

# SERVICE

# MANUAL

# MQ

MULTIQUIP®



# MVH306 • 406 PLATE COMPACTORS

MAINTENANCE ◦ DISASSEMBLY DIAGRAMS ◦ TROUBLESHOOTING

Manual No. MVH3062015SM



# CALIFORNIA



## Proposition 65 Warning:

Engine exhaust and some of its constituents, and some dust created by power sanding, sawing, grinding, drilling and other construction activities contains chemicals known to the State of California to cause cancer, birth defects and other reproductive harm.

### Some examples of these chemicals are:

- Lead and lead-based paint.
- Crystalline silica from bricks.
- Cement and other masonry products.
- Arsenic and chromium from chemically treated lumber.

Your risk from these exposures varies, depending on how often you do this type of work. To reduce your exposure to these chemicals: ALWAYS work in a well ventilated area, and work with approved safety equipment, such as dust mask that are specially designed to filter out microscopic particles.

# C O N T E N T S

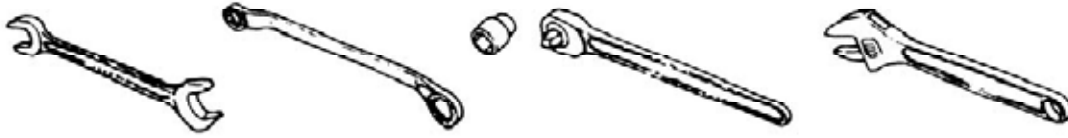
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# 1. TOOLS

1. Wrench 10mm 12mm 13mm 14mm 17mm 19mm 22mm 24mm 27mm

Offset wrench/Socket wrench/Adjustable wrench



2. Hexagonal wrench 3/16inch  
5mm 8mm 10mm 14mm



3. Plier



4. External snap ring plier/Internal snap ring plier(bent type can be also

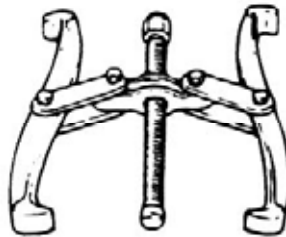
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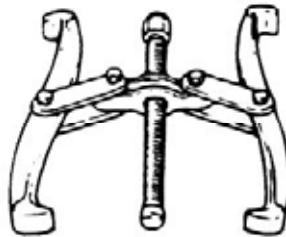
5. Screwdriver, flat and cross



6. Metal and plastic hammers



7. Pulley puller



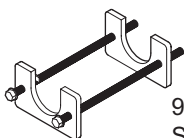
8. Sealing compound (Loctite 242, 271 and 638)

9. Liquid gasket



10. Pressing machine

11. Special jigs for Disassembling/Assembling of Hand Pump



9840-10030  
Spring Compression Tool



9840-10040  
Disassembling Tool A



9840-10050  
Disassembling Tool B

## 2. INSPECTION PROCEDURE

### 1. External appearance check

- (1) Installation of parts (loosened screw, defective parts, etc.)
- (2) Damage on machine
- (3) Oil check (level and contamination)
  - a. Engine oil (SAE10W-30 when shipped) (See Table 1 for the capacity)
  - b. Vibrator
  - c. Hydraulic oil (forward and reverse)
- (4) V-belt for proper tension, damage, crack, hardening, etc.
- (5) Shock rubber for damage, crack, fatigue, hardening, etc.

### 2. Operating test

- (1) Engine
  - Engine speed check (Max. set rpm and idling)
- (2) Traveling
  - a. Check for selection of forward/reverse travel.
  - b. Check for speed of forward/reverse travel.
- (3) Check for abnormal noise during operation.

## 3. Engine, Oil and V-belt

Table 1

Type	MVH-306D S	MVH-306G H	MVH-306G E
Mounted engine	Yanmar L70AE	Honda GX270	Robin EX270
Set rpm ( $\text{min}^{-1}$ )	3600	3600	3600
Fuel tank capacity (Liter)	3.5	6.0	6.1
Engine oil capacity (L)	1.1	1.1	1.1
Vibrator oil capacity (L)	0.6	0.6	0.6
Lubrication oil in use	Engine Oil SAE10W-30		
Vibrator oil replacement interval (hours)	200		
Size and quantity of belt	HDPF5370 x 1	HDPF5360 x 1	HDPF5360 x 1
Hydraulic oil	Shell Tellus #46 or equivalent		
Type	MVH-406DSZ/DSCPAS	MVH-406H	MVH-406DSY
Mounted engine	Hatz/Subaru 1B40	Honda GX390	Yanmar L100V
Set rpm ( $\text{min}^{-1}$ )	4600	4600	4600
Fuel tank capacity (Liter)	5.0	6.5	5.4
Engine oil capacity (L)	1.55	1.1	1.6
Vibrator oil capacity (L)	0.6	0.6	1.5
Lubrication oil in use	Engine Oil SAE10W-30		
Vibrator oil replacement interval (hours)	300		
Size and quantity of belt	HDPF5370 x 1	HDPF5350 x 1	HDPF5370 x 1
Hydraulic oil	Shell Tellus #46 or equivalent		

## 4. RULES FOR CONDUCTING SERVICE WORK

1. In order to avoid deficient reassembly, know normal status of installation before removing or disassembling any part. Level check or replacement of vibrator oil should be carried out on level ground.
2. Each time disassembly is made involving oil seal, gasket, packing, o-ring, lock washer or the like, be sure to replace them with new ones.
3. Mating surfaces of vibrator case and compaction plate should be sealed with liquid gasket (Clean and de-grease the mating surfaces thoroughly).
4. Clean the screw before coating with Loctite. For tightening bolts and nuts, use the specified standard torque and bonding agent (Loctite or the like). For such bolts and nuts that are not specified, see Table of Tightening Torque.

**NOTE:** All the screw in use with this machine are right handed.

**Table of Tightening Torque (kgf-cm)**

Table 2

Screw diameter	6mm	8mm	10mm	12mm	14mm	16mm	18mm	20mm
Material								
4T(SS41)	70	150	300	500	750	1,100	1,400	2,000
6-8T(S45C)	100	250	500	800	1,300	2,000	2,700	3,800
11T(SCM3)	150	400	800	1,200	2,000	2,900	4,200	5,600
In case counter part is made from aluminum	100	300~350	650~700					

※For indication in SI Unit (International Unit System), use the conversion of 1kgf-cm=9.80665N-cm

5. Disassembly work should be conducted where it is free from dust.
6. Where bonding agent such as Loctite has been in use and screw is hard to loosen, heat it with torch lamp or the like. Such heated bolt must be replaced with new one, which is of high-tension type as specified.
7. Use proper tool in proper manner.
8. Remove (-) battery terminal first before disassembling and connect (-) battery terminal lastly.

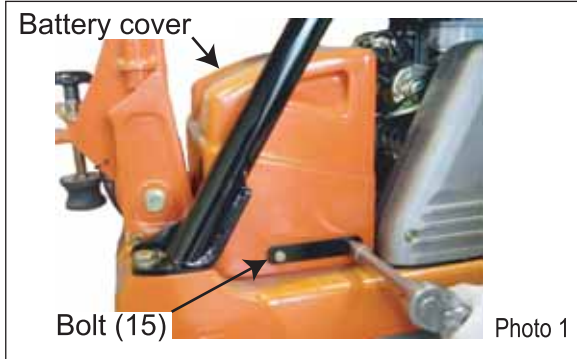
Hydraulic hose tightening torque: Screw size 1/4 380kgf-cm

## 5. REMOVING AND RE-MOUNTING

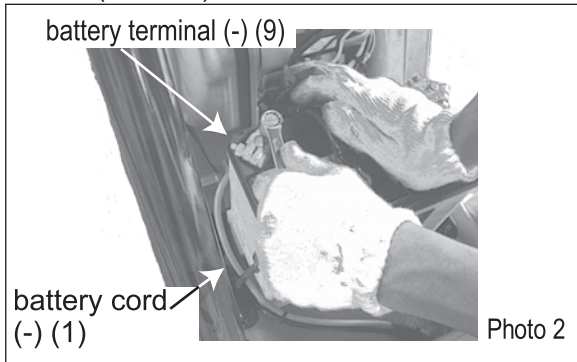
### 5-1 Removing and re-mounting the battery

#### (1) Removing the battery

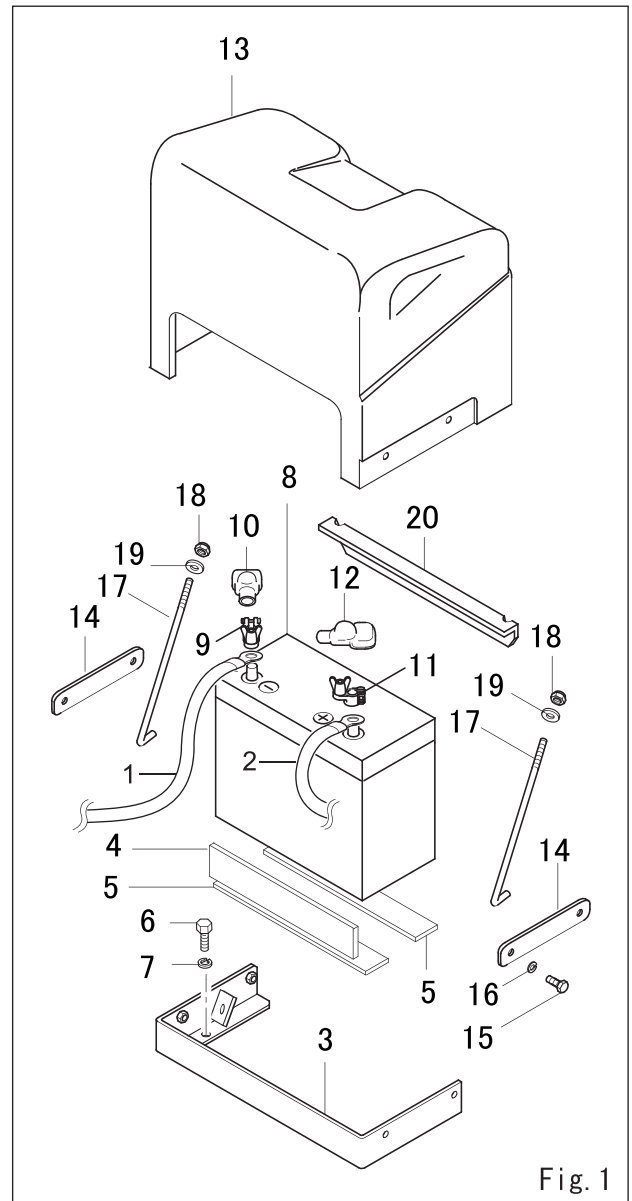
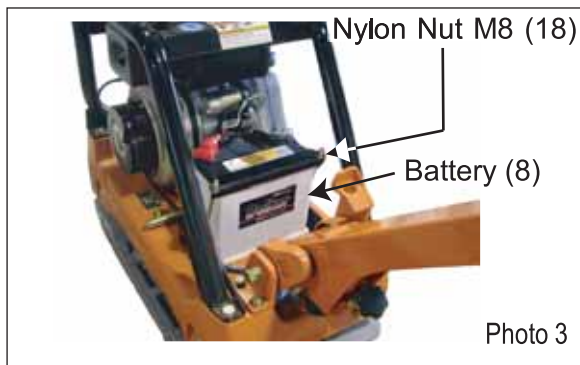
- a. 4 pieces of Bolt (15) unscrewed and take off the Battery cover (13). (Photo 1)



- b. Nut of the battery terminal (-) (9) removed, disconnect the (-) (1) battery cord. Nut of the battery terminal (+) (11) removed, disconnect the (+) (2) battery cord. (Photo 2)



- c. Nylon Nut M8 (18) removed, the battery be taken out from the machine. (Photo 3)



#### (2) Re-mounting the battery

- a. Reversed procedure is applied for re-mounting of the battery while observing below :
1. When removing cables, use care not to allow short circuiting between (+) and (-) terminal
  2. Connect (+) battery cord to the (+) terminal and (-) cord to the (-) terminal.

