1. REFERENCE INFOMATION

1 -1. Principle of The Impact Wrench

When bolts are tightened or loosened with a wrench, they can be tightened with a stronger force than by hand if the wrench arm is tapped with a hammer. (Fig. 3)

The tightening torque (or loosening torque) increases as the hammer striking force and number are increased. The above operation done mechanically by the impact wrench. Tightening torque strength with the impact wrench is determined not by motor size, but by the hammer striking force strength and the transmission efficiency of the striking force.

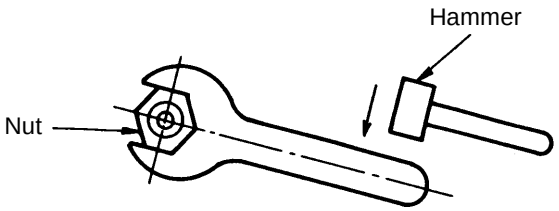


Fig. 3

1-2. High Tension Bolt and Tightening Torque

The high tension bolt tightening torque is determined by the bolt diameter, grade and torque coefficient (obtained by the friction coefficients of screw, nut and washer) .

Table 5 shows an example of the tightening torque range of high tension bolts available on the market.

Table 5

Grade / Nominal diameter	F10T	
	Type A	Type B
M16		29 - 32 kg-m
M20		57 - 62 kg-m
M22	58 - 64 kg-m	
M24	71 - 82 kg-m	

1-3. Torque coefficient of High Tension Bolt

When you buy a high tension bolt, you will find its torque coefficient printed on the box.

The relationship between the torque coefficient and optimum tightening torque is as follows:

$$T = \frac{K \times D \times N}{1000}$$

K: Torque coefficient
D: Screw diameter (mm)
N: Tightening force (kg)
T: Tightening torque (kg-m)

Therefore, a bolt of high torque coefficient requires a large torque (T) to obtain the same tightening force, while a bolt of low torque coefficient requires a small torque to obtain the same tightening force. Torque coefficients are distinguished as Types A and B. The torque coefficient of an actual bolt is 0.113-0.129 in type A, for example, and 0.151-0.166 in type B.

2. PRECAUTIONS ON DISASSEMBLY AND REASSEMBLY

The circled numbers in the descriptions below correspond to the part numbers in the Parts List and exploded diagram for Type WH16, while those in parentheses are for Type WH22.

2-1. Disassembly

(1) Housing

a) Removing the Armature Ass'y

Loosen the M4 x 10 ⊕-Hd. Tapping Screw ㊵ (52), and remove the Cap Cover ㊶ (53). Remove the Brush Cap ㊷ (54), and take out the Carbon Brush ㊸ (55). Loosen the four M5 Hexagon Socket-Hd. Bolts ㉙ (32), and separate the Inner Cover ⑮ (17) from the Housing Ass'y ㉔ (27). The Armature Ass'y ⑲ (21) can then be removed. Take care not to lose the Felt Packing ⑯ (18) and Packing Washer ⑰ (19). In the Type WH16, take care not to lose the Rubber Washer ㊼ mounted by the ball bearing at the tail cover side of the Armature Ass'y

b) Removing the Switch

Loosen the two M4 x 35 ⊕-Hd. Tapping Screws w/washers ㊶ (43). Then, by removing the M3.5 x 5 ⊕-Hd. Machine Screws w/washers ㊹ (48), the Handle Cover ㊹ (45), Switch Holder ㊼ (49), and Switch ㊹ (46) can be disassembled. At this time, be very careful not to lose the Switch Adapter ㊺ (47).

