MTX SERIES RAMMERS

TOOLS ○ DISASSEMBLY DIAGRAMS ○ TROUBLESHOOTING
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.
# MTX TAMPING RAMMER SERVICE MANUAL

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1. PREFACE

- Please read an instruction manual of a separate volume before work by all means in order to get security of work when I do right driving, maintenance of TAMPING RAMMER and preparation.

- On the handling of an engine, please read an engine instruction manual and a preparation manual of a separate volume.

- This preparation commentary handwriting mentions the point of the resolution / assembling in preparation of TAMPING RAMMER and a preparation standard. You read this preparation commentary handwriting carefully before getting it ready, and please understand enough structure / a function of each part.

- For inquiries about repair parts, parts lists, service manuals, and repair of the machine, please contact Multiquip dealer in your area. In addition, parts lists are available on the MQ Service & Support Center website at: http://service.multiquip.com

2. WARNING LABELS

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.

Precautions (without a triangular mark): Failure to follow the instructions may result in damage to property.

3. PRECAUTIONS FOR SAFETY

3.1 Work area

⚠️ **DANGER**

- Do not work in a poorly ventilated area such as indoors or inside a tunnel. Exhaust from engines contains toxic substances such as carbon monoxide, and it is very dangerous if those poisonous gases and dust are inhaled. Also to maintain better ventilation, keep an appropriate distance from buildings when operating this machine.

⚠️ **CAUTION**

- Do maintenance work in a place with a flat robust surface to keep the machine stable while being maintained. Also select an area with sufficient space for maintenance work.

- Before maintenance work, clean the floor thoroughly. Oil and other soiling left on the floor may cause accidental fall. For maintenance work, make sure the work area is well lighted.

- A portable lamp to illuminate the work site has to be protected by wire. If the lamp breaks, fuel and oil might ignite.

- To prepare for emergency, the work area should be equipped with emergency medical devices and fire extinguishers.
3.2 Clothing and protective gear

DANGER
- To make the work safe, wear work clothes that fit properly, and use protective gear such as a helmet and safety boots appropriate for the work. Work clothes that do not fit might be caught in the rotating parts, leading to an unexpected injury.

3.3 Cautions during refueling

CAUTION
- When refueling, pay attention to the following points.
  - Always refuel in a well ventilated area.
  - Make sure that the engine is stopped. Refuel after the engine cools down.
  - Refuel on a flat surface area with no flammable objects around.
  - Be careful not to spill the fuel. If a spill occurs, wipe it well.
  - Keep away from open fires while refueling. (Smoking is strictly prohibited while refueling.)
- Spills might occur if the fuel is filled to the top. After refueling, tightly close the tank cap by twisting it to the end.

3.4 Preventing burns and accidentally being caught in the machine

WARNING
- Start your work only after the machine cools down completely. The muffler, in particular, gets very hot, and an accidental burn might occur. The engine and engine oil also get very hot, so be careful not to get a burn.
- If you perform maintenance work with the engine running, you might be accidentally caught in the rotating parts such as the clutch and gear. Perform maintenance work after the engine is stopped.

3.5 Tools and equipment, etc

WARNING
- Qualification is required for handling the crane. Only someone qualified to operate a crane and do hooking work can handle the crane.
- Before operating the crane, for safety reasons, check the machine parts (especially the hook and anti-vibration rubber) for any damage and loosened or missing bolts.
- Stop the engine while hoisting.
- Use a sufficiently strong wire rope.
- For safety reasons, do not hoist to a height that is higher than necessary.
- Do not use a wire rope if it is damaged.
- For hoisting, use only the one point hoisting hook, and do not hoist at other parts (such as the handle).
- When using a hydraulic shovel as a crane, never hoist up and down suddenly.
- When the machine is hoisted, never allow people or animals underneath the crane.
- For safety reasons, do not hoist to a height that is higher than necessary. Be careful not to cause accidents while operating the hoisting equipment. Also make sure the hoisting equipment is not malfunctioning.
- Use appropriate tools. Using tools that do not fit the parts will not only damage the parts but also cause unexpected injury.
3.6 Use of genuine parts and genuine oils

⚠️ **CAUTION**
- Always use genuine parts and oils. The use of inappropriate parts will greatly shorten the life of the machine, also resulting in unexpected accidents.