## 5-2 Operation System

### (1) Disassembly

- a. Unscrew Bolt (44) and take off Handle Cover (43). (Photo: 4, 5)



Photo: 4



Photo: 5

- b. Remove Bolt (66) and take off Travel Lever (64). Unscrew Nut (71) and take off Handle Grip (68) (Photo: 6, 7)



Photo: 6



Photo: 7

- c. Remove Hydraulic Hose (99) from Hand Pump (98), and the remove Hand Pump (98) from Handle (61) (Photo: 8, 9)



Photo: 8



Photo: 9

Note: Whenever Hydraulic Hose has been disconnected, apply blank plug to it for prevention of any dust from entering. (Photo: 10)

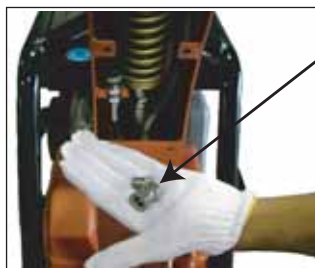


Photo: 10

Blank plug



Photo: 11

- d. After confirming the battery cord was disconnected from the battery, pull off the terminal of wire harness on the engine side (photo: 3, 11)

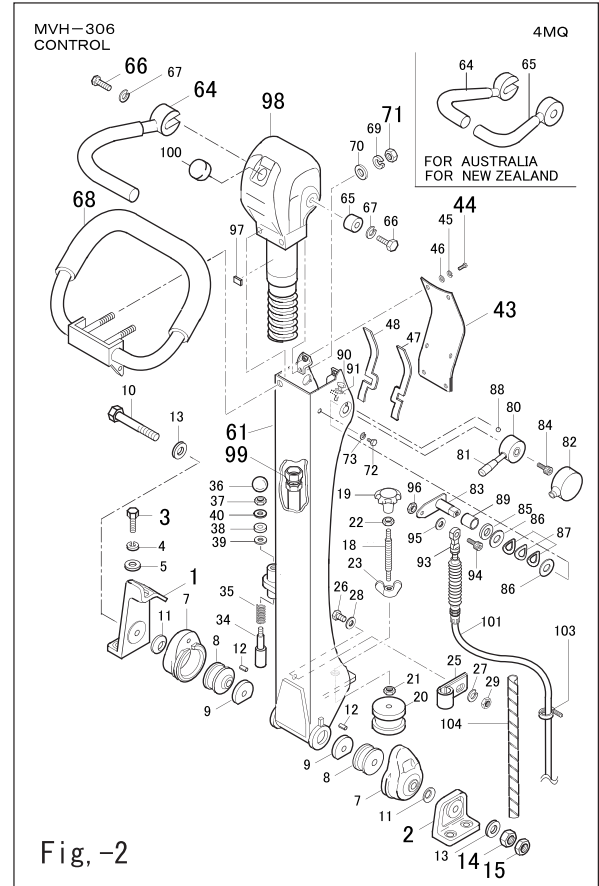


Fig. -2

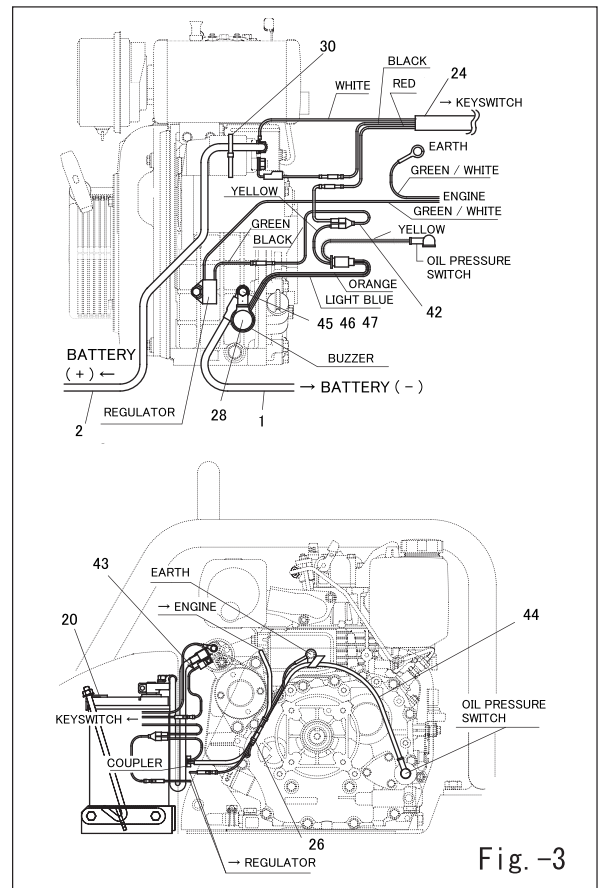
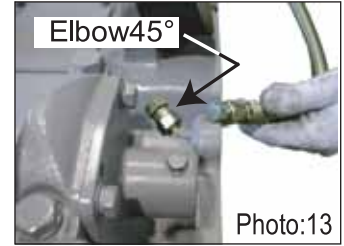
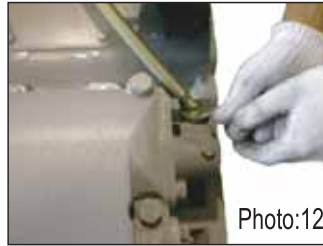


Fig. -3

- e. Separate the hydraulic hose (99) from the elbow 45° on the vibrating case (Photo: 12, 13)



- f. Remove the clamp and nut from the throttle wire (Photo: 14, 15, 16)

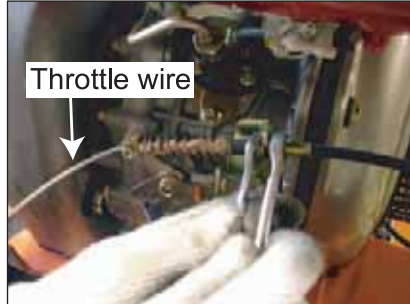


Photo:15

Photo:16

- g. Unscrew the 4 pieces of the bolt (3) and take off the handle (61) (Photo: 17, 18)



Photo:17

Photo:18

## (2) Reassembly

- a. Reassembly should be conducted with the disassembly procedures reversed, while observing below :  
When install the handle assembly (61) on the machine, 4 pieces of the bolt (3) which are tightening the handle bracket of (right) and (left) (1, 2) shall be firstly temporally tighten and after adjusting the handle movement (soft or hard) by the double nut (14, 15), tighten fully. (Photo: 18, 19)



Photo:19

## 5-3 Base machine (disassembly of the base and vibrating plate)

### (1) Disassembly

- a. Unscrew the 4 pieces of the bolt (21) and remove the belt cover (out) (20) (Photo: 20)



Photo:20

- b. Remove V belt (61) and unscrew the bolt (15), and then take off the clutch (Photo:21)



Photo:21

Before removing the hydraulic hose, remove mud or any other smear from the joint area.

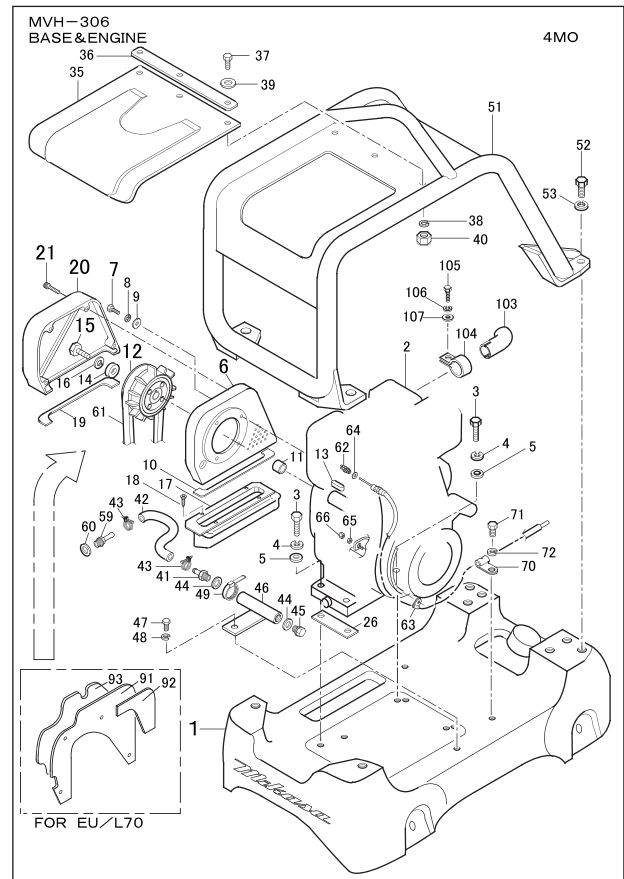
- c. After removing 4 bolts which have been fixing the shock absorber to the base (1), lift the base assembly upward. The vibrating plate will be separated. (Photo: 22, 23)



Photo:22



Photo:23



### (2) Reassembly

Reassembly should be conducted with the disassembly procedures reversed, while observing below:

- Coat the bolts and nuts for mounting the shock absorber with Loctite 242
- All the mounting bolts for the base machine should be coated with Loctite 242
- Installation of the clutch should be made with the side which can be seen the clutch shoes coming to the engine side.
- B type of V belt has an interchangeability but it has less durability therefore please use our recommended HDPF type V belt

## 5-4. Vibrating system

During disassembly and reassembly work, pay attention not to damage any part(s). O-ring, oil seal, packing or the like must be replaced with new one.

### (1) Disassembly

- a. Remove any hydraulic hose connection. Unscrew 5 pieces of the bolt (52) and separate the belt cover (51).

(Photo: 24 , 25)



Photo:24



Photo:25

- b. Unscrew the bolt (48), and withdraw the pulley (46). With the vibrating case mounting bolts removed, separate the vibrating case assembly from the vibrating plate.

(Photo: 26, 27)



Photo:26

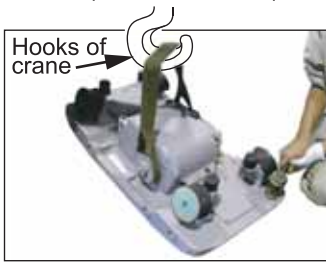


Photo:27

- c. With 4 bolts (34) removed, separate the cylinder (31). The cylinder is taking off by bolting into two screw holes which are provided on the cylinder (L) for this purpose only.

- d. Disassembling the piston

- ① With the vibrating case inverted upside down, rotate gear in either direction to cause the piston assembly (27) to be projected from the vibrating case, before removing the stop ring R-26 (29) from inside of the piston. (Use a bent nose type stop ring plier for this purpose) (Photo: 28)

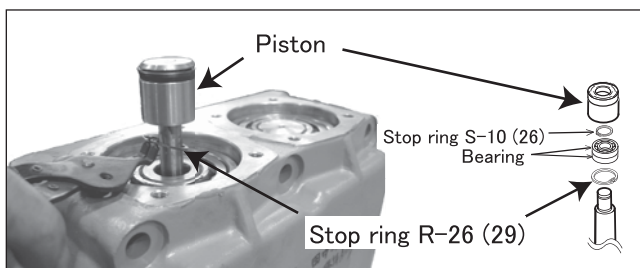


Photo:28

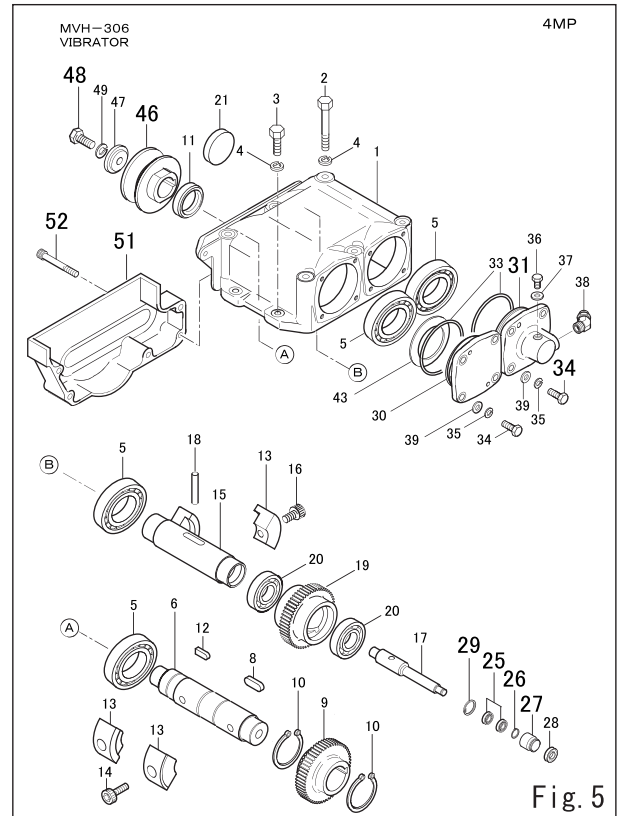


Fig. 5

- ② Withdraw the piston

- ③ With the contraction stop ring S-10 (26) removed, take off bearing (25) and stop ring (25) which had been removed earlier. (Photo: 29)

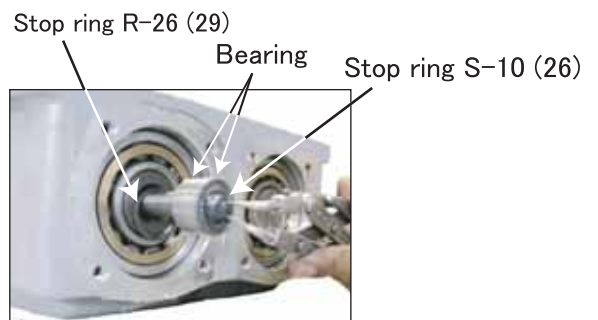
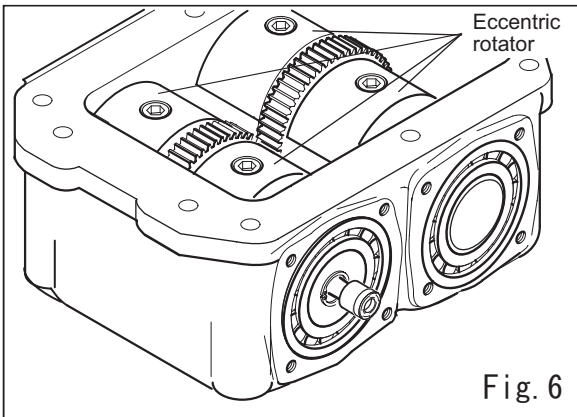
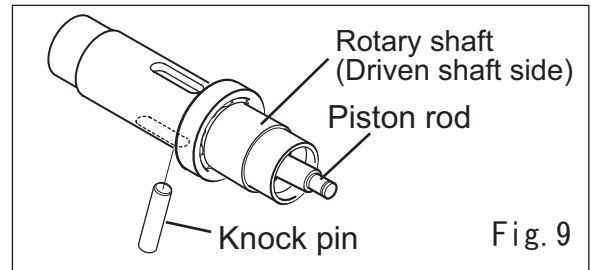