(2) Hammer Case Ass'y Portion

a) Removing the Hammer Case Ass'y

Support the Hammer Case Ass'y ③ (3), and tap the end of Anvil (A) ④ (5) lightly with a wooden hammer to remove the hammer case.

b) Removing the Anvil

When the Hammer Case Ass'y ③ (3) has been removed, Anvil (A) ④ (5) can be removed from the hammer case bearing portion. In the Type WH22, take care not to lose Washer (A) (4).

c) Removing the Spring (See Fig. 4)

with a hand press or similar tool, press down on the clickend of the Hammer ⑥ (7) until the Spring ⑦ (8) is fully compressed. Then, remove the two Steel Balls ⑤ (6) (WH16: ϕ 6.35, WH22: ϕ 7.14) from the cam groove portion of the Spindle ⑪ (12) and Hammer ⑥ (7) with a screwdriver or similar tool. Release the hand press, and remove the Hammer ⑥ (7) from the Spindle ⑪ (12). The Spring ⑦ (8) can then be removed. At this time, take care not to lose the 22 Steel Balls ⑨ (10) (WH16: ϕ 3.175, WH22: ϕ 3.969) which are located between the Spindle ⑪ (12) and the Spring Seat ⑧ (9).

d) Removing the Ring Gear ⑬ (15)

To remove the Ring Gear ⑬ (15) from the Hammer Case Ass'y ③ (3), tap lightly on the end of the hammer case with a wooden hammer. If it cannot be easily removed, heat the Hammer Case Ass'y before tapping it with the wooden hammer.

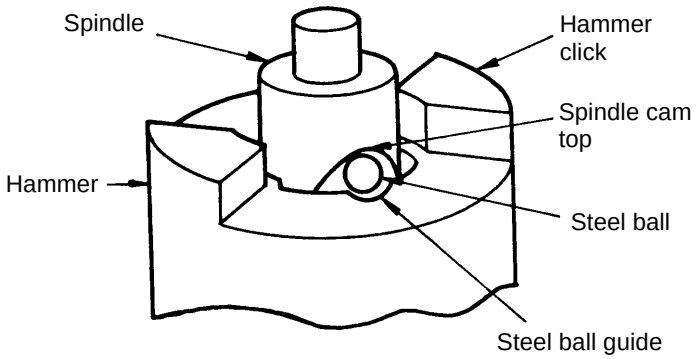


Fig. 4

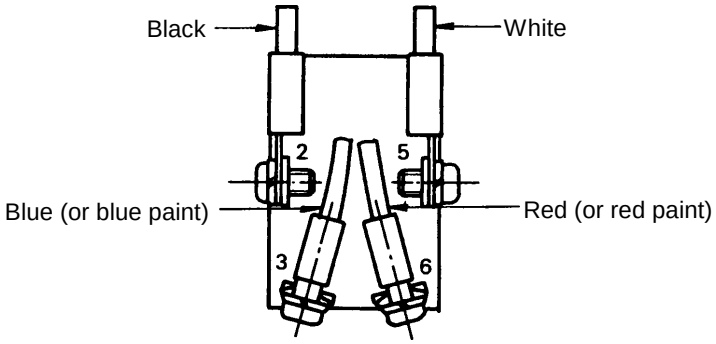
2-2. Reassembly

Reassembly can be accomplished by following the disassembly procedures in reverse. However, particular attention should be given to the following points.

(1) Housing

- Mounting the Switch

  When connecting the lead wires, ensure that the correct colored wires are connected to the correct numbered switch terminals, as illustrated below.



