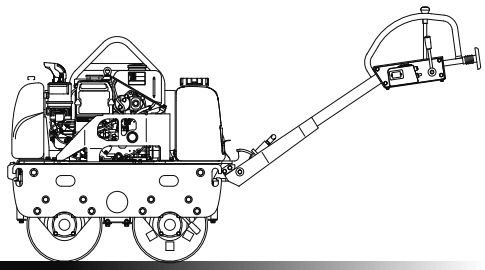
Mikasa

VIBRATION ROLLER

MRH-501DS
MRH-601DS



INSTRUCTION MANUAL

en

http://www.mikasas.com

502-04204

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1. INTRODUCTION

Thank you for your purchase of MIKASA MRH vibration roller. This product can be operated easily by the first time user for rolling compaction because, with this machine using hydraulic pump and hydraulic motor, just the operation of the running lever enables the operator to do forward and reverse switching and non-stage shifting of the speed.
This manual describes the operation method and easy maintenance of this vibration roller. Please read this manual before using this machine. For the engine, please refer to the separate operation manual.

2. APPLICATION, STRUCTURE AND POWER TRANSMISSION

Application

This vibration roller does rolling compaction by vibrating the drum with the strong one axis vibration of the vibrator.
Compaction effect is delivered to most of the soil types except for soft soil with high water content. So, this machine can be used for a wide range of rolling compaction of earth and sand mixture, earth, sand, gravels and asphalt.
Because the vibration and the running of this machine are separated, the machine is capable of doing static pressure rolling compaction and rolling compaction on a sloping surface. With its good work efficiency, this machine is suitable for a wide range of rolling compaction work.
On the ground with high water content, especially on the clayish soil, this roller will not work properly, with the drum not running effectively. On the other hand, on the firmly compacted ground that is stiffer than the level of this machine's compaction capability, do not try to operate this machine by applying vibration because that might result in the damage of this machine
Do not use this machine for works other than those described above.

Structure

An engine, hydraulic pump, oil tank, electromagnetic clutch for vibration, sprinkler tank, and handle are on the upper portion of this machine. Via an antivibration rubber, the upper portion is fixed to the frame that connects to the lower portion.
The lower portion of the machine consists of a vibrator that generates vibration, two drums with hydraulic motor for running and a frame to support the vibrator part.

Power Transmission

The mounted power engine is a water cooled single cylinder diesel engine. On the engine output shaft, a rubber coupling to drive the hydraulic pump for running is installed. The hydraulic pump is rotated via this rubber coupling.
The hydraulic pump, by its rotation, pumps in the hydraulic oil from the oil tank via the oil filter to generate hydraulic pressure. The hydraulic pressure generated feeds the hydraulic oil to the hydraulic motor assembled in the drum bracket to drive the hydraulic motor. The hydraulic motor rotates the drum, which in turn drives the machine. The running speed adjustment and the forward and reverse switching are done by the adjustment of the rotation of the trunnion shaft of the hydraulic pump via the control cable, which is done by the change of the tilt of the running lever attached to the control box of the handle. The steering of the machine is done by the operation of the handle bar.
On the same axis of the engine output shaft, outside the hydraulic pump, an electromagnetic clutch is installed. When the vibration ON-OFF switch is turned on, the input/output shaft of the electromagnetic clutch gets engaged to rotate the V pulley (1). Via the V belt, this V pulley (1) rotates the V pulley (2) installed on the pendulum shaft inside the vibrator between the two drums (wheels). The vibration generated by the rotation of the pendulum (shaft) is transmitted to the frame side plate at both sides of the machine, the drum bracket and then to the drum to send vibration to the ground for rolling compaction.

3. WARNING SIGNS

The triangle shaped ⚠ marks used in this manual and on the decals stuck on the main body indicate common hazards. Be sure to read and observe the cautions described.

⚠ Warning labels indicating hazards to humans and to equipment.	
⚠ **DANGER**	Denotes an extreme hazard. It calls attention to a procedure, practice, condition or the like, which, if not correctly performed or adhered to, is likely to result in serious injury or death.
⚠ **WARNING**	Denotes a hazard. It calls attention to a procedure, practice, condition or the like, which, if not correctly performed or adhered to, could result in serious injury or death.
⚠ **CAUTION**	Denotes a hazard. It calls attention to a procedure, practice, condition or the like, which, if not correctly performed or adhered to, could result in injury to people and may damage or destroy the product.
CAUTION (without at ⚠)	Failure to follow the instructions may result in damage to property.

4. CAUTIONS FOR SAFETY

4.1 General Cautions

⚠ WARNING

- Do not work with this machine, when
  - you are tired or sick and not feeling well,
  - you have taken medicine or drug, or
  - you have had a drink.

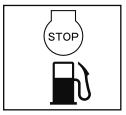
⚠ CAUTION

- Please read the operation manual well and work safely by using the machine properly.
- For handling of the engine, please refer to the separate engine operation manual.
- Please have a good understanding of the structure of this machine.
- Make sure to do work start inspection, regular self inspection and specified self inspection.
- To make your work safe, please use protective equipment (use specified helmet, protective shoes, etc.) and wear appropriate work clothes.
- Always use noise protection equipment such as ear muffs or ear plugs.
- Always check the machine to make sure it is in normal condition before operating the machine.
- The nameplates attached to the machine (nameplates showing operation method, warning, etc.) are very important for your safety. Clean the machine so that the nameplates can be read easily. If it is difficult to read the nameplate, please replace the old one with a new one.
- It is dangerous for young children to come near the machine. Please pay careful attention to the method of storing and the storage location for this machine. Especially the engine start key has to be taken out every time you finish your work, and keep it in a designated location.
- To do maintenance work, stop the engine and remove the battery wiring.
- We are not responsible for accidents that have occurred after the machine was refurbished without approval from the manufacturer.

4.2 Cautions During Refueling

⚠ DANGER

- Always refuel in a well ventilated area.
- Make sure to stop the engine and wait until the engine cools down when refueling.
- Select a flat surface area with no flammable material around for refueling. Be careful not to spill the fuel. Wipe off well if there is any spill.
- Never put fire near the machine during refueling. (Especially, be careful about smoking.)
- If you fill to the top of the fuel tank inlet, fuel might spill out from the tank, and it becomes dangerous
- After refueling, tighten the tank cap well.



4.3 Cautions About The Location Of Use And Ventilation

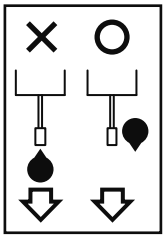
⚠ DANGER

- Do not use this machine in an area with poor ventilation, such as indoor or inside a tunnel. The exhaust gas from the engine contains poisonous gas, such as carbon monoxide, which is very dangerous.
- Do not operate this machine near fire.

4.4 Cautions For Work

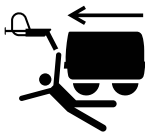
⚠ WARNING

- When parking this machine, or moving away from the machine while it is stopped, always apply the parking brake and use the wheel stopper. Also, never park on a sloping surface.
- Do not stop the machine on a soft ground where the wheel stopper will sink in.
- During work or while driving to move to other location, run the engine to the specified maximum revolution. Especially on a sloping surface, when the engine revolution is low or if the engine stops suddenly, the machine might start to move by its own weight. While working by moving up on a sloping surface, the machine might move back toward you, and there is a danger of being caught between the machine and some other object. So, it is recommended to operate the machine at either the left or right side of the machine, not directly behind the handle.
- When working with the machine on a side sloping surface, there is a danger of rollover, so please be extra careful. Also, make sure there is nobody at the bottom of the slope.
- When reversing, to make it easier for the operator to check behind, the operator should operate the machine by facing towards the back either at the left or right side of the operation handle. Do not try to reverse by facing the front by standing right behind the handle.
- The engine and muffler become very hot. Do not touch the hot part during operation.



⚠ CAUTION

- Because the handle is heavy, be careful when you try to move it from the upright position (stored position) to the operation position. Always check to make sure the handle lock is functioning.
- When starting the engine, make sure it is safe to do so by checking the surroundings for people and objects. Also make sure the running lever is at neutral position and the vibration switch is set to OFF.
- Make sure that no one can enter the area where work is done.
- Do not operate the machine with the handle at the upright position. The operation becomes unstable and it becomes very dangerous if the handle is at the upright position. Especially during reversing, there is a danger of being caught between the machine and some other object.



⚠ CAUTION

- Do not touch the moving parts and rotating parts during operation. Also, do not go near the rotating part because your clothes might get caught.
- Do not rush when making forward/reverse switching. Do not make sudden starting or sudden stop except for emergency situation.
- When coming close to an object while working by reversing, stop at about two meters in front of the object, then reverse the roller at a safe location before starting your work by forward movement.
- Have the work area well illuminated when working at night.
- If your work might become dangerous because of bad weather, stop your work.
- If you experience any trouble with the machine or notice any abnormality during your work, immediately stop your work and inform someone responsible for the work to take appropriate action.

4.5 Cautions For Transporting The Machine

⚠ WARNING

- Do not try to tow this machine by a car or a heavy machine.
- For unloading, designate a person responsible for the unloading work, then follow the instruction of that person.
- Choose a flat surface area for unloading.

⚠ WARNING

- If oil or dirt is on the rear deck of a transportation vehicle, the ramp and the machine, it becomes slippery and very dangerous. Clean well to remove oil and dirt before unloading.
- For transportation, always stop the engine and drain the fuel.
- After loaded, use the stopper (wheel stopper) to hold the machine, then fix it with wire rope.

⚠ CAUTION

- The ramp used for unloading should have sufficient strength, and it has to be securely fixed to the rear deck of the transportation vehicle at its hook part. The width of the ramp should be adjusted to the width of the machine, and the gradient has to be within 15 degrees.
- Before putting the machine on the ramp, determine the direction of the machine correctly. There is a danger of machine falling off if the orientation of the machine is even slightly off the correct position. So, correct the machine orientation by putting it back to its original position, then unload.
- Loading, in principle, should be done by the forward movement, and for unloading, use backward movement.
- Qualification is required for unloading work using a crane. You need to have someone qualified for crane operation or slinging work.
- When lifting this machine, always lift at the part (hook, etc.) specified.
- Before lifting, check for any breakage or loosened part, or fallen off part of this machine.
- When lifting, stop the engine.
- Use a damage-free wire rope that has sufficient strength.
- Never do sudden lifting up (lifting down) nor make sudden lateral movement while lifted.
- Make sure there is no person/animal around under the lifted machine.
- Do not lift up higher than the required height.

