

MODEL

**WH 14DM**

# Hitachi Power Tools

**CORDLESS IMPACT DRIVER  
WH 14DM**

**TECHNICAL DATA  
AND  
SERVICE MANUAL**



LIST No. F884

Jun. 2003

REMARK:

Throughout this TECHNICAL DATA AND SERVICE MANUAL, a symbol(s) is(are) used in the place of company name(s) and model name(s) of our competitor(s). The symbol(s) utilized here is(are) as follows:

Symbol Utilized	Competitor	
	Company Name	Model Name
C	MAKITA	BTD/50SA
P	DEWALT	DW054



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## 1. PRODUCT NAME

Hitachi Cordless Impact Driver, Model WH 14DM

## 2. MARKETING OBJECTIVE

Owing to the shift of demand from nails to screws and increased demand for long screws, there is a market need for a powerful, high-speed, compact and easy-to-handle impact driver that provides more efficient operation per charge. The current cordless impact drivers Model WH 9DM (9.6 V) and WH 12DM (12 V) are well reputed on the market. The new Model WH 14DM (14.4 V "Super Impact 14") is being introduced to respond to user requests for a more powerful impact driver with high torque.

- 30% higher speed than Model WH 12DM
- Higher torque 135 N•m (1375 kgf•cm, 1190 in-lbs.)
- Higher durability
- Comfortable handle grip

The Model WH 14DM broadens our lineup of cordless impact drivers from 9.6 V to 14.4 V.

## 3. APPLICATIONS

- Tightening/loosening of small screws, tapping screws, wood screws, bolts, nuts, etc.
- Drilling into wood and various other materials (with use of optional accessory drill chuck adapter).

### [Applicable Markets]

- Wood-product assembly: Tightening/loosening of wood screws.
- Construction industry: Assembly of scaffolding, roofing, aluminum sashes, fencing, etc.; removal of plastic cones from concrete forms, mounting/removal of form ties; drilling into the wood frames of concrete forms, etc.
- Manufacturing industry: Assembly work for automobiles, rolling stock, shipbuilding, agricultural machinery and tools, industrial machines, steel furniture, etc.
- Utility industry: Assembly and installation of electric equipment, plumbing facilities, air conditioning (duct assembly, etc.), sanitary fixtures and various other facilities.
- Service industry: General repair work; installation of advertising aids, automobile repair, assembly of garages and carports storage sheds, etc.
- Various other assembly, construction or repair facilities.

## 4. STANDARD EQUIPMENT

- (1) BFK specification: One EB 14B battery (NiCad, capacity 2.0 Ah), UC 14YF2 charger and case
- (2) 2BFK specification: Two EB 14B batteries (NiCad, capacity 2.0 Ah), UC 14YF2 charger and case
- (3) HFK specification: One EB 1430H battery (NiMH, capacity 3.0 Ah), UC 14YF2 charger and case
- (4) 2HFK specification: Two EB 1430H batteries (NiMH, capacity 3.0 Ah), UC 14YF2 charger and case

## 5. SELLING POINTS

### Model WH 14DM Cordless Impact Driver

#### Powerful

**Ultra-compact body but class-top tightening speed**  
(30% faster than the Model WH 12DM, same as P, and 30% faster than C)

Maximum tightening torque 135 N·m (1375 kgf·cm, 1190 in-lbs.), the same torque in forward/reverse rotation

#### Protector

- Protects workpieces from scratches and stains.
- Resistant to being caught on bracing plates, etc.
- Does not get hot even if operated continuously.

#### Compact

• Overall length of the Model WH 14DM compared with the following models

C: - 11 mm (- 3/64") P: + 12 mm (+ 3/64")

• Height of the Model WH 14DM compared with the following models

C: - 40 mm (- 1-37/64") P: + 2 mm (+ 5/64")

• Center height of the Model WH 14DM compared with the following models

C: 0 mm (0") P: - 2 mm (- 5/64")

• Weight of the Model WH 14DM compared with the following models

C: - 220 g (- 485 lbs.) P: + 100 g (+ 220 lbs.)