3.7 Tightening torque of bolts and nuts

⚠️ **WARNING**
- For tightening of bolts and nuts, use the tightening torque specified in this maintenance manual. Over-tightening and the lack of torque will not only shorten the life of the machine but also result in unexpected accidents such as breakage and break-down of the machine while in use.

3.8 Handling of wastes

⚠️ **CAUTION**
- Store waste engine oil, lubrication oil and fuel in a container. Never release such wastes on the ground or discharge them in side ditches. Handle them in compliance with the applicable laws and other regulations.

- Be careful not to cause accidents while operating the hoisting equipment. Also make sure the hoisting equipment is not malfunctioning.

- Use appropriate tools. Using tools that do not fit the parts will not only damage the parts but also cause unexpected injury.
1. Wrench 6mm 8mm 10mm 12mm 13mm 14mm 17mm 19mm
   Offset wrench/Socket wrench/Adjustable wrench

2. Hexagonal wrench / Hexagonal socket
   5mm 6mm

3. External snap ring plier/Internal snap ring plier (bent type can be also used)

4. Screwdriver, flat and cross

5. Metal and plastic hammers

6. Sealing compound (Locktite 221 and 242)

7. Molybdenum grease

8. Grease for combination lever C1-Z (P/N:9800-10420)

10. Pressing machine

11. Special tool

Clutch puller “A” (P/N:9810-10400)
Clutch munter (P/N:9830-10060)
Piston rod holder (P/N:9839-10090)
Socket head bolt 8x50 (Crank gear remover) (P/N:0091-10044)

Clutch puller “B” (P/N:9839-10020)
Spring cylinder remover (P/N:9830-10040)
Piston end remover (P/N:9839-10010)
5. INSPECTION PROCEDURE

5.1 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 operation manual for the engine)
   B. Main body oil (SAE10W-30 when shipped) (See table 1)
(4) Shock rubber for damage, crack, fatigue, hardening, etc.

5.2 Operating test
(1) Check for engine speed. (Idling and Operating speed)
(2) Check for abnormal noise and jump during operation.

6. ENGINE AND OIL

<table>
<thead>
<tr>
<th></th>
<th>MTX-60</th>
<th>MTX-70</th>
<th>MTX-80</th>
<th>MTX-90</th>
</tr>
</thead>
<tbody>
<tr>
<td>Engine type</td>
<td>Honda</td>
<td>Robin</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>GX100U-KRBF</td>
<td>EH12-2D46530</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Setting speed</td>
<td>rpm</td>
<td>3800 - 4100</td>
<td>3800 - 4100</td>
<td>3400 - 3600</td>
</tr>
<tr>
<td>Fuel tank capacity</td>
<td>liters (quart)</td>
<td>2 (2.1)</td>
<td></td>
<td>3 (3.2)</td>
</tr>
<tr>
<td>Lubricant for Body</td>
<td></td>
<td></td>
<td>Automobile Oil SAE 10W-30; Class SE or higher</td>
<td></td>
</tr>
<tr>
<td>Capacity of Lubricant for Body</td>
<td>liters (quart)</td>
<td>0.65 (0.69)</td>
<td></td>
<td>0.82 (0.87)</td>
</tr>
<tr>
<td>Lubricant for Engine</td>
<td></td>
<td></td>
<td>Automobile Oil SAE 10W-30; Class SE or higher</td>
<td></td>
</tr>
<tr>
<td>Capacity of Lubricant for Engine</td>
<td>liters (quart)</td>
<td>0.28 (0.30)</td>
<td></td>
<td>0.4 (0.42)</td>
</tr>
<tr>
<td>Fuel</td>
<td></td>
<td></td>
<td></td>
<td>Unleaded Gasoline</td>
</tr>
</tbody>
</table>

Table 1
7. RULES FOR CONDUCTING SERVICE WORK

(1) Before removing or disassembly any parts or component, be sure to know exactly how it was installed or assembled.
(2) Disassembly work should be conducted working space where it is free from dust.
(3) Protect the parts or component with sheet to avoid smearing or damaging during service work.
(4) Use proper tools and genuine parts in proper manner.
(5) Level check or replacement of oil for main body and engine should be carried out on level ground.
(6) Replace the disassembled O-ring, oil seal, packing, gasket or the like with new one.
(7) Do not reuse any bolts which it has been heated for disassembly.
(8) Use the specified standard tightening torque (See Table 2) and bonding agent (Loctite#221 and #242 or the like) when tightening the bolts and nuts. And clean the bolts and nuts before tightening them or coating with bonding agent to them.