Photo:29

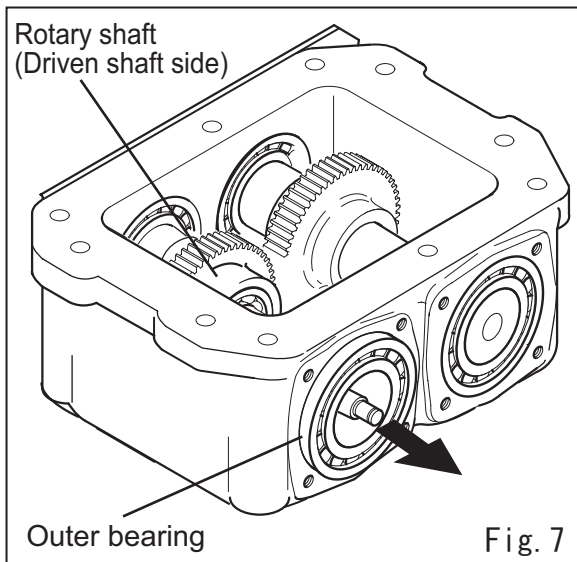
- e. Remove the eccentric rotator (13) from each rotary shaft (Fig. 6)



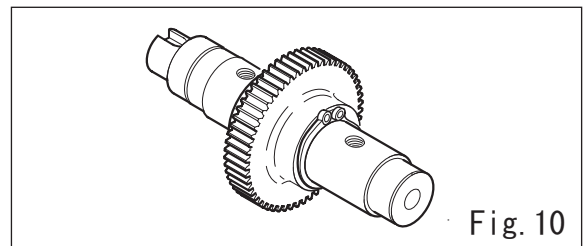
- h. Push the knock pin (18) with your finger or by using a plastic hammer if it is sticky, which will allow to pull out the piston rod (17) from the rotary shaft. (Fig. 9)



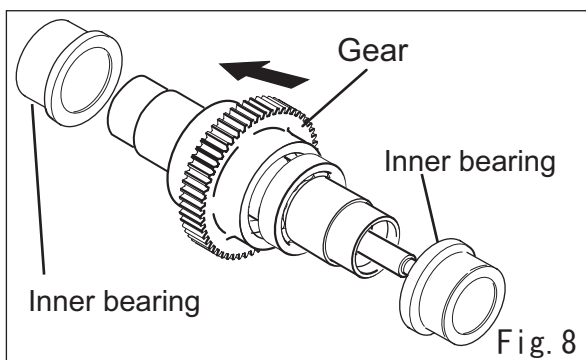
- f. Shift the rotary shaft (driven shaft side) (15) to one side of the vibrating case and remove the outer bearing and withdraw the rotary shaft assembly from the vibrating case. (Fig. 7)



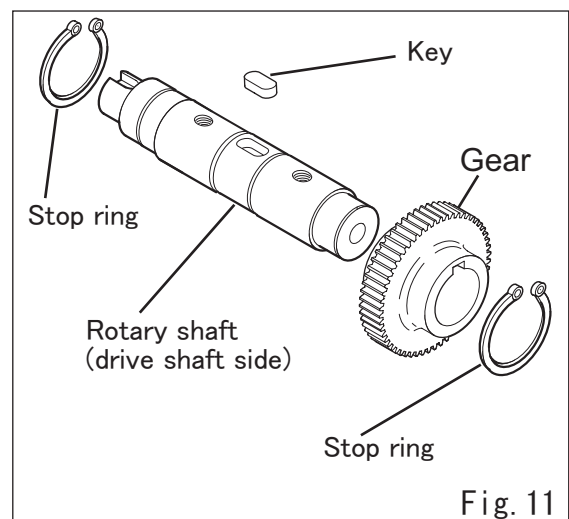
- i. Disassembling of the rotary shaft (drive shaft side)
- ① Separate the bearing cover (30) from the vibrating case
  - ② Push out the rotary shaft (drive shaft side) (6) to the opposite side of the pulley of the vibrating case, withdraw the bearing and take off the oil seal (11) also (Remove both outer and inner bearings).
  - ③ Withdraw the rotary shaft (drive shaft side) from the vibrating case. (Fig. 10)



- g. Withdraw inner bearing by using the pulley puller and push out the gear (driven shaft side) (19) to one side and pull it out. If the gear is hard to remove, use the press rather than tapping on it with hammer. (Fig. 8)



- ④ Remove the stop ring and get out the gear by the press. (Fig. 11)



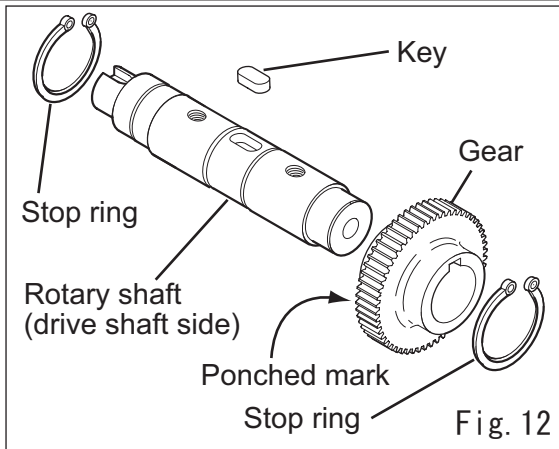
## (2) Reassembling

Before proceeding with reassembly, remove residual liquid packing thoroughly from mating surface of vibrating case and vibrating plate. Clean and de-grease all the other parts as well.

### a. Reassembling the rotary shaft (drive shaft side)

- ① After inserted the key in the rotary shaft (drive shaft side), press the drive gear into the rotary shaft (drive side) and fix it by both stop rings. (Fig. 12)

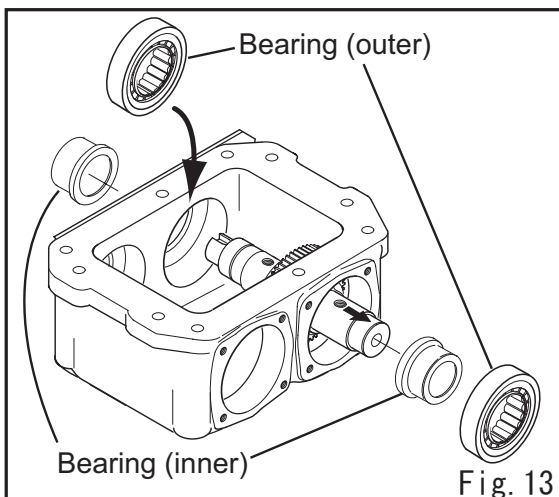
- Coat the press-fit area with molybdenum grease.
- Face the punched mark of the drive gear toward the pulley



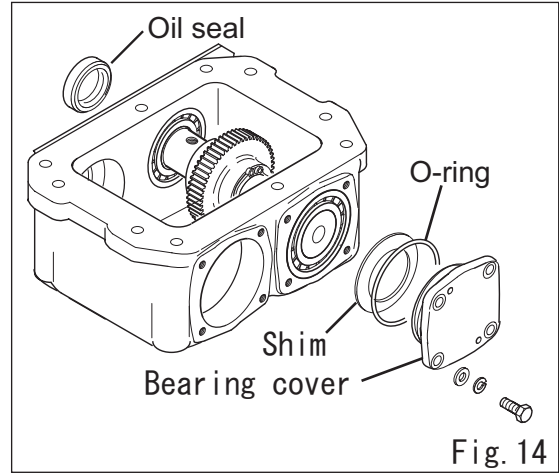
- ② After placing such rotary shaft assembly inside the vibrating case, have the bearing (inner) pressed-in.

Pay attention to the direction of bearing (inner) face to press-in.

- ③ Shift the rotary shaft to the opposite side of the pulley, and put the bearing (outer) of the pulley side into the vibrating case and insert the rotary shaft. Bearing (outer) of the opposite side of the pulley shall be pressed in from the outside of vibrating case. (Fig. 13)



- ④ Install o-ring (33) to the bearing cover (30) and fix to the vibrating case. After installation, check if there is a play of the thrust on the rotary shaft. (Within an allowance: 0.2 ~ 0.5mm). If a play is bigger than this allowance, adjust it by inserting a 0.5mm shim inside the bearing cover. (Fig. 14)



- ⑤ Insert oil seal into the vibrating case. (Fig. 14)

- Apply grease to the bearings
- Place the side with rib of inner ring toward the eccentric rotator.
- Apply grease to the o-ring
- Pay attention when insert oil seal into vibrating case not to having twisted and also not to scratch the lip.
- Apply Loctite #242 on the fixing bolts of the bearing cover. Tightening torque: 800kgf · cm ( $\approx 7.85\text{kN} \cdot \text{cm}$ )

b. Reassembling the rotary shaft (driven shaft side)

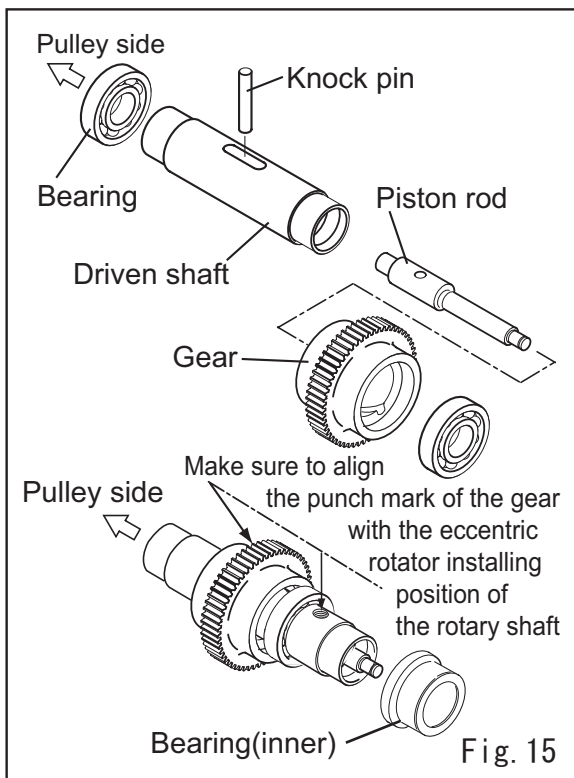
- ① Place the bearing (outer) of the pulley side in the vibrating case and insert it. (Fig. 16)
- ② Fit the piston rod to the rotary shaft, penetrate knock pin through center hole and push the gear to the middle of the rotary shaft before inserting bearings from each side. (Fig. 15)

When inserting the driven gear to the rotating shaft, make sure to align the punch mark of the gear with the eccentric rotator installing position of the rotary shaft, before placing the knock pin in the spiral groove. Installing with the phase displaced by 180°, will cause operation of forward and reverse travel to be reversed. Also make sure that piston rod and gear installed in proper direction. (Fig. 15)

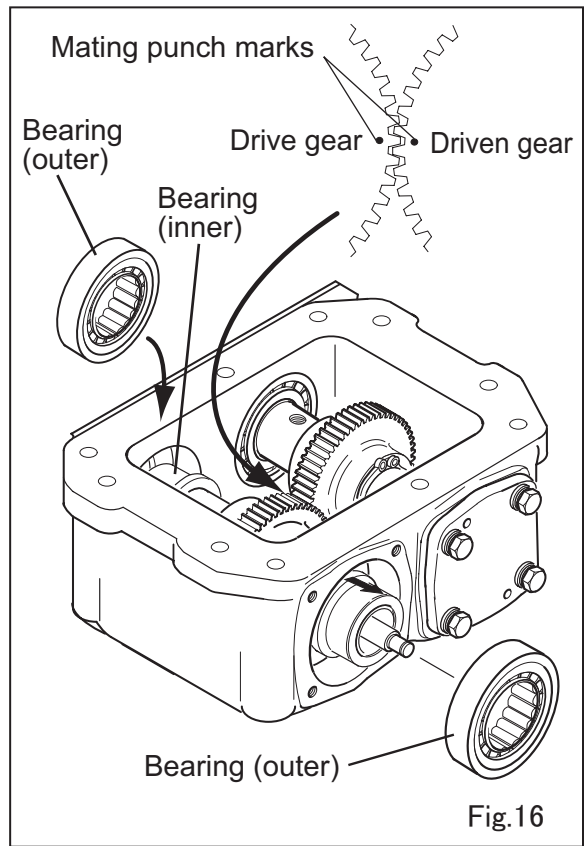
Be sure to apply molybdenum type extreme pressure grease sufficiently to the bore of eccentric rotator shaft, piston rod, spiral portion of the bore of gear, before assembling.

- ③ Insert bearings (inner) into both ends of the rotary shaft by press. (Fig. 15)

Place the side with rib of bearing (inner) toward inside of the vibrating case. Apply grease when press-in.