4.6 Cautions For Maintenance

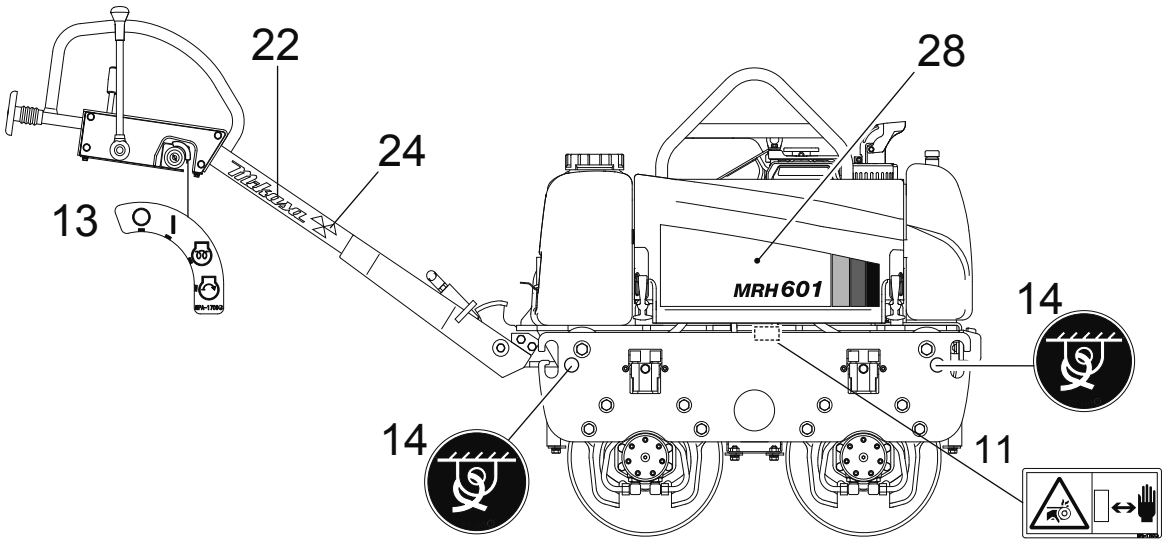
⚠ WARNING

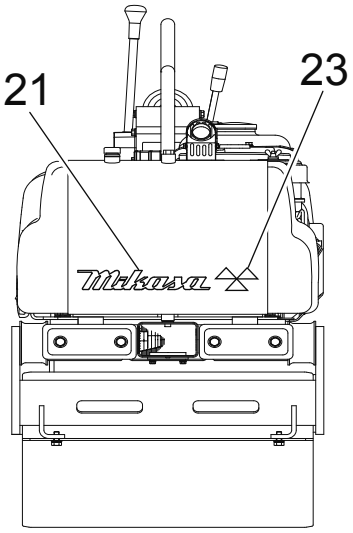
- To secure safety, appropriate maintenance is required. Because inappropriate maintenance might result in serious accident, always keep the machine in good condition.
- For inspection and adjustment, always stop the engine and wait until the engine and other parts cool down.
  Even when removing the radiator cap, always wait until the engine cools down.
- For inspection and maintenance of electric system, remove the (-) terminal of the battery.

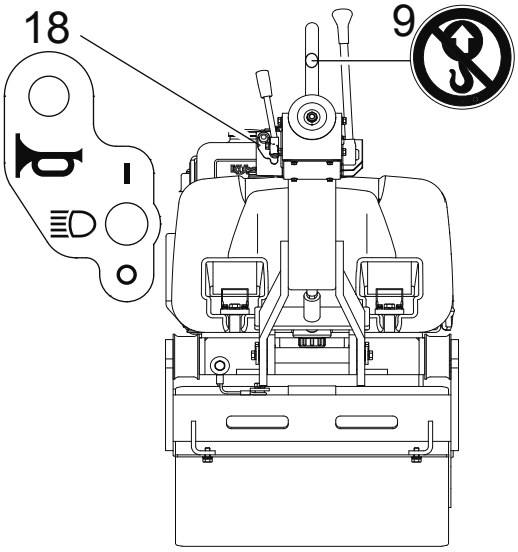
⚠ CAUTION

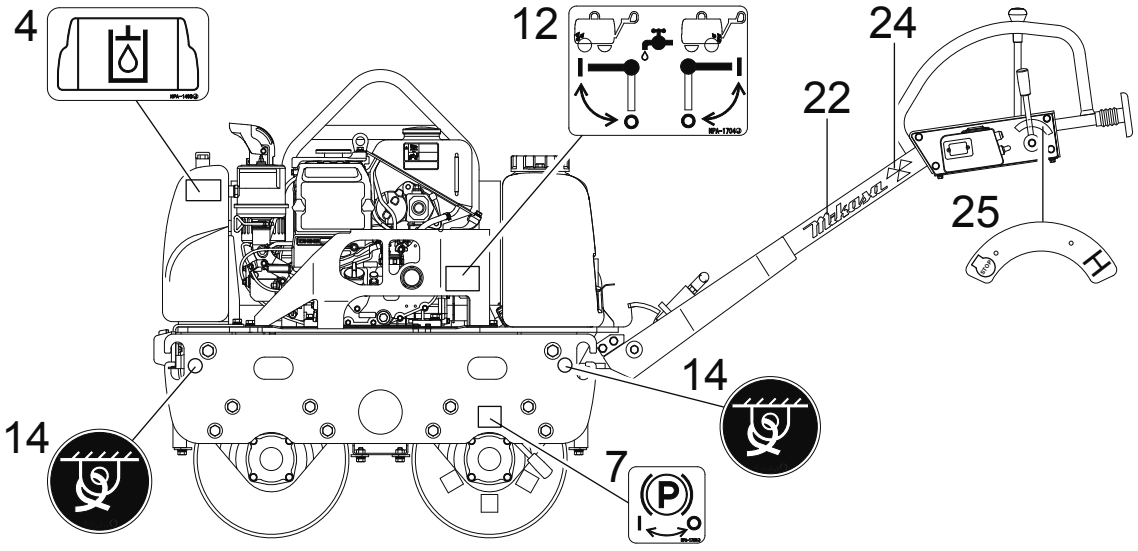
- When loosening the hydraulic pipe, always lower the pressure in the hydraulic circuit. If you remove the pipe while the pressure is still high, the force of the hydraulic pressure might cause the hose to hit you and you might get injured.
- After maintenance, check the installed condition of the security parts and the safety. Make sure that tightening of bolts and nuts was not forgotten.

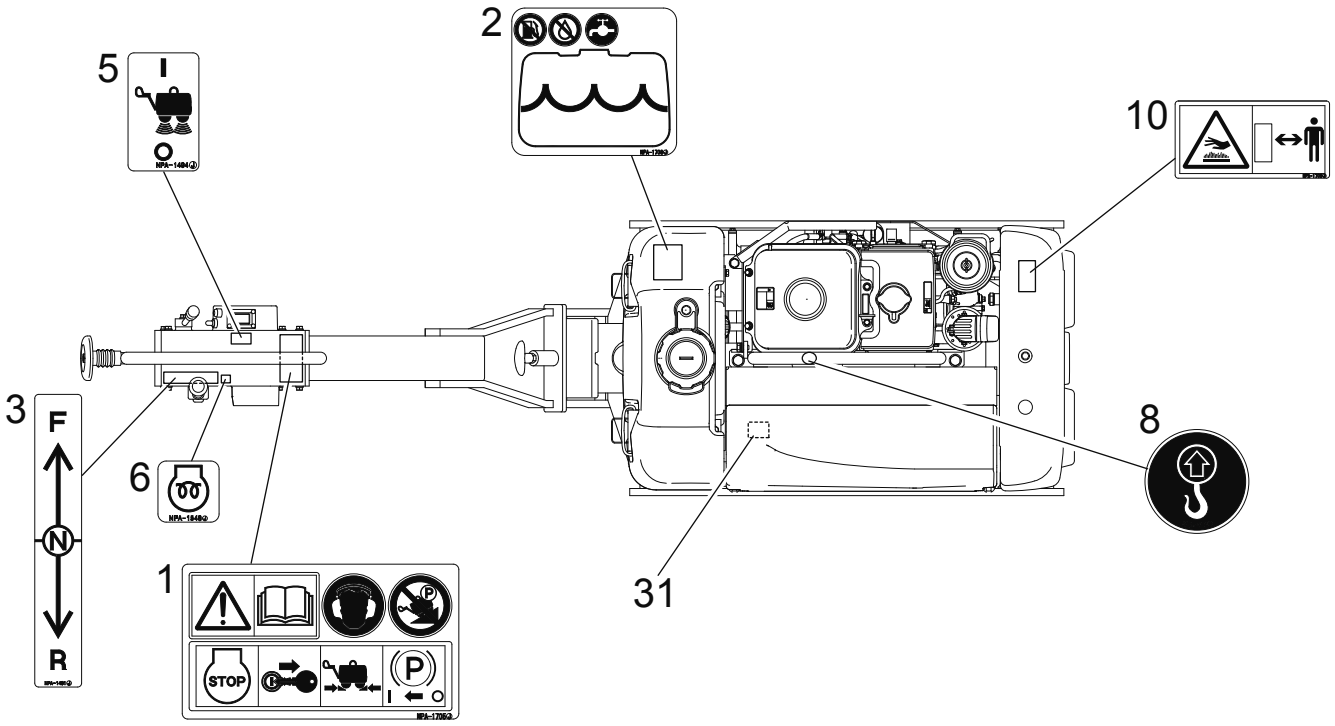
4.7 Label Attachment Position







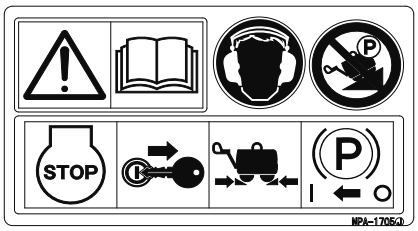
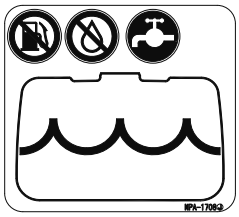


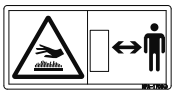
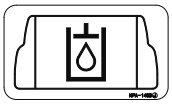
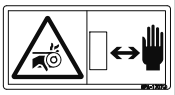
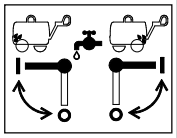
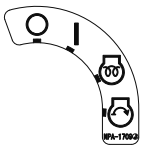
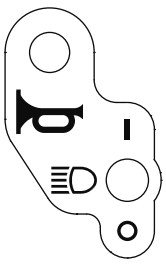


4.8 Label List

REF No.	PARTS No.	PARTS NAME	Q'TY	REMARK
1	9202-17050	DECAL, COUTION,CONBI/MRH	1	NPA-1705
2	9202-17080	DECAL, WATER TANK(ICON)MRH	1	NPA-1708
3	9202-18410	DECAL, FORWARD & REVERSE	1	NPA-1841
4	9202-18460	DECAL, OIL TANK(ICON)/MRH	1	NPA-1846
5	9202-18420	DECAL, SWITCH(VIB),ICON	1	NPA-1842
6	9202-18430	DECAL, GLOW LAMP(ICON)/MRH	1	NPA-1843
7	9202-17030	DECAL, PARKING BRAKE(ICON)	1	NPA-1703
8	9202-18450	DECAL, LIFTING POSITION	1	NPA-1845
9	9202-18440	DECAL, DO NOT LIFTING	1	NPA-1844
10	9202-17060	DECAL, CAUTION BURN(ICON)	1	NPA-1706
11	9202-17070	DECAL, CAUTION ROTATING	1	NPA-1707
12	9202-17040	DECAL, WATER VALVE(ICON)	1	NPA-1704
13	9202-17090	DECAL, KEY OPERATION/MRH	1	NPA-1709
14	9202-17170	DECAL, FOR FIXED(ICON)/MRH	4	NPA-1717
18	9202-18370	DECAL, HORN&LAMP(ICON)	1	NPA-1837
21	9202-17120	DECAL, MIKASA MARK(W)250L	1	NPA-1712
22	9202-17130	DECAL, MIKASA MARK(W)200L	2	NPA-1713
23	9202-17100	DECAL, MIKASA MARK 40X80	1	NPA-1710
24	9202-17110	DECAL, MIKASA MARK 35X70	2	NPA-1711
25	9202-15390	DECAL, FULL THROTTLE/MRH	1	NPA-1539
28	9202-20430	DECAL, MODEL /MRH-501	1	NPA-2043
28	9202-16900	DECAL, MODEL /MRH-601	1	NPA-1690
31	————	PLATE,SERIAL NO.		————

