the following steps:

1. Park the machine on a level surface and engage the parking brake.
2. Lower the blade and attachments to the ground. Stop the engine.
3. The circle bearing has two fitting (see Fig. 5-47). Clean the two fittings. Open the dust cover. Apply appropriate lubricant.

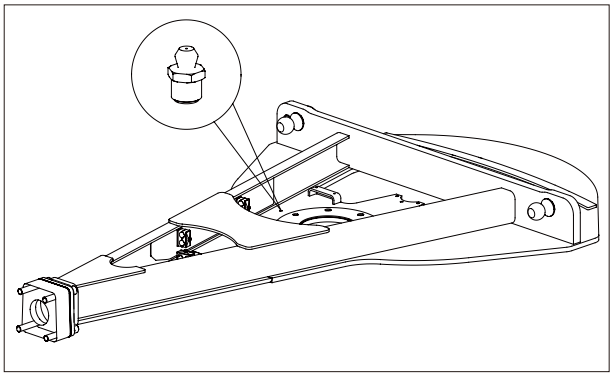


Fig.5-47

5.3.9.2 Circle drive oil - change

⚠ WARNING

Hot oil and hot components can cause personal injury. Do not allow hot oil or hot components to contact skin.

NOTICE

Care must be taken to ensure that fluids are contained during performance of inspection, maintenance, testing, adjusting and repair of the product. Be prepared to collect the fluid with suitable containers before opening any compartment or disassembling any component containing fluids.

NOTICE

Dispose of all fluids according to local regulations and mandates.

Clean the area around the drain plug before removing the drain plug (1).

1. For draining the oil quickly, tilt the blade with the drain plug tilted toward the ground. Lower the blade to the ground.
2. Remove drain plug (**see Fig.5-48**). Allow the oil to drain into a suitable container. For draining the oil quickly, you could remove the filler plug (2) (**see Fig.5-49**). After draining the oil completely, clean the drain plug, replace the seal ring, install the drain plug and tighten it.
3. Operate the blade lift cylinder to set the circle drive horizontally.
4. Fill the circle drive housing with oil through the oil filler hole (**see Fig.5-49**). Observe the sight glass till the oil level is above the middle position.

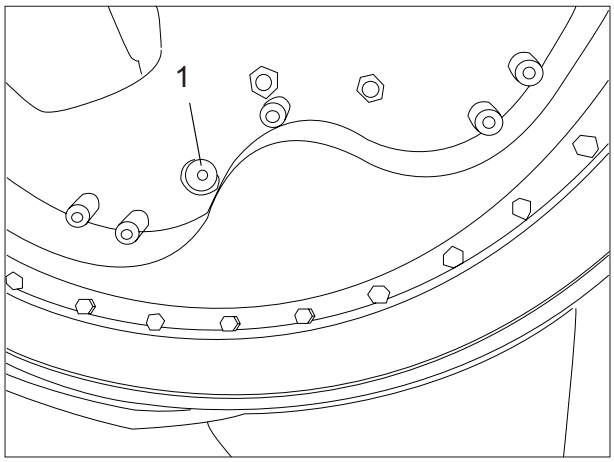


Fig.5-48

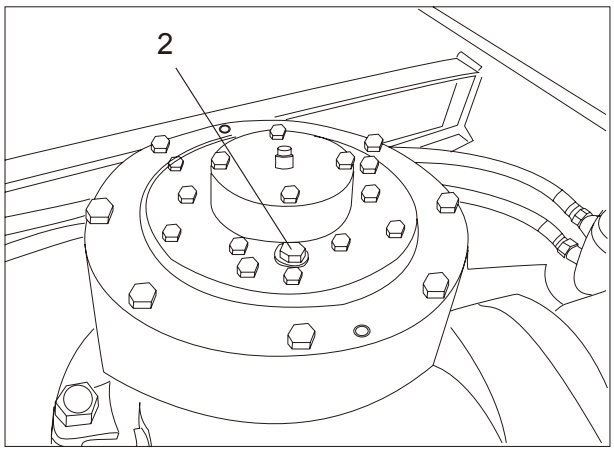


Fig.5-49

5. Clean the filler plug. Replace the seal ring. Install the filler plug and tighten it.
6. Capacity: when the oil level is at the middle of the sight glass, the oil capacity is 6.5 L.
7. Start the engine. Operate the circle to swing for a few minutes. Check the circle drive housing for leaks.
8. Stop the engine. Observe the sight glass (3) (**see Fig.5-50**) of circle drive. If necessary, add lubricant.

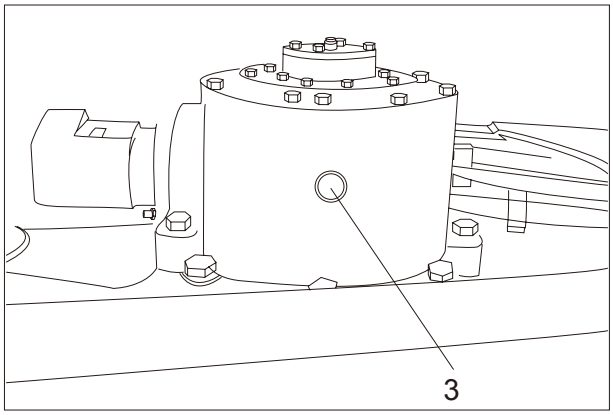


Fig.5-50

5.3.9.3 Circle drive oil level - check

If a leak develops or you suspect a leak, check the oil level. Wipe the oil filler hole (**see callout 2 in Fig.5-51**) and sight glass (**see callout 3 in Fig.5-52**) before checking the circle drive oil level.

1. Set the circle drive horizontally.
2. Observe the sight glass. The oil level should be above the middle position.
3. If the oil level is low, fill oil through the oil filler hole.

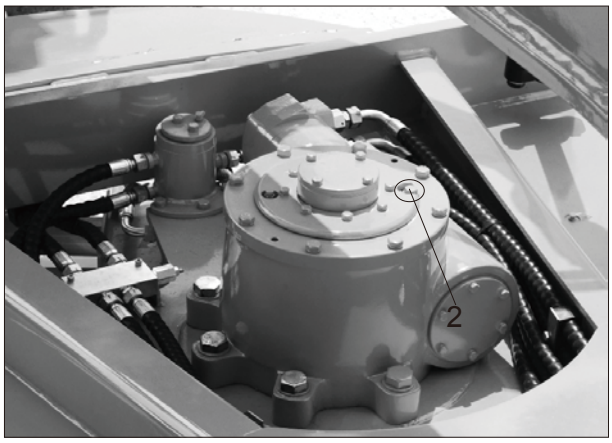


Fig.5-51

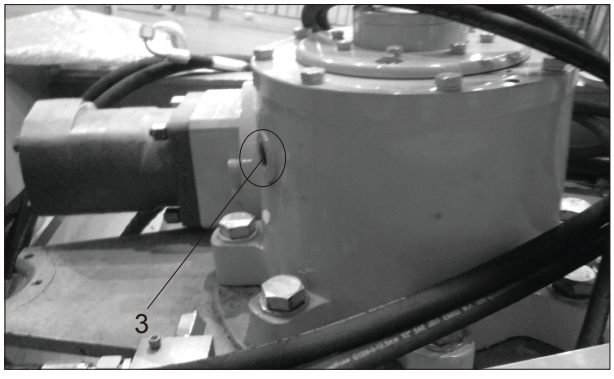


Fig.5-52

5.3.9.4 Circle drive torque - adjust

To prevent the grader from bumping hard objects during operation, the overload protection value for circle drive is calibrated before delivery. If the circle drive torque exceeds the preset value, the circle drive will slip automatically and the protection will function.

In normal working conditions, the circle drive torque should be adjusted after 1000 hours operation. Especially in adverse working conditions, if the grader slips frequently, the circle drive torque should be adjusted.

Special tools: A spanner 13, a torque spanner equipped by Sany, a sleeve 18. See Fig.5-55.

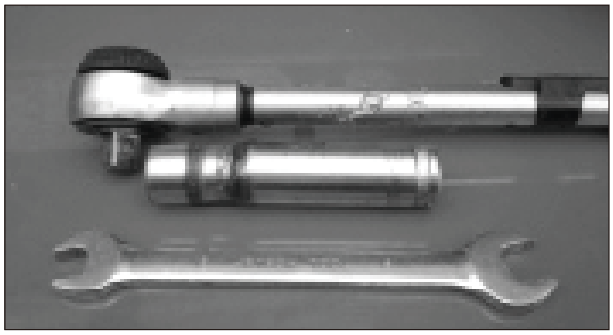


Fig.5-53

Procedures for adjusting circle drive torque:

1. Lay down the blade to ensure personnel safety during adjustment, and level the drawbar for easy operation.

Fig.5-54

2. Stop the grader, and clean the maintenance area to prevent dust from entering the circle drive when opening the circle drive housing.

Fig.5-55

3. Unscrew the M8 bolt, and remove the upper housing of circle drive.

4. Operate the circle drive lever to make each ratchet in the adjusting hole of circle drive align each hole for easy operation of the torque spanner sleeve.

Fig.5-56

5. Remember to rotate the ratchet clockwise and not to rotate it anticlockwise.
6. The torque values are chosen depending on practical situations on the jobsite. The range of torque value is within 35N.m～45N.m.
7. Adjust the rachet evenly.

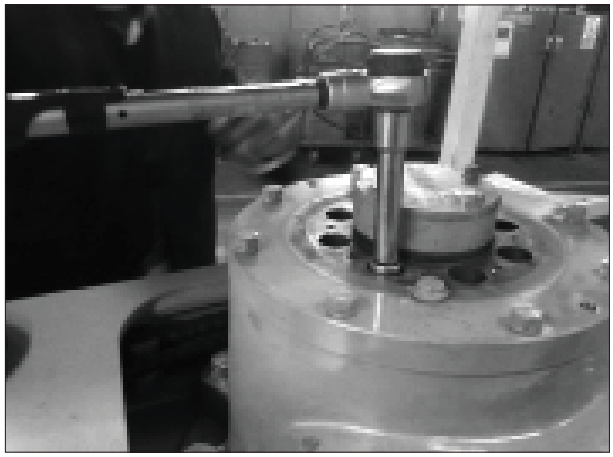


Fig.5-57

8. Ensure the seal plate in a good condition when installing the circle drive housing. If there is any damage, replace it with a new one.

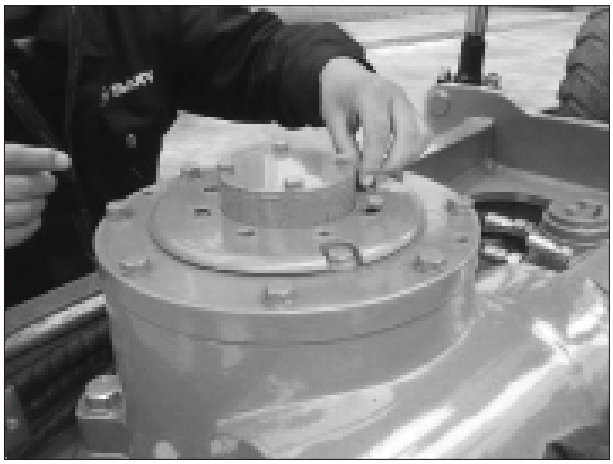


Fig.5-58

5.3.10 Blade maintenance and service

5.3.10.1 Cutting edges and end bits - check/ replace

NOTICE

Personal injury or death can result from the blade falling.
Place blocks under the blade before replacing the blade.

End bits (1) and cutting edges (2) may be damaged. The end bits (1) and the cutting edges (2) may be worn excessively. If necessary, replace the end bits (1) and the cutting edges (2).

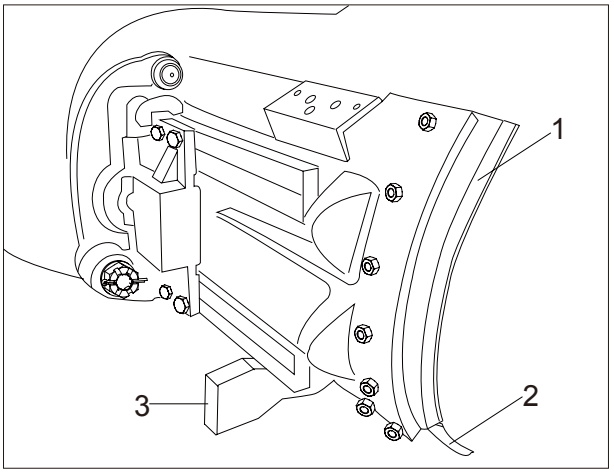


Fig.5-59

Replace the end bits and cutting edges by observing the following steps:

1. Place blocks (3) under the blade. Lower the blade onto the blocks. Do not block up the blade too high. Just use enough blocks so that the end bits (1) and the cutting edges (2) can be removed.

2. Remove the end bits (1) and the cutting edges (2).

3. Install new end bits (1) and new cutting edges (2).

4. Raise the blade and remove the blocks (3).

5.3.10.2 Wear plate at blade guide - replace

After the grader has been used for a certain time. the blade will shake due to the worn wear plate (3). If it shake badly, replace wear plates at two sides at the sime time. If the blade guide become uneven or is scored, refine it with a file and then replace wear plated.