Standard torque table

<table>
<thead>
<tr>
<th>Screw diameter</th>
<th>The caller screws materials</th>
<th>Aluminum type</th>
<th>SS,FCD, Aluminum type+Helisert</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>M6</td>
<td>N·m</td>
<td>11.8 - 14.7</td>
<td>14.7 - 17.7</td>
</tr>
<tr>
<td></td>
<td>Kgf·cm</td>
<td>120 - 150</td>
<td>150 - 180</td>
</tr>
<tr>
<td></td>
<td>ft·lbf</td>
<td>8.7 - 10.8</td>
<td>10.8 - 13.0</td>
</tr>
<tr>
<td>M8</td>
<td>N·m</td>
<td>24.5 - 29.4</td>
<td>32.4 - 35.3</td>
</tr>
<tr>
<td></td>
<td>Kgf·cm</td>
<td>250 - 300</td>
<td>330 - 360</td>
</tr>
<tr>
<td></td>
<td>ft·lbf</td>
<td>18.1 - 21.7</td>
<td>23.9 - 26.0</td>
</tr>
<tr>
<td>M10</td>
<td>N·m</td>
<td>58.8 - 68.6</td>
<td>73.5 - 78.5</td>
</tr>
<tr>
<td></td>
<td>Kgf·cm</td>
<td>600 - 700</td>
<td>750 - 800</td>
</tr>
<tr>
<td></td>
<td>ft·lbf</td>
<td>43.4 - 50.6</td>
<td>54.2 - 57.9</td>
</tr>
<tr>
<td>M12</td>
<td>N·m</td>
<td>98.1 - 107.9</td>
<td>112.8 - 122.6</td>
</tr>
<tr>
<td></td>
<td>Kgf·cm</td>
<td>1000 - 1100</td>
<td>1150 - 1250</td>
</tr>
<tr>
<td></td>
<td>ft·lbf</td>
<td>72.3 - 79.6</td>
<td>83.2 - 90.4</td>
</tr>
<tr>
<td>M14</td>
<td>N·m</td>
<td>117.7 - 127.5</td>
<td>166.7 - 176.5</td>
</tr>
<tr>
<td></td>
<td>Kgf·cm</td>
<td>1200 - 1300</td>
<td>1700 - 1800</td>
</tr>
<tr>
<td></td>
<td>ft·lbf</td>
<td>86.8 - 94.4</td>
<td>123.0 - 130.2</td>
</tr>
</tbody>
</table>

Table 2 Standard torque table
8. DISASSEMBLY AND REASSEMBLY

8.1 Disassembly and reassembly the Engine

MTX-60
MTX-70
(Figure is MTX-70)

MTX-80
MTX-90

fig. 1
(1) Disassembly

A. Remove the EX bar (57) by unscrewing 4 pcs bolts (58).

B. Remove the muffler guard (52) and the link guard (51) by unscrewing 4 pcs bolts (63) and 2 pcs bolts (56).

C. Remove the engine guard (60) as per following terms
i) In case of MTX-60 / 70
Remove the engine guard (60) by unscrewing 4 pcs bolts (61).

<table>
<thead>
<tr>
<th>No.</th>
<th>Size</th>
<th>Tightening Torque</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>61</td>
<td>Socket Head Bolt M8X30</td>
<td>17.6N•m (13.0ft-lbf)</td>
<td>Apply Loctite #221</td>
</tr>
</tbody>
</table>

ii) In case of MTX-80 / 90
Remove the engine guard (60) by unscrewing 4 pcs nuts (65) and 2 pcs bolts (72).

<table>
<thead>
<tr>
<th>No.</th>
<th>Size</th>
<th>Tightening Torque</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>65</td>
<td>Nut M8</td>
<td>19.6N•m (14.5ft-lbf)</td>
<td>Apply Loctite #221</td>
</tr>
<tr>
<td>72</td>
<td>Socket Head Bolt M8X20</td>
<td>19.6N•m (14.5ft-lbf)</td>
<td></td>
</tr>
</tbody>
</table>

D. Disconnect the fuel hose from the carburetor side. Disconnect the wire harness of combination lever and the curl cord of hour & tachometer from the engine. (fig.2)

E. Remove the speed control wire by loosening a pan head screw and 2 pcs M6 nuts. (fig.3)

F. Remove the intake pipe (34) by loosening a flat screw of cyclone clamp (35).

G. Remove the engine as per following terms.
   i) In case of MTX-60 / 70
   Remove the engine from the crankcase slowly by having it firmly with both of hands.