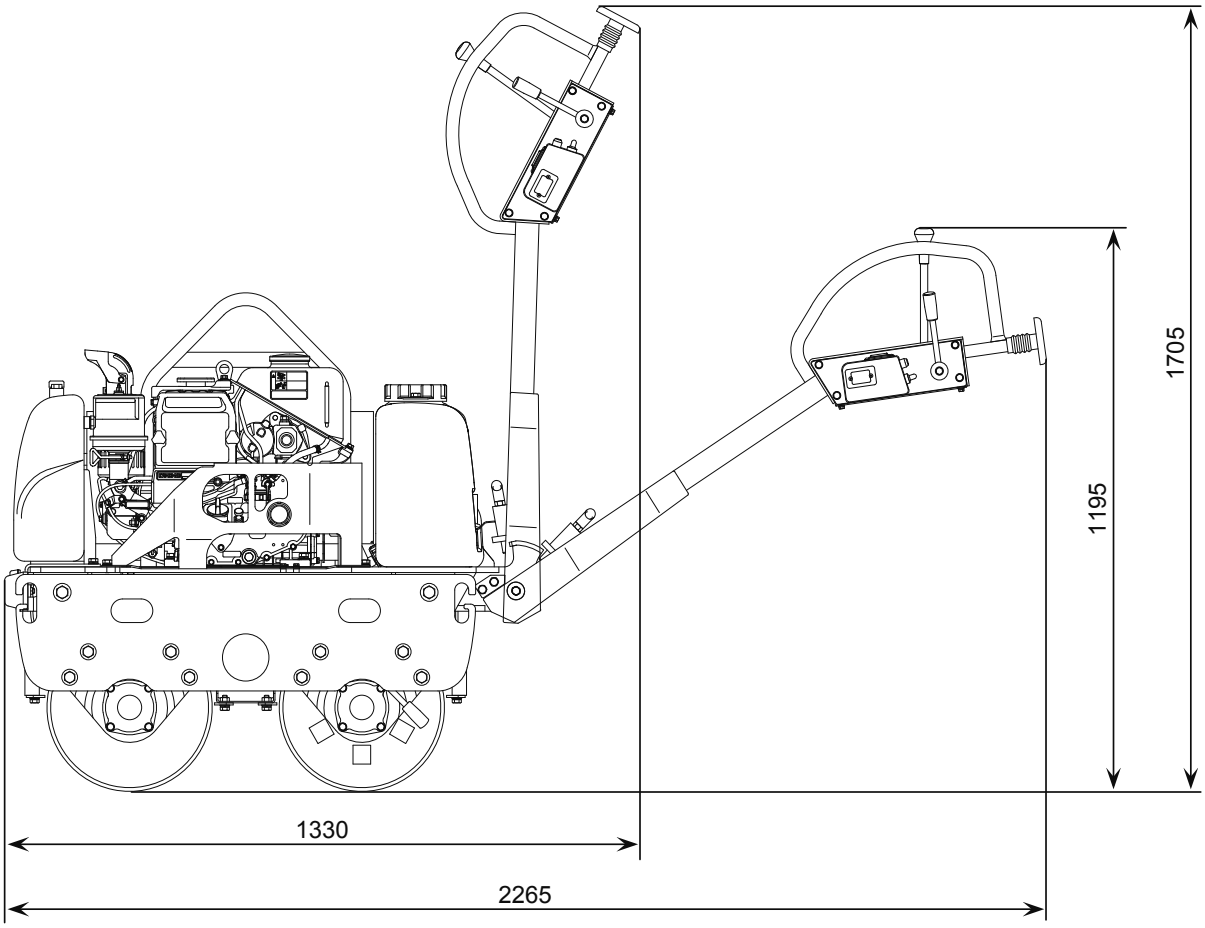
4.9 Label Description

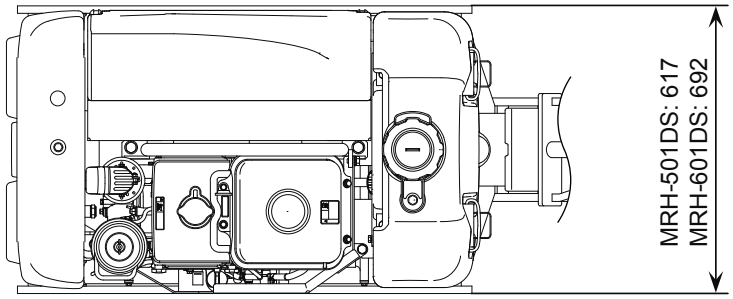
1		**These labels show caution, instruction and prohibition.** (Upper) ・Please read the operation manual well to fully understand the operation method. ・Instruction for using ear protection. ・Parking prohibited on slope (Lower) ・When the motor is stopped, always remove the key and use the wheel stopper, then set the parking brake to ON (lock).
2		**WATER TANK** **This tank shows water tank.** Always feed tap water in this tank. Do not put fuel, such as gasoline and light oil, hydraulic oil or engine oil.

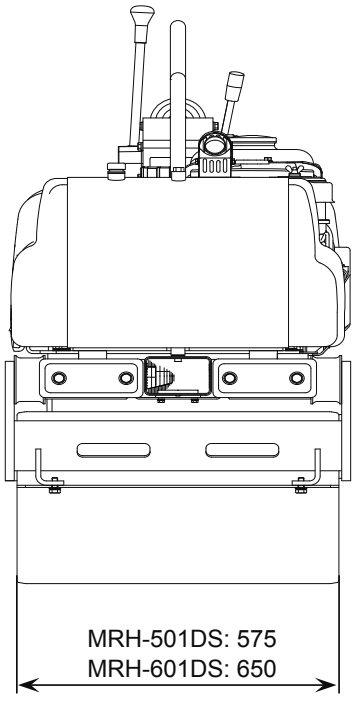
3		**Forward/reverse lever operation direction** F: Forward N: Neutral (stop) R: Reverse	*10*		**Caution for hot part** To prevent burn by contacting, keep a safe distance from the hot part.
4		**Oil tank** This tank shows hydraulic oil tank.	*11*		**Caution for rotating part** To prevent accident of being caught by a rotating part, keep a safe distance from the rotating part.
5		**Switching of vibration switch** | : ON (At start) ○ : OFF	*12*		**Switching of sprinkling** (See Fig. 8 of p. 13 and Fig. 17 of p. 15) The left cock is for switch to front side, and the right cock is for switch to back side. | : Open the cock. (Sprinkling) ○ : Close the cock.
6		**Glow lamp** Indicates preheat lamp.	*13*		**Key switch position** (See Fig. 12 of p. 13) ○ : STOP　　: PREHEAT | : OPERATION　　: START
7		**Switching of parking brake** | : When the lever is moved to left: ON (lock) ○ : When the lever is move to right: OFF	*14*		**Instruction about the fixing part for transportation** For transportation, always fix at the part specified.
8		**Specified lifting part** When lifting the machine, always lift by this part.	*18*		**Horn** Indicates a horn. **Switching of headlight** | : ON (Lighted) ○ : OFF (Not lighted)
9		**Prohibited lifting part** When lifting the machine, always lift by the specified part. Otherwise, the machine might fall.			