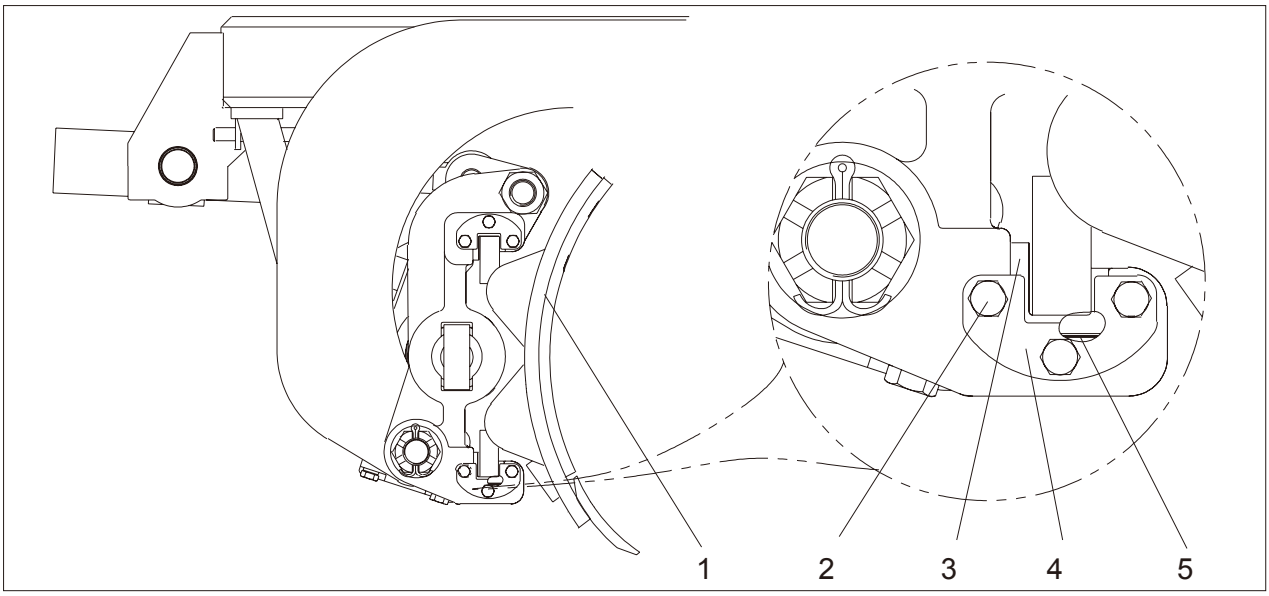


Fig.5-60

Procedures:

1. Lay wood block at two ends of the blade.

2. Put the blade on wood block and apply slight force on it.

3. Remove the mounting bolt (2) at two sides of lower baffles and baffles (4).

4. Press down one side of the blade (1) to ensure there is a certain clearance between the lower blade guide and the bottom/side of wear plates. Knock out the used wear plate. Install a new wear plate (3) and adjusting washer (5).

5. Install the baffle (4) and screw up the bolt (2).

6. Use the same method to replace the wear plate at the other side.

7. Adjust the position of the blade, and put it on wood block again. Apply slight force on the rear part of the blade to ensure there is a certain clearance between the upper wear plate and the left/right sides of the guide.

8. Remove the mounting bolt (2) of the upper wears at two sides and the baffle (4).

9. Knock out the used wear plate. Install a new wear plate (3) and an adjusting washer (5).

10. Reinstall the baffle (4) and screw up the bolt (2).

5.3.11 Brake system test

The brake system includes service brake system and parking brake system.

⚠ WARNING

Personal injury can result if the machine moves while testing.

NOTICE

If the machine begins to move during test, reduce the engine speed immediately and engage the parking brake.

5.3.11.1 Service brake holding ability test

NOTICE

If the machine moved while testing the service brake, consult your Sany dealer. Have the dealer inspect. If necessary, repair the service brake before returning the machint to operation.

Make sure that the area around the machine is clear of personnel and clear of obstacles.Test the service brake on a dry level surface.

Fasten your seat belt before you test the brakes.

Use the following test in order to determine whether the service brake is functional. This test is not intended to measure the maximum holding ability of the service brake.

1. Start the engine and depress the service brake pedal. Raise the blade slightly. Depress the inching pedal. Set the knob of hand throttle to the MANUAL position. Turn the knob of hand throttle in order to set the engine speed to high idle.

2. Select the FIFTH SPEED FORWARD position on the transmission. Set the knob of the hand throttle to the MANUAL position. Turn the knob of hand throttle in order to set the engine speed to high idle.
3. Gradually release inching pedal. The machine should not move. The engine should stall.
4. Reduce the engine speed to low idle. Engage the parking brake. Lower the blade to the ground. Stop the engine.

NOTICE

The friction material for the brake may require replacement. The new friction material for the brake may require polishing for optimal performance.

5.3.11.2 Parking brake holding ability test

NOTICE

If the machine moved while testing the parking brake, consult your Sany dealer. Have the dealer inspect. If necessary, repair the parking brake before returning the machint to operation.

Be sure that the area around the machine is clear of personnel and clear of obstacles. Test the parking brake on a hard dry surface.

Fasten the seat belt before you test the parking brake.

Use the following test to determine whether the parking brake is functional. This test is not intended to measure the maximum holding ability of the parking brake.

1. Position the machine on a slope of 20 percent.

2. Engage the parking brake. Release the service brake pedal. The wheels should not rotate. If the wheels rotate, engage the service brake.

NOTICE

If the wheel rotates, contact Sany dealer for adjusting the parking brake.

5.3.12 Brake accumulator - check

⚠ WARNING

Cold ambient temperatures could result in the loss of secondary braking capability due to inadequate hydraulic accumulator nitrogen pre-charge. The loss of the secondary braking system as well as the main hydraulic pressure will result in little or no braking capability and a potential for injury or death.

It is recommended to perform a brake accumulator check anytime the machine has been idle for longer than two hours below -25 ℃ (-13 ℉). For the location of the acculator, see Fig. 5-61.

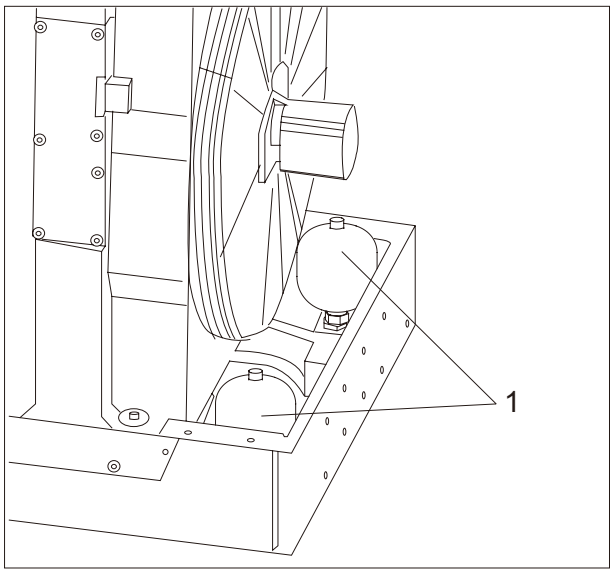


Fig.5-61

(1) Move the engine start switch to the ON position.

NOTICE

Alert indicator (see Fig.5-62) will flicker if the brake system is not at the normal operating pressure.

(2) Start the engine and run the engine for one minute in order to increase the accumulator pressure. Alert indicator should turn off. Stop the engine.

(3) Apply the service brake pedal and release the service brake pedal in order to decrease the accumulator pressure. Apply the service brake pedal and release the service brake pedal for a minimum of five applications until alert indicator flickers.

(4) If alert indicator flickers with less than five applications of the service brake pedal, measure the nitrogen precharge pressure of accumulators.

NOTICE

Only use dry nitrogen gas to recharge the brake accumulators.

Fig.5-62

5.3.13 Drawbar maintenance

5.3.13.1 Drawbar ball and socket - lubricate

NOTICE

Sany recommends the use of 5% molybdenum grease for lubricating the drawbar ball and socket.

Wipe the fitting (see Fig.5-63) before you apply lubricant through the fitting.

Apply the appropriate lubricant through the fitting in order to lubricate the drawbar ball and socket.

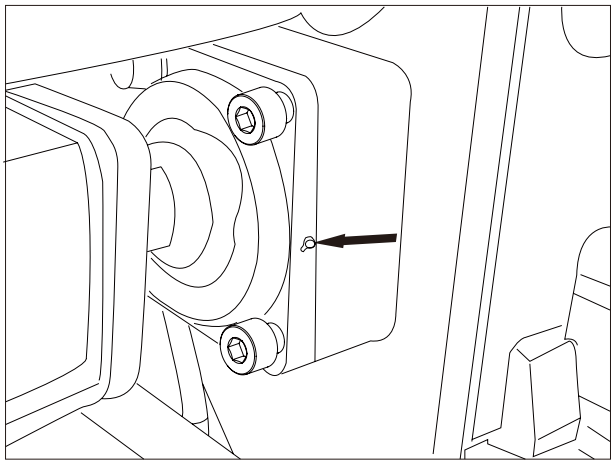


Fig.5-63

5.3.13.2 Drawbar ball and socket end play - check/adjust

Check the end play:

(1) Rotate the blade so that the blade is placed at an angle of 90 degrees to the frame. Lower the blade to the ground.
(2) While you maintain a light load between the ball and the socket, inch the machine slowly to the rear. Stop the machine and shut off the engine.
(3) On the drawbar ball and socket, measure the end play that is between ball (6) and cap (4). The cap fastens the drawbar ball and socket to the adapter. The end play should be 0.6±0.2mm (0.024±0.008 inch).
(4) Adjust the end play, if necessary.

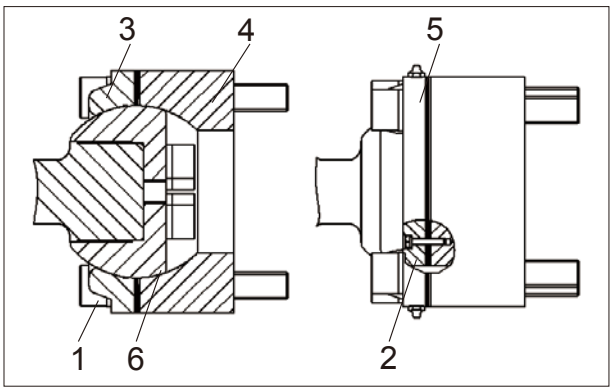


Fig.5-64

Adjust the end play:

(1) Support the drawbar and support the circle.
(2) Remove bolts (1) that fasten the drawbar to bolster. Move the drawbar backward or move the machine forward.
(3) Remove capscrews (2) from cap (3). The cap fastens the drawbar ball and socket to adapter (4). Remove the adapter.
(4) As required, remove shims (5) or install the shims in order to attain an end play of 0.6±0.2mm (0.024±0.008 inch).
(5) Install capscrews (2) in cap (3). Rotate the cap of the socket by hand. The socket should rotate freely on ball (5) of the drawbar.
(6) Check the torque on bolts (1) that fasten ball (5) to the drawbar.
(7) Install the drawbar ball and socket to bolster. Tighten bolts (1) to a torque of +540/-25 N.m (+400/-18 lb ft).

5.3.14 Other major components - lubricate

NOTICE

Sany recommends the use of 5% molybdenum grease for lubricating the following components.

5.3.14.1 Articulation bearings - lubricate

Wipe all the fittings before you apply lubricant through the fittings. As shown in Fig.5-67, the fittings for the articulation bearings are located on the right side of the front frame.

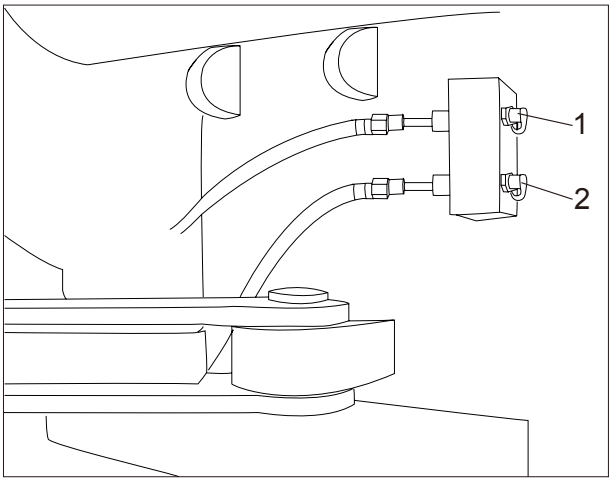


Fig.5-65

The upper articulation bearing has one fitting

(1). The lower articulation bearing has one fitting (2). In order to lubricate the articulation bearings, apply the appropriate lubricant through each fitting.

5.3.14.2 Axle oscillation bearings - lubricate

In order to lubricate the axle oscillation bearings, apply the appropriate lubricant to the fittings.

Wipe the fittings before you apply lubricant to the fittings. As shown in Fig.5-66, the fittings for the oscillation bearings are located in the middle of the left side.