#### Hook with lighting function

- Lighting function is usable at any time.
- Quick slide-out hook (angle-adjustable)
- Mountable on either side

Selling points common to the Model WH 12DM

- Newly designed compact body
- Ergonomically designed comfortable handle (slip-resistant double-molded grip)
- High durability, dust resistance and long service life

## 5-1. Selling Point Descriptions

Refer to pages 4 through 8 of Technical Data Service Manual for the Models WH 12DM/WR 12DM for common selling points.

### (1) Class-top tightening speed

The Model WH 14DM is equipped with the neo rare-earth magnet motor that has 20 % higher magnetic force than the previous Model WH 12DM while the armature size is the same and the 15 % larger hammer. With the computer analysis, the Model WH 14DM gives optimum impact at tightening screws and the tightening speed is 30 % higher than the previous Model WH 12DM (same as P and 30 % higher than C). The Model WH 14DM can also tighten long screws at high speed even into a hard wood workpiece. Tightening time comparison of the Model WH 14DM with C is shown below.

#### ① Wood screw 5.3 mm dia. x 120 mm (1/64" x 4-23/32") length, lauan

Model	← Fast                      Slow →									
	2	4	6	8	10	12	14	16	18	20 sec.
HITACHI WH 14DM	4.0 sec.									
P	4.0 sec.									
C	6.0 sec.									
HITACHI WH 12DM	6.5 sec.									

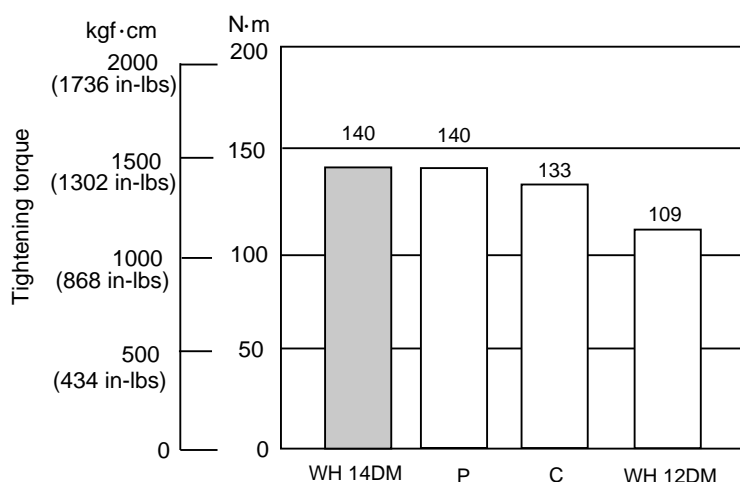
#### ② Wood screw 4.2 mm dia. x 90 mm (11/64" x 3-3/64") length, lauan

Model	← Fast                      Slow →				
	1	2	3	4	5 sec.
HITACHI WH 14DM	1.8 sec.				
P	1.8 sec.				
C	2.6 sec.				
HITACHI WH 12DM	2.6 sec.				

\* Tightening time may vary depending on hardness of the workpiece, ambient temperature, characteristics of the battery, etc.

### ● Maximum tightening torque: 135 N·m {1375 kgf·cm, 1190 in-lbs.}

It should be noted that an M12 (15/32") strength grade 12.9 high-strength bolts were tightened in 3 seconds with a hexagon socket (115 mm (4-3/64") long) in the test. The tightening torque of the Model WH 14DM is substantially higher than the previous model.