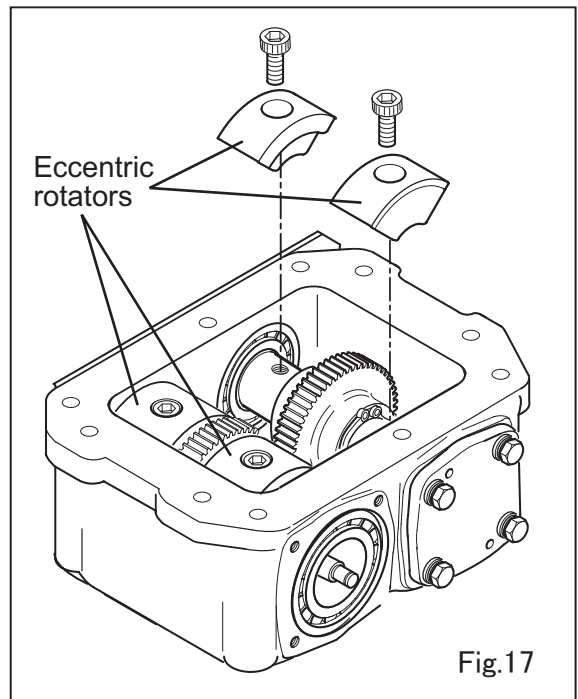


- ④ Fit the driven rotary shaft assembly to the vibrating case and after aligning the punch marks of the drive gear and driven gear, insert it to bearing.



- c. Each eccentric rotators are installed on the both drive and driven rotary shaft. (Fig.17)

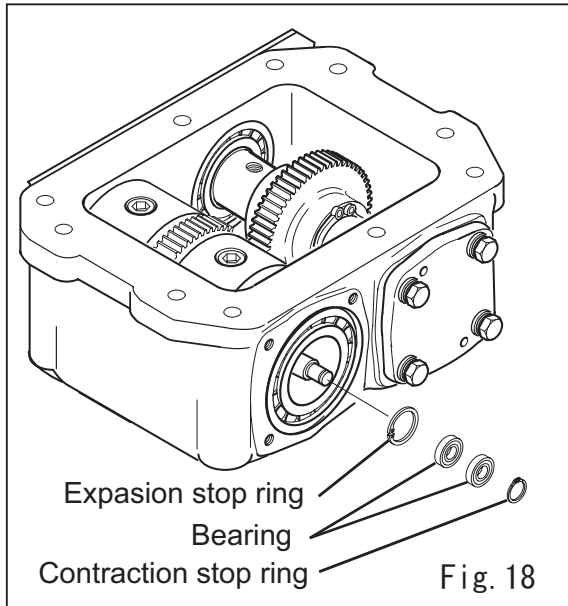
Apply Locktite #271 on the socket head bolts.  
Tightening torque: 2,800kgf · cm



d. Reassembling the piston

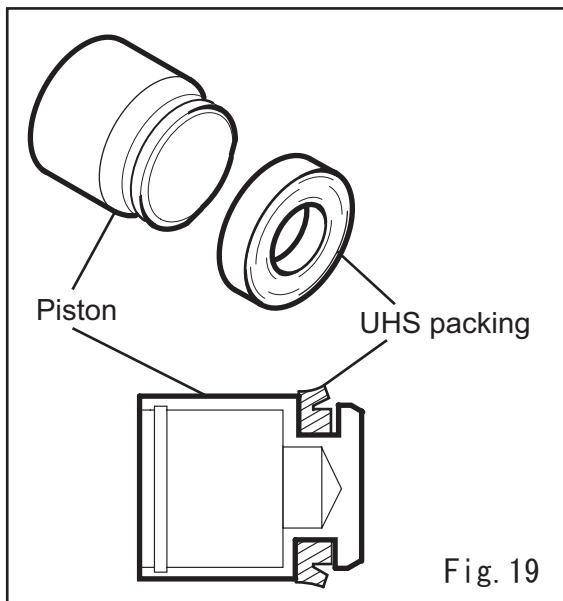
- ① Have the expansion stop ring installed over the piston rod and insert two bearings before retaining it with contraction stop ring. (Fig. 18)

Make certain the stop ring is firmly fixed.  
When using commercially available bearing, use molybdenum extreme pressure type grease to pack.  
Apply grease to the area of the piston rod where bearing is inserted.



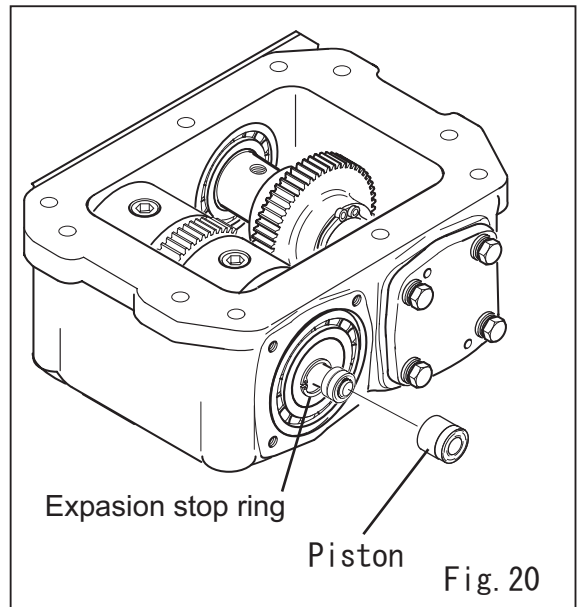
- ② Install UHS packing to the piston (Push it in with your finger after coating with oil.) ( Fig. 19 )

Make certain that piston has no scar or scratch.  
Use care not to damage piston  
Install packing in proper direction.



- ③ Place the piston over the bearing and push the assembly into the vibrating case, before retaining it with the expansion stop ring which had been installed earlier. (Fig. 20)

To install the piston, either push it in with hand or lightly tap on it with plastic hammer.  
When installing the expansion stop ring, use bent nose type plier and make sure that it has seated properly in the groove.  
After installation, make sure that the piston rotates smoothly.



- e. Assembling the cylinder to vibrating case.  
Install o-ring to the cylinder and coat it with grease. (Fig. 21)

Coat the cylinder mounting bolt with Loctite #242.  
Tightening torque: 800kgf·cm  
When inserting piston into cylinder, use sufficient care not to damage USH packing.

- f. Install 45° elbow and breather bolt on the cylinder. (Fig. 21)

Bandage 45° elbow with sealing tape and position the elbow so that its tip points into vibrator.

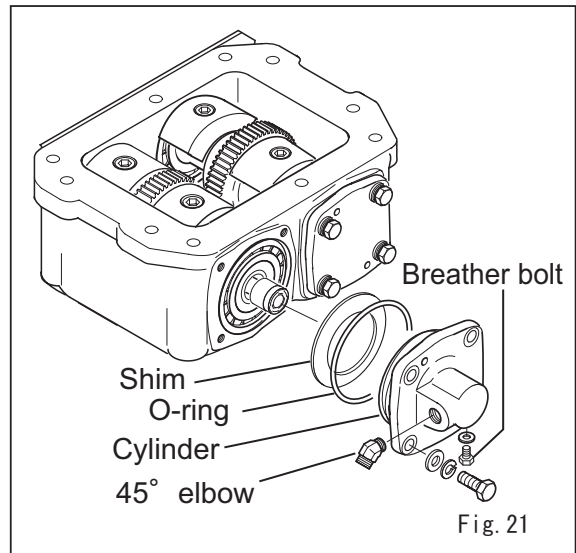


Fig. 21

- g. Install the seal cap to the vibrating case of the opposite side of the cylinder. Install o-ring to the bearing cover and coat it with grease. After installation, check if there is a play of the thrust on the rotary shaft (driven). (Fig. 22)

(Within an allowance: 0.2 ~ 0.5mm)

If a play is bigger than this allowance, adjust it by inserting a 0.5mm thickness shim inside the bearing cover.

- h. That completes the reassembly of vibrator but make certain that it rotates smoothly by turning its rotary shaft manually.  
If resistance is great, tapping on the gear side with plastic hammer lightly and it will help the rotation to be smooth.

Do not possibly tap on the gear tooth.

Install the vibrator assembly to compaction plate.

Thoroughly degrease the mating surfaces and coat the plate with liquid packing (Three Bond 1216 or equivalent) to the thickness of about 0.5mm on the plate side.

Apply Loctite #242 to bolts.  
Tightening torque: 1,700kgf·cm  
Tighten bolts alternately in diagonal order.

After the liquid packing has hardened ( in about 15 to 16 hours ) , feed oil to the vibrator .

Type of oil: Engine oil SAE10W-30  
Capacity: 600cc (0.6 liter)  
Be sure to fill the oil exactly same volume indicated.  
Excessive filling causes over-load and shortage causes abnormal sound and shortage of bearing life.

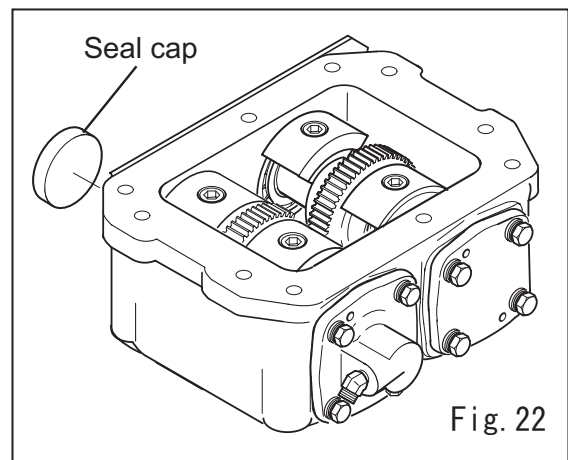


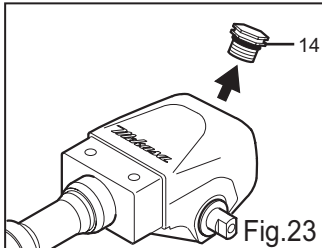
Fig. 22

## 5-5 Hand Pump

**When disassembling and re-assembling, pay attention not to harm each part.  
O-ring, oil seal, packing etc should be replaced with new ones.  
Disassembly and re-assembly job should be conducted where it is free from dust.**

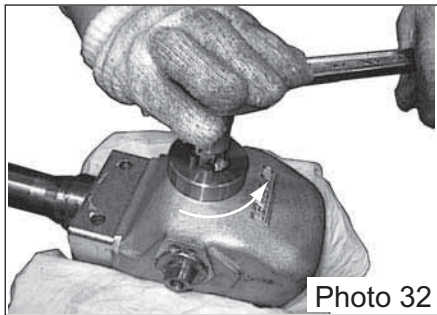
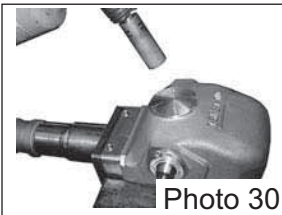
### (1) Disassembling

A. Remove breather plug (14) and drain off hydraulic oil completely (Fig.23)



B. Heat the Plug Center (11) about 200°C by torch and put the special jig and turn to counter-clockwise.  
(Photo 30, 31 and 32)

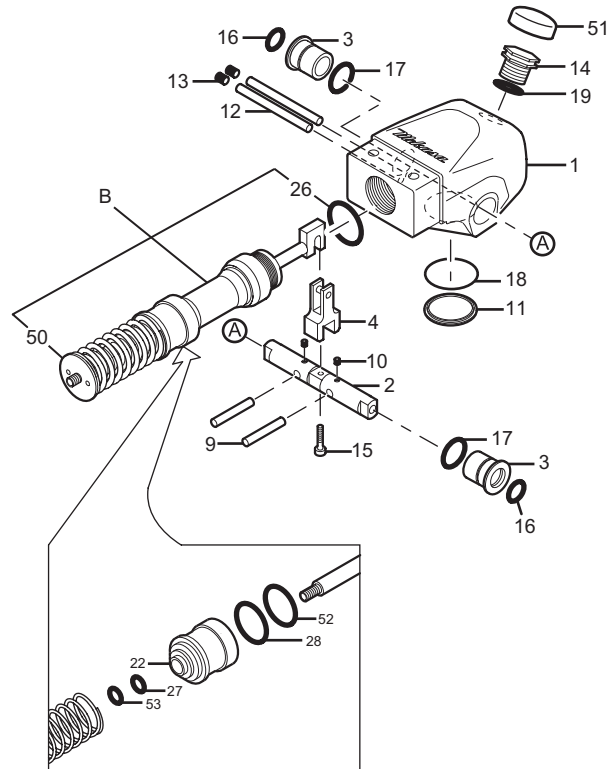
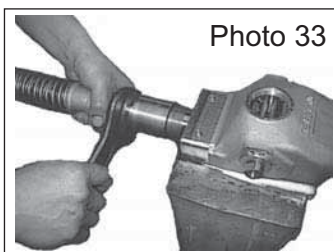
**! NOTE: Pay attention not to be burned by torch**



C. Loosen the Adapter Tube from Pump Body (1) but it is not come off because Hook is inserted in the Cam (4) of the Control Part which is equipped with Servo Rod (31) in Cylinder Tube.