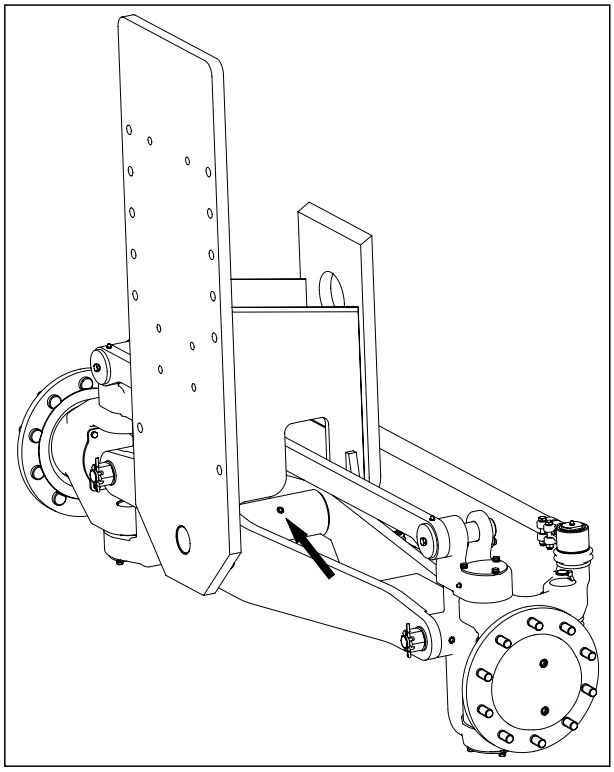


Fig.5-66

5.3.14.3 Blade lift cylinder socket - check/ adjust/replace/lubricate

Check/adjust/replace the blade lift cylinder socket:

(1) Rotate the blade. Position the blade at an angle of 90 degrees to the frame. Lower the blade to the ground.
(2) Operate the blade lift cylinders. Observe the socket. If the socket moves without blade movement, adjustment is necessary.
(3) Remove two bolts (1) from each cap (2). Remove cap (2).
(4) Remove one shim from either side of the inserts in order to reduce clearance.

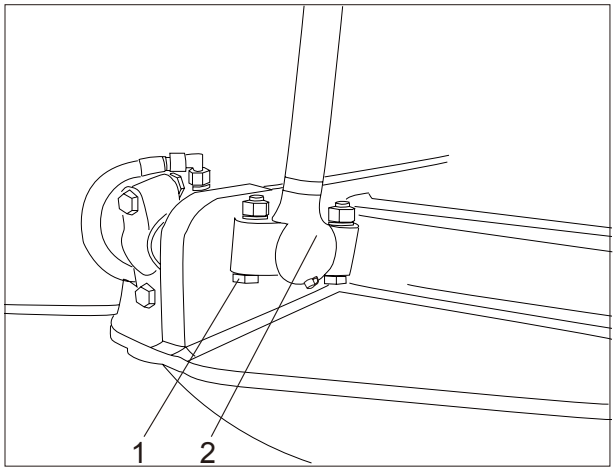


Fig.5-67

NOTICE

If you need to remove two shims, then remove one shim from each side of the inserts.

(5) Install the cap. Install the bolts and tighten the bolts.
6) Check the socket for movement. If you observe movement in the socket, repeat step 3 through step 5.

NOTICE

If no shims remain, install new inserts. Install two shims on each side of the inserts. Add additional shims, as needed.

Lubricate the blade lift cylinder socket:

Wipe all the fittings before you apply lubricant to the fittings.

There are two blade lift cylinders. Each blade lift cylinder socket has one fitting (1) (**see Fig.5-68**). In order to lubricate the blade lift cylinder sockets, apply the appropriate lubricant to each fitting.

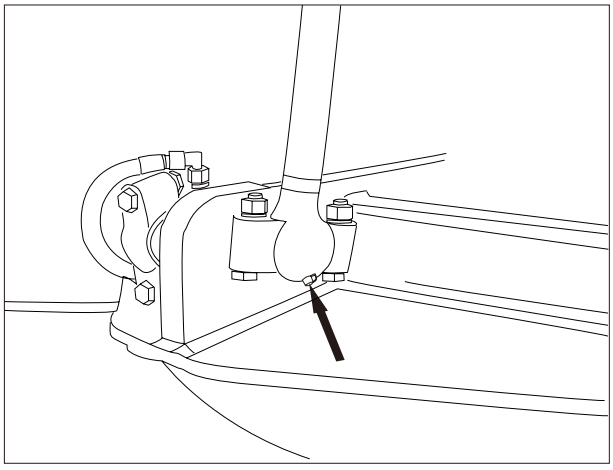


Fig.5-68

5.3.14.4 Swing support - lubricate

Lubricate the swing support by observing the following steps:

(1) Park the machine on a level surface and engage the parking brake.
(2) Stop the engine. Lower the blade and attachments to the ground.
(3) As shown in Fig. 5-71, swing support has 12 fittings (including the opposite sides of point 1, 3, 5, 7). Wipe the fittings before lubricating, open the dust cap, and apply recommended lubricant to each fitting.

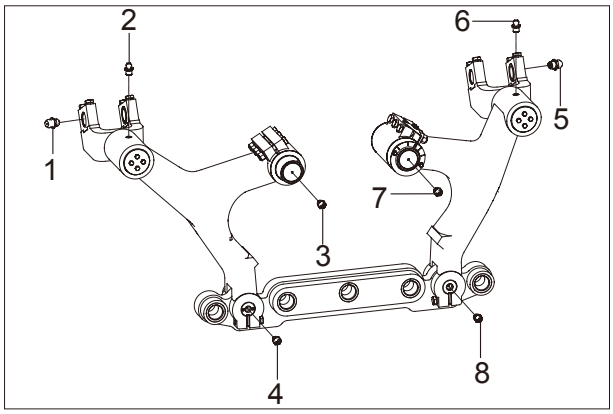


Fig.5-69

5.3.14.5 Centershift cylinder socket - lubricate

Two centershift cylinder sockets need to be checked, adjusted and replaced. The method is the same as procedures in “Blade lift cylinder socket check/cdjust/replace” (**see chapter 5.3.14.3 on page 5-58**).

Wipe all the fittings before you apply lubricant through the fittings.

There are two centershift cylinder sockets. As shown in Fig.5-70, each centershift cylinder socket has one fitting. Apply appropriate lubricant through the fitting in order to lubricate the centershift cylinder sockets.

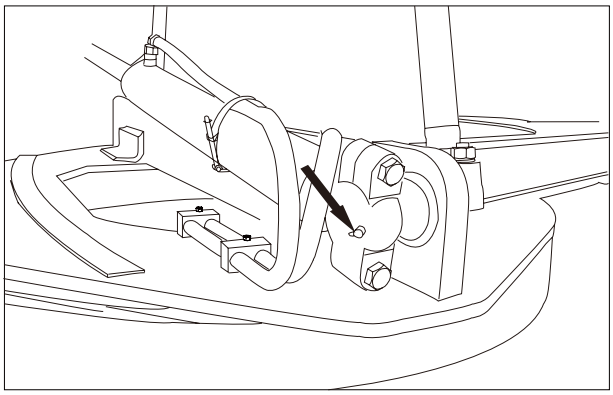


Fig.5-70

5.3.14.6 Centershift lock bar - lubricate

As shown in Fig. 5-73, centershift lock bar is located under the front frame and above the circle.

Clean the dirt, the lubricant and the rust from the holes in the centershift lock bar.

Apply the appropriate lubricant to the holes in the centershift lock bar.

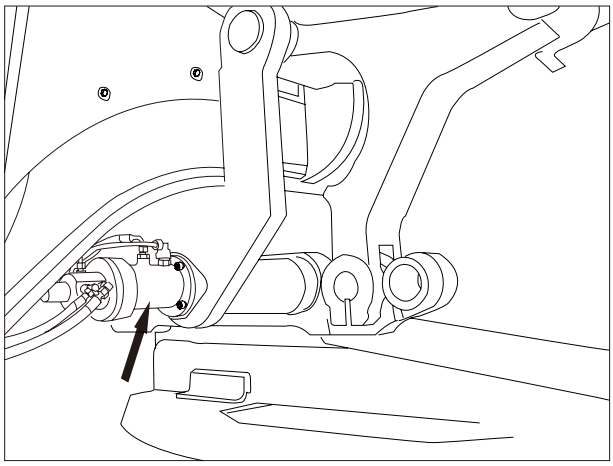


Fig.5-71

5.3.14.7 Blade angle cylinder - lubricate

Lubricate the blade angle cylinder by observing the following steps:

1. Park the machine on a level surface and engage the parking brake.
2. Stop the engine. Lower the blade and attachments to the ground.
3. Wipe the fittings (**see Fig.5-72**) before lubricating, open the dust cap, and lubricate the articulation points of blade angle cylinder with recommended lubricant.

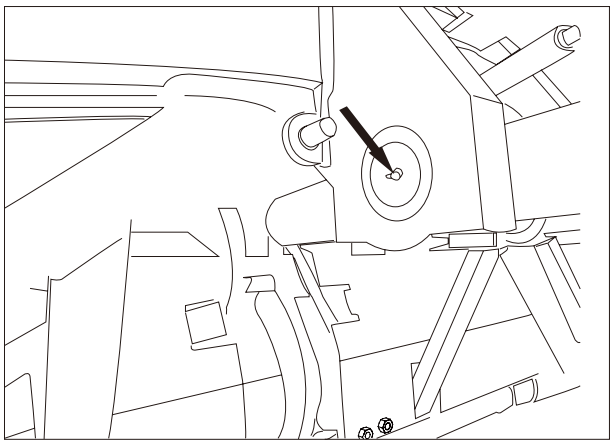


Fig.5-72

5.3.14.8 Blade side shift cylinder - lubricate

Lubricate the blade side shfit cylinder by observing the following steps:

(1) Park the machine on a level surface and engage the parking brake.
(2) Slide the blade rightward about 500 mm.
(3) Stop the engine. Lower the blade and attachments to the ground.
(4) Wipe the fittings (**see Fig.5-73**) before lubricating, open the dust cap, and lubricate the articulation points of blade slid cylinder with recommended lubricant.

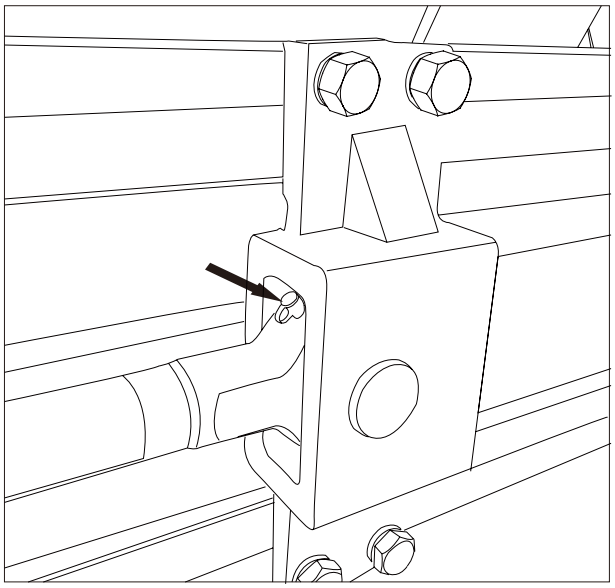


Fig.5-73

5.3.14.9 Wheel bearing - lubricate

Wipe all the fittings before you apply lubricant through the fittings.

The front wheel bearings are located on the inner side of each front wheel. As shown in Fig.5-74, filler plug is located on the housings of each front wheel bearing. Apply the appropriate lubricant through the fittings in order to lubricate the bearings.

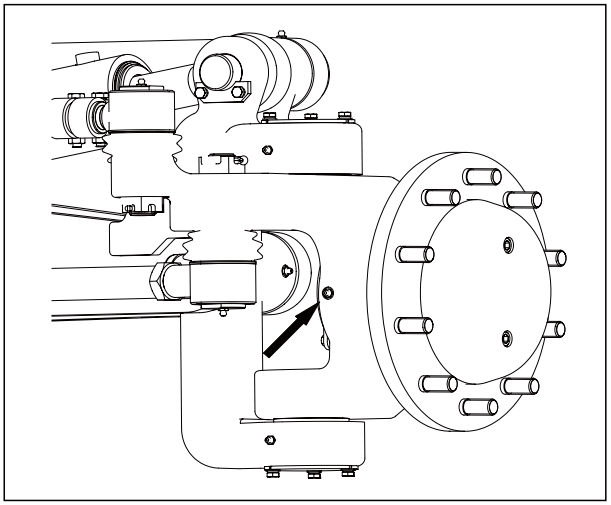


Fig.5-74

5.3.14.10 Wheel lean bar bearing - lubricate

Wipe the fittings before you apply lubricant through the fittings.

As shown in Fig.5-75, each end of wheel lean bar has one fitting. Apply the appropriate lubricant through the fittings in order to lubricate the wheel lean bar bearings.

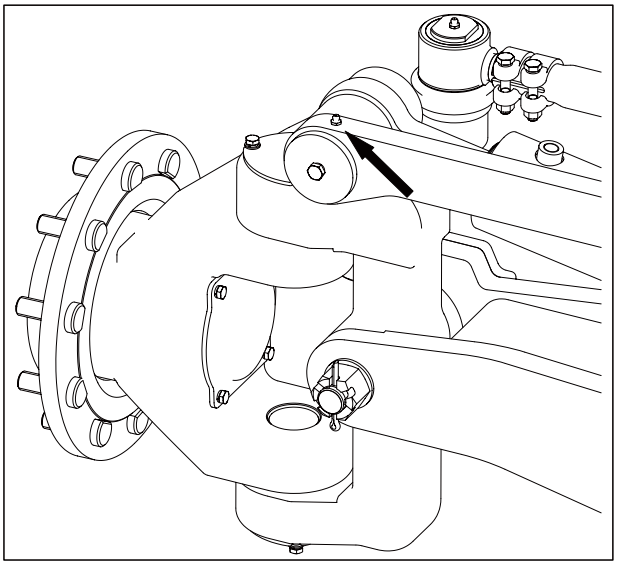


Fig.5-75

5.3.14.11 Wheel lean joint bearing - lubricate

Wipe the fittings before you apply lubricant through the fittings.