#### Test conditions

Bolt: M12 x 45 mm (15/32" x 1-3/4")

(strength grade: 12.9)

Steel plate: Mild steel, thickness: 25 mm (1")

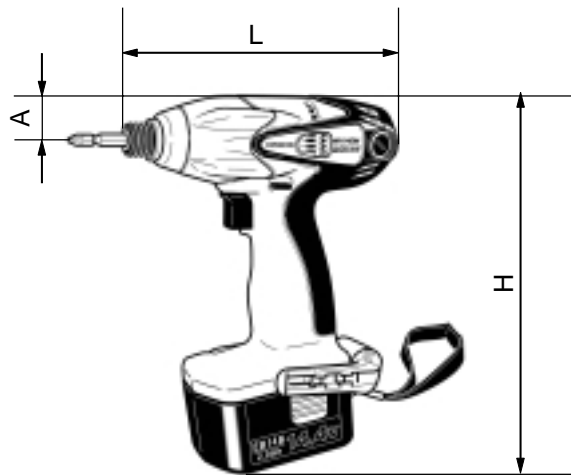
Accessory tool: Hexagon socket

\*The data above are intended for reference purposes only because actual tightening torque will vary depending on tightening conditions.

Fig. 1

## (2) Compact and lightweight

The Model WH 14DM is equipped with a separate-type motor like the Super Impact Series. Thanks to the new separate-type motor, the steel case is eliminated and the motor section is downsized. In addition, the newly adopted neo rare-earth magnet motor having 1.2 times higher coercive force is as small as the motor of the previous Model WH 12DM while it can provide high power. The overall length of the Model WH 14DM is shortened by 12 mm (3/64") in comparison with P and by 11 mm (3/64") in comparison with C, and it is equivalent to the previous 12-V product Model WH 12DH thanks to the downsized hammer case. The weight of the Model WH 14DM is about 220 g (0.485 lbs.) lighter than C (The actual weight of P is about 100 g (0.220 lbs.) lighter than WH 14DM).



Model		Unit	WH 14DM	P	C	(Reference) WH 12DH
L	Overall length	mm	179 (7-3/64")	167 (6-37/64")	190 (7-31/64")	176 (6-59/64")
A	Center height	mm	27 (1-1/16")	29 (1-9/64")	27 (1-1/16")	26 (1-1/32")
H	Height	mm	236 (9-19/64")	234 (9-7/32")	276 (10-55/64")	245 (9-41/64")
Weight	Catalog weight	kg	1.9 (4.1 lbs.)	1.9 (4.1 lbs.)	2.1 (4.6 lbs.)	1.7 (3.7 lbs.)
	Actual weight	kg	1.98 (4.4 lbs.)	1.88 (4.1 lbs.)	2.20 (4.9 lbs.)	1.73 (3.8 lbs.)

## 6. SPECIFICATIONS

### 6-1. Specifications

Item	Model	Cordless impact driver WH 14DM
Capacity		Small screw M4 – M10 (5/32" – 3/8") Ordinary bolt M6 – M14 (1/4" – 9/16") High-strength bolt M6 – M12 (1/4" – 15/32")
Tightening torque		135 N·m (1,375 kgf·cm, 1,190 in-lbs.)* <sup>1</sup>
Tip condition		6.35 mm (1/4") bit holder
Type of motor		Fan cooled DC magnet motor
Enclosure		Main body: Polyamide resin + elastomer ..... Housing Aluminum alloy die casting ..... Hammer case Elastomer ..... Protector Storage battery: Polyamide resin (black) Charger: ABS resin (black)
Type of switch		Trigger switch with forward/reverse changeover pushing button (with brake and variable)
Handle configuration		T-type
No-load rotational speed		0 – 2,600 /min.
Impact rate		0 – 3,200 /min.
Weight	Main body	1.9 kg (4.1 lbs.) (Includes battery)* <sup>2</sup>
	Battery	0.86 kg (1.9 lbs.)
Overall length x height		179 mm (7-3/64") x 236 mm (9-19/64")
Center height		27 mm (1-1/16")
Battery (Type EB 14B)		Sealed cylindrical nickel-cadmium batteries Nominal voltage: DC 14.4 V Nominal life: Charging/discharging approximately 1,000 cycles (in the case of Model UC 14YF2) Nominal capacity: 2.0 Ah
Battery (Type EB 1430H)		Sealed cylindrical nickel-metal hydride batteries Nominal voltage: DC 14.4V Nominal life: Charging/discharging approximately 500 cycles (in the case of Model UC 14YF2) Nominal capacity: 3.0 Ah
Charger (UC 14YF2)		Sealed power source: Single-phase AC, 50/60 Hz Voltage: Depending on the order specification Power input: 44 W Charging system: Constant current charge with full wave phase control Overcharge protection system: (1) Battery voltage detection ( $\Delta^2V$ system) (2) Battery surface temperature detection (thermostat or thermistor) (3) 120-minute timer  Output voltage: 7.2 V – 14.4 V Output current: 1.9 A Charging time: Approx. 60 minutes (for B-type storage battery at 20 °C (68 °F)) Approx. 90 minutes (for H-type storage battery at 20 °C (68 °F)) Product weight: 1.3 kg (2.8 lbs.) Operable ambient temperature range: 0 °C – 40 °C (32°F – 104°F) The maximum allowable temperature of the EB 14B type battery is 60 °C (140°F) and the EB 1430HL type battery is 45 °C (113°F).