<table>
<thead>
<tr>
<th>No.</th>
<th>Size</th>
<th>Tightening Torque</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>29</td>
<td>Flange Nut M10</td>
<td>53.9N•m (39.8ft-lbf)</td>
<td></td>
</tr>
</tbody>
</table>

   ii) In case of MTX-80 / 90
   i) Unscrew 4 pcs nuts (29) and remove the engine from the crankcase slowly by having it firmly with both of hands.

<table>
<thead>
<tr>
<th>No.</th>
<th>Size</th>
<th>Tightening Torque</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>28</td>
<td>Flange Bolt M10X40</td>
<td>22.5N•m (16.6ft-lbf)</td>
<td>MTX-60</td>
</tr>
<tr>
<td></td>
<td>Flange Bolt M10X30</td>
<td>22.5N•m (16.6ft-lbf)</td>
<td>MTX-70</td>
</tr>
</tbody>
</table>

   ii) Unscrew 2 pcs flange nuts (27) and 2 pcs bolts (28), and remove the engine from the crankcase slowly by having it firmly with both of hands.

<table>
<thead>
<tr>
<th>No.</th>
<th>Size</th>
<th>Tightening Torque</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>27</td>
<td>Flange Nut M10</td>
<td>53.9N•m (39.8ft-lbf)</td>
<td></td>
</tr>
<tr>
<td>28</td>
<td>Bolt M10X70</td>
<td>53.9N•m (39.8ft-lbf)</td>
<td></td>
</tr>
</tbody>
</table>

   (2) Remove the engine flange (26) from the crank case by unscrewing 4 pcs flange bolts (29).

<table>
<thead>
<tr>
<th>No.</th>
<th>Size</th>
<th>Tightening Torque</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>29</td>
<td>Flange Bolt M8X30</td>
<td>19.6N•m (14.5ft-lbf)</td>
<td></td>
</tr>
</tbody>
</table>
H. Unscrew a bolt (25) which is fixing the clutch. Then, assemble the clutch puller B (P/N:9839-10020) to the clutch by tightening 4 pcs pan head screws, and tighten the center bolt B to the crankshaft of engine. (fig.4)

I. In addition, assemble the clutch puller A (P/N:9810-10400) to the clutch puller B by tightening 2 pcs bolts A, and tighten the center bolt A. (fig.5)

J. Remove the clutch by shocking the top end of center bolt A with plastic hammer. (fig.6) If it doesn’t remove, shock it after tightening the center bolt A again.

(2) Reassembly
Reassemble with the reversed procedure of disassembly with attention to the following terms.
A. Replace the clutch with new one, if it is damaged.
B. Degrease the engine shaft when assembling the clutch.
C. Tighten a bolt which is fixing the clutch by fixing the clutch with the clutch mounter (P/N:9830-10060). (fig.7)

<table>
<thead>
<tr>
<th>No.</th>
<th>Size</th>
<th>Tightening torque</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>25</td>
<td>Bolt M8X25</td>
<td>32.4N·m (23.9ft·lbf)</td>
<td>Apply Loctite #221</td>
</tr>
</tbody>
</table>

D. Adjust the operating speed of engine as table 1.
E. The well nut (53, 59) is tightened by compressing the rubber of it when is tightening the bolt. (fig.8)

Disassembling the engine is completed above.
8.2 Disassembly and reassembly the guide cylinder and the spring cylinder.

(1) Disassembly
A. Unscrew 4 pcs bolts (22) which is fixing the crankcase and the guide cylinder.