As shown in Fig. 5-76, each joint has two fittings. Apply the appropriate lubricant through the fittings in order to lubricate the wheel lean joint bearing.

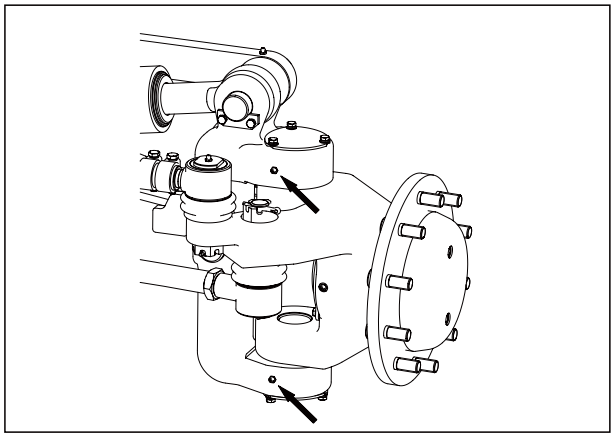


Fig.5-76

5.3.14.12 Wheel lean cylinder - lubricate

Wipe the fittings before you apply lubricant through the fittings.

As shown in Fig. 5-77, the right front wheel has two fittings on the wheel lean cylinder. Apply the appropriate lubricant through the fittings in order to lubricate the wheel lean cylinder bearings.

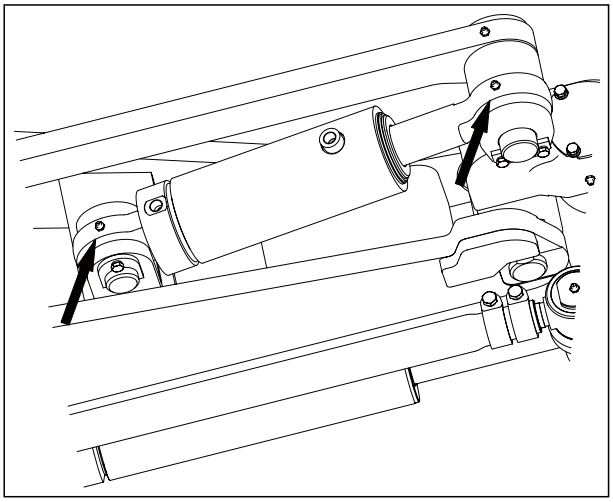


Fig.5-77

5.3.14.13 Steering cylinder ends and tie rods - lubricate

Wipe the fittings before you apply lubricant through the fittings.

As shown in Fig.5-78, both steering cylinders have two fittings. Both tie rods have one fitting. Apply the appropriate lubricant through the fittings in order to lubricate the cylinder ends and the tie rods.

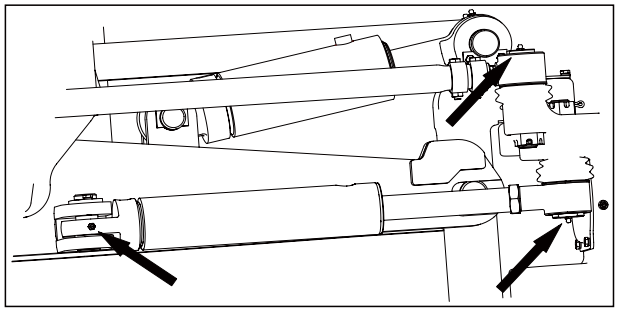


Fig.5-78

5.3.14.14 Drive shaft-lubricate

Wipe the fittings before you apply lubricant through the fittings.The drive shaft between the transmission output and rear axle input, has three fittings on the two end of Drive shaft. Apply the appropriate lubricant through the fittings in order to lubricate the bearings inside.

Fig.5-79

5.3.15 Electrical system maintenance

5.3.15.1 Control box - maintain

NOTICE

Keep the control box clean during maintenance in order to avoid electrical control module failure.

Maintain the control box according to following steps:

1. Open the cover plate.

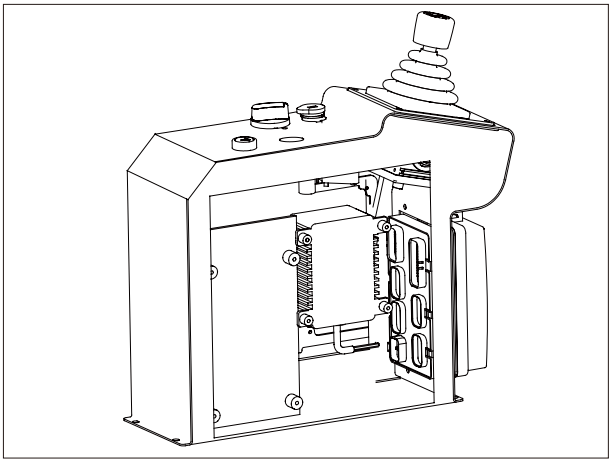


Fig.5-80

2. Remove the dust on the control module with a dry brush.
3. Check the connections of controller, relay and fuse.
4. Lock the cover plate.

5.3.15.2 Fuse - replace

Fuses protect the electrical system from damage that is caused by overloaded circuits. Replace the fuse if the element is separated. Check the circuit if the element is separated in a new fuse.

NOTICE

- **Replace the fuses with the same type and size only.**
- **If it is necessary to replace fuses frequently, an electrical problem may exist. Consult your Sany dealer.**

5.3.16 Window washer reservoir - fill

NOTICE

Use nonfreezing window washer solvent or a commercially available windshield washer fluid in order to prevent freezing of the windshield washer system.

Window washer reservoir is installed inside the cab, as shown in the figure.

NOTE: The window washer nozzles can be adjusted so that the window washer solvent will be sprayed in the desired direction.

Fig.5-81

5.3.17 Windshield wiper - check/replace

Inspect windshield wiper blade. Inspect rear window wiper blade. If any of the wiper blades are streaking the windshield or the rear window, replace the wiper blade.

5.3.18 Bolts - check

Check the botls for tightness in inital 50 working hours. After that, check the bolts for tightness every 250 working hours. See Table 5-4 for the tightening torque:

Table 5-4 Bolt Tightening Torque

Bolt Size	Norminal Diameter of Bolt mm										
	M6	M8	M10	M12	M14	M16	M18	M20	M22	M24	M30
	Tightening torque N.m										
8.8	10±1	25±3	50±5	90±10	145±10	235±15	310±20	410±30	600±40	760±50	1510±120
10.9	15±1	33±3	75±6	123±10	195±10	300±20	415±30	570±35	800±50	1030±50	1850±150
12.9	18±2	45±5	90±10	150±10	245±15	350±15	520±35	710±45	1030±50	1200±50	2545±200

5.3.19 Seat belt

5.3.19.1 Inspect

Always check the condition of the seat belt and the condition of the seat belt mounting hardware before you operate the machine.

Replace any parts that are damaged or worn before you operate the machine.Check the seat belt mounting hardware for wear or for damage. Replace any mounting hardware that is worn or damaged. Make sure that the mounting bolts are tight. Check buckle for wear or for damage. If the buckle is worn or damaged, replace the seat belt. Inspect the seat belt for webbing that is worn or frayed. Replace the seat belt if the seat belt is worn or frayed. Consult your dealer for the replacement of the seat belt and the mounting hardware.

NOTE: Within three years of the date of installation or within five years of the date of manufacture, replace the seat belt. Replace the seat belt at the date which occurs first. A date label for determining the age of the seat belt is attached to the seat belt, the seat belt buckle, and the seat belt retractor.

If your machine is equipped with a seat belt extension, also perform this inspection procedure for the seat belt extension.

5.3.19.2 Replace

Within three years of the date of installation or within five years of the date of manufacture, replace the seat belt . Replace the seat belt at the date which occurs first. A date label for determining the age of the seat belt is attached to the seat belt, the seat belt buckle, and the seat belt retractor.

Consult your dealer for the replacement of the seat belt and the mounting hardware. If your machine is equipped with a seat belt extension, also perform this replacement procedure for the seat belt extension.

5.3.20 Tire inflation-Check

Measure the air pressure on each tire. Consult your tire dealer for the correct load rating and for the correct operating pressures.
If necessary, inflate the tires.

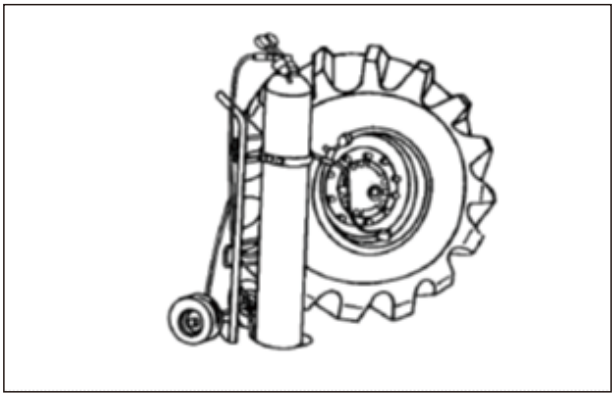


Fig.5-82

5.3.21 Crankshaft vibration damper-Inspect

Damage to the vibration damper or failure of the vibration damper will increase torsional vibrations.
These vibrations will result in damage to the crankshaft and to the other engine components. A deteriorating vibration damper will cause excessive gear train noise at variable points in the speed range.

Recommends replacing vibration damper (1) for any of the following reasons:

- The engine has had a failure because of a broken crankshaft.
- Fluid leakage is detected during inspection.
- The housing is damaged.

Refer to Disassembly and Assembly, The vibration damper can be used again if none of the above conditions are found or if the vibration damper is not damaged.

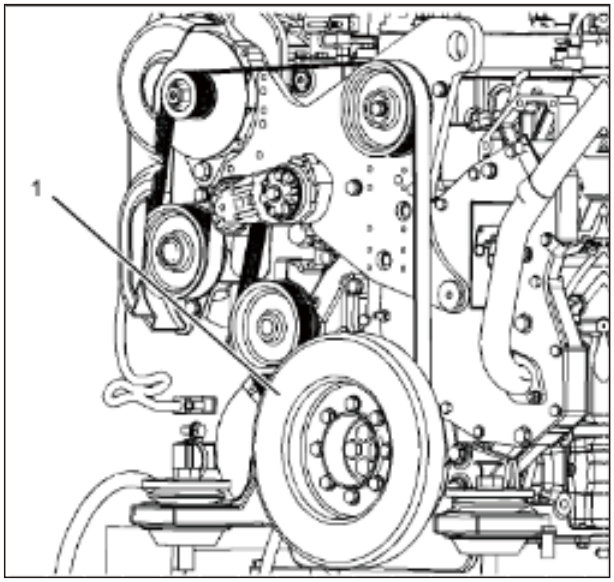


Fig.5-83

5.3.22 Battery or battery cable-Inspect/ Replace

1. Turn the engine start switch key to the OFF position. Turn all the switches to the OFF position.
2. Turn the key for the battery disconnect switch to the OFF position. Remove the key.
3. Disconnect the negative battery cable at the battery disconnect switch. The battery disconnect switch is connected to the machine frame.

NOTE: Do not allow the disconnected battery cable to contact the battery disconnect switch or the machine.

4. Disconnect the negative battery cable from the battery.
5. Disconnect the positive battery cable from the battery.
6. Inspect the battery terminals for corrosion. Inspect
7. the battery cables for wear or damage.
8. If necessary, make repairs. If necessary, replace the battery cable or the battery.
9. Connect the positive battery cable at the battery.
10. Connect the negative battery cable at the battery.
11. Connect the battery cable at the battery disconnect switch.
12. Install the key for the battery disconnect switch.
13. Turn the battery disconnect switch to the ON position.

5.4 Maintenance Overview

5.4.1 Basic principle

All repair work shall be done by the professional personnel assigned by the manufacturer. Operation by personnel on the work site shall be authorized by the service engineer assigned by the manufacturer in advance. Any consequence caused by unauthorized operation to the machine shall be assumed by the relevant personnel. Sany will assume no joint liability.

5.4.2 Basic maintenance methods

1) Observation method

Observation before maintenance is the basic method for diagnosis and maintenance. It applies to the whole maintenance process. You must observe the following points carefully and comprehensively:

- The environment, ground conditions and weather conditions (ambient temperature and humidity, air condition, etc.) around the machine.

- Loose welds on the machine body and structural members; the connection of all parts; the condition of indicator lights; the condition and display of the control panel; difference between the normal and abnormal working conditions of the control panel.

Before maintenance, you must perform analysis according to the observation. Pay attention to the following points before maintenance:

- Analyze and determine the possible causes before maintenance.

- Check the relevant documents for technical requirements and operation characteristics according to the observation, and take them as the basis for maintenance;

- Perform analysis and diagnosis with your own knowledge and experience; for problems you are not familiar with, turn to the technical engineer for suggestion and help.