\*<sup>1</sup>: This torque is based on tightening an M12 (15/32") bolt (strength grade: 12.9) for 3 seconds with a hexagonal socket.

\*<sup>2</sup>: Main body does not include accessory tools (hexagonal bit, etc.).



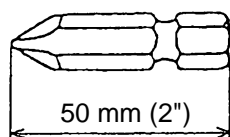
### Pilot lamp indications (Model UC 14YF2)

Red pilot lamp remains lit or flashes.	Prior to charging	Blinks	0.5 sec ON, 0.5 sec OFF ■ ■ ■ ■ ■	
	During charging	Lit	Stays ON constantly ■■■■■■■■■■	
	Charging completed	Blinks	0.5 sec ON, 0.5 sec OFF ■ ■ ■ ■ ■	
	Charging not possible	Flickers	0.1 sec ON, 0.1 sec OFF ■ ■ ■ ■ ■ ■ ■ ■	Storage battery or charger is faulty.
Green pilot lamp is lit.	High battery temperature	Lit	Stays ON constantly ■■■■■■■■■■	Charging not possible because storage battery temperature is too high.

## 6-2. Optional Accessories

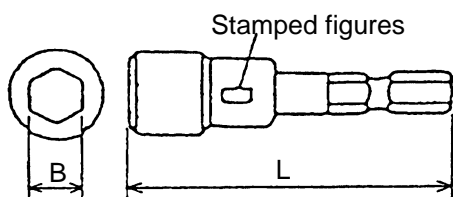
(1) Optional accessories for the Model WH 14DM

### • Plus driver bit



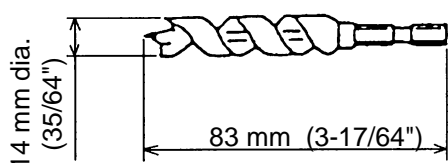
Bit No.	Code No.
No. 2	992671
No. 3	992672

### • Hexagon socket



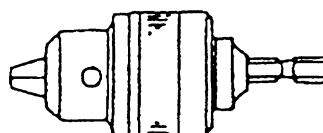
Part name	Stamped figures	L (mm)	B (mm)	Code No.
5 mm Hexagon socket	8	65 (2-9/16")	8 (5/16")	996177
6 mm Hexagon socket	10	65 (2-9/16")	10 (3/8")	985329
5/16" Hexagon socket	12	65 (2-9/16")	12 (15/32")	996178
8 mm Hexagon socket	13	65 (2-9/16")	13 (1/2")	996179
10 mm Hexagon socket (small type)	14	65 (2-9/16")	14 (9/16")	996180
10 mm Hexagon socket	16	65 (2-9/16")	16 (5/8")	996181
10 mm Hexagon socket	17	65 (2-9/16")	17 (21/32")	996182
1/2" Hexagon long socket	21	166 (6-17/32")	21 (53/64")	996197

### • Woodworking drill bit (Code No. 959183)



### • Drill chuck adaptor set (Code No. 321823)

The drill chuck adapter set permits mounting of various types of locally-available drill bits for a variety of drilling operations.