5. APPEARANCE VIEW

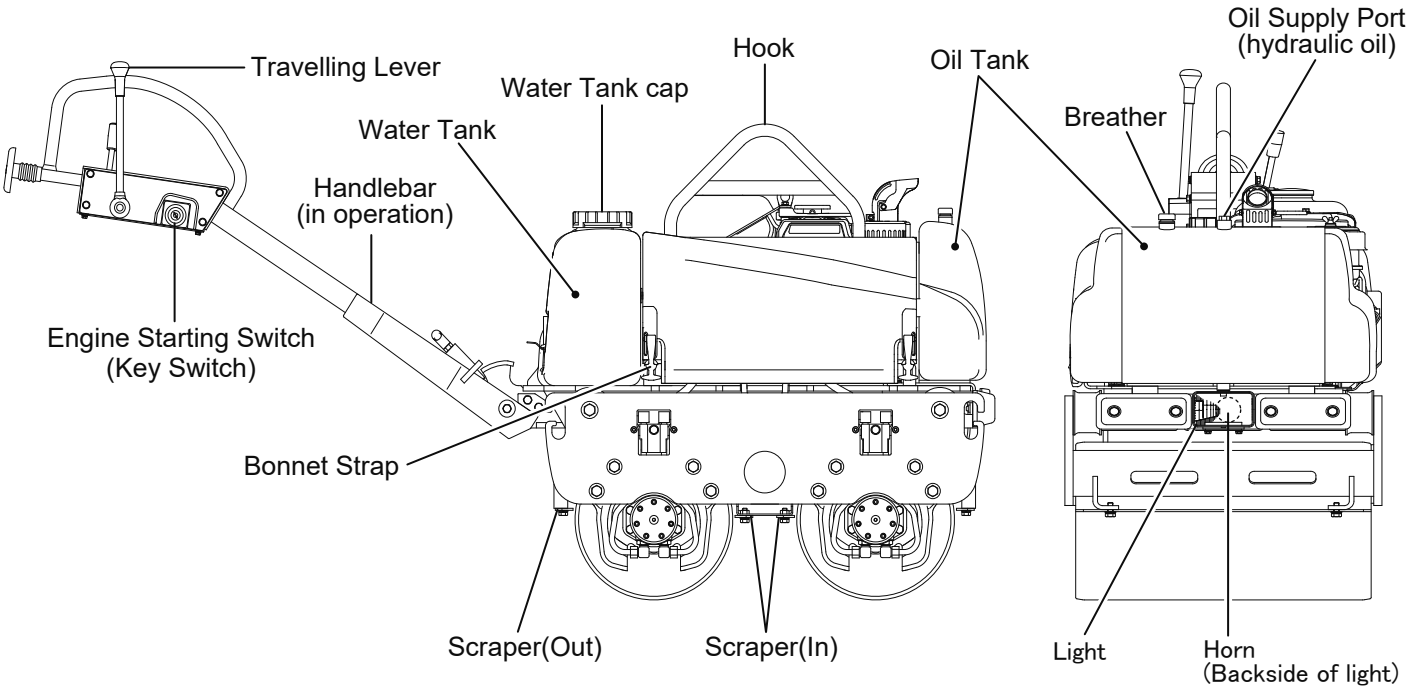
5.1 Appearance Dimension

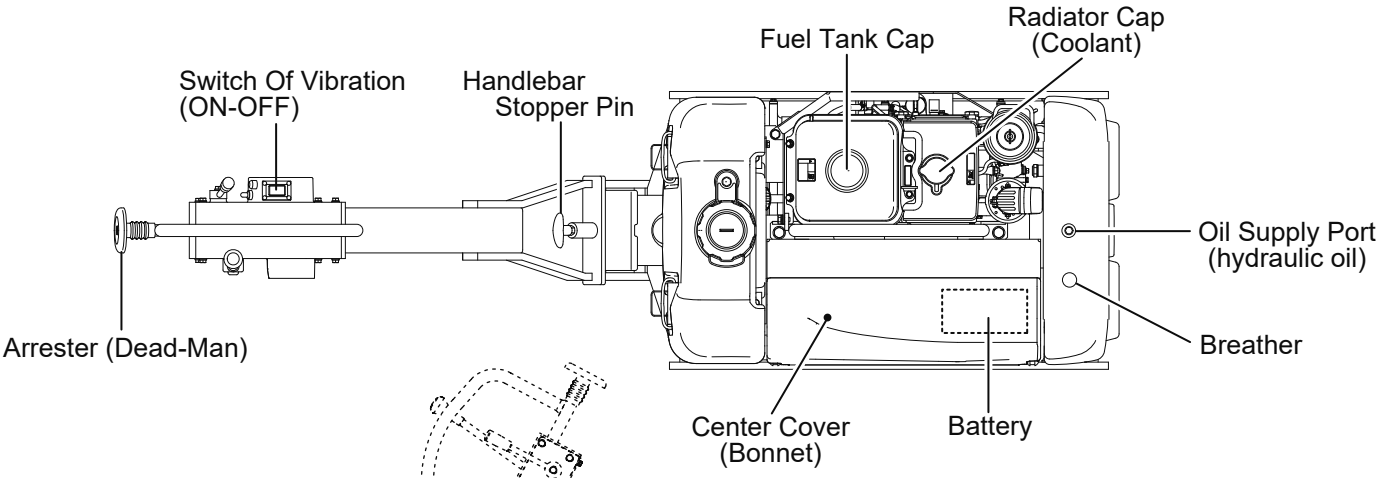


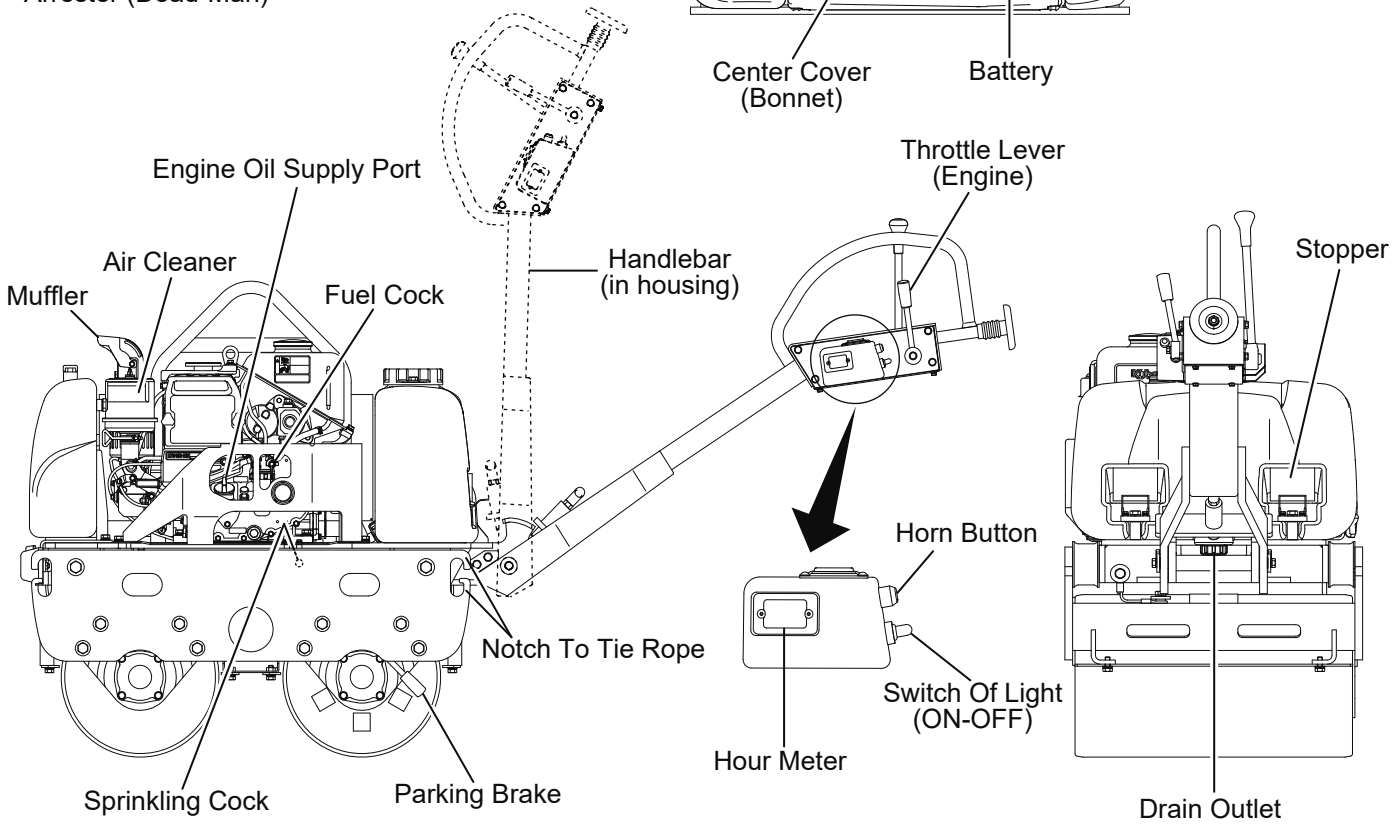




5.2 Control Device Location And Operation Name







6. SPECIFICATIONS

6.1 Machine Body

M O D E L			MRH-501DS	MRH-601DS
Engine			Kubota	Kubota
			EA330	EA330
Body Dimension	Overall Length	Operation	2265 mm	2265 mm
		Storage	1330 mm	1330 mm
	Overall Height	Operation	1195 mm	1195 mm
		Storage	1705 mm	1705 mm
	Overall Width		617 mm	692 mm
Drum Dimension	Drum dia		355 mm	355 mm
	Drum Width		575 mm	650 mm
Distance between axes			500 mm	520 mm
Weight			530 kg	551 kg
Working Speed			0～3 km/h	0～3 km/h
Gradeability			35% (20deg.)	35% (20deg.)
Vibration Frequency			55Hz (3300vpm)	55Hz (3300vpm)
Centrifugal Force			9.8kN (1000kgf)	10.8kN (1100kgf)
Water Tank Capacity			30 liters	30 liters
Hydraulic Oil Tank Capacity			22 liters	22 liters

6.2 Engine

Maker	Kubota
Model	EA330
Maximum Output	4.6kW / 2500rpm (6.3PS /2500rpm)
Starting System	Electric
Operating Engine Speed	2650rpm

6.3 Hydraulic Pump

Maker	Poclain
Mode	PMV 0-09

7. INSPECTION BEFORE OPERATION

Part inspection sheet before work start

Check point	Check item
Parking brake	Movement check
Wheel stopper	With or without、Breakage
Visual inspection	Crack、Skewness
Hook	Falling off、Breakage、Crack、Looseness and falling off of bolt & nuts
Fuel tank	Leak、Quantity of oil、 Dirt
Fuel system	Leak
Fuel filter	Dirt
Engine oil	Leak、Quantity of oil、 Dirt
Coolant	Leak、Quantity of water
Oil tank	Leak、Quantity of oil、 Dirt
V-belt for vibrator	Crack、Tension
Fan belt for engine	Crack、Tension
Oil pressure pipe line system	Leak、Looseness、Crack、Abrasion
Water pipe line system	Leak、Looseness、Crack、Abrasion
Horn	Operation check
Head light	Lighting check
Traveling lever & part of system	Falling off、Breakage、Crack、Looseness and falling off of bolt & nuts
Operation of traveling lever, rink origin	Operation check、Permissible error
Arrester, DEAD-MAN	Operation check
Scraper	Curve、Damage、Adjustmen
Bolt, nuts	Looseness、Falling off

The check is details of engine is referred to engine instruction manual independently.

⚠ CAUTION

Please stop the engine before inspection. Open the center cover and fix the Maintenance Stay in the center cover. (Fig. 1, 2)

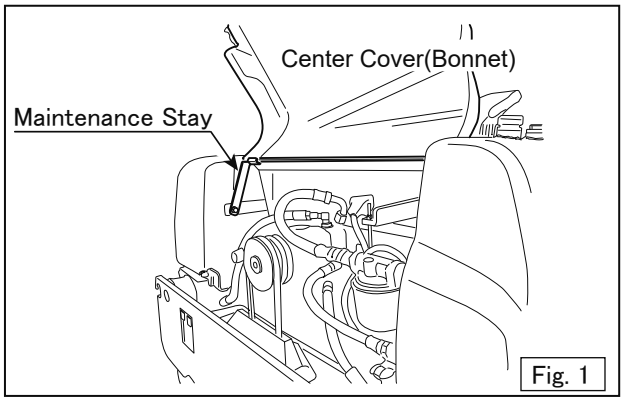


Fig. 1

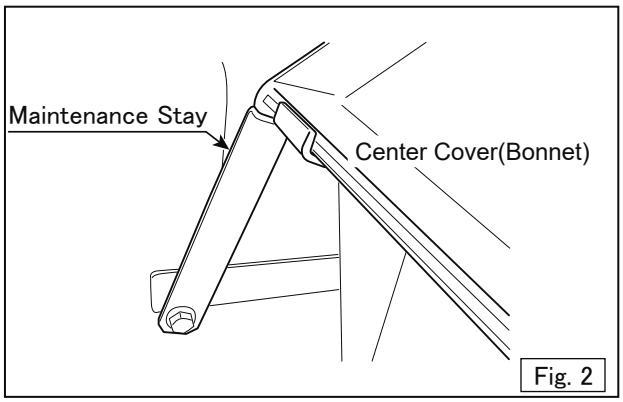


Fig. 2

7.1 Hydraulic Related

- Check the oil level gauge of the oil tank to make sure the hydraulic oil is at the specified level (middle of the gauge). When shipped from the factory, Idemitsu Duffny Super Hydro 46ST (22L) is filled. (Fig. 3)
- For recommended hydraulic oil, please see p. 20.

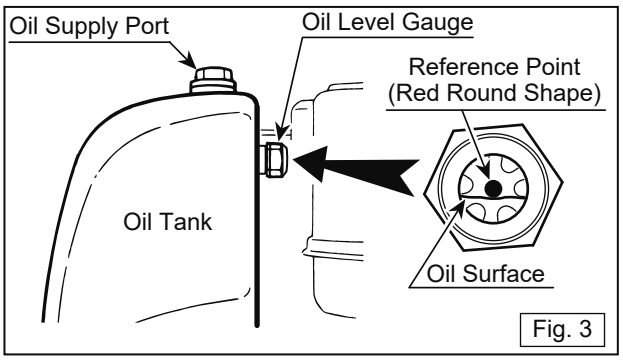


Fig. 3

- Check oil tank, hydraulic pump, hydraulic motor and hose joints for oil leakage.

7.2 Engine Related (Figs. 21-25 of p.19)

⚠ DANGER

Be very careful because the engine oil and cooling water might be very hot.

- Check the level of engine oil.
- Check the level of cooling water. (For details, please refer to the separate engine operation manual.)

7.3 Vibrator Related

- Check the looseness of V belt. When the tension is low, the vibration becomes weak, or V belt tends to get damaged. (Fig. 4)

⚠ WARNING

For check of V belt, always stop the engine. It is dangerous if hand or clothes get caught by the rotation part.