Keep it on the way, and take next step (Photo 33)

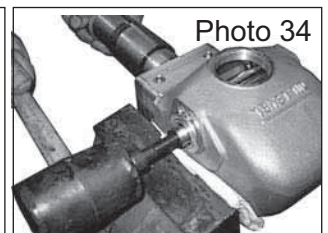
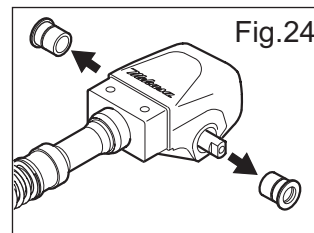
Fix Pump Body by vice, and engage Accumulator Tube with wrench to turn to counter-clockwise.



D. Remove Bush (3) from Pump Body. Screw in the M10 x P1.5 Bolt for both ends of Control Shaft (2) and tap on the Bolt center by Plastic Hammer to move. Bushes slide and come off from Pump Body.

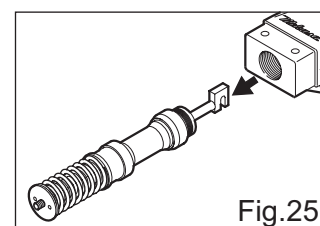
Pull off Bushes from Pump Body. At the same time, check any deformation of inserted parts of Lever (both end flat surface) for Control Shaft. If any, grind the surface smoothly before pulling off.

(Fig.24, Photo 34)

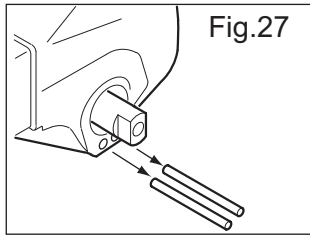
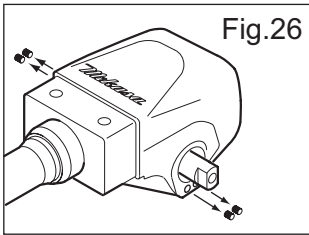


E. Hold the double-sided of the Adapter by hand and unscrew it until Accumulator Assembly (B) can be taking off.

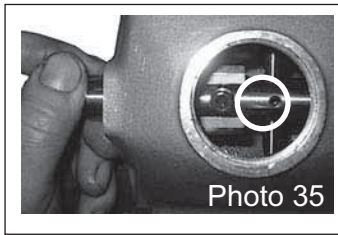
(Fig.25)



F. Remove two pieces of PT1/8 Plugs (13) from Pump Body. Clamp the Stopper Pin (12) by the Plier to move from Pump Body. (Fig.26,27)



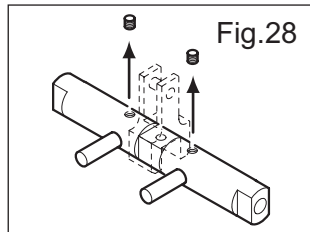
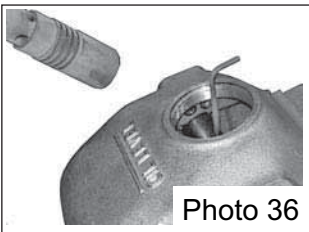
G. Slide Control Shaft to the position where the Hex. Socket Screw M5x5 (10) can unscrew properly and remove Stopper Pin. (Photo 35)



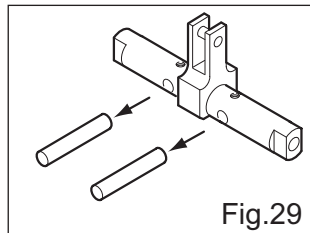
H. This Hex. Socket Screw (10) was applied Loctite 638, and therefore it is necessary to heat up at pin point. Heat up Hex. Socket Wrench indirectly to transfer the heat to wrench end. (Photo 36)

Use another Hex. Socket Wrench to remove Hex. Socket Bolt. Then take same manner to remove another Hex. Socket Screw at the opposite end. (Fig. 28)

**! NOTE**  
**Pay attention not to be burned by the heat. Never use the Hex. Socket Wrench which once the heat was added for other normal workshop job because it might be changed its quality.**

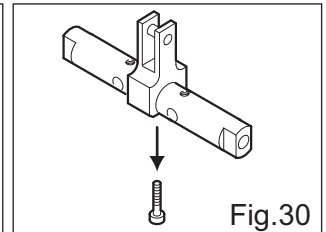
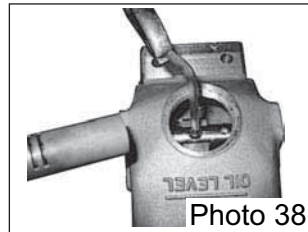


I. Tap on two pieces of Stopper Pins by small hammer, to remove from Control Shaft. (Photo 37 and Fig. 29)

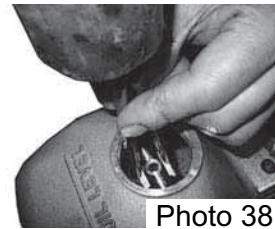


J. Control Shaft and Cam can be separated by removing Hex. Socket Screw, but it was applied Loctite 638 to fix. So it is also required to heat up Hex. Socket Wrench indirectly after wrench engaged. Remove M6 Screw by Hex. Socket Wrench carefully. (Photo 38, Fig. 30)

**! NOTE**  
**Pay attention not to be burned by the heat.**



K. Tap both ends of Cam, to remove from Control Shaft. (Photo 38)



Finally Hand Pump is completely disassembled, and take the opposite way to assemble.

(2)Cleaning

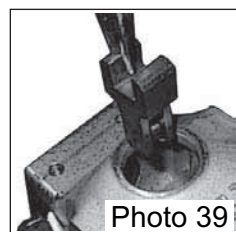
A. Brush up the adhesion of Loctite 638 at the threads of the bottom end of Body and inserted portion of Bush by the wire brush and others.

B. After brushing up, clean up Pump Body by benzin thoroughly. Wipe off oil completely, and dry off by compressed air.

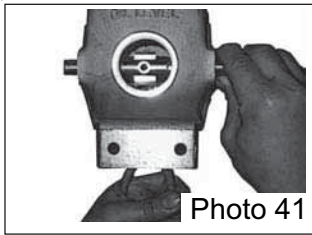
C. Clean off the remaining Loctite at the neck of the bolt and free from oil.

(3)Assembling

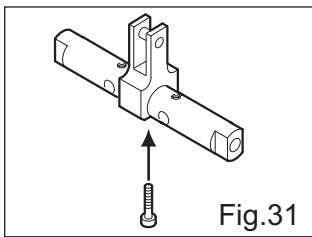
A. Fix Pump Body by vice, and insert Cam to the same direction of the Photo 39 and let Cam stand inside of Pump Body as per Photo 40.



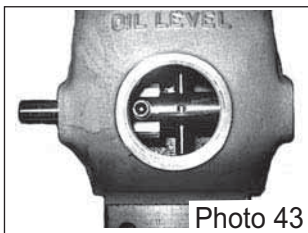
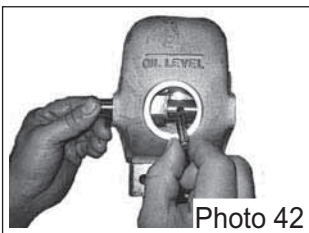
B. Insert Control Shaft with the M5 Screw part upright. Clamp Cam by Plier from the bottom end, and adjust the position center to engage. Each between is clamped and assembled by hand pressed.  
(Photo 41)



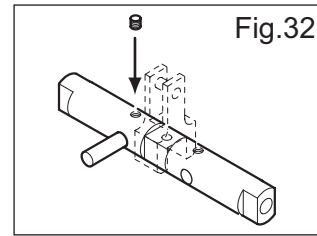
C. Apply Loctite 638 at the several screw threads of M6 Screw but not apply any Loctite on the edge and edge surface of the Bolt. Fix M6 Hex. Socket Screw vertically against Control Shaft and Cam. To get the ideal torque 1.25kg-m (0 ~ +10%) for M6 bolt to fix correctly, use M10xP1.5 bolt at the end of threads hole. Then ensure the correct torque again. (Fig. 31)



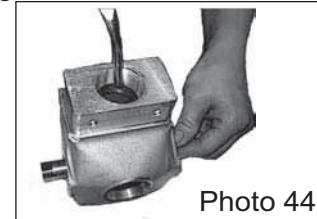
D. Hold the end of Control Shaft by hand, and turn 90 degrees to meet the position of Pin Insert (Photo 42), which shows the receptacle of Cam part at upright. Stopper Pin is inserted by small hammer for easiness. Fix the position of Stopper Pin to let the groove meet M5 screw center of Control Shaft. The edges of Stopper Pin elongate 15mm at both ends (Photo 43)



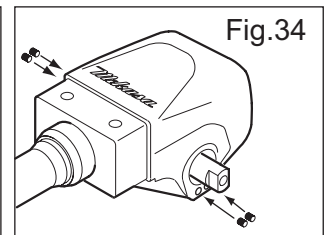
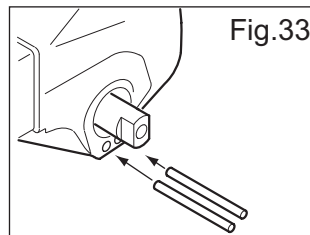
E. Apply Loctite at the threads of M5x5 Hex. Socket Head Screw and M5 threads of Control Shaft. (use a pin to apply Loctite for easy embrocation). Set Hex. Socket Head Screw to Control Shaft, and fix it completely at the torque of 0.3kg-m (0 ~ +10%)  
(Fig. 32)



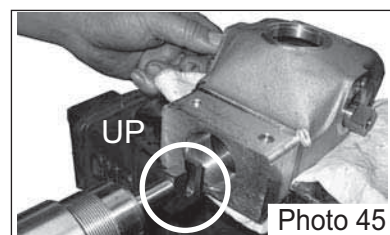
F. Then turn Pump Body as Photo 44, to fix Opposite side Pin with groove from the bottom end. Use Radio Nipper for this purpose. Take the same procedures of tightening above D. and E.



G. Insert Stopper Pin from each hole at the side end of Pump Body. Push Stopper Pin until the end of insert hole by suitable rod. Screw in PT 1/8 Plug rolled with sealing tape to the end of Stopper Pin in Pump Body. Fix it correctly at the suitable torque to avoid any deformation or damage. Take off excess sealing tape and do not let the tape inside of Pump Body.  
(Fig. 33, 34)



H. Hold the end of Control Shaft, and turn the receptacle of Cam to let it come at front end. Then insert and engage Hooking Groove of Piston Assembly to Pump Body. Position the groove upright as referred to Photo 45. After confirming of the insertion of the Hooking Groove in Control Shaft, screw Piston Assembly in Pump Body slowly. Pay attention to avoid any damage of O-ring when it is screwed at the sealed face in Pump Body. Fix Piston Pin properly with Wrench at the torque of 25kg-m (0 ~ +10%).

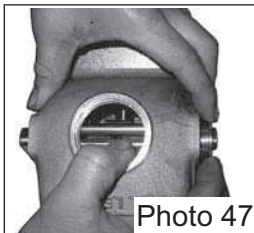


Remove both Inner and Outer O-ring from Bush, and wipe off Loctite completely. Use flat tip file or wire brush softly for removing the remaining Loctite, then dry off by compressed air. Use new O-rings.

J. Apply Loctite 638 equally at entire circumstance between the groove of O-ring and collar of Bush. (Photo 46)

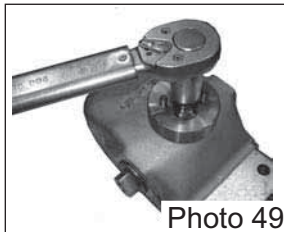
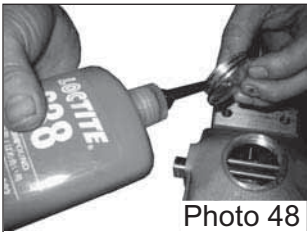


Do not apply Loctite to the groove to refrain from loosening of sealing performance, which may cause leakage of oil from Pump. Insert Bush until the collar of Bush touches Pump Body (Photo 47).



To avoid any damage of O-ring by edge, insert slowly with turn or moving back if necessary. Do not have any space between Collar and Pump Body. Tap on the ring jig by hammer if necessary.

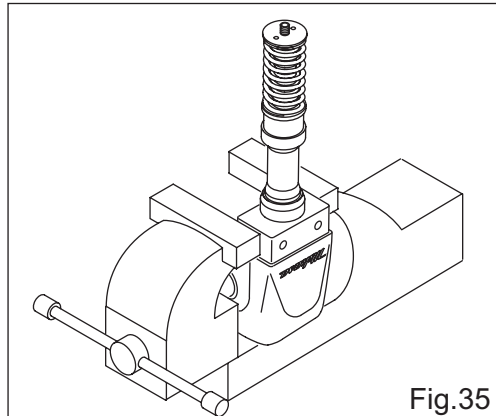
K. Equally apply Loctite 638 at all threads of Plug to fix at Pump Body. By using special jig screw it into Pump Body at the torque of 5kg-m (0 ~ +10%). Breather Plug shall be fixed after installing Hand Pump on the machine and after refilling hydraulic oil.