<table>
<thead>
<tr>
<th>No.</th>
<th>Size</th>
<th>Tightening torque</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>22</td>
<td>Bolt M10X35, SW</td>
<td>53.9N·m (39.8ft-lbf)</td>
<td>Apply Loctite #221</td>
</tr>
</tbody>
</table>

B. Lift the crankcase and separate the connecting rod and the piston rod by removing the piston pin (1). (fig.10)

C. Drain oil from drain plug (17).

<table>
<thead>
<tr>
<th>No.</th>
<th>Size</th>
<th>Tightening torque</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>17</td>
<td>Oil Drain Plug</td>
<td>39.2N·m (28.9ft-lbf)</td>
<td></td>
</tr>
<tr>
<td>30</td>
<td>Oil Fill Plug</td>
<td>39.2N·m (28.9ft-lbf)</td>
<td></td>
</tr>
</tbody>
</table>

D. Remove the guide cylinder (20) by removing a clamp (25) for the upper bellows (25) after removing the nut (28), bolt (27) and pin (29), which fixing it.
(There is no pin (29) on the MTX-60.)

<table>
<thead>
<tr>
<th>No.</th>
<th>Size</th>
<th>Tightening torque</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>27</td>
<td>Bolt M8X40</td>
<td>12.7N·m (9.4ft-lbf)</td>
<td></td>
</tr>
<tr>
<td>28</td>
<td>Nut M8</td>
<td>12.7N·m (9.4ft-lbf)</td>
<td></td>
</tr>
</tbody>
</table>

E. Remove the bellows (23) by removing a clamp (25) for the lower bellows after removing the nut (28), bolt (27) and pin (29), which fixing it.
(There is no pin (29) on the MTX-60.)

<table>
<thead>
<tr>
<th>No.</th>
<th>Size</th>
<th>Tightening torque</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>27</td>
<td>Bolt M8X40</td>
<td>12.7N·m (9.4ft-lbf)</td>
<td></td>
</tr>
<tr>
<td>28</td>
<td>Nut M8</td>
<td>12.7N·m (9.4ft-lbf)</td>
<td></td>
</tr>
</tbody>
</table>

F. Remove the foot assembly by unscrewing 4 pcs M12 nylon nuts. (fig.11)

<table>
<thead>
<tr>
<th>No.</th>
<th>Size</th>
<th>Tightening torque</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>38</td>
<td>Nylon Nut M12</td>
<td>78.4N·m (57.8ft-lbf)</td>
<td></td>
</tr>
</tbody>
</table>

G. Remove the foot plate from the protection sleeve (51) as per following procedure.
i) In case of MTX-60
1) Unscrew 2 pcs bolts which marked foot plate. (fig.12) Assemble the spring cylinder remover(P/N: 9830-10040) there. Then, unscrew 6 pcs remaining bolts after tightening the center bolt of the spring cylinder remover.

<table>
<thead>
<tr>
<th>No.</th>
<th>Size</th>
<th>Tightening torque</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>15</td>
<td>Socket Head Bolt M10X20</td>
<td>68.6N·m (50.6ft-lbf)</td>
<td>Apply Loctite #221</td>
</tr>
<tr>
<td>16</td>
<td>Socket Head Bolt M8X40</td>
<td>24.5N·m (18.1ft-lbf)</td>
<td>Apply Loctite #221</td>
</tr>
</tbody>
</table>
i) In case of MTX-70 / 80 / 90
1) Unscrew 2 pcs bolts which marked foot plate. (fig.12)
Assemble the spring cylinder remover(P/N: 9830-10040) there. Then, unscrew 6 pcs remaining bolts after tightening the center bolt of the spring cylinder remover.

<table>
<thead>
<tr>
<th>No.</th>
<th>Size</th>
<th>Tightening Torque</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>15</td>
<td>Socket Head Bolt M10X20</td>
<td>68.6N·m (50.6ft·lbf)</td>
<td>Apply Loctite #221</td>
</tr>
<tr>
<td>16</td>
<td>Socket Head Bolt M10X40</td>
<td>53.9N·m (39.8ft·lbf)</td>
<td>Apply Loctite #221</td>
</tr>
</tbody>
</table>

MTX-60
Backside of "Foot plate"
Front (Front cover side)

Mark
Special tool wearing point
Rear (Engine side)

MTX-70 / 80 / 90
Backside of "Foot plate"
Front (Front cover side)

Mark
Special tool wearing point
Rear (Engine side)

<table>
<thead>
<tr>
<th>No.</th>
<th>Size</th>
<th>Tightening Torque</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>Bolt M12X30 (Fine Pitch Thread)</td>
<td>117.6N·m (83.7ft·lbf)</td>
<td>Apply Loctite #221</td>
</tr>
</tbody>
</table>

2) Loosening the center bolt of the spring cylinder remover slowly will remove the foot plate (13). (fig.13)
Remove the spring cylinder remover when decreasing pressure of main springs (9). Then, remove the lower main springs (9) and lower stopper (8).