2) Replacement method

Replace the suspected defective part with a good one to see if the malfunction still exists.

3) Comparison method

The comparison method is similar to the replacement method. The causes may be determined by comparing the appearances and functions of the suspected defective part and a well-conditioned one.

4) Test method

Test the electrical or hydraulic part of the defective system. Determine the causes according to the comparison between the test results and standard values.

5.4.3 Scarifier tip - replace

Check scarifier tips for damage or excessive wear. If necessary, replace the scarifier tips.

Replace the scarifier tips according to the following steps:

(1) Block up the scarifier to a height that is adequate for the removal of the tips.
(2) Drive out the retainer pin (2) from the retainer side of the ripper tip.
(3) Remove the scarifier tip (1) and retainer ring (3). Clean the retainer pin (2) and retainer (4).
(4) Install the new scarifier tip over the retainer.
(5) Drive the retainer pin through the retainer, through the retainer ring, and through the ripper tip from the opposite side of the retainer.
(6) Repeat step 2 through step 5 in order to replace additional scarifier tips.
(7) Raise the scarifier. Remove the block. Lower the scarifier to the ground.

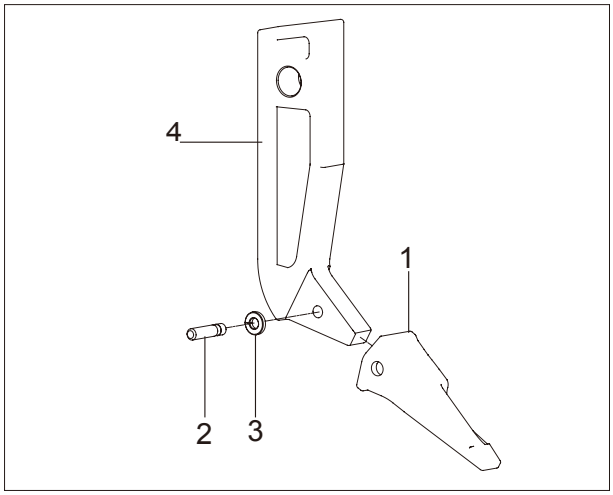


Fig.5-84

5.4.4 Front wheel - disassemble

1. Park the machine on a level ground. Apply the parking brake.

2. Loosen the rim nut by 1 turn. Set the blade or dozer plate on ground to make the front wheel off the ground. See Fig.5-85.

3. Use several jacks to jack up the front axle.

NOTICE

The operating weight of front axle is about 4900 kg.

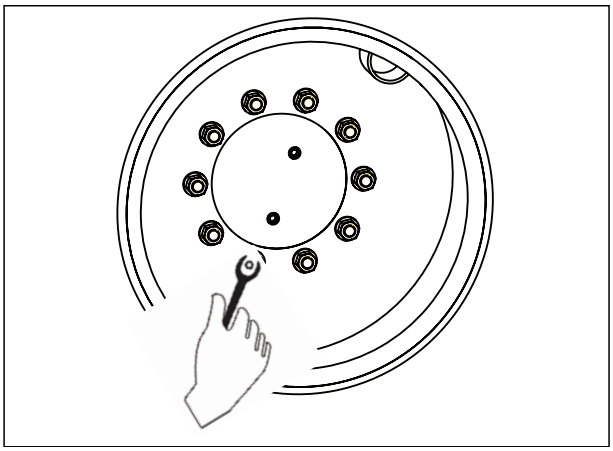


Fig.5-85

4. Loosen the rim nut and remove the tire.

5. Disconnect the hydraulic pipeline.

Disconnect the hydraulic pipe connectors at the wheel lean cylinder and steering cylinder. Seal the pipe openings with clean plugs. See Fig.5-86.

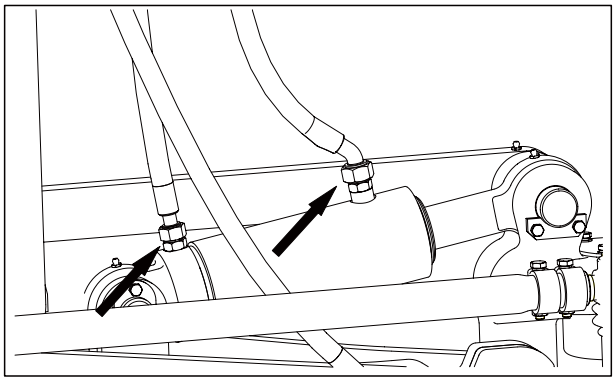


Fig.5-86

6. Remove the wheel lean cylinder (1) and wheel lean bar (2).

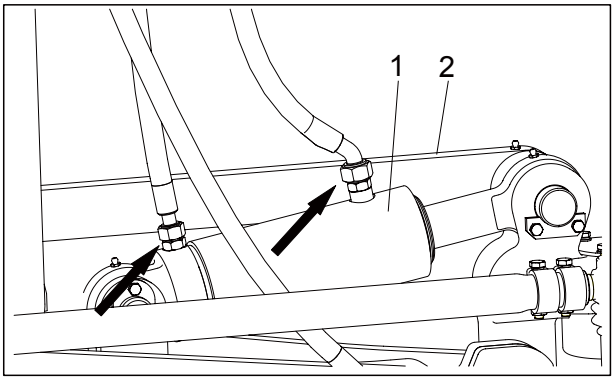


Fig.5-87

- Remove the bolt (1), washer (2), cover plate (3) at one end of the wheel lean bar. Remove the wheel lean bar.

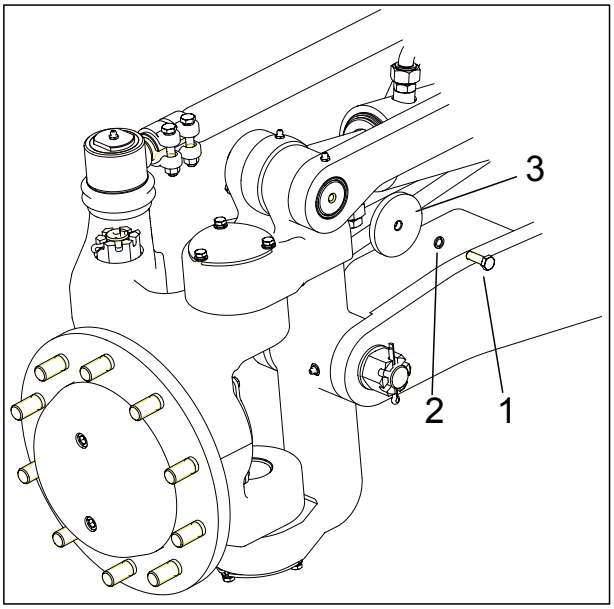


Fig.5-88

- Remove the bolt (1), washer (2), retaining plate (3) at one end of the wheel lean cylinder.

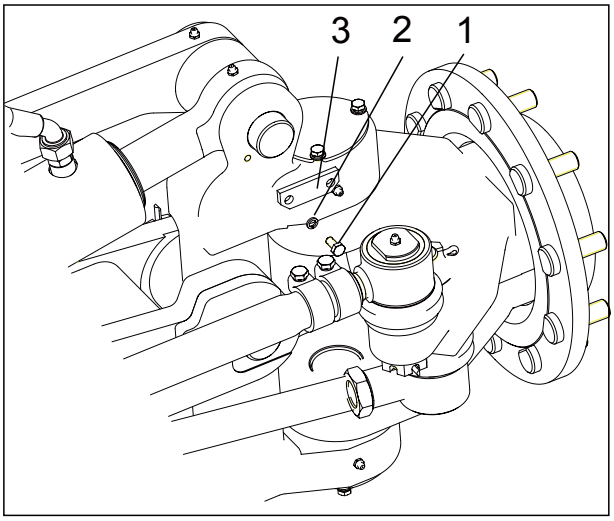


Fig.5-89

- Remove the bolt (1), washer (2) and retaining plate (3) on the other end of the wheel lean cylinder. Remove the wheel lean cylinder.

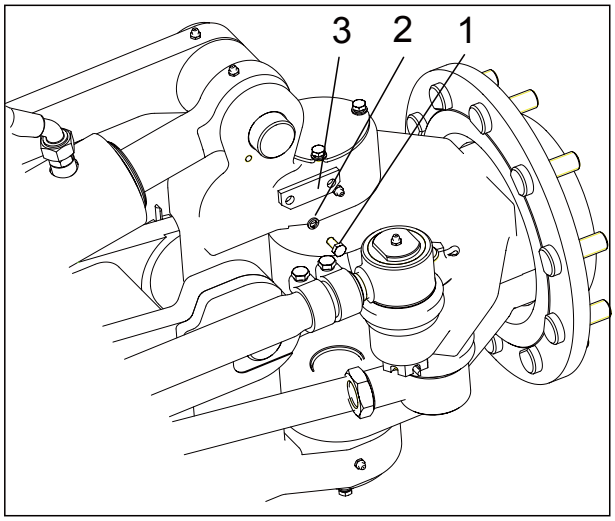


Fig.5-90

7. Disassemble the steering linkage.
- Remove the pin (1) and lock nut (2) at both ends of the steering linkage.
- Remove the steering linkage (3).

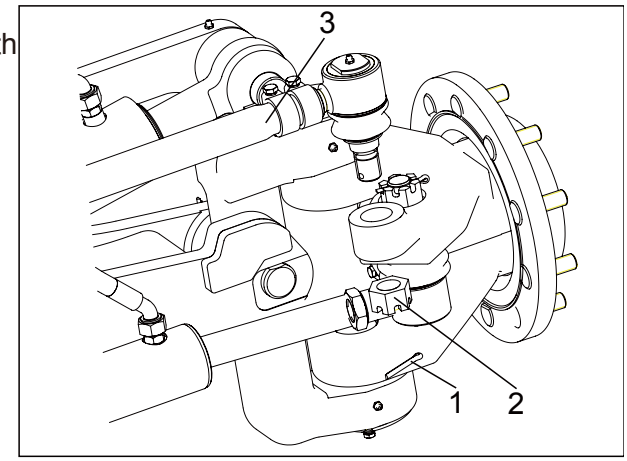


Fig.5-91

8. Disassemble the steering cylinder.
- Loosen the pin (1) and lock nut (2) at one end of the steering cylinder.

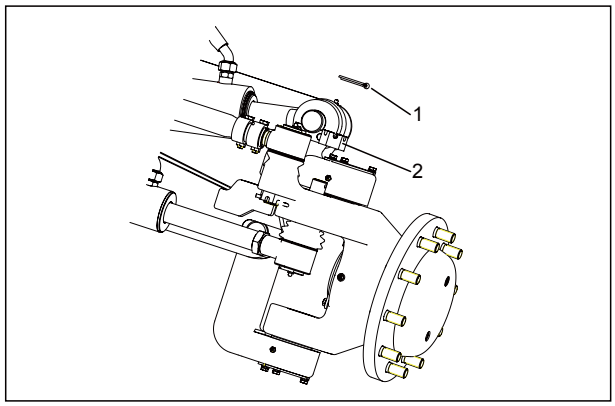


Fig.5-92

- Remove the bolt (1), washer (2), retaining plate (3) at the other end of the steering cylinder, and the pin (4) of the steering cylinder.

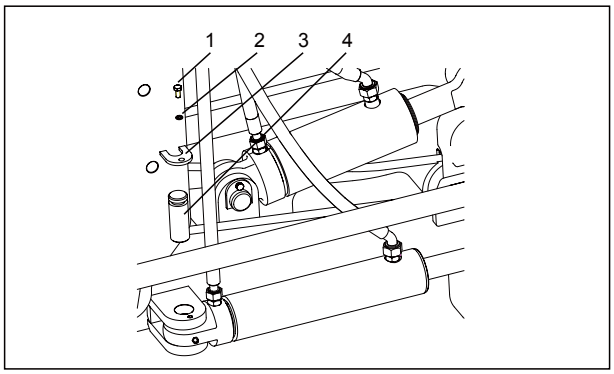


Fig.5-93

- Remove the steering cylinder.

9. Disassemble tilt knuckle and steering knuckle.

- Remove the pin (1), lock nut (2), washer (3) and axis pin (4) connecting the tilt knuckle and axle frame.
- Remove the tilt knuckle (5) and steering knuckle (6) from the axle frame.

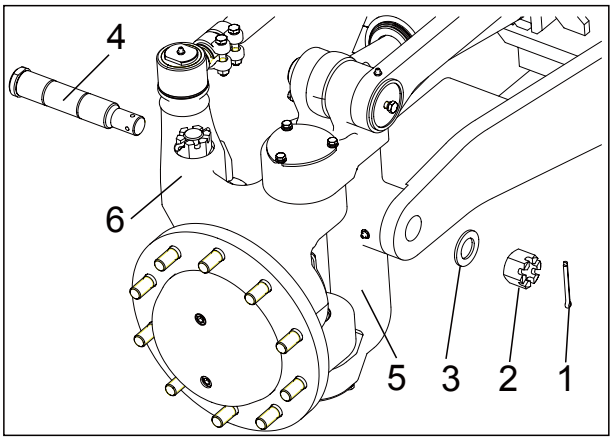


Fig.5-94

10. Remove the tilt knuckle and steering knuckle at the other side in the same way.

5.4.5 Oil cylinder - replace

5.4.5.1 Articulation steering cylinder - replace

Articulation steering cylinder is used in articulation steering system to make the grader steer in narrow area.