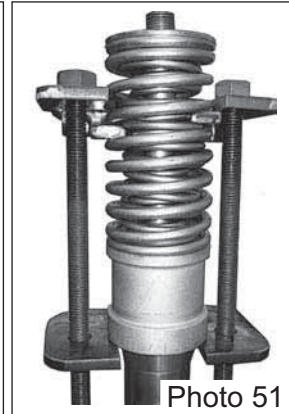
## 5-6 Hand Pump Accumulator

(1) Disassembling

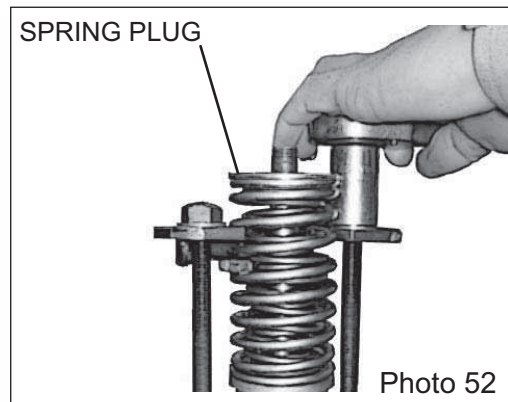
A. Fix the Pump Body by vice clamping the both sides of Pump Body (Fig 35)



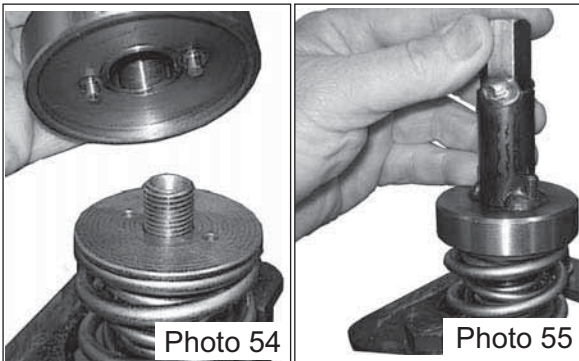
B. Prepare special jig of Spring Press Holder (Photo 50) and set Pump Body with it. Put the upper part of Spring Press into the Spring and lower part in the bump between Accumulator Case and Accumulator Tube firmly (Photo 51)



C. Adjusting the balance of either side of Spring, screw up the both bolts one after the other until the Spring Holder becomes free from Outer Spring strength. (Photo 52)



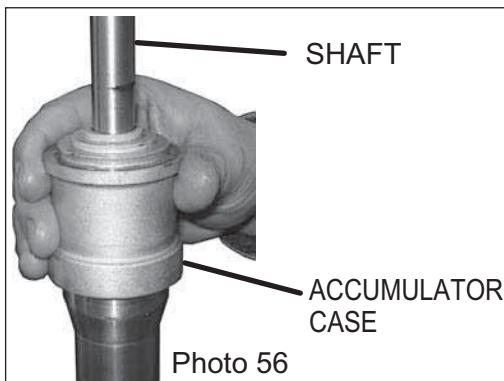
D. Prepare Special Jig for disassembling and assembling (Photo 53).  
Set it in the correct position to meet the pins on Special Jig and holes on Spring Holder.  
(Photo 54 and 55)



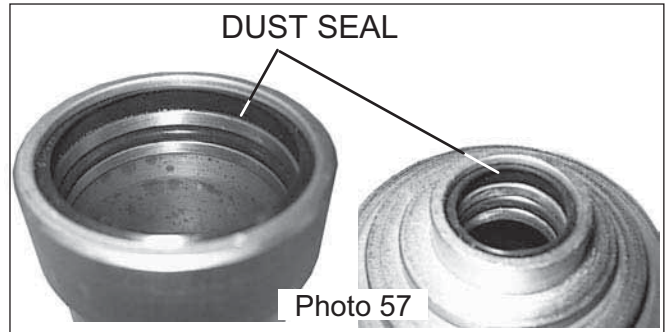
E. Unscrew the Spring Jig slowly and take off Spring Holder from Pump Body. At that time please pay attention that Spring Holder is yet receiving the pressure from Spring. Then three kind of Spring can be lifted up.

**! NOTE**  
**Spring Holder is still receiving the pressure from Inner Springs, therefore slowly taking off the Spring Holder and pay attention of your finger(s) not to be pinched by Springs.**

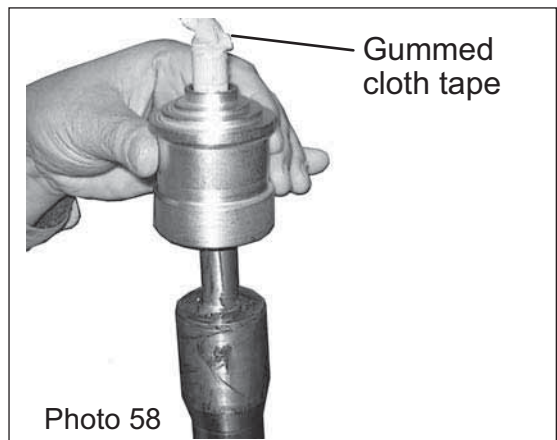
F. Clean up Cylinder Shaft first and take off the Accumulator Case. When difficulty, take off Accumulator Case by revolving slowly.  
(Photo 56)



G. If the Accumulator Case is the old type which is not required dust seal, please change with the new type with dust seal. (Photo 57)  
In case of the new type Accumulator Case, change with new O-ring and Dust Seal by all Means. Please put the Lip side of new Dust Seal to outside direction.



(2) Assembling  
A. After molybdenum grease is applied to Dust Seal and O-ring of Accumulator Case, assemble with Cylinder Tube. At the same time, the screw threads portion of Cylinder Shaft should be covered by the gum tape avoiding any damage of Dust Seal and O-ring from the screw threads. (Photo 58)  
If it can not smoothly enter, revolve Accumulator Case by hand and slowly slide it down.



B. Take off the gum tape from the screw threads portion and after degreasing and cleaning it, apply 2 ~ 3 drops of Loctite 638 on the screw threads. (Photo 59)



C. 3 pieces of Springs which was degreased and cleaned are put in the Shaft (Photo 60) and fix the special jig of Spring Press Holder positioning the upper part into the Spring and lower part in the bump between Accumulator Case and Accumulator Tube firmly. (Photo 61)

**! NOTE**

Pay attention of your finger(s) not to be pinched by Springs and special jig.

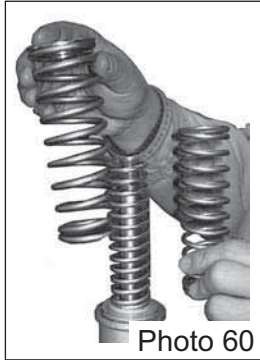


Photo 60

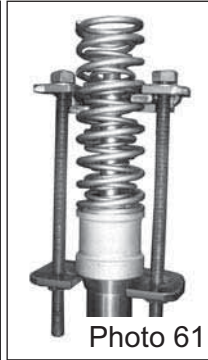


Photo 61

D. Adjusting the balance of either side of Spring, screw up the both bolts one after the other until the Spring Holder becomes free from Outer Spring strength (Photo 62), and press down the Outer Spring until the screw thread portion of Cylinder is bulged. (Photo 63)

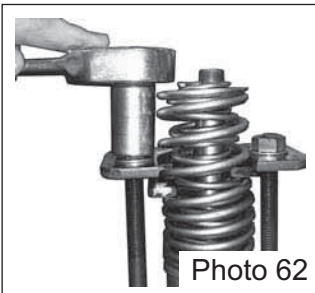


Photo 62



Photo 63

E. Prepare Special Jig for disassembling and assembling (Photo 53).

Set Special Jig in the correct position to meet the pins on Special Jig and holes on Spring Holder and screw it up. (Photo 64)

**CAUTION**

Pay attention to fix the Spring Holder because of pressure from Inner Springs.

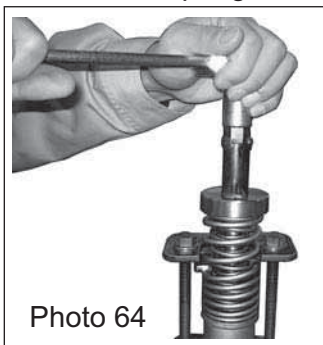


Photo 64

Tightening torque of Spring Holder is 200kgf · cm

F. Loosen each Bolt of the Special Jig (Photo 65) and take off from Hand Pump Accumulator.

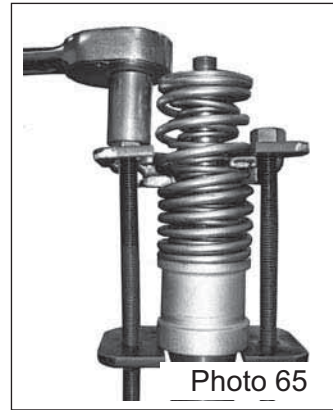


Photo 65

## 6. PERIODICAL INSPECTION AND MAINTENANCE WORK

**! Note:** Inspection or maintenance service should be conducted on hard and level ground. Be sure to have engine shutdown before starting such inspection or service work.

### 1. Inspection and maintenance chart:

To enable the use of machine always in its top condition, be sure to conduct maintenance inspection in accordance with the chart below:

#### Machine Inspection:

Item		Hours of Operation
Pre-start up inspection:	Loosened or missing screws	8 Hours (Daily)
	Damage of parts or components	Ditto
	Function of control system components	Ditto
	Leakage in hydraulic system piping	Ditto
Vibrator oil – Check		Every 100 hours
Vibrator oil – Replacement		Every 300 hours
Hydraulic oil – Check		Every 100 hours
Hydraulic oil – Replacement		At first 200 hours; every 1,000 hours thereafter
V-belt (Clutch) – Inspection		Every 200 hours
Battery – Inspection		Every 100 hours

#### Engine Inspection (See Engine Instruction Manual for detail)

Item	Hours of Operation
Oil and/or fuel leakage	Every 8 hours (Daily)
Tightness of fasteners	Ditto
Engine oil – Check and replenishment	Ditto (Replenish to specified level when insufficient)
Engine oil – Replacement	At first 20 hours; every 100 hour thereafter
Air cleaner – Clean	Every 50 hours

#### Oil application table

	Quality	Temperature ( °C )													
		-30	-25	-20	-15	-10	-5	0	5	10	15	20	25	30	35
Engine oil	For diesel CE/CF class SAE10W-40 OR SAE15W-40	SAE 5W- 20/5W- 30													
		SAE 10W-30													
		SAE 20W-40													
		SAE15W-40													
		SAE 10W - 40													
Vibrator oil	Engine oil SAE 10W - 30	SAE 10W - 30													
Hydraulic oil	Hydraulic oil ISO VG46	ISO VG32													
		ISO VG45													

**! NOTE:** Above intervals are for normal operating circumstances. Shorten it or improve the substance of service according to requirement.

**! NOTE:** Fuel piping should be replaced in every 2 years

### 2. Inspection of the fuel and oil leakage:

Check if any oil leakage from the hand pump, hydraulic oil piping or hose.

Check loosen hose, joint part if any by a spanner.

### 3. Replacing engine oil:

Replace engine oil after first 20 hours and in every 100 hours of operation thereafter. It is easier to drain oil when engine is warm after its operation (For detail, see engine supplier's manual).

### 4. Cleaning the air cleaner:

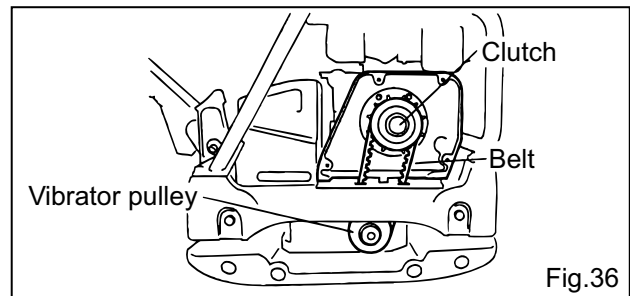
Air cleaner element should be cleaned, as it becomes dirtier not merely engine starting difficulty, lack of power or operating deficiency will result in but useful life of the engine itself will be shortened (For detail, see engine supplier's manual).

### 5. Checking and replacing V-belt and clutch:

#### a. Checking the V-belt (See Fig.36)

In every 200 hours of operation, with the belt cover (upper) removed, check the tension of V-belt. The tension is normal if the bend is about 10mm when the belt is pressed with our finger at midway between the pulleys.

When the belt is slackened, transmission of engine rotation will be deficient, resulting in poor compaction and accelerated wear of the belt.



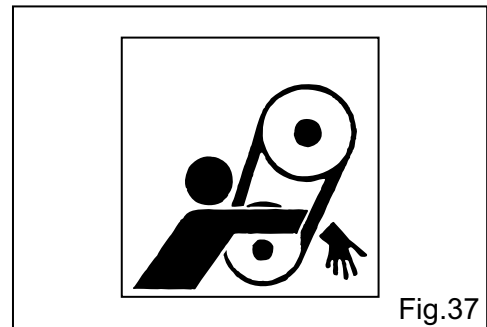
#### b. V-belt replacing procedure:

##### V-belt removal

With upper and lower belt covers removed, engage offset wrench (19mm) to vibrator pulley tightening bolt (lower). Hook a piece of cloth at left side midway of the V-belt and pull it back forcibly while rotating the wrench clockwise until the belt comes off.

##### V-belt reinstallation

Engage the V-belt to vibrator pulley at the bottom and press the V-belt against left side of the upper clutch. Same as in the case of removal, rotate the offset wrench clockwise until the belt is installed.



**! NOTE:** There is a risk for injury. Use sufficient care for your hand not to be caught between the belt and clutch. Use glove for protection.