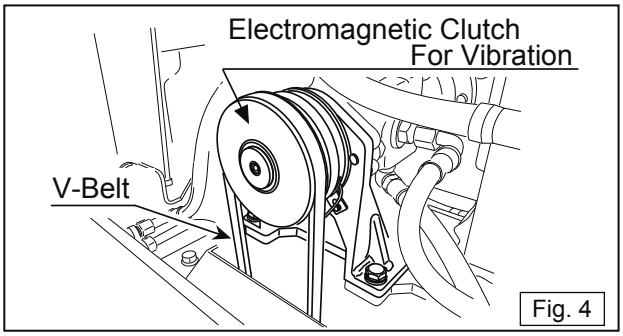


Fig. 4

- **Electromagnetic clutch for vibration**
  The clutch friction surface gets worn out gradually over the course of machine use, which results in increase in the gap. When this gap exceeds more than 0.5 mm (gap limit), the clutch operation failure occurs or the engagement function of the clutch fails. This indicates the end of the clutch life, so please replace the electromagnetic clutch.

Specification of electromagnetic clutch for vibration	
Static friction torque	25Nm (2.5kg･m)
Rated voltage	DC12V
Capacity	20W
Coil resistance	6.6Ω
Gap limit	0.5mm

- If excess current flows, the blowout of the fuse (10A) of the wire (harness) in the handle box will occur. If vibration does not occur even when the engine starts and its vibration reaches the specified value (2,600±50min-1 [2,600±50 r.p.m]) with no problem in driving, replace the fuse.
- The surface might get hot even by energization. The temperature of the surface of the electromagnetic clutch might rise to about 90°C to 100°C due to the slip heat and the heat from the built-in coil. Make sure that the periphery temperature of the friction surface will not become higher than 80°C. Be careful not to get a burn on your hand when checking the temperature.

⚠ WARNING

For inspection of electromagnetic clutch, always stop the engine. It is dangerous if your hand or clothes is get caught by the rotating part.

7.4 Operation Related

- If the handle is at the stored position (upright), pull the handle stopper pin to slowly set the handle down (operation condition).

⚠ CAUTION

When setting the handle down (to the operation condition), do so in an empty space with no obstacle around. Also, make sure that the handle will not fall down suddenly.

- Check levers and wires to make sure they operate properly. Press the horn button to make sure the horn goes off normally. Turn on the headlight switch to see if the headlight is lighted. (Fig. 5)

CAUTION

Do not use the headlight if not running at the maximum rotation.

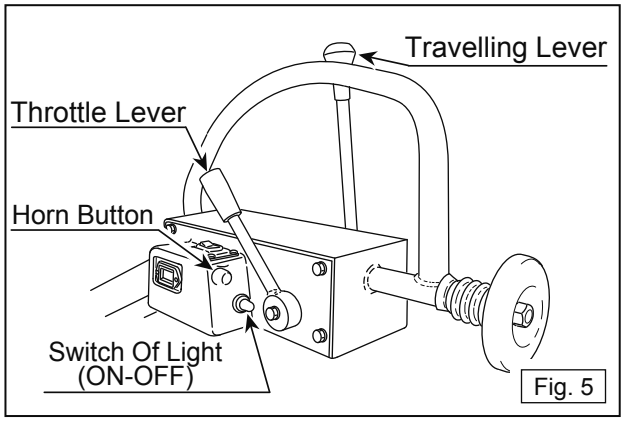


Fig. 5

- The travelling lever has three functions (forward, neutral, reverse). Check to see if the lever returns to the "neutral" position when the deadman is pressed with the running lever at "reverse". (Fig. 6)

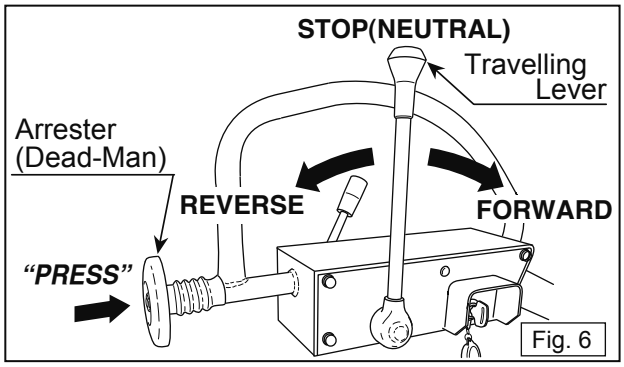


Fig. 6

7.5 Sprinkler Related

- When using sprinkler, fill water in the water tank at the rear. (Fig. 7)

CAUTION

- Be careful not to mistake the water tank for the oil tank or vice versa.
- Always use tap water.

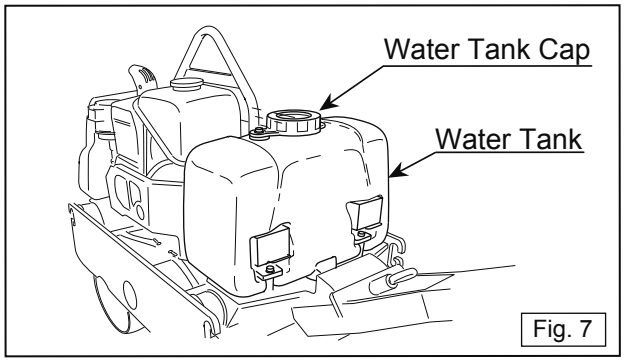


Fig. 7

- Open the sprinkler cock for front side drum and the other cock for rear side drum to see if water flows normally. (Fig. 8)

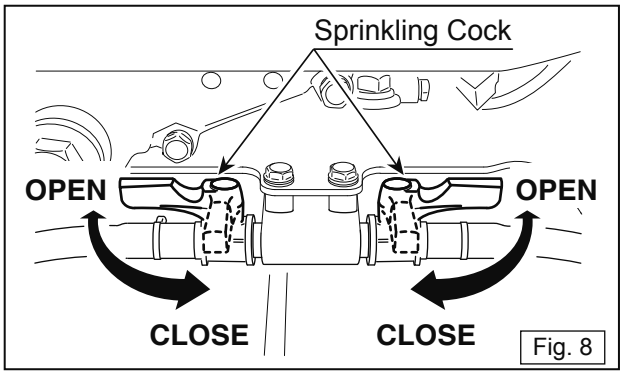


Fig. 8

7.6 Scraper

- Check to see if it is not clogged with dirt or bent, or damaged. (Fig. 9)
- Adjust the gap between the drum and the scraper if necessary. (Fig. 9)

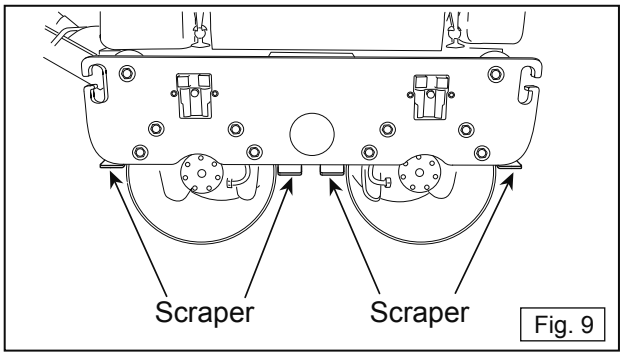


Fig. 9

7.7 Others

- Check bolts and nuts of each part of the machine (with engine included) for looseness.

8. OPERATION

8.1 Starting

- Set the throttle lever to the operation position(Full throttle). (Fig. 10)

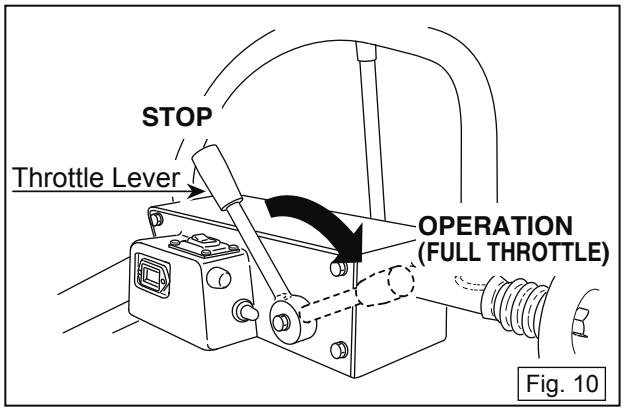


Fig. 10

- Set the travelling lever to the stop (neutral) position, and set the vibration ON/OFF switch and headlight switch to OFF position. (Fig. 11)

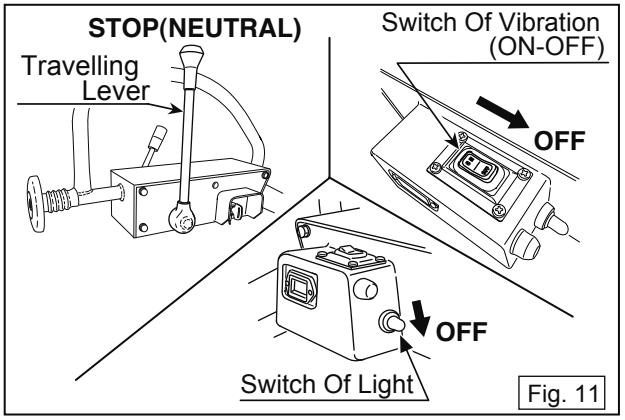


Fig. 11

- Open the fuel cock.

- **Operation of key switch** (Fig. 12)

a) Insert the key to key switch and turn to the operation position. The buzzer should be heard by this operation.

b) Turn the key to preheat position and wait until the glow lamp is lighted (about 5 seconds). The glow lamp goes out automatically after 5 seconds.

c) After the completion of preheat, turn the key to the start position. The cell starter starts and the engine runs. After the engine is started, take your hand off the key.
After the engine revolution rises, the buzzer stops.

d) Because there is a micro-switch, the cell starter will not start if the travelling lever is not at the stop position.

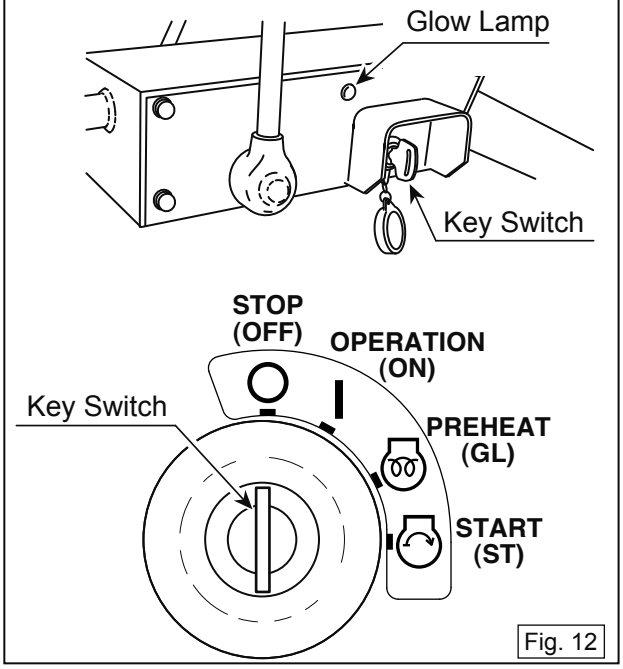


Fig. 12

CAUTION

- If the engine does not start even after the key switch is turned, do not run (at the start position) the cell starter continuously for more than 5 seconds.
- While the engine is running, never turn the key switch to the start position.