H. Load the piston rod holder (P/N:9839-10030) to the vice, and put the spring cylinder assembly which removed the foot plate upside down to it. Then, remove the bolt (5), SW and PW, which fixing the piston end (4). (fig.14)

I. Assemble the piston end remover (P/N:9839-10010) to the piston end(4), and tightening the center bolt of it. (fig.15)
J. Remove the piston end (4) by shocking the top end of center bolt with the plastic hammer. (fig.16)
If it doesn’t remove, shock it after tightening the center bolt again.

K. Remove the protection sleeve (51) from the spring cylinder (12). (fig.17)

Disassembling the guide cylinder and spring cylinder are completed above.

(2) Reassembly
Reassemble with the reversed procedure of disassembly with attention to the following terms.

A. Replace the disassembled O-ring with new one.
B. Replace the main spring (9) as a set with upper and lower when replacing it
C. Replace the bellows (23) with new one, if it is damaged.
D. The bellows (23) is easy to install by applying grease to inner wall of its opening.
E. Be careful not to pinch and to twist the O-ring when assembling the spring cylinder (12) and guide cylinder (20).
F. Apply molybdenum grease to inner sliding parts of spring cylinder (12), guide cylinder (20) and main spring (9) before assembling them.
G. Assemble the foot plate (13) to the spring cylinder (12) with the spring cylinder remover (P/N:9830-10040) after fitting position of the oil drain plug (17) of foot plate and the oil fill

8.3 Disassembly and reassembly the crankcase.

A. Remove the engine assembly as per 8-1.
B. Separate the crankcase and the guide cylinder as per 8-2.
C. Remove the handle assembly by unscrewing 4 pcs bolts (4) which fixing it.
D. Remove the air cleaner assembly (33) by unscrewing 2 pcs bolts (40) and 2 pcs bolts (39), which is fixing it. (fig.19)

<table>
<thead>
<tr>
<th>No.</th>
<th>Size</th>
<th>Tightening torque</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>39</td>
<td>Bolt M8X55</td>
<td>24.5N•m (18.1ft-lbf)</td>
<td></td>
</tr>
<tr>
<td>40</td>
<td>Bolt M8X15</td>
<td>24.5N•m (18.1ft-lbf)</td>
<td></td>
</tr>
</tbody>
</table>
E. Remove the shock absorber bracket (31) by unscrewing 4 pcs bolts (32) which fixing it. (fig.20)

<table>
<thead>
<tr>
<th>No.</th>
<th>Size</th>
<th>Tightening torque</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>32</td>
<td>Bolt M10X30,SW</td>
<td>53.9N·m (39.8ft·lbf)</td>
<td>Apply Loctite #221</td>
</tr>
</tbody>
</table>

F. Remove the front cover (106) by shocking it with the plastic hammer after unscrewing 8 pcs bolts (21) which fixing it. (fig.21)

<table>
<thead>
<tr>
<th>No.</th>
<th>Size</th>
<th>Tightening torque</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>21</td>
<td>Socket Head Bolt M8X25</td>
<td>24.5N·m (18.1ft·lbf)</td>
<td>Apply Loctite #242</td>
</tr>
</tbody>
</table>

G. Remove the stop ring (11) which fixing bearing (10) through the hole of crank gear (101) with the snap ring plier. (fig.22)

H. Remove the crank gear by tightening 2 pcs M8x50 full threaded bolts (P/N:0091-10044) to threaded holes which installed in the crank gear evenly, after fitting position of the top end of bolts and the ribs of front cover which had three o’clock and nine o’clock positions. (fig.23)

I. Remove the connecting rod (14) from crank gear (101) with the pulley puller after removing the stop ring (17).

J. Remove the bearing (9) from the connecting rod with the press after removing the stop ring (16). (fig.24)

K. Remove the pinion drum (4) from the crank case (1) with the press after removing the stop ring (7). (fig.25)

Disassembling the crank case is completed above.