#### c. Checking the clutch:

Check the clutch simultaneously when you check V-belt. With the belt cover removed, visually check the outer drum of clutch for seizure, V-groove for wear or damage. Clean the V-groove as necessary.

Wear of lining and shoe should be checked through operation.

Worn shoe reduces transmission efficiency of engine rotation, causing a slip to occur.

#### d. Replacing the clutch:

- Remove V-belt (See above for the procedure).
- Remove bolt at the engine power output shaft end by giving a shock to a wrench (tap on with hammer) engaged to it and turning it counterclockwise.
- Pull out the clutch by means of pulley puller.
- Reinstall the clutch with above procedure reversed. Turn-in the bolt securely by giving a shock to the wrench in use.

**! NOTE:** If vibration is weakened during operation or vibration does not occur in spite of engine running, conduct the check of V-belt and clutch regardless of maintenance interval of 200 hours.

## 6. Checking the vibrator oil (See Fig.38)

In every 100 hours of operation, position the machine horizontally and remove the vibrator oil level check plug (use 14mm wrench) to see oil is up to the port.

In every 300 hours of operation, change the vibrator oil. Drain oil through level check plug hole with the machine inclined by inserting a sleeper or the like under the opposite side of compaction plate.

※ Lubrication oil to use: Engine oil 10W-30.  
Oil Capacities: 0.6 Liter

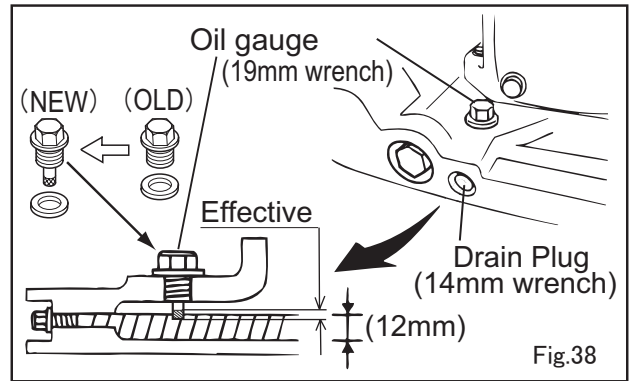


Fig.38

**! NOTE:** To prevent dust from entering, clean the port before proceeding with the vibrator oil check.

**! NOTE:** In case any leakage from vibrator should be detected, check vibrator oil frequently.

## 7. Checking the hydraulic oil (See Fig.39):

a. Check the hydraulic oil in every 100 hours of operation.

With the handle positioned vertically (stowed position), remove breather plug at the top of hydraulic hand pump and check the oil for proper level (To OIL LEVEL mark)

b. Replacing the hydraulic oil:

Change the oil at first 200 hours and in every 1,000 hours of operation thereafter.

**! NOTE:** Be careful not to allow any dust to enter the hand pump during the work.

- ① With the plug cap taken off the hand pump, remove breather plug (with 24mm wrench) before disconnecting hydraulic hose which has entered vibrator cylinder at the vibrator side, and with the travel lever placed in forward position, drain the hydraulic oil.
- ② After draining hydraulic oil, reinstall the hydraulic hose to vibrator.
- ③ Feed hydraulic oil through breather plug of the hand pump.  
Hydraulic oil capacity: 0.55 Liter
- ④ Shortly after removing breather plug at the vibrator cylinder, oil starts to flow out of the plug hole. Wait until aeration disappears before replacing the plug. Tighten it securely. (See Fig.40)

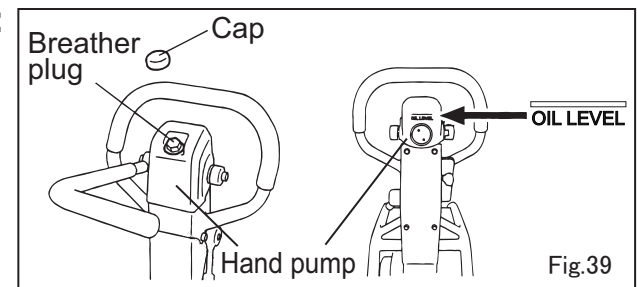


Fig.39

- ⑤ Then release the rope from the travel lever and move the lever forward and reverse several dozen times (until air bubble not be found).  
Stay the lever at the reverse position for 10 seconds every time.  
(Because the check valve is opened at the maximum reverse position and air bubble will come out from the oil tank of the hand pump).  
If the accumulator moves 2 - 3cm when move the lever to forward side, air bleeding is finished.  
In case the air bleeding is insufficient, repeat the procedure of above 4 and 5.
- ⑥ Install breather plug to hand pump and fit the plug cap. Breather plug should be reinstalled only after making sure that hydraulic oil in the pump is up to OIL LEVEL.

Hydraulic oil to use: Shell Tellus Oil #46 or its equivalent

**! NOTE:** Be sure to fill the hydraulic oil exactly to the OIL LEVEL.  
Excessive filling causes oil to gush out of the breather.

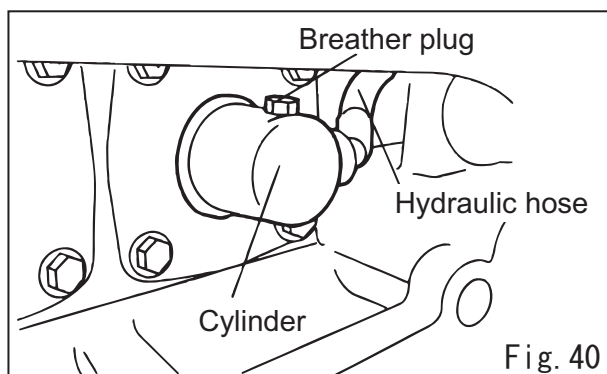


Fig. 40

## 8. Checking the battery:

The battery installed is of maintenance-free type and replenishment with electrolyte is not needed.

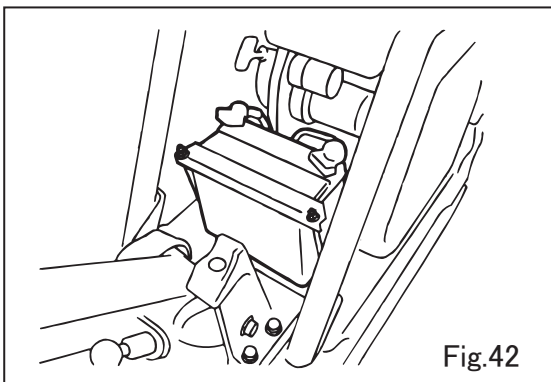
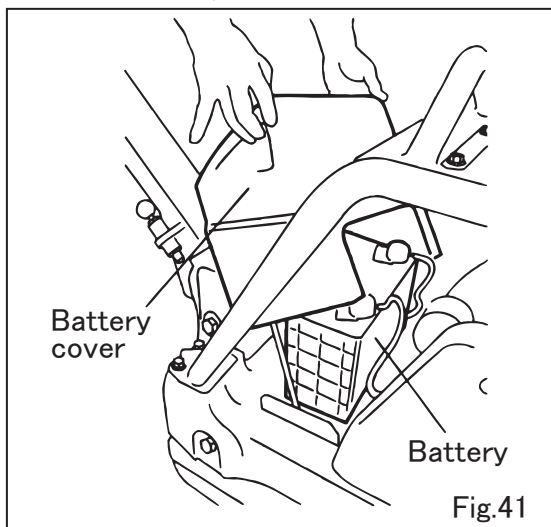
If voltage drops, replace with new battery because rapid charging is not possible.

### a. Removing the battery: (Fig.41,42)

1. With two M8 nuts removed, take off the battery cover.
2. Disconnect the battery terminals, starting with (-) terminal.  
For installation, start with (+) terminal and connect (-) terminal lastly.

**! NOTE:** When removing cables, use care not to allow short circuiting between (+) and (-) terminals.

3. Take out the battery from the machine.



### b. Checking and cleaning the battery:

1. Check the battery for crack or any other damage.
2. Check the terminals for decay.  
If decayed, polish it with wire brush or emery paper, before coating the terminals with grease.
3. Clean the externals of battery.
4. Check and clean the battery stowing space of the machine.

Check vibration isolating mattress as well and replace as necessary.

## 9. When battery runs out

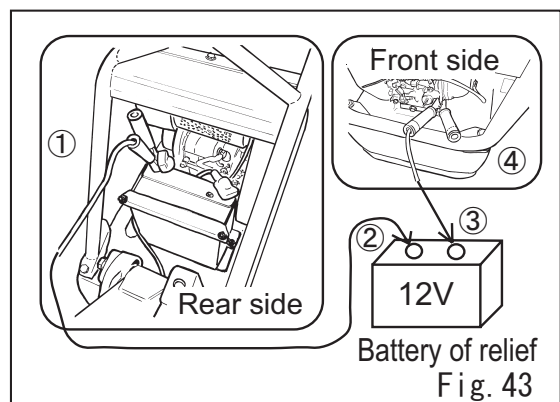
In case starter does not run, or runs slowly or engine does not start shortly, it is one of reason of the battery power shortage.

### How to tentatively solve this situation

- A. Try to start engine with recoil starter
- B. In case the recoil starter can not be used because of breakage, try to start engine connecting the booster cable from the car battery. But car battery should be 12V.

### Connecting procedure of the booster cable ;

- ① (+) battery terminal at Vibrator
- ② (+) battery terminal of the car
- ③ (-) battery terminal of the car
- ④ connect instructed place on (earth)



### ! Warning:

As for connection of ④ booster cable, don't connect this booster cable to the (-) battery terminal of the machine in order to avoid any spark in between a booster cable & (-) battery terminal and also avoid possible explosion of the combustible gas which is generated from the battery liquid.

When handle the booster cable, never touch booster end of (+) and (-).

It causes spark and combustible gas will be generated from the battery and possible be burst.

Never put fire close to the battery.

- C. Disconnection of the booster cable should be conducted with the connecting procedures reversed.

### ! Warning:

During battery recharging, keep away from the battery.

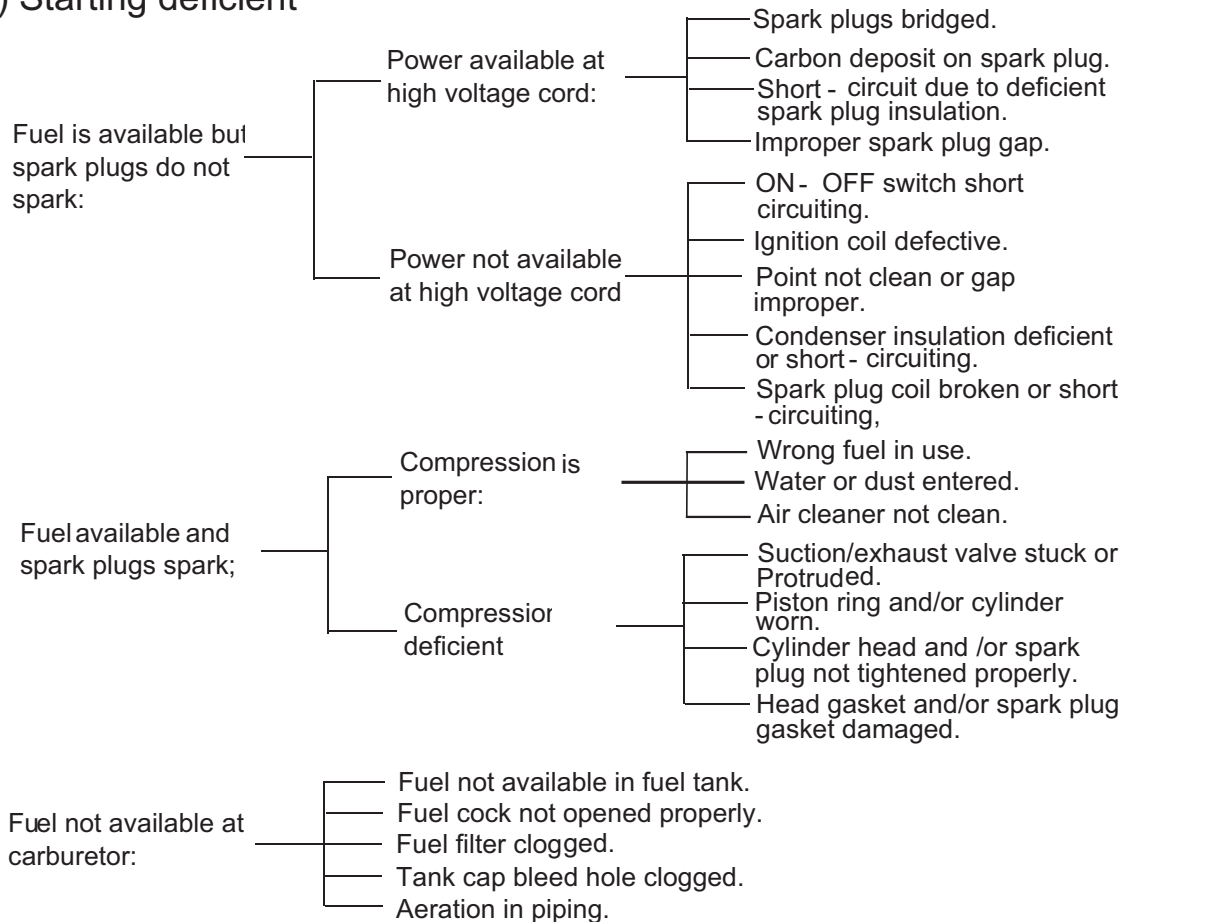
There will be the possibility of coming out the battery liquid which is containing the dilute sulfuric acid and it is danger to have such liquid into eye or on the bear skin.