(2) Hammer Case Ass'y Portion

a) Reassembling the Hammer

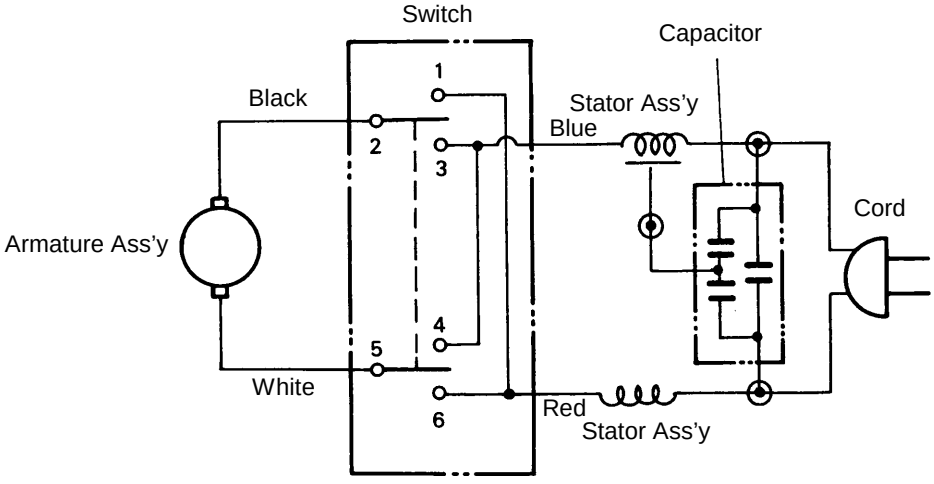
1) Ensure that the 22 Steel Balls ⑨ (10) (WH16: ϕ 3.175, WH22: ϕ 3.969) are inserted between the Spindle ⑪ (12) and the Spindle Seat ⑧ (9). (Be sure to apply grease at the time of reassembly.)
2) Put the Spring ⑦ (8) in place, and insert the Hammer ⑥ (7). Press down on the click end of the Hammer with a hand press until the Spring is fully compressed, and hold it in that position. Ensure that the cam groove in the Spindle is properly aligned with the steel ball guide in the Hammer (see Fig. 4).
3) Insert the two Steel Balls ⑤ (6) (WH16: ϕ 6.35, WH22: ϕ 7.14) through the steel ball guide in the Hammer, and ensure that they properly enter the cam groove in the Spindle. Then, release the hand press to complete assembly of the Hammer.

b) Grease Lubrication

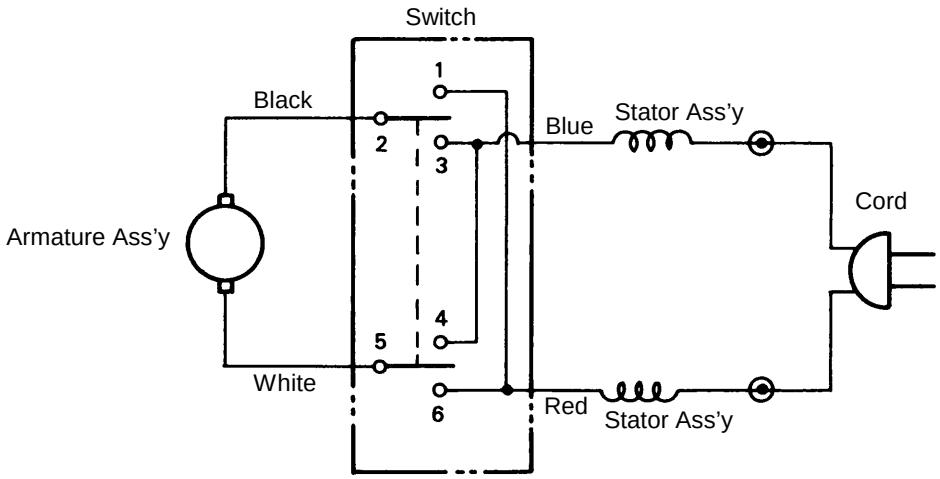
Apply Molub-Alloy #777-1 around the Gear, inside the Hammer and cam groove, in the Spindle cam groove, to the sliding parts of the Hammer and Spindle, to the sliding parts of the Anvil and Spindle, and to the metallic parts of the Hammer Case Ass'y.

c) Tightening Torques

WH16: M5 x 45 Hexagon Socket-Hd. Bolts ㉙	40 ± 5 kg-cm
WH22: M5 x 60 Hexagon Socket-Hd. Bolts (32)	80 ± 5 kg-cm



Connection diagram (for Europe, New Zealand and South Africa)



Connection diagram (for U.S.A., Canada and other countries)

2-3. After disassembly and repair, be sure to measure the insulation resistance and perform the dielectric strength test (resistance voltage test).

2-4. No-load Current

The no-load current after 30-minute no-load operation should be as specified below.

At 100V, 50/60Hz

WH16: 110V version ..... 2.3A or less
115V version ..... 2.2A or less
120V version ..... 2.1A or less
127V version ..... 2A or less
220V version ..... 1.2A or less
230V version ..... 1.1A or less
240V version ..... 1A or less

WH22: 110V version ..... 3.9A or less
115V version ..... 3.7A or less
120V version ..... 3.5A or less
127V version ..... 3.3A or less
220V version ..... 2A or less
230V version ..... 1.9A or less
240V version ..... 1.8A or less