(2) Reassembly
Reassemble with the reversed procedure of disassembly with attention to the following terms.

A. Be careful not to pinch fingers between the crank case and the front cover.

B. Apply molybdenum grease to contact surface of oil seal, O-ring, tooth face of pinion gear and crank gear.
8.4 Disassembly and reassembly the handle.

(1) Disassembly
A. Remove the fuel tank (10) from the handle by unscrewing 3 pcs bolts (11) after disconnecting the fuel hose (19).

B. Unscrew 2 pcs tapping screws (22) which fixing the meter finisher from the underside of the fuel tank, and remove the hour & tachometer and the meter finisher at the same time because they are tightening at the same time.

C. In case of replacing the fuel filter (14) which installed in the fuel tank, remove the fuel filter holder (16) by unscrewing 3 pcs nuts (17) which is fixing it.

(2) Reassembly
Reassemble with the reversed procedure of disassembly with attention to the following terms.

A. Replace the damaged fuel hoses (19, 103, 104) with new one.

B. Be careful not too tightening the tapping screws (22) which is fixing the hour & tachometer and the meter finisher because the threaded holes of the meter finisher made by plastic is broken by over tightening torque.

8.5 Disassembly and reassembly the combination lever

5-1 Disassembly and reassembly the throttle wire
(1) Disassembly
A. In case of removing the throttle wire (5), move to idling position of the lever (2) (fig.28)

B. Remove the end cap (11) and unscrew a bolt (10) and 2 pcs nuts (8).

C. Remove the slider (9) and the inner wire from there.

D. Remove the outer wire by unscrewing 2 pcs nuts (7) after removing the wire cap (6).

(2) Reassembly
Reassemble with the reversed procedure of disassembly.

5-2 Disassembly and reassembly the fuel cock
(1) Disassembly
A. In case of removing the fuel cock (3), move to high speed position of the lever (2) ready. (fig.29)
Never disassemble the stop switch (4).

**CAUTION**

B. Remove the fuel cock (3) by unscrewing 2 pcs tapping screw (16). (fig.30)

<table>
<thead>
<tr>
<th>No.</th>
<th>Size</th>
<th>Tightening torque</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>16</td>
<td>Tapping Screw M4X12</td>
<td>0.78N·m (0.58ft-lbf)</td>
<td></td>
</tr>
</tbody>
</table>

(2) Reassembly
Reassemble with the reversed procedure of disassembly with attention to the following terms.

A. Assemble the fuel cock after fitting the position of groove between the fuel cock and the stop switch.

B. Apply grease for combination lever (P/N:9800 -10420) to the O-ring (19), the groove and the gear of the stop switch.

C. In case of the threaded hole was broken by too over screwing the tapping screw M4X12 (16), it is available by M4X16.

D. In case of the threaded hole was broken by too over screwing the tapping screw M4X30 (19), it is available by M4X34.

5-4 Disassembly and reassembly the lever
(1) Disassembly
Remove the lever (2) by unscrewing a bolt (12) after unscrewing a bolt (14). (fig.32)

(2) Reassembly
Reassemble with the reversed procedure of disassembly with attention to the following terms.

A. Be careful the way of dick springs as per fig.33 when assembling the lever.

<table>
<thead>
<tr>
<th>No.</th>
<th>Size</th>
<th>Tightening torque</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>12</td>
<td>Socket head bolt M8×35</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Dick springs