In case it happens, wash it off with plenty of water and check with the doctor.

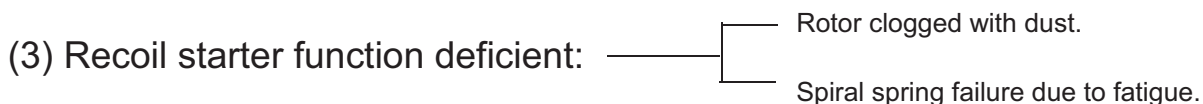
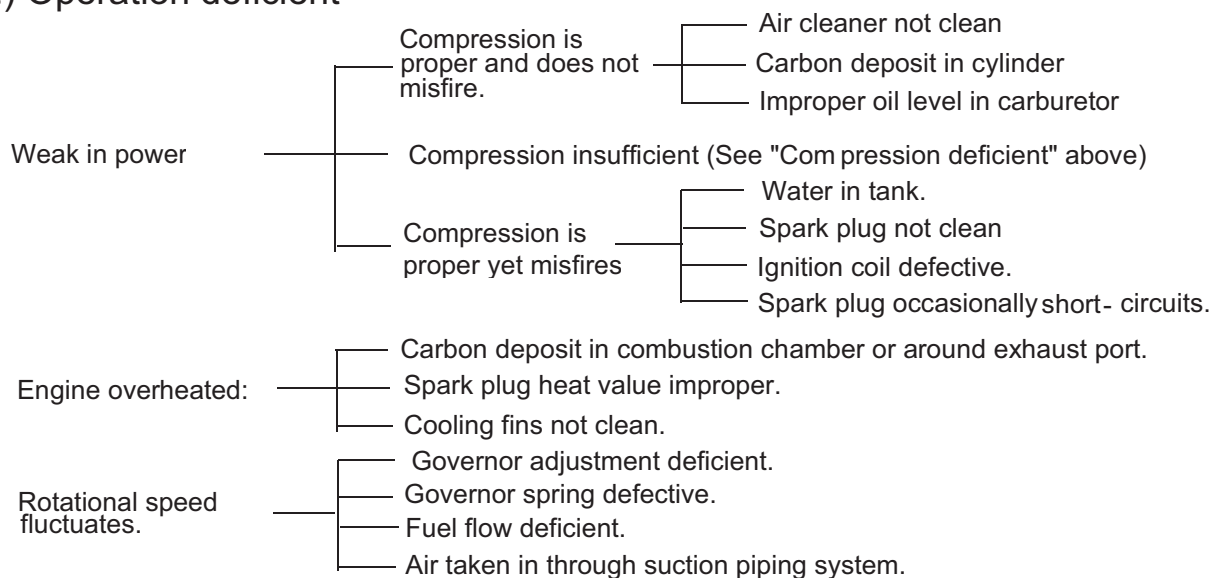
# 7. TROUBLE SHOOTING

## 1. Gasoline Engine

### (1) Starting deficient



### (2) Operation deficient



## 2. Diesel Engine

### (1) Starting deficient

#### (A) Due to deficient compression

No compression available at all — Suction/exhaust valve protruded

Hardly any compression or very little compression available. —

- Seat contact deficient.
- Piston cylinder worn.
- Cylinder worn.
- Improper setting between cylinder and cylinder head.
- Nozzle seat loosened.

#### (B) Improper fuel injection into combustion

Fuel flow is too low or not available. —

- Bleeder hole in tank cap clogged.
- Fuel strainer passage blocked or strainer clogged.
- Fuel strainer cock closed.
- Aeration in the piping. (Occurs particularly when tank is emptied)

Fuel not injected into chamber. —

- Injection pump barrel or plunger clogged.
- Nozzle hole clogged.
- Nozzle needle clogged.

No fuel available in fuel tank.  
Water or trash in the fuel.

#### (C) Fuel and compression are normal yet engine does not start.

Does not reach starting rotational speed. —

- Starting procedure improper.
- Engine oil viscosity too high or deterioration excessive.
- Aeration in piping.

### (2) Insufficient output and deficient operation

Insufficient compression. — See “deficient compression”

Engine overheated and black smoke exhausted. —

- Cooling fins deficient.
- Water entered fuel filter.
- Carbon deposit inside combustion chamber or exhaust hole.
- Smoke setting improper.
- Over loading.
- Injection timing improper.
- Nozzle blocked.

Rotational speed fluctuates. —

- Improper contact between governor fork and sleeve.
- Governor spring deficient.
- Fly plate or sliding part worn and malfunction.

Engine speed does not increase. —

- Valve open /close timing improper.
- Exhaust hole or muffler clogged.
- Over loading.

Misfire accompanying white smoke. (at no-load) —

- Piston, cylinder or ring worn.
- Nozzle hole blocked.
- Piston cylinder stuck.
- Piston ring installation reversed. (Upper and lower.)
- Injection timing deficient.
- Valve open/close timing deficient.
- Injection pump joint loosened.

Fuel consumption too high.  
(Black smoke exhausted) ————

- Leakage from fuel route.
- Air cleaner element clogged.
- Fuel improper with foreign matter entered or the like.
- Over loading.

Sliding part extremely worn or piston ring stuck. ————

- Improper oil in use.
- Oil replacement neglected.
- Air cleaner element damaged or its cleaning neglected.

Suddenly stopped  
accompanying abnormal sound. ———— Piston or rod seizure or damage.

Lubricant diluted with  
volume increasing. ———— Injection pump plunger barrel worn.

Engine does not stop  
even with fuel supply  
discontinued.(or overruns) ————

- Excessive oil.
- Governor system installation improper.
- Injection pump rack came off.

### 3.Machine

Travel speed slow  
and vibration weak. ————

- Engine output deficient and high speed revolution setting improper
- Clutch slips.
- V-belts slips.
- Excessive oil in vibrator.
- Defect in vibrator internals.

Travels forward or  
reverse but  
impossible to  
switch direction. ————

- Reversing parts defective.
- Reversing lever installation deficient
- Oil hose broken.
- Aeration in hydraulic oil for reversing system.
- Check valve in hand pump clogged with dust.
- Piston bearing in cylinder defective.

Does not travel  
either forward nor  
reverse. ————

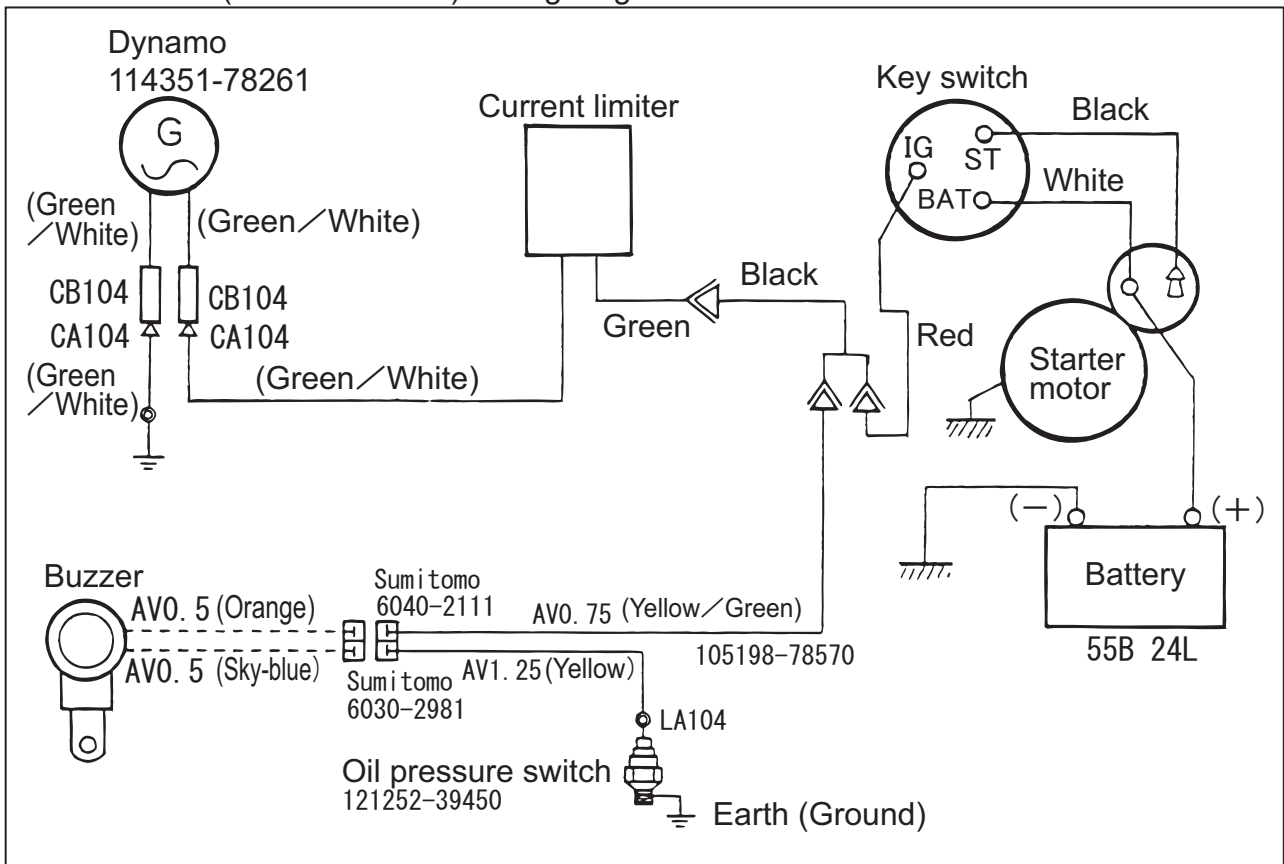
- V-belt disengaged or slips.
- Clutch slips.
- Vibrator locked.
- Piston bearing in cylinder defective.

Travel lever  
operating  
resistance great. ————

- Gall of hand pump piston.
- Gall of vibrator cylinder piston.

# 8. WIRING DIAGRAM

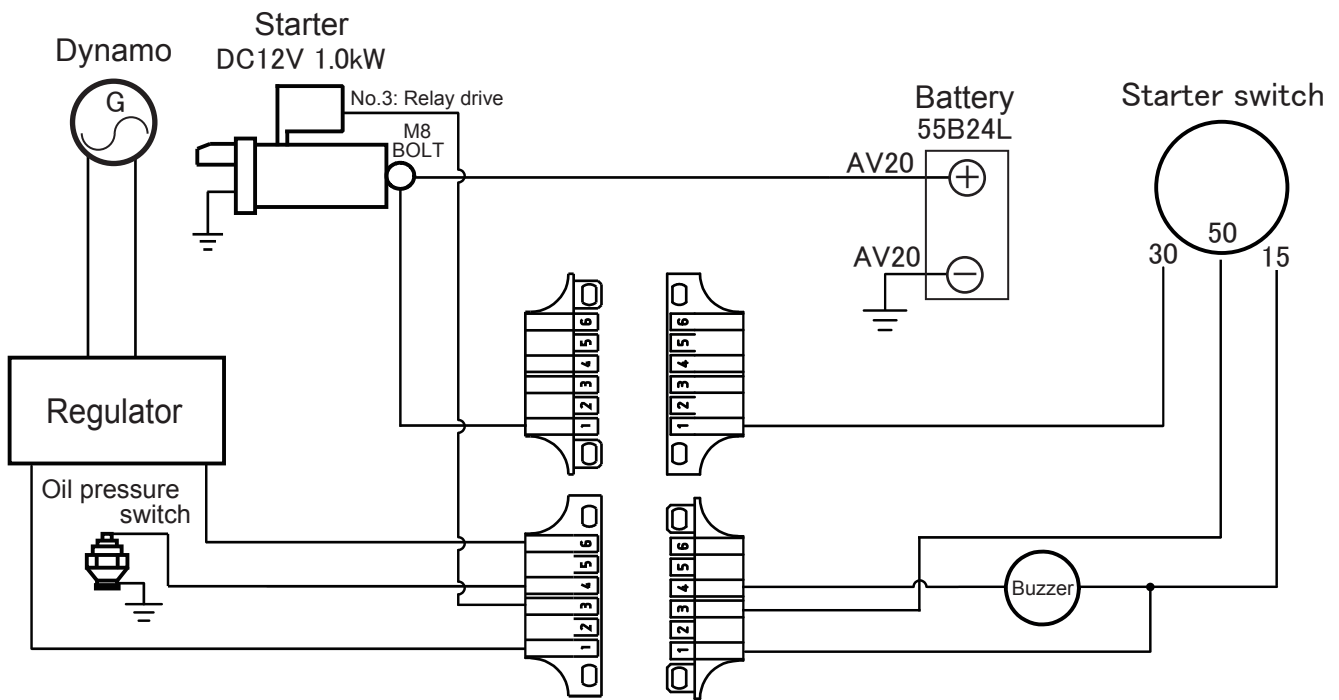
MVH-306DS(YANMAR L70A)Wiring diagram



●Key switch actuation

Terminal Position	BAT	IG	ST
0			
1	○—○		
2	○—○—○		

# MVH-406DSZ









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