- After started, do warming up for about 3 to 10 minutes. Especially under the cold weather, always do the warming up.
- The buzzer that goes off at engine start also serves as the warning of engine oil level. If the buzzer does not stop even after the engine was started, stop the engine immediately and check the engine oil.

⚠WARNING

After the engine is started, be very careful not to have your hand or clothes get caught by the rotating part because that might result in a very serious accident.

8.2 Driving

- Release the parking brake. (Fig. 13)

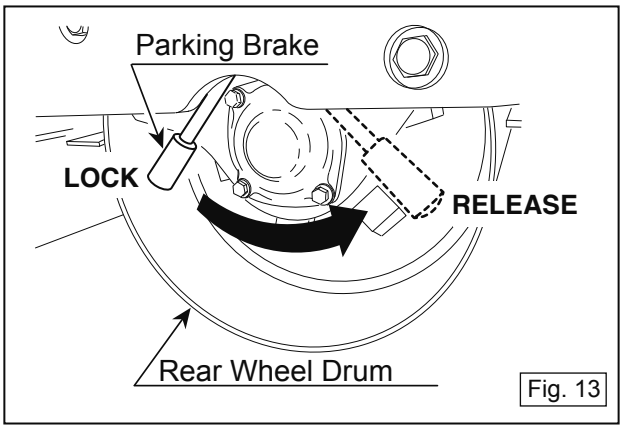


Fig. 13

- If the travelling lever is slightly pressed forward, the machine moves forward at low speed. If the lever is further pressed forward, the speed increases. By the operation of the travelling lever, the speed is changed by non-stage shifting (for both forward and reverse).
If the travelling lever is pulled towards you, the machine reverses. (Fig. 14)

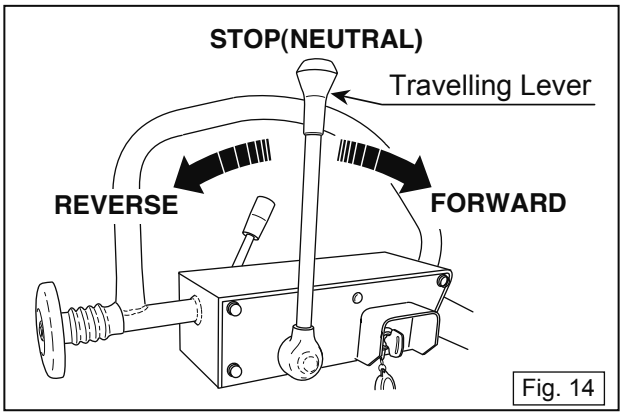


Fig. 14

CAUTION

- While moving forward or backward, do not lower the engine revolution because it might result in engine failure.
- When switching from forward to reverse (or vice versa), always stop once at the stop (neutral) position. Do not do sudden switching.

8.3 Vibration

- Vibration occurs when the ON/OFF switch for vibration is flipped from OFF to ON. (Fig. 15)

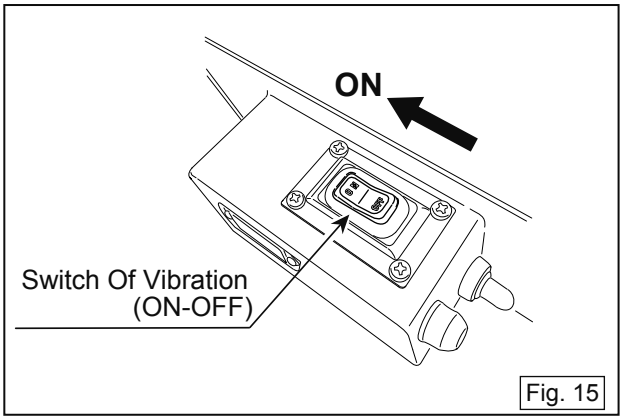


Fig. 15

CAUTION

Do not do vibration when the travelling lever is at the stop (neutral) position. Also, do not do vibration on sufficiently compacted ground or paved road surface because the machine and the road surface might be damaged.

- If vibration does not occur (electromagnetic clutch does not operate) even when other functions are working normally, the fuse might be blown out. Check the fuse (10A) in the handle box, and if it is blown out, replace it with a new one. (Fig.16)

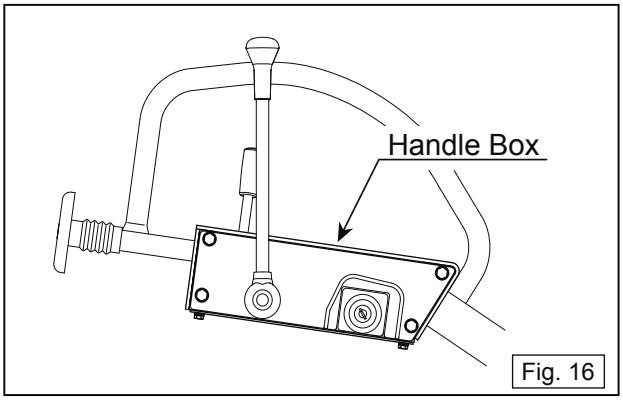


Fig. 16

8.4 Sprinkler

- For sprinkling, open the water cock. Water cocks are at two locations, one for front side drum and the other for the rear side drum. (Fig. 17)

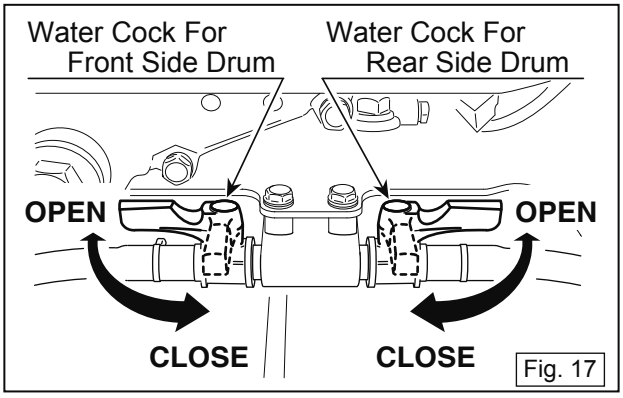


Fig. 17

8.5 Deadman Device

- As a safety device, the machine is equipped with a deadman to prevent the operator from being caught between the machine and some other object while operating the machine in reverse. If the deadman is pressed forward, the travelling lever returns to the neutral position. (Fig. 18)

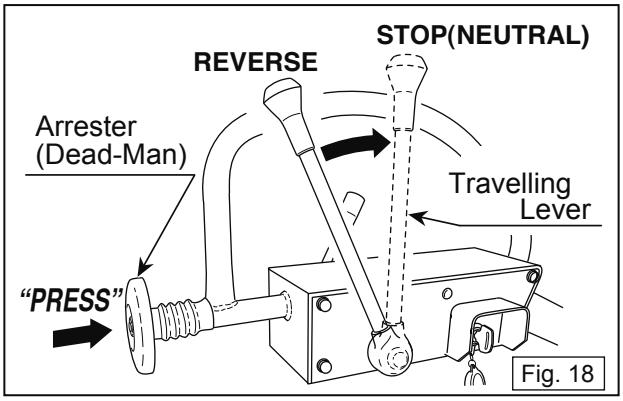


Fig. 18

⚠WARNING

Except for the switching operation between forward, reverse and neutral, take your hand off the travelling lever because if your hand is on the lever, the deadman might not work properly if you are caught between the machine and some other object.

9. PARKING

- With the vibration ON/OFF switch at OFF position, return the travelling lever to the stop (neutral) position. Set the throttle lever to the stop position after making sure the vibration is stopped. (p.14 Fig. 11)
- After the engine has stopped, turn the key switch to the stop position. The buzzer stops when the key switch is turned to the stop position. (p.15, Fig. 12)

CAUTION

Please be aware that the battery keeps discharging unless the key switch is at the stop position.

- Shut the fuel cock.
- Lock the parking brake.(Fig. 19)

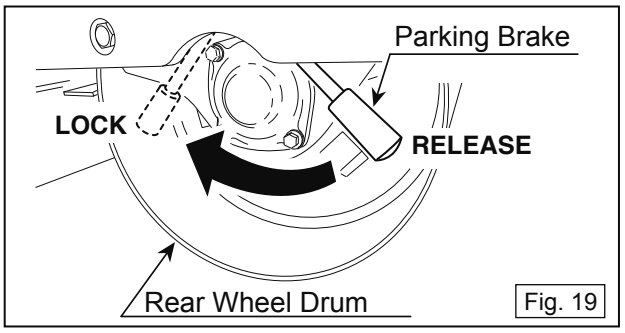


Fig. 19

- When leaving from the machine, use the wheel stopper and remove the key, then keep the machine in the designated location.

⚠DANGER

- Never park or stop on a slope because it is dangerous.
- Select and use a wheel stopper that is appropriate for the road surface condition.

10. CARE AND STORAGE

10.1 Care

- Rinse off dust and dirt from every part of the machine.
- Especially clean the roller and the scraper parts carefully because they might be clogged with dirt, which will create resistance to machine operation.

CAUTION

When using a high pressure water sprayer, be careful not to let water enter inside the engine from the engine muffler and air cleaner.
If water enters inside the engine cylinder, water hammer effect might occur.

- From the waste water outlet, drain the water out from the water tank. Wash and clean inside the tank if it is dirty.
- An air breather is equipped with the oil tank. A cover is provided to prevent entry of water into the oil tank. Be careful not to let the cover fall off when cleaning with a high pressure water sprayer.(Fig. 20)

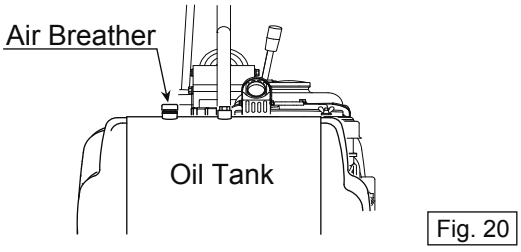


Fig. 20

10.2 Storage

For short term storage

- Put a cover over the machine to prevent collection of dirt and dust, and keep the machine indoor away from direct sunshine and high humidity.

For long term storage

- Drain fuel from the fuel tank. Also, remove the fuel remaining in the fuel filter.
- In case if the temperature drops below 0°C, add antifreeze liquid in the cooling water.
- Securely close the intake/exhaust openings of the air cleaner and muffler. If water enters inside the engine, water hammer effect might occur.
- Store the machine indoor. Do not leave it outdoor.

About water hammer effect

When water enters inside the diesel engine cylinder, because the water cannot be compressed like air, shock and high water pressure occur inside the cylinder, which damages the parts inside the engine. This phenomenon is called water hammer effect.