## 7. COMPARISONS WITH SIMILAR PRODUCTS

### 7-1. Specification Comparisons

Item			Maker	HITACHI	P	C	HITACHI
			Model	WH 14DM			WH 12DM
Catalog specifications	Capacity	Small screw* <sup>1</sup>		M 4 – M 10 (5/32" – 3/8")	—	M 4 – M 10 (5/32" – 3/8")	M 4 – M 8 (5/32" – 5/16")
		Ordinary bolt		M 6 – M 14 (1/4" – 9/16")	—	M 6 – M 14 (1/4" – 9/16")	M 5 – M 12 (3/16" – 15/32")
		High-strength bolt		M 6 – M 12 (1/4" – 15/32")	—	M 6 – M 10 (1/4" – 3/8")	M 5 – M 10 (3/16" – 3/8")
	Max. tightening torque		N·m	135 (1375 kgf·cm, 1190 in-lbs.)	130 (1325 kgf·cm, 1150 in-lbs.)	130 (1325 kgf·cm, 1150 in-lbs.)	100 (1020 kgf·cm, 885 in-lbs.)
	No-load rotation speed		min <sup>-1</sup>	0 – 2,600	0 – 2,400	0 – 2,300	0 – 2,300
Measured figures	Impact rate		min <sup>-1</sup>	0 – 3,200	0 – 3,000	0 – 3,000	0 – 3,000
	Main body weight* <sup>3</sup>		kg	1.9 (4.1 lbs.)	1.9 (4.1 lbs.)	2.1 (4.6 lbs.)	1.6 (3.5 lbs.)
	Max. tightening torque* <sup>2</sup>		N·m	140 (1428 kgf·cm, 1239 in-lbs.)	—	133 (1356 kgf·cm, 1177 in-lbs.)	109 (1112 kgf·cm, 965 in-lbs.)
	No-load rotation speed		min <sup>-1</sup>	0 – 2,650	0 – 2,560	0 – 2,420	0 – 2,390
	Impact rate		min <sup>-1</sup>	0 – 3,210	—	0 – 2,920	0 – 2,800
	Overall length x height		mm	179 x 236 (7-3/64" x 9-19/64")	167 x 234 (6-37/64" x 9-7/32")	190 x 276 (7-31/64" x 10-7/8")	167 x 226 (6-37/64" x 8-7/8")
	Center height		mm	27 (1-1/16")	29 (1-9/64")	27 (1-1/16")	26 (1-1/32")
Tool tip mounting system	Main body weight* <sup>3</sup>		kg	1.98 (4.4 lbs.)	1.88 (4.1 lbs.)	2.20 (4.9 lbs.)	1.66 (3.7 lbs.)
	No-load sound pressure level		dB(A)	71	—	69	69
	Type of switch			Variable speed switch with forward/reverse changeover lever	Variable speed switch with forward/reverse changeover lever	Variable speed switch with forward/reverse changeover lever	Variable speed switch with forward/reverse changeover lever
	Type of motor			DC magnet	DC magnet	DC magnet	DC magnet
	Voltage		V	14.4	14.4	14.4	12
	Current		A	27	—	19	28
	Type			EB 14B or EB 1430H	DW9091	BH 1420 or BH 1433	EB 1220BL or EB 1230HL
Battery	Nominal capacity	Ah		EB 14B: 2.0 EB 1430H: 3.0	—	EB 1420: 2.0 EB 1433: 3.3	EB 1220BL: 2.0 EB 1230HL: 3.0
	Nominal voltage	V		14.4	14.4	14.4	12
	Ambient temperature	°C		0 – 40	4.5 – 40.5	—	0 – 40
Charger	Model			UC 14YF2	DW9107	DC 14SA	UC 14YF2
	Power input capacity	VA		44	—	—	44
	Recharging voltage	V		7.2 – 14.4	7.2 – 14.4	7.2 – 14.4	7.2 – 14.4
Standard accessories				• Plastic tool case • Charger (UC 14YF2)	• Plastic tool case • Charger (DW9107)	• Plastic tool case • Charger (DC14SA)	• Plastic tool case • Charger (UC 14YF2)