Lever

Socket head bolt M8×35

fig.33
9. PERIODIC CHECKS AND ADJUSTMENTS

9.1 Table of scheduled checks

<table>
<thead>
<tr>
<th>How often?</th>
<th>Place to check</th>
<th>Item to check</th>
<th>Oil etc.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Daily (before starting operation)</td>
<td>Appearance</td>
<td>Flaws, deformity, dirt</td>
<td>Engine oil</td>
</tr>
<tr>
<td></td>
<td>Air cleaner</td>
<td>Dirt, flaws, deformation</td>
<td>Engine oil</td>
</tr>
<tr>
<td></td>
<td>Bolts, nuts</td>
<td>Loose or missing parts</td>
<td>Engine oil</td>
</tr>
<tr>
<td></td>
<td>Handle</td>
<td>Flaws, deformity, cracks, damage</td>
<td>Gasoline</td>
</tr>
<tr>
<td></td>
<td>Rubber damper</td>
<td>Wear, deformity, cracks, damage</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Engine oil</td>
<td>Dirt, oil level</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Lubrication oil in the main body</td>
<td>Dirt, oil level</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Fuel tank</td>
<td>Leaks, fuel level, dirt</td>
<td>Engine oil</td>
</tr>
<tr>
<td></td>
<td>Fuel system</td>
<td>Leaks, wear, looseness</td>
<td>Engine oil</td>
</tr>
<tr>
<td>After first 20 hours</td>
<td>Engine oil</td>
<td>Replace once, after the first 20 hours</td>
<td>Engine oil</td>
</tr>
<tr>
<td>Every 50 hours</td>
<td>Spark plug</td>
<td>Clean, adjust gap</td>
<td>Engine oil</td>
</tr>
<tr>
<td></td>
<td>Engine oil</td>
<td>Replace</td>
<td>Engine oil</td>
</tr>
<tr>
<td>Every 200 hours</td>
<td>Lubrication oil in the main body</td>
<td>Replace</td>
<td>Engine oil</td>
</tr>
<tr>
<td>Every 200 to 300 hours</td>
<td>Pre-air cleaner (primary element)</td>
<td>Cleaning</td>
<td>Lamp kerosene</td>
</tr>
<tr>
<td>Every 2 years</td>
<td>Fuel hose</td>
<td>Replace</td>
<td></td>
</tr>
</tbody>
</table>

9.2 Periodic checks and adjustments

(1) Daily maintenance
Carefully wipe off any mud, dirt or oil from each component.
If oil leaks, retighten the joints and check again.

(2) Maintenance after every 50 hours of operation
Remove the fuel filter cup and clean the inside thoroughly. (fig.34)
Remove the spark plug and clean it. Then adjust the gap to 0.6 to 0.7 mm.

(3) Replacing the lubrication oil
Remove the drain plug on the lower part of the machine body and drain the oil inside. Then add the specified amount of new oil. (fig.35)
(4) Cleaning the air cleaner
Remove the upper air cleaner cover on the main body. Loosen and remove the 2 Phillips screws that hold the cover on the air cleaner assembly.

A. Primary element (clean every 80 to 100 hours)
If the primary element is dirty, wash it with gasoline or lamp kerosene. Then, dip it in engine oil SAE10W-30 and wring it out. (Wring the element so that 25 to 30 cc of engine oil remains in the element.) (fig.36)

B. Secondary element (clean every 100 to 150 hours)
When the secondary element (under the primary element) becomes dirty, wash it with neutral detergent solution and dry it well. Then reuse it. (fig.37,38)

(5) Be sure to check the fuel line for damaged or looseness.
Replace the fuel line every 2 years, even if it does not show any abnormality.

(6) Cleaning the machine body
If you want to clean the machine body using high-pressure steam, do not spray water directly into the air cleaner, carburetor, muffler, or top of the fuel tank. Otherwise engine problems may occur.
## 10. TROUBLESHOOTING

### Engine

#### 1. Won’t start

<table>
<thead>
<tr>
<th>Condition of Fuel and Spark</th>
<th>Cause</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fuel present but no spark</td>
<td>Electricity is being supplied to the high voltage cable.</td>
</tr>
<tr>
<td>Fuel and spark both present</td>
<td>Compression is good</td>
</tr>
<tr>
<td>Fuel is not supplied to the carburetor</td>
<td>No fuel in the fuel tank.</td>
</tr>
</tbody>
</table>

#### 2. Faulty operation

<table>
<thead>
<tr>
<th>Condition</th>
<th>Cause</th>
</tr>
</thead>
<tbody>
<tr>
<td>Too little power</td>
<td>Good compression and no misfiring</td>
</tr>
<tr>
<td>Too low compression (See “Compression in low” above)</td>
<td>Faulty compression but misfires</td>
</tr>
<tr>
<td>Engine overheats</td>
<td>Excessive accumulation of carbon in the combustion chamber.</td>
</tr>
<tr>
<td>Smoke comes from the muffler</td>
<td>Black smoke</td>
</tr>
<tr>
<td>White smoke</td>
<td>Moisture in the gasoline.</td>
</tr>
</tbody>
</table>

(In the winter, the machine may emit white smoke for a while when first started in the morning. This is not abnormal.)