11. REGULAR INSPECTION AND ADJUSTMENT

11.1 Schedule For Inspection Of Each Part

Check schedule	Check point	Check item	Type of oils and fats
Daily (before work)	Parking brake	Movement check	
	Stopper	With or without、Breakage	
	Sprinkler pipe related	Leak,Looseness,Crack,Abrasion	
	Visual inspection	Crack,Skewness	
	Fuel tank	Leak,Quantity of oil,Dirt	Light oil
	Hook	Falling off,Breakage,Crack Looseness & falling off of bolt & nuts	
	Fuel system	Leak	
	Fuel filter	Dirt	
	Engine oil	Leak,Quantity of oil,Dirt	Engine oil
	Cooling water	Leak,Quantity of water	Coolant
	Oil tank	Leak,Quantity of oil,Dirt	Hydraulic oil
	V-Belt for vibrator	Crack,Tension	
	Fan belt (engine)	Crack,Tension	
	Oil pressure pipe line system	Leak,Looseness,Crack,Abrasion	Hydraulic oil
	Horn	Operation check	
	Head light	Lighting check	
	Traveling lever & part of rink system	Falling off,Breakage,Crack Looseness & falling off of bolt & nuts	
	Operation of traveling lever, rink origin	Operation check,Permissible error	
	Arrester (DEAD-MAN)	Operation check	
	Scraper	Curve,Damage,Adjustment	
	Bolt, nuts	Looseness,Falling off	
10 hours	Fan belt (engine)	Check,Adjustment	
50 hours	Engine oil	Exchange(Only first time)	Engine oil
	Engine oil filter	Cleaning(Only first time)	
	Air-cleaner element	Cleaning(Only first time)	
	Filter for hydraulic oils	Change after 50 hours only at the first time	
	Fan belt (engine)	Change after 50 hours only at the first time	
	Wiring	Check	
Every 50 hours	Traveling lever corollary part	Supply of oils and fats	Grease
	Lever for hydraulic pumps	Supply of oils and fats	Grease
	Arrester (DEAD-MAN)	Operation check,Supply of oils and fats	Grease
	Handle stopper	Operation check,Supply of oils and fats	Grease
	Parking brake	Operation check,Supply of oils and fats	Grease
Every 100 hours	Engine oil	Exchange	Engine oil
	Battery terminal	Cleaning	
	Air-cleaner element	Cleaning	
	Fan belt (engine)	Check	
Every 200 hours	Engine oil filter	Cleaning	Engine oil
Every 300 hours	Filter for hydraulic oils	Exchange	
Every 450 hours	Fuel filter	Exchange	
	Sediments in fuel tank	Remove	
	Inside of radiator (engine)	Cleaning	
Every 500 hours	Fan belt (engine)	Exchange	
Every 800 hours	Valve clearance (engine)	Adjustment	
1000 hours	Hydraulic oil	Exchange	Hydraulic oil
1500 hours	Injection nozzle (engine)	Check,Cleaning	
2000 hours	Injection pump (engine)	Check	
1 year	Air-cleaner element	Exchange	
2 years	Fuel return pipe and band	Exchange	
	Cooling water	Exchange	
	Battery	Exchange	
Irregular time	Hydraulic hose	Exchange	
	Electro-magnetic Clutch	Exchange(Limited Gap 0.5mm)	

Refer the attached engine instruction manual about the details of check & maintenance for engine.

11.2 Engine Related

⚠DANGER Always stop the engine when doing inspection.

For daily inspection and regular inspection as well as simple adjustment and maintenance of the engine, please follow the instruction in the separate engine operation manual.

● Engine oil (Fig. 21)

1. Check to see if the oil level is between the two level marks (2) of the gauge (1). Add oil if the oil level is low.
2. For draining of engine oil, remove the oil strainer at the bottom surface of the engine to drain the oil while it is warm.
3. Clean the oil strainer before putting it back.

Recommended engine oil: SAE10W-30
Quantity of engine oil: 1.3L

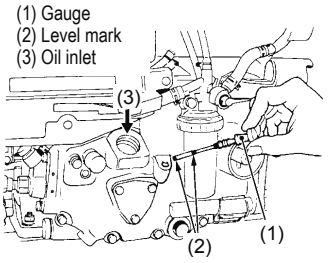
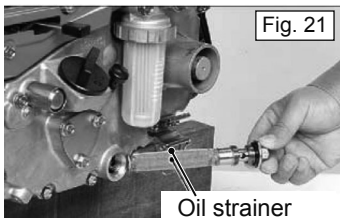


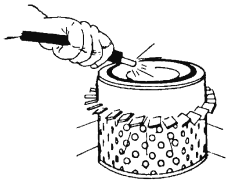
Fig. 21



※ The oil used is of the API service category Use the grade above CC.

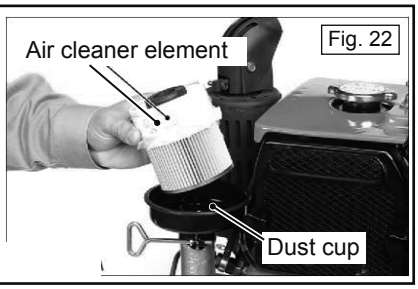
● Air cleaner (Fig. 22)

1. Remove air cleaner element from the air cleaner.
2. If dust and dirt are on the element, blow them off by sending compressed air from inside in vertical direction.
3. If the element is dirty with carbon and oil, clean with neutral detergent.
4. Change the element once per year or every six



※ When cleaning the element with compressed air, the air pressure should not exceed 0.69MPa (7.0kgf/cm2).

Fig. 22

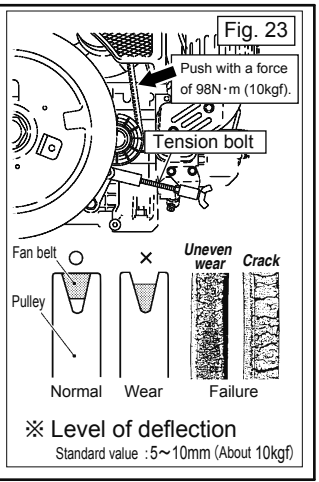


● Fan belt (Fig. 23)

⚠DANGER Be careful not to get caught.

1. Push the fan belt (middle of the fan drive pulley and tension pulley) at 98N (about 10kgf) to check the deflection.
2. If the level of deflection is not of the standard value, adjust it with tension bolt.
3. Check the belt visually to see if there is any breakage, crack or discoloration on the surface skin. If any defect is found, replace it with a new one. Also, replace if the belt is worn and it touches the bottom of the pulley.
4. The fan belt should be replaced every two years or every 500 hours.

Fig. 23



※ Level of deflection
Standard value :5~10mm (About 10kgf)

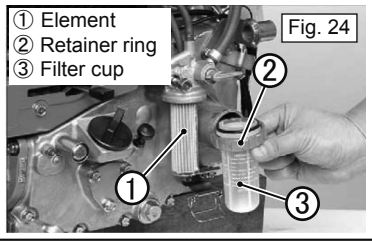
● Fuel filter (Fig. 24)

⚠DANGER Keep fire away

1. Close the fuel filter cock.
2. Remove the retainer ring ② above the cup to remove the filter cup ③ and the element ①.
3. Rinse inside the cup with light oil, and install a new filter element.
4. Tighten the retainer ring to prevent dust and dirt entry and fuel leakage, then open the filter cock.

① Element
② Retainer ring
③ Filter cup

Fig. 24

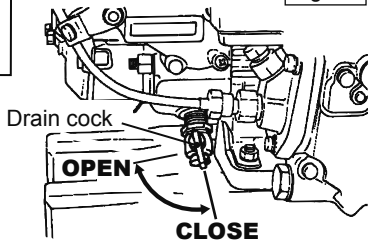


● Cooling water (Fig. 25)

⚠DANGER Because the cooling water is very hot while the machine is operated or immediately after operation, open the cap only when the radiator has cooled down sufficiently after the machine was stopped.

1. Remove the radiator cap to see if the cooling water is filled to the cap opening.
2. If the cooling water has decreased due to evaporation, add distilled water.In case of leakage, mix antifreeze liquid from the same manufacturer with the distilled water before adding. (For handling of antifreeze, refer to the operation manual provided by the manufacturer.) **Do not use the antifreeze from other manufacturer.**
3. As cooling water, mix coolant conditioner or antifreeze liquid (long life coolant) with distilled water, but do not use both coolant conditioner and antifreeze liquid at the same time.
4. When draining the cooling water, open the cock at the bottom of the radiator.

Fig. 25



※ Defined amount :1. 2 L

11.3 Adjustment Of Neutral For Forward And Reverse

CAUTION

Always stop the engine before making adjustment.

- If the stop position (neutral) of the travelling lever is not at the right position, do adjustment of the neutral position.
- Check of the stop position (neutral) should be done during operation before adjustment. Regardless of the position of the travelling lever, stop the engine at the location where the machine has stopped (neutral).
- The travelling lever gets lightly locked at the neutral position. Adjust the turnbuckle part of the running cable at the hydraulic pump side to correct the position. (Fig. 26)

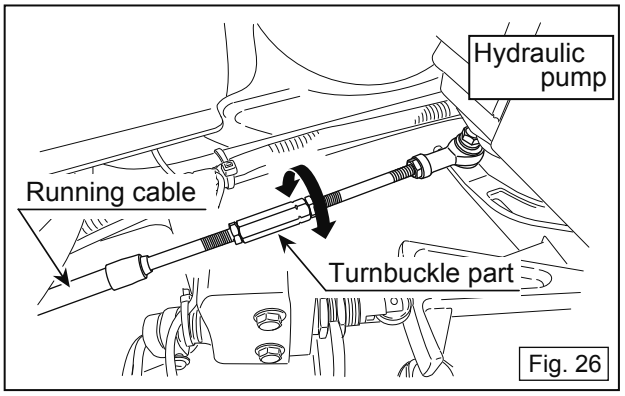


Fig. 26

11.4 Adjustment Of Micro-switch

As a standard specification, this machine has a micro-switch that allows the engine to start only at the stop (neutral) position to prevent uncontrolled running at the time when the engine is started.

- The condition of the neutral status is that the roller at the end of the micro-switch is at the dent of the cam shaft of the lever (hydraulic pump). (Fig. 27)
- After adjustment, lightly apply grease to the roller bearing of the micro-switch.

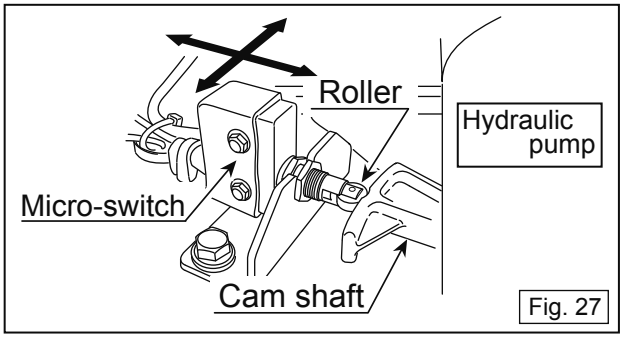


Fig. 27

11.5 Handling Of Battery

⚠CAUTION

Check to see if the battery is securely fixed with a clasp.

- ***Care of battery***
  Looseness and corrosion of the terminal will lead to contact trouble. If white powder is found on the terminal part, clean with lukewarm water, then apply grease on it.
  Also if the corrosion is serious, replace the battery with a new one.
- ***Batter removal and attachment***
  Remove the battery from the minus (-) terminal. For attaching, start with the plus (+) terminal, then finish with the minus (-) terminal. (Fig. 28)

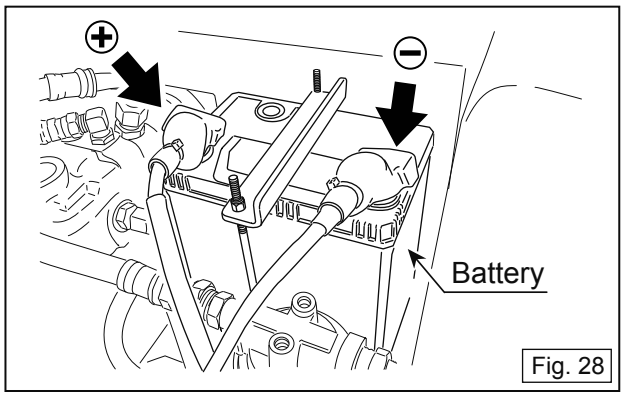


Fig. 28

⚠CAUTION

When handling the battery, never let the plus side cable (cord) come into contact with the minus terminal. Also, you need to be careful because damage occurs with the electric parts if you mistake the plus for the minus or vice versa when connecting.