Disassembly procedures:

1. Use a spanner to loosen the guide sleeve. There is a mounting hole on the guide sleeve for fixing the spanner. Remove the oil cylinder.

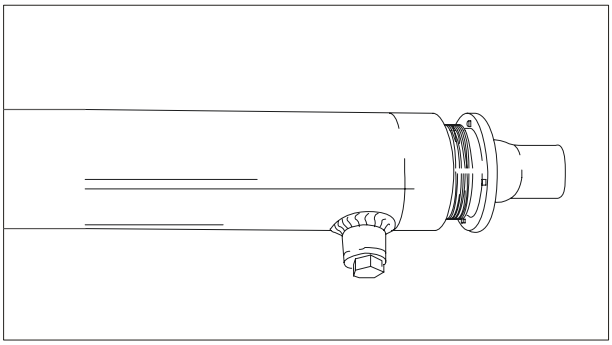


Fig.5-95

2. Place the cylinder on the rack and secure it.

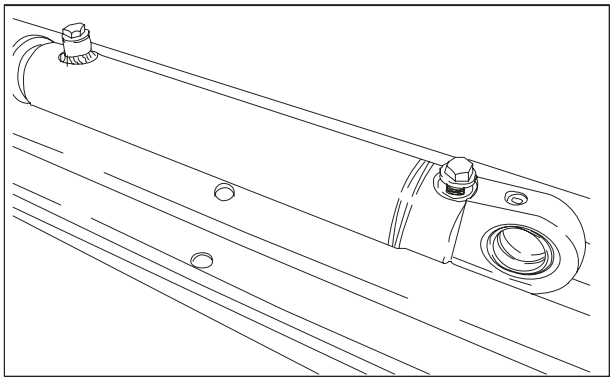


Fig.5-96

3. As shown in Fig. 5-97, charge the oil cylinder with high-pressure air of 0.7MPa through the oil port.

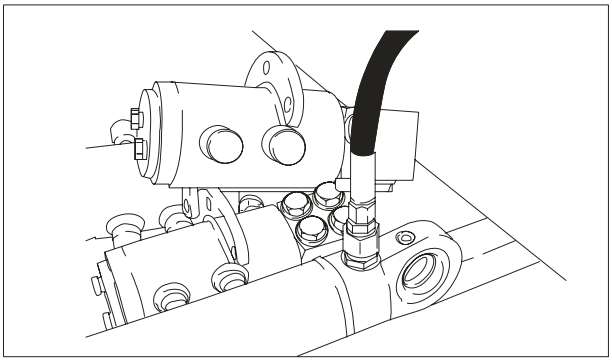


Fig.5-97

4. Remove the piston rod and piston which are under high pressure.

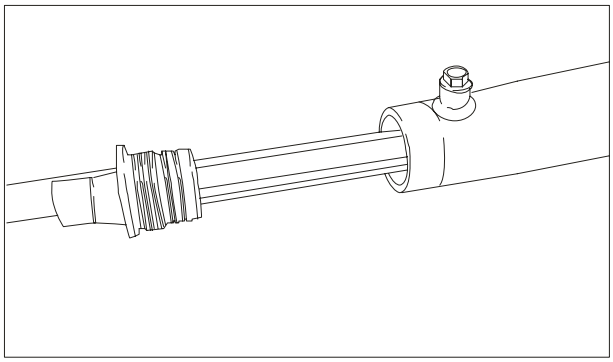


Fig.5-98

5. Check the seals of piston and piston rod for damage. If case of damage, replace the seals.

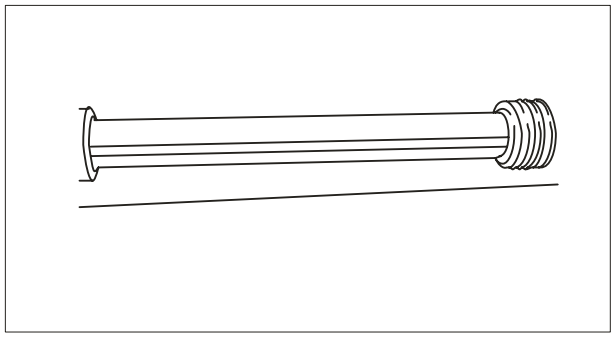


Fig.5-99

Assembly procedures:

1. Check all removed elements.
2. Use kerosene or hydraulic oil of the same type to clean the elements to avoid contamination caused by dust and foreign matter.
3. Blow and dry the removed elements with compressed air.
4. Set the cylinder body upright. Fit the piston rod (together with the piston) into the cylinder body by external force. (Apply even force to the piston when tapping it with a hammer.) Set the cylinder on the rack and secure it.
5. Use a spanner to fix the threaded guide sleeve on the cylinder body.
6. Charge high-pressure air through the oil ports at both ends of the cylinder.

7. Turn on the switch to make the piston rod move outwards under high pressure.

5.4.5.2 Centershift cylinder - replace

Swing support assembly has several locking holes on the link arm. Operate the centershift cylinder control button in order to pull the lock bar out from the locking hole to release the swing support. Rotate the swing support in order to adjust the blade.

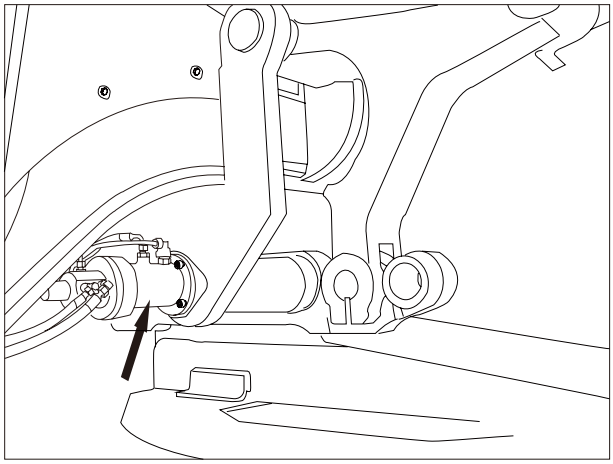


Fig.5-100

Removal procedures:

1. Loosen four M12x50 bolts on the front end face of the cylinder with a pneumatic spanner. Remove the rubber hose and adapter on the back cylinder head. Remove eight M8x40 bolts connecting the back cylinder head and the cylinder barrel.

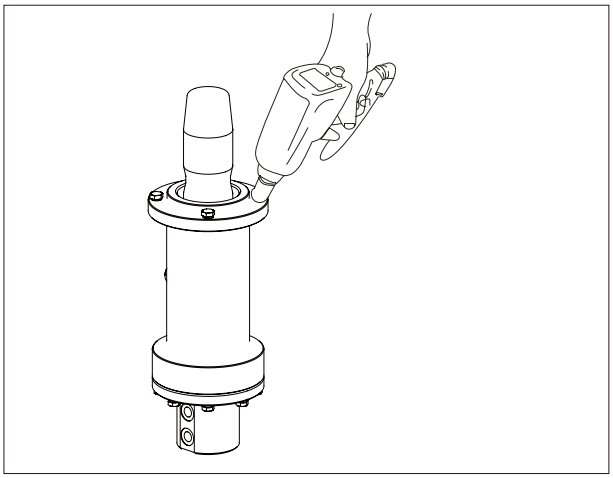


Fig.5-101

2. Separate the cylinder body from the cylinder bottom.

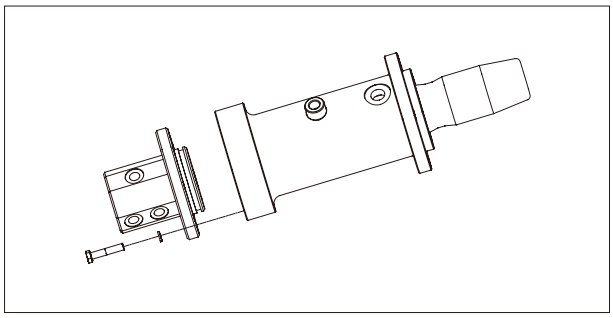


Fig.5-102

3. Tap the cylinder body and remove the piston rod.
4. Check the seal ring of piston for damage. In case of damage, replace the seal.

The installation of centershift cylinder is the same as that of articulation steering cylinder. Strictly carry out dwell test to the oil cylinder till it meets the requirements.

5.4.5.3 Blade angle cylinder - replace

The blade angle cylinder mainly controls the moldboard pitch in order to adjust the blade cutting angle.

The blade angle cylinder mainly consist of guide sleeve, cylinder body, piston rod, piston, oil cup and seals.

Disassemble the blade angle cylinder:

1. Use a pair of retainer pliers to remove the retainer ring and the retaining sleeve which is mounted on the piston rod.

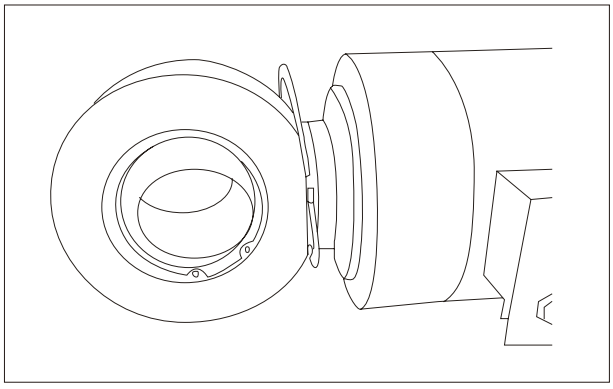


Fig.5-103

2. Tap the guide sleeve with a ball hammer to make it move inwards till you can see the front clipping key.

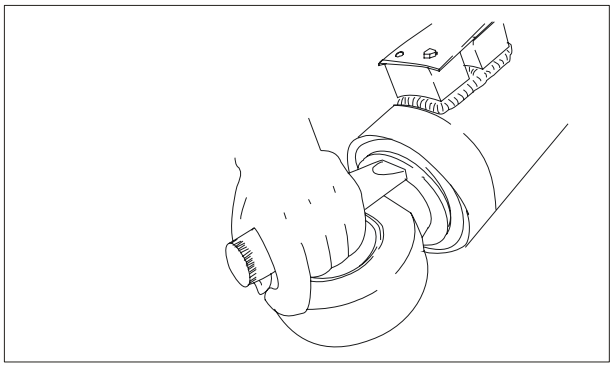


Fig.5-104

3. Remove the front clipping key with magnetic tools.

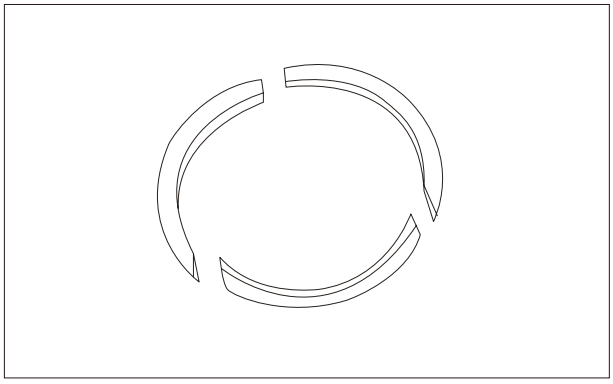


Fig.5-105

4. Place the oil cylinder on the fixing rack and secure it.

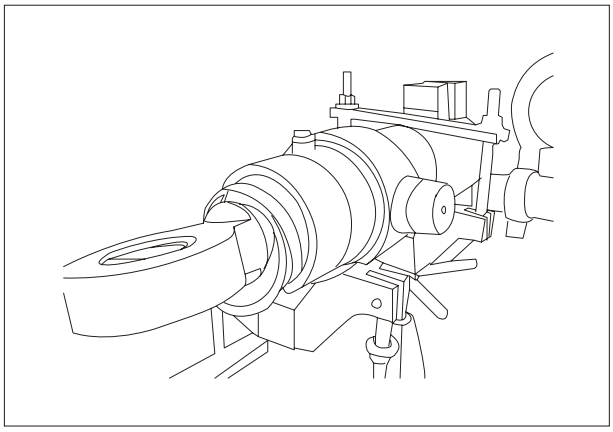


Fig.5-106

5. As shown in Fig.5-107, charge the oil cylinder with high-pressure air of 0.7MPa through the oil port.

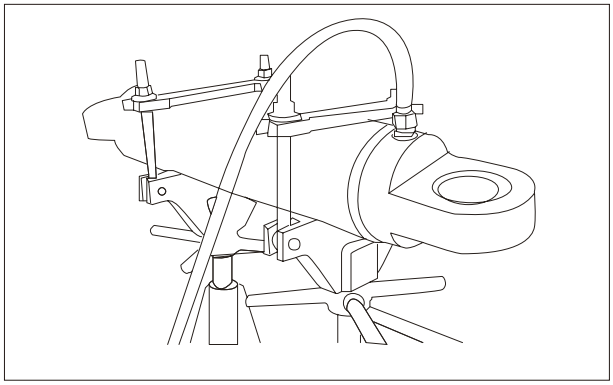


Fig.5-107

6. Remove the piston rod and piston which are under high pressure.

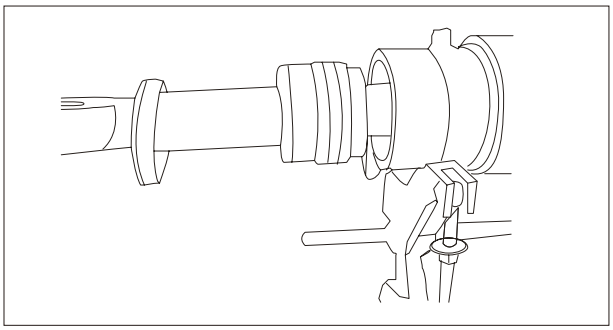


Fig.5-108

7. Check the seal of piston rod for damage. In case of damage, replace it.

8. Use a pair of retainer pliers to remove the retainer ring mounted at one end of piston.

9. Remove the clipping key cap.

10. Forcibly strike the rear clipping key outwards and take it down to remove the piston.

11. Check the piston seal ring and its compression allowance. In case of any damage, replace it with.

Assemble the oil cylinder:

1. Check all the removed elements.

2. Use kerosene or hydraulic oil of the same type to clean the elements to avoid

contamination caused by dust and foreign matter.