\*<sup>1</sup>: In the case of tapping screws and wood screws, a minimum of M3 (1/8") is possible.

\*<sup>2</sup>: Max. tightening torque is based on tightening an M12 (15/32") bolt (strength grade: 12.9) for 3 seconds with a hexagon socket.

\*<sup>3</sup>: Main body weight does not include accessory tools (hexagon bit, etc.).

## 7-2. Tightening Torque

### 7-2-1. Tightening torque characteristic comparisons

Thanks to the high-power rare-earth magnet motor and the larger hammer inertia, the Model WH 14DM can provide greater tightening torque.

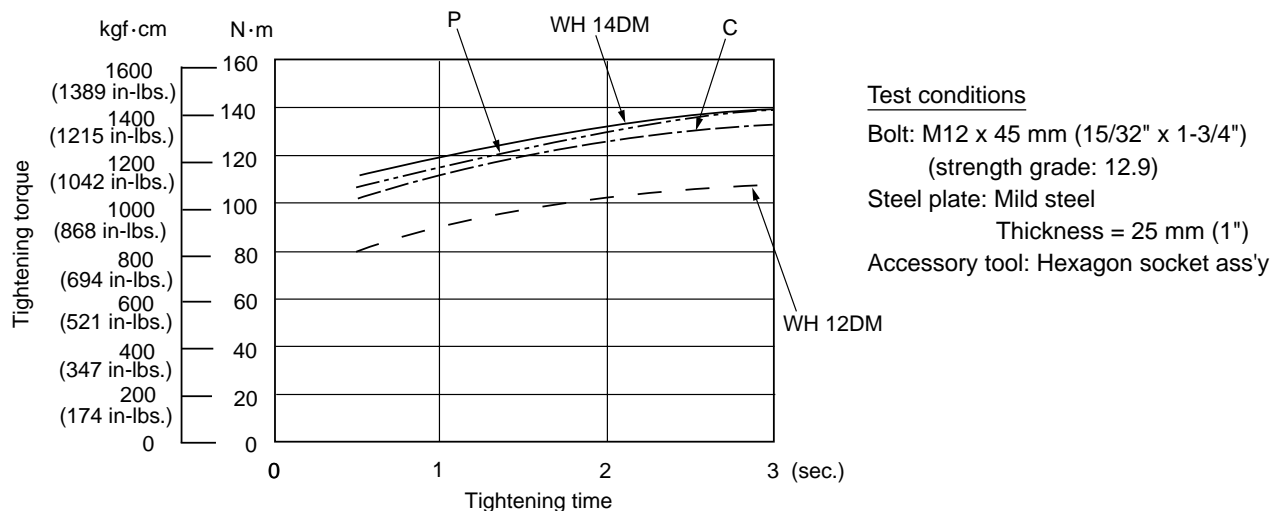


Fig. 2

### 7-2-2. Screw diameter and appropriate tightening torque

Generally speaking, the appropriate tightening torque for a screw can be determined by the strength grade of the screw and the material tightened. Tables 1 and 2, and Fig. 3 below list data relative to the strength grade of various screws and the appropriate tightening torque. For further reference, appropriate tightening torque is calculated with the following formula. Study and use this formula for accurate selection of tightening torque.

$$T = 9.8 \cdot k \cdot d \cdot p / 100$$

T: Appropriate tightening torque (N·m)

k: Torque coefficient (0.17)

d: Nominal diameter for the screw (mm)

p: Recommended axial tightening force to be applied to the screw (kgf)

p = rated axial stress (kgf/mm<sup>2</sup>) x 0.8 x effective sectional area of the thread (mm<sup>2</sup>)