11.6 Inspection And Maintenance Of Hydraulic System

- ***Inspection***

a) Check the hydraulic pump and hydraulic motor for damage.
b) Check for loosening of hose and pipes, and check for oil leaking part.
c) Check the oil tank to see if the hydraulic oil is at the specified level. Also check to see if the hydraulic oil looks whitish and cloudy.
(p.21, Fig. 29)

The hydraulic oil looks whitish and cloudy when the hydraulic pump is sucking air. Tighten the pipe and add hydraulic oil to the specified level. The hydraulic oil is emulsified when water is mixed. If that happens, change the hydraulic oil.

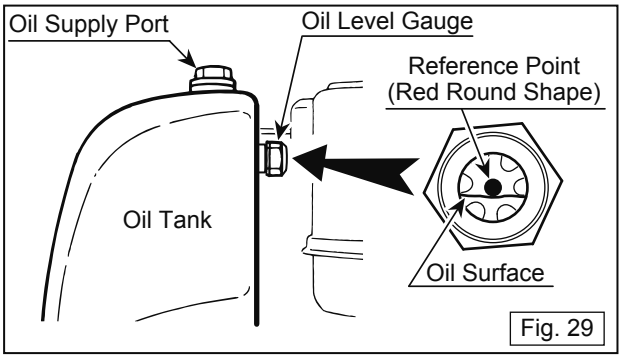


Fig. 29

● ***Maintenance***

a) Oil filter change (Fig. 30)

First time: After about 50 hours
After the first change:
Change every 300 hours.

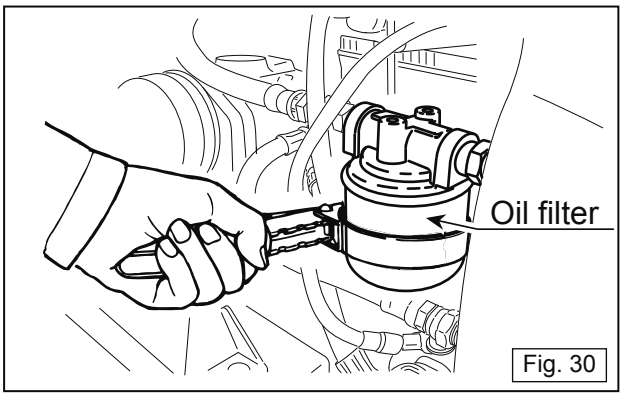


Fig. 30

CAUTION

Use MIKASA genuine oil filter with 10 micron filter paper.

b) Hydraulic oil change

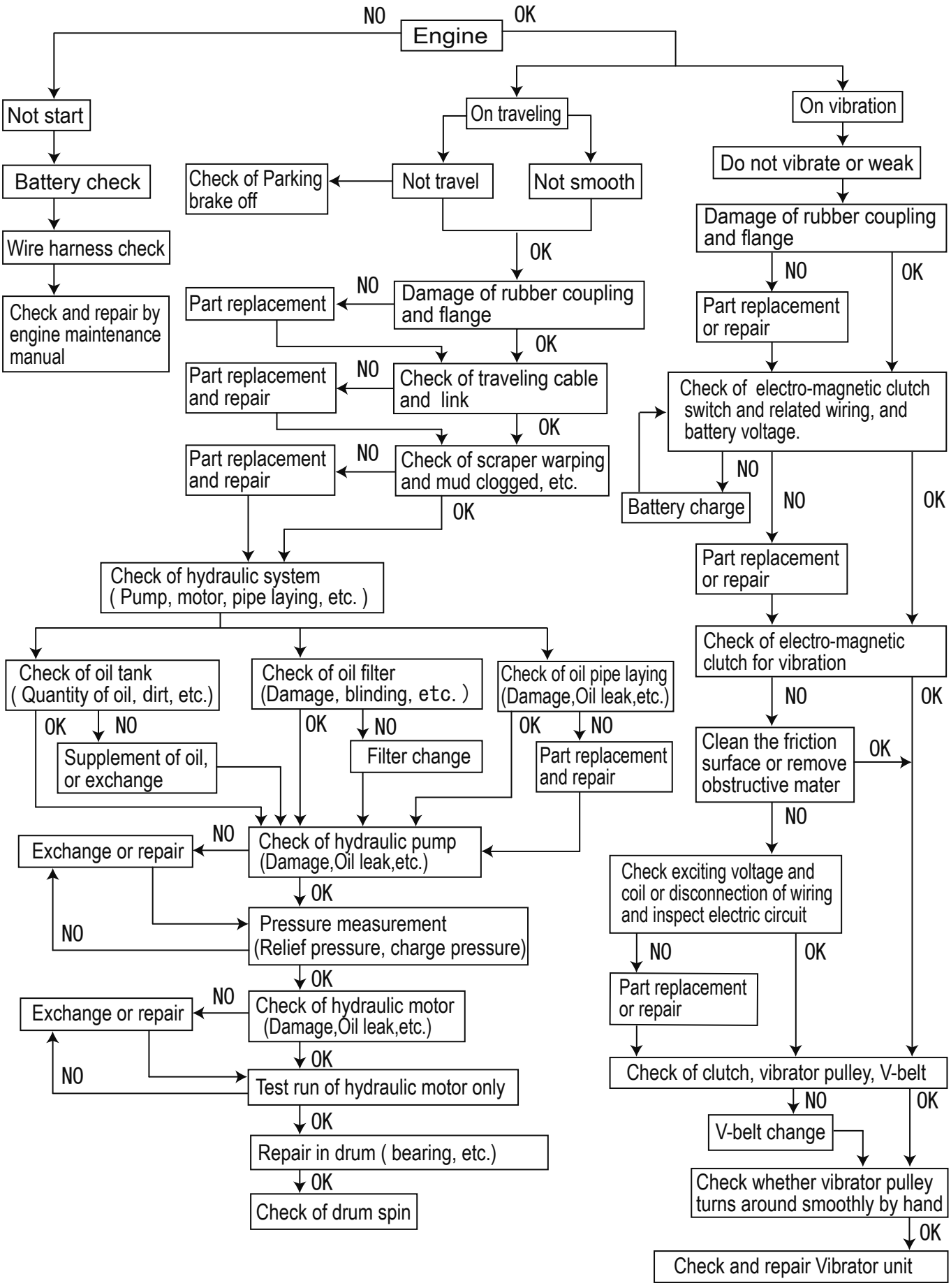
Oil change should be done every 1000-1500 hours depending on the load. Remove the drain plug (oil drain port) of the oil tank to drain the old hydraulic oil, and fill the recommended hydraulic oil to the specified amount (22L). While doing so, be careful not to let foreign matter such as dirt and water enter the tank.

Recommended hydraulic oil (anti-wear hydraulic oil)

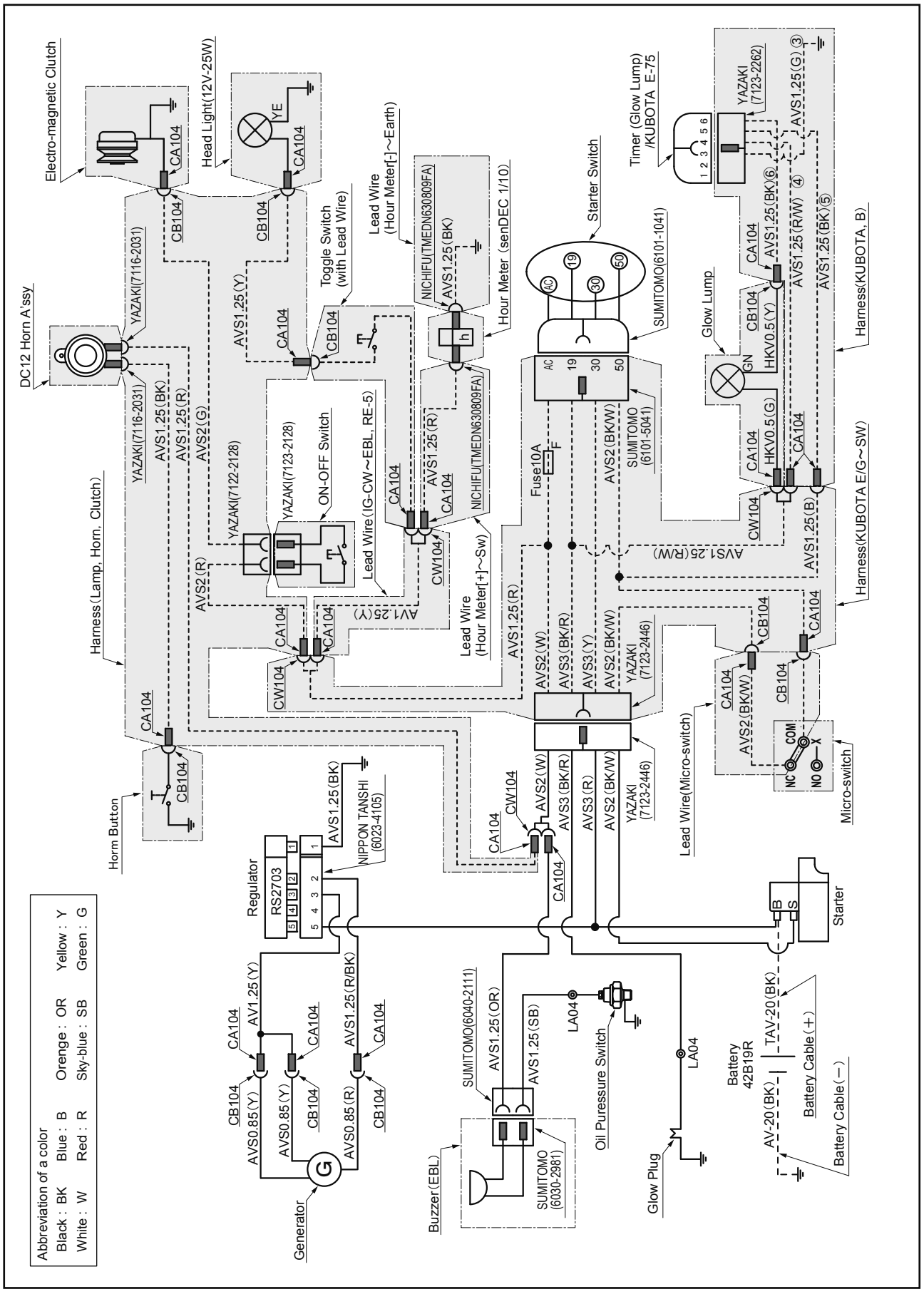
Viscosity ISO: Equivalent to VG32
(For cold weather)
Viscosity ISO: Equivalent to
VG46 or 56 General
(For warm weather)

When shipped from the factory, Idemitsu Duffny Super Hydro 46ST is filled.

12. TROUBLESHOOTING



13. WIRING DIAGRAM



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