3. Blow and dry the removed elements with compressed air.

4. Install the piston on the piston rod. Install the clipping key and cap.

5. Install the retainer ring at one end of the piston with a pair of retainer pliers.

6. Set the cylinder body upright. Fit the piston rod (together with the piston) into the cylinder body by external force. (Apply even force to the piston when tapping it with a hammer.)

7. Set the cylinder on the rack and secure it.

8. Put the snap ring into the groove with magnetic tool. Strike the guide sleeve with a hammer.

9. Charge with high-pressure air through the oil ports at both ends of the oil cylinder.

10. Turn on the switch in order to the piston rod move outward under high-pressure.

11. Install the retaining sleeve in the same way. Apply uniform force to strike.

12. Install the retainer ring with a pair of retainer pliers.

13. Strictly carry out dwell test to the oil cylinder till it meets the requirements.

Refer to the information above to replace and install the front wheel lean cylinder, blade swing cylinder, blade lift cylinder, blade side shift cylinder, dozer plate cylinder and scarifier cylinder.

5.4.5.4 Several common seal rings

1) OK type piston seal ring

The OK type seal ring is mainly used for heavy-duty hydraulic equipment. Its applicable operating pressure is more than 500 bar. It features small size, which guarantees small friction resistance in starting even after a long dwell time. Its open structure makes it easy to be mounted on the integral piston, without the help of any auxiliary means. It has good wear resistance.

2) OD type piston seal ring

The OD type seal ring comprises PTFE piston seal ring and O-ring. It is used for the hydraulic piston rod and piston. It features small sizes, which ensures small friction in starting and moving, and stable movement without creeping even when the machine travels at low speed. It is resistant to crushing and high temperature. It has good oil return characteristics due to the special sealing structure.

3) BS type piston seal ring

The BS type seal ring comprises 2 seal lips which fit tight at the external radius. The lubricant between the lips greatly reduces the friction and wear. It features good friction resistance, good crushing resistance, small compression deformation and convenient installation.

5.4.6 Precautions of repair, assembly and disassembly for transmission

- Only when the inner damaged or worn parts are to be replaced or complete overhaul is required, can the transmission be removed from the grader. After its removal, clean its surface with proper detergent. The assembly and disassembly of the transmission must be done on the clean platform with special tools to ensure high cleanliness of all parts.

NOTE: The repair, disassembly and check of the transmission must be done or guided by professional personnel.

- Before reassembling the transmission, seal gum left on all joining faces must be cleared, and burr on all parts or flaws affecting the assembly must be repaired with oil stone.

- The inner housing of the transmission must be cleared with detergent. Damaged or badly worn parts must be replaced. The friction clutch and the steel plate must be replaced together, and it is prohibited to change one or several parts in the same group. Replace bearings and lock rings if they are damaged due to the removal. Don't recycle removed seal rings. Use new parts of the same grade. Pay special attention not to let metal debris or other impurities into the transmission, and to check all oil ports and oil lines in case of blockage.

- Before assembling the transmission, strictly ensure tightening torques of bolts on all joining faces and clearances of assembly of related parts.

- If the electrical welding is performed on the grader, disconnect all electric elements and the electrical system.

- After the transmission is repaired or replaced, replace the high pressure filter element, clean or replace the magnetic oil suction filter element A and B, clean out oil stain and sediments in oil lines and outside the cooler.

SANY

Troubleshooting

6 Troubleshooting

⚠ WARNING

Read and understand all safety precautions and instructions in this manual before reading any other manuals provided with this machine and before operating or servicing the machine. Failure to do this can cause property damage, personal injury or death.

6. Troubleshooting

6.1 Mechanical System

6.1.1 Service brake

Table 6-1 Fault Analysis and Troubleshooting for Service Brake

Fault Symptom	Cause	Remedy
After releasing the throttle pedal and applying the brake pedal during traveling, the service brake works without braking effect or poor braking effect.	Oil leakage at brake pipe connector	Check all pipe connectors and then tighten leaking connector or replace seals.
	Air in brake hydraulic pipeline	Bleed service brake hydraulic pipeline.
	Friction disc abrasion	The thickness of the friction disc is less than 3 mm. Replace it.
High temperature at service brake	Blocked hydraulic pipeline or valve for service brake, seized valve spool, leading to piston of service brake retraction failure	Check the hydraulic pipeline, valve for service brake, and eliminate the fault.
Abnormal noise at service brake	Oil emulsion in tandem drive case	Replace the oil in tandem drive case.

Hydraulic pipeline bleeding procedures:

1. Remove the rubber cap on the bleed bolt.

2. Fit one end of the hose on the bleed bolt, and put the other end into a clean container.

3. Unscrew the bleed bolt by a half turn and depress the brake pedal. When you see oil flowing out from the bleed nipple without bubbles, tighten the bleed bolt and release the brake pedal immediately.

6.1.2 Circle drive

Table 6-2 Fault Analysis and Troubleshooting for Circle Drive

Fault Symptom	Cause	Remedy
Blade slip	1. Friction disc is normally worn, but the pretightening force is insufficient. 2. Friction disc is damaged.	1. Open the seal plate of upper cover on the circle drive. Use a torque spanner to adjust torque (follow step 2 directly when the circle drive is not with overload protection). 2. If the adjustment is not effective through step 1, open upper cover to check the interior. Replace damaged parts.
Excessive output gear teeth abrasion or breakage	Frequent operation impact and insufficient lubrication result in excessive output gear teeth abrasion or breakage.	Replace gear output shaft.
Oil leakage	Oil leakage at the housing	Wash the housing and perform repair welding (first drain the gear oil in the worm-gear box).
	Oil leakage at the dynamic seal	Check the seal steel ring and seal ring. If necessary, replace them.

6.2 Hydraulic System

General tools for hydraulic system troubleshooting are: pressure gauge (0~4 MPa), pressure gauge (0~25 MPa), pressure gauge (0~60 MPa), test hose (L= 3 m, 2 pieces), multimeter, common hexagon socket spanner (1 set), and common spanner.

Table 6-3 Fault Analysis and Troubleshooting for Hydraulic System

Fault Symptom	Cause	Remedy
Noise from plunger pump	Insufficient oil suction; insufficient oil in the oil tank; high oil viscosity due to low ambient temperature.	Under low ambient temperature, use low-viscosity hydraulic oil (46#); fill hydraulic oil in the hydraulic oil tank to 70% of the scale.
	Oil suction failure or unsmooth oil flow due to blocked filter	Clean or replace the filter element.
	Plunger pump failure	Oil pump is excessively worn and oil leaks seriously. Check the oil pump. Repair or replace the oil pump.
No steering action or is difficult to turn	Low set pressure of relief valve in steering gear	Set the pressure of relief valve of steering gear to 17.5 MPa .
	Damaged spring of relief valve of steering gear; poor sealing of relief valve seat; damaged relief valve body.	Replace the damaged parts.
	Severe internal leakage at steering cylinder	Temperature of hydraulic oil is high and the steering cylinder is hot, and the cylinder leaks internally. Replace the sealing element of the steering cylinder.
Nonsynchronous left and right lift cylinders action	The spline in the steer out of alignment with the steering rod	Adjust the steer installation to align with the steering rod.
	The lower mechanism is jammed and the multiply valve spool fails to be pushed in position	Add lubricant or replace the worn mechanism components.
Unsmooth action	Air in the cylinder	Bleed the hydraulic system. Seal the hydraulic system and the pipeline properly.
	Slow pressure boosting in the cylinder or is difficult to reach the set value due to severe internal leakage in the hydraulic cylinder.	Replace the deteriorated or damaged seal ring of the piston.

Fault Symptom	Cause	Remedy
Low speed and unstable action due to insufficient piston thrust	Large tolerance clearance due to cylinder barrel and piston abrasion or severe internal leakage due to deteriorated seal ring of the piston.	If the clearance is large, install mounting groove for sealing element, and add seal ring. If the seal ring is deteriorated, replace it.
	Contaminated oil causes the resistance increases due to contaminant.	Test the oil cleaness. Replace the oil.
	Oil viscosity is reduced due to high oil temperature, resulting in leakage.	Find out the cause of high oil temperature. Reduce the oil temperature by cooling.
Control lever is operated with great effort	Damaged return spring of multiway valve	Replace return spring.
	Distorted mounting plate for multiway valve	Adjust the mounting position of multi-way valve, making it vertically downward.

6.3 Electrical System

Table 6-4 Fault Analysis and Troubleshooting for Electrical System

Fault Symptom	Cause	Remedy
The machine is not energized when ignition key turned	1. Failed (open) fuse F1.	1. Replace fuse.
	2. Failed iginition key.	2. Check the ignition key for good connection. Turn the ignition key. Meaure the pressure of 102# and 104# cable. If the 102# calbe has 24V pressure while the 104# cable has no pressure, replace ignition key.
	3. Damaged power delay K0.	Turn the ignition key. Measure the pressure of 100# cable of central control box. If it has no pressure, replace K0 relay.
	4. Damaged battery.	Check the sight glass of battery. Geen indicates it is normal. Black indicates charging is needed. Other colors ind icate it is necessary to replace the battery.
Starter motor does not act when ignition key turned	Transmission lever not at P position.	Set the transmission control lever at P position.
	Failed (open) fuse F2.	Replace fuse.
	Charing signal failure.	Check 109# cable; check the engine.
	Damaged relay K2.	Check K2 relay and replace.
	Damaged starter relay K1.	Check K1 relay and replace.
	Starter failure (including relay and motor)	Adjust, replace or repair.
Starter motor acts (has sound), but fails to start	Low battery voltage.	Check the sight glass of battery. Green indicates it is normal. Black indicates charging is needed. Other colors indicate it is necessary to replace the battery.
	Starter failure (including relay and motor)	Adjust and repair.
	Enrichment electromagnetic valve failure of engine	Repair.

1) Check the battery:
Observe the sight glass of the battery. Green indicates it is normal; black indicates charing is needed; white indicates the battery is damaged.

2) Check the generator charging
Start the engine. Use a multimeter to measure the voltage to ground of the B+ terminal. If the voltage is more than 27V (charging indicator light does not light on the display). Otherwise, check the circuit or replace generator.

3) Check the charging signal:
Stop the engine (disconnect the power swich), use a multimeter to measure the voltage to ground of the D+ terminal (109# cable). If the voltage is zero, it is normal. Otherwise, check the circuit and generator.

6.4 Drive system

Table 6-5 Fault Analysis and Troubleshooting for Drive System

Fault Symptom	Cause	Remedy
Powerless action or no gear	1.Too low oil level in auxiliary tank 2. Jammed main reducing valve spool 3.Defective dual gear pump 4. Burnt clutch friction disc of transmission. 5 Damaged seal ring on the shaft	1. Check the oil level in the auxiliary oil tank and take a sample of the lubricant. If the lubricant has some black floating particle with strong odor, the friction disc is burnt. Disassemble the transmission to replace the friction disc and wash the oil circuit twice; if the oil level at the auxiliary oil tank is too low, the friction disc is burnt due to insufficient lubricant; if the oil level at the auxiliary oil tank is normal, test the pressure of each valve. If the lubricant sampe is normal, test the pressure of each valve to find out the cause. 2. At low idle speed, pull out the connectors of control lines of k1, k2 and k3 clutch valves, switch gears, and test and check if the outlet pressures of k4~k8 clutch valves and the main relief valve are within 22~24bar based on the shifting logical diagram; connect the connectors of control lines of k1, k2 and k3 clutch valves, pull out the connectors of control lines of k7 and k8 clutch valves, switch gears, and test and check if the outlet pressures of k1, k2 and k3 clutch valves and the main relief valve are within 22~24bar based on the shifting logical diagram. If the pressure of certain clutch valve is too low or zero, the possible cause is the clutch valve spool is seized by foreign matter, control current is low, or the seal ring of the shaft is damaged. If the outlet pressure of the main relief valve is too low or zero, the possible cause is the main relief valve spool is seized by foreign matter or the dual gear pump of the transmission is damaged. 3. If the fault still exists after washing the valve spool, the cause is not that the valve spool is seized by foreign matter; if the fault still exists after replacing the gear pump, the cause is not that the dual gear pump is damaged; if the fault still exists after replacing the seal ring of the shaft, the cause is not that the seal ring is damaged.

Fault Symptom	Cause	Remedy
High oil temperature in transmission (exceed 110 ℃ for a long time)	1. Two low main pressure (the theoretical value 22-30bar) causing the clutch to slip. 2. Insufficient lubricant. 3. Damaged overflow valve to the radiator. 4. Damaged overflow valve to the lubrication system. 5. Damaged dual gear pump of transmission	1. Refer to the fault sympton. 2. Check the oil level at the auxiliary oil tank. If the oil level is too low, fill lubricant; if the oil level is normal, perform further check. 3. Remove the main relief valve, and check the overflow valve to the radiator mounted on the transmission body for damage. In case of damage, replace. If not, perform further check. 4. Remove the plug on the left rear of the main relief valve on the transmission body. Check the overflow valve mounted on the inside wall of the transmission through the plug hole for damage. In case of damage, replace; if not, perform further check. 5. Replace the dual gear pump of transmission. Check if the high oil temperature is cuased by insufficient flow due to damaged pump.
Unsmooth shifting	1. Valve spool does not act. 2. Pressure oil circuit leaks due to damaged seal ring at the shaft.	1. Find out the defective clutch valve according to the gear logical diagram. 2. Under low idle speed, measure the outlet pressure of possible defective clutch valve. If the pressure exists while the logical diagram does not have, wash the possible defective clutch valve spool. If the fault still exists, perform further check. 3. If the two clutch valves on the same shaft have pressure, the seal ring on the middle of the pressure control oil circuit at the shaft is damaged. Replace the seal ring.

6.5 Engine

6.5.1 Procedures for engine troubleshooting

In order to eliminate fault and shorten the machine downtime, observe the following procedures:

1. Before troubleshooting, know the fault in detail: working condition of the engine before the fault: load, altitude, dust and so on. Fault characte: Fault continues or bursts out; fault appears after replacing fule or engine oil. Fault symptom: color of the smoke emitted; coolant temperature, consumption and leakage; engine oil temperature, consumption and leakage; fuel consumption; engine noise; contaminated coolant (has engine oil, rust or sediment); contaminated engine oil (has water or fuel);diesel engine vibraiton.
2. Analyse the fault.
3. Find out the relationship between the fault symptom and diesel egnine system and basic parts.
4. Find out the relationship between the latest repair and the current fault.
5. Check carefully before dismantling the engine.
6. First eliminate the most easy-to-handle and obvious problem.
7. Find out the fault cause and have it repaired.
8. Start the engine and confirm the fault has been eliminated.

6.5.2 Fault Analysis and Troubleshooting for Engine

Table 6-6 Fault Analysis and Troubleshooting for Engine

Fault Symptom	Cause	Remedy
Engine fails to start or is difficult to start (with white smoke)	Fuel is used up.	Refuel and purge air from fuel system.
	Electronic fault code.	Contact your local authorized Cummins service agent.
	Low battery voltage.	Replace battery or charge battery.
	Low engine starting speed: less than 150 rpm.	Contact your local authorized Cummins service agent.
	High load.	Check if the pressures of work pump and parking brake are normal.
	Fuel leakage.	Check the fuel pipe, fuel filter and connector. Have it repaired.
	Air in fuel system.	Purge air from fuel system.
	High resistance in air inlet system	Check the air inlet pipe and air filter. Clear blockage or replace.
Engine fails to start or is difficult to start (no smoke emitted)	Fuel is used up.	Refuel and purge air from fuel system.
	Electronic fault code.	Contact your local authorized Cummins service agent.
	Low battery voltage.	Replace battery or charge battery.
	Abnormal power supply to the ECM.	Check ECM circuits. Repair or replace.
	Air in fuel system.	Purge air from fuel system.
Too much black smoke	High resistance in air inlet system.	Maintain air filter or replace filter element; check air inlet pipe for blockage.
	Leakage at air inlet system or air outlet system.	Check pipeline and connector. Tighten it.
	High resistance or leakage in intercooler.	Check the intercooler. Have it repaired.
Too much white smoke	Engine is too cold.	Warm up engine slowly.
	Leakage at air inlet system or air outlet system.	Check pipeline and connector. Tighten it.
	High resistance in air inlet system	Maintain air filter or replace filter element; check air inlet pipe for blockage.
	High resistance or leakage in intercooler.	Check the intercooler. Have it repaired.
	Poor diesel oil atomization.	Contact your local authorized Cummins service agent.

Fault Symptom	Cause	Remedy
Engine is overheated, and stalls	Cylinder and radiator cooling fin on the top of cylinder are blocked by deposit.	Wash radiator cooling fin, especially wash the vertical fin on the top of the cylinder.
	Defective injection nozzle.	Contact your local authorized Cummins service agent.
	Plunger pump is adjusted incorrectly.	Contact your local authorized Cummins service agent.
	Cooling air flow is restricted.	Clear cooling air delivery line.
	Failed radiator.	Check fan speed and check radiator core for blockage.
Low engine oil pressure	High engine oil consumption. Engine oil level is low.	Fill engine oil. Stop the engine and find out the cause immediately. Check engine oil filter or cooler for leaks.
High engine oil pressure	Low coolant temperature.	Warm up engine slowly.
Charing indicator light flashes to alarm	Low generator running speed.	Check belt. Adjust or replace.
	Failed generator or modulator. Battery fails to charge.	Check battery. Check clamps on both poles of battery, tighten and apply grease on them.
Crankshaft rotate slowly and it fails to start	Loose or rusted battery cable.	Clean and secure.
	Low battery voltage.	Charge.
	Incorrect lubricant type.	Replace with correct lubricant.
Crankshaft rotates normally but it fails to start	No fuel supply to injector.	Check injector and high-pressure oil pipeline. Contact your local authorized Cummins service agent.
	Fuel cut solenoid valve does not act.	Check electric resistance of solenoid valve. Contact your local authorized Cummins service agent.
	No fuel supply to fuel pump.	Check if low-pressure oil circuit and fuel tank have fuel.
	Abnormal warm-up system.	Check warm-up system.
	Failed glow plug.	Replace.
	Leakage at fuel injection tube.	Tighten connector or replace fuel injection tube.
	Fuel injection timing is not good.	Adjust fuel injection timing. Contact your local authorized Cummins service agent.
	Damaged injector or injector seat.	Repair or replace. Contact your local authorized Cummins service agent.

Fault Symptom	Cause	Remedy
Unstable idle speed	Engine is too cold.	Warm up engine slowly.
	Air in fuel system.	Purge air in fuel system.
	Fuel leakage.	Check, tighten or repair.
	Idle speed is too low.	Adjust idle speed. Contact your local authorized Cummins service agent.
	Injector or fuel supply valve is damaged or works abnormally.	Check, adjust or replace injector or fuel supply valve.
	Insufficient fuel supply to fuel injection pump.	Check and adjust. Contact your local authorized Cummins service agent.
	Moisture at connector.	Dry connector.

6.6 A/C System

Table 6-7 Fault Analysis and Troubleshooting for A/C System

Fault Symptom			Possible Cause	Remedy
Evaporator fan rotates	Condenser fan does not rotate.	Compressor works	—	Check the fan connector for deterioration. Check if grounding in good condition. Check the fan for damage.
		Compressor does not work	—	Check the temperature control switch for damage. Check the relay connector for looseness.
	Condenser fan rotates, but compressor does not work.		—	Check the clutch for damage. Check the connetor for looseness. Check the belt for looseness and slip.
Evaporator fan stops	Condenser fan rotates, and compressor works.		—	Check governor switch for failure. Check the fan cable for disconnection. Check if the gounding of fan is in good condition.
	Condenser fan does not rotate and compressor does not work.		—	Check if the breaker is in normal condition. Check the cable for looseness.
Cooling effect of A/C system is good at the beginning. After operating for a certain period, cool air flow is not sufficient. There are bubbles in the reservoir through the sight glass. The reading of low-pressure gauge is low.			Loose connector due to vibration, resulting in leakage.	Use a leak detector to find out the leaking point. Tighten it.
After operating for a certain period, the amount of cool air flow reduces. The reading of high-pressure gauge is high and the low-pressure gauge is low.			Screen of the orifice tube is blocked by the foreign matter in the system. Thin frost appears on the orifice tube.	Bleed the system. Replace the reservior. Refill R134a.

Fault Symptom	Possible Cause	Remedy
After operating for a certain period, the amount of cool air reduces gradually. The reading of high-pressure gauge is high, and the reading of low-pressure gauge is low.	Orifice of orifice tube is blocked by ice due to saturated desiccant in the reservoir.	Bleed the system. Replace reservoir. Refill R134a.
Fan works, but compressor does not work (no cool air)	Poor connection of temperature control switch or damaged coil of magnetic clutch of compressor.	Check the temperature control switch for damage by using a multimeter. Replace magnetic clutch of compressor.
Magnetic clutch of compressor acts frequently, resulting in low amount of cool air.	Incorrect temperature control switch causes the comperssor to stop, resulting in low amount of cool air.	Check the temperature control switch. Turn the switch to the MAX position.

6.7 Transmission

Some common faults (abnormal phenomenon) and corresponding solutions are introduced as follows. Some faults can be troubleshot by the customers themselves, but the repairs, disassembly and check of the transmission must be done or guided by professional personnel. If some faults or abnormal phenomenon are not included in this table, consult professional personnel.

Table 6-7 Fault Analysis and Troubleshooting for Transmission

Fault Symptom	Possible Cause	Remedy
Fault 1: During the working process, the engine stalls and the parking brake indicator on the display screen flickers with buzzer.	Connection between control wires of change valve of parking brake is defective.	Check wires of change valve.
	Main pressure is too low (the theoretical value is 2.4~3.0MPa)	See Fault 2.
Fault 2: Main pressure is too low and unstable (the theoretical value is 2.4~3.0MPa)	Poor connection of temperature control switch or damaged coil of magnetic clutch of compressor.	Check the temperature control switch for damage by using a multimeter. Replace magnetic clutch of compressor.
	Valve spool of the main reducing valve is jammed.	Clean or replace the main pressure reducing valve.
	The oil pump is failed.	Replace a new oil pump.
Fault 3:The temperature of oil is too high (above 110℃ for a long time).	The cooling system is failed.	Check the cooling system.
	Main pressure is too low (the theoretical value is 2.4~3.0MPa), resulting in sliding of the clutch.	See Fault 2.
Fault 4: At certain gear but no running	Connection between control wires of proportional valve is defective.	Check wires.
	Pilot type electric proportional valve is jammed or blocked.	Check the pressure of the electric proportional valve, and replace it.

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Technical Specifications

7 Technical Specifications

⚠ WARNING

Read and understand all safety precautions and instructions in this manual before reading any other manuals provided with this machine and before operating or servicing the machine. Failure to do this can cause property damage, personal injury or death.

7 Technical Specifications

7.1 Dimension of the Equipment

The following data are specifications of standard machine. Special specifications are subject to marks on the machine.

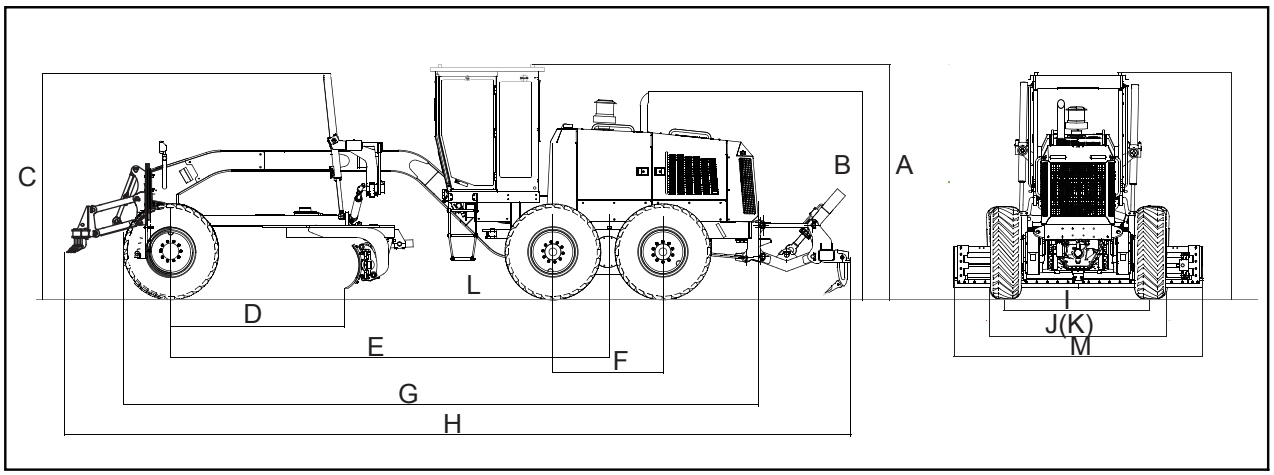

Fig.7-1

Table 7-1 Dimension of the equipment

Item		Unit	SMG200
A	Height to top of cab	mm	3310
B	Height to exhaust pipe	mm	3155
C	Height to top of cylinders	mm	3110
D	Length (front axle to moldboard)	mm	2462
E	Wheel base (front-rear axles)	mm	6156
F	Wheel base (between rear wheels)	mm	1549
G	Length (front tire to rear of machine)	mm	8946
H	Overall length	mm	11062
I	Width (tire center lines)	mm	2077
J	Width (outside rear tires)	mm	2634
K	Width (outside front tires)	mm	2740
L	Ground clearance at rear axle	mm	370
M	Blade length	mm	3660/ 4270 (optional)

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