#### • Strength grade and rated axial stress of threads

Table 1

Strength grade	4.8	6.8	8.8	12.9
Rated axial stress (kgf/mm <sup>2</sup> )	29.1	43.7	58.2	95
Material	Mild steel		Alloy steel including Ni, Mn, Cr, etc.	
Heat treatment	None		Processed-hard material	

#### • Diameter and effective sectional areas of threads

Table 2

Kind of thread (x pitch)	M5 x 0.8 mm (3/16")	M6 x 1 mm (1/4")	M8 x 1.25 mm (5/16")	M10 x 1.5 mm (3/8")	M12 x 1.75 mm (15/32")	M14 x 2 mm (9/16")
Effective sectional area of thread (mm <sup>2</sup> )	14.2	20.1	36.6	58.0	84.3	115

• Thread diameter and appropriate tightening torque

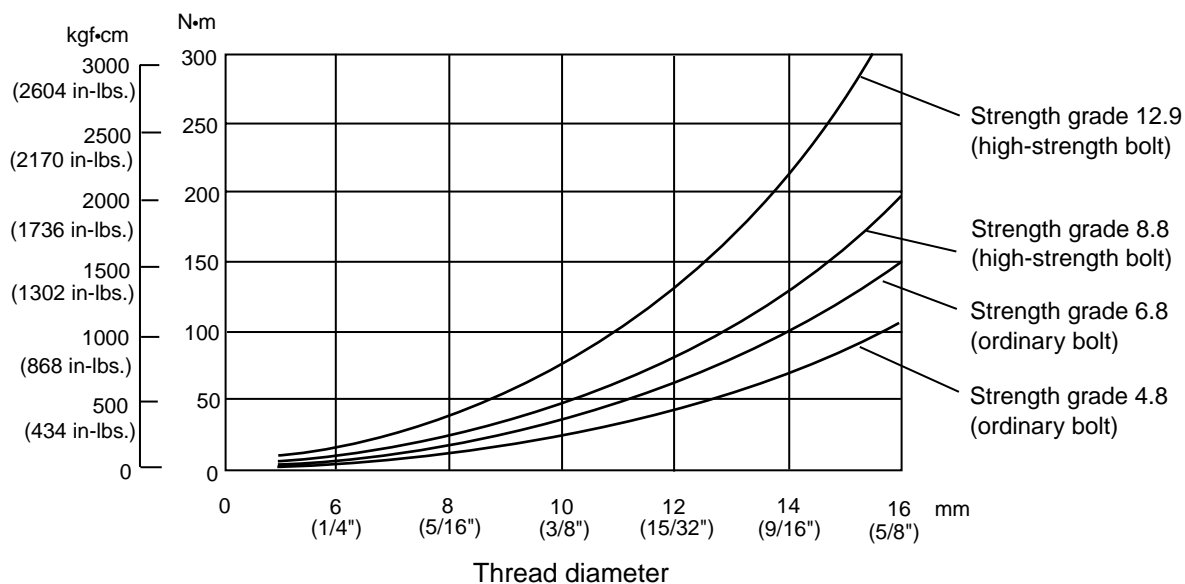


Fig. 3

7-2-3. Bolt Tightening torque characteristics

Fig. 4 shows relationships between time and tightening torque for individual bolt types and sizes. While the data are useful for handy reference, actual tightening torque will vary depending on tightening conditions and other variables. For details, please refer to Para. 8-3, "Tightening Torque Variation".

(Note)

- The term "tightening time" indicates the impact time after the lower surface of the bolt has come in contact with the material into which it is being tightened.
- In the tightening conditions shown in Fig. 4, the screws are being tightened directly into a steel plate; accordingly, the torque goes up very abruptly in comparison with ordinary bolt tightening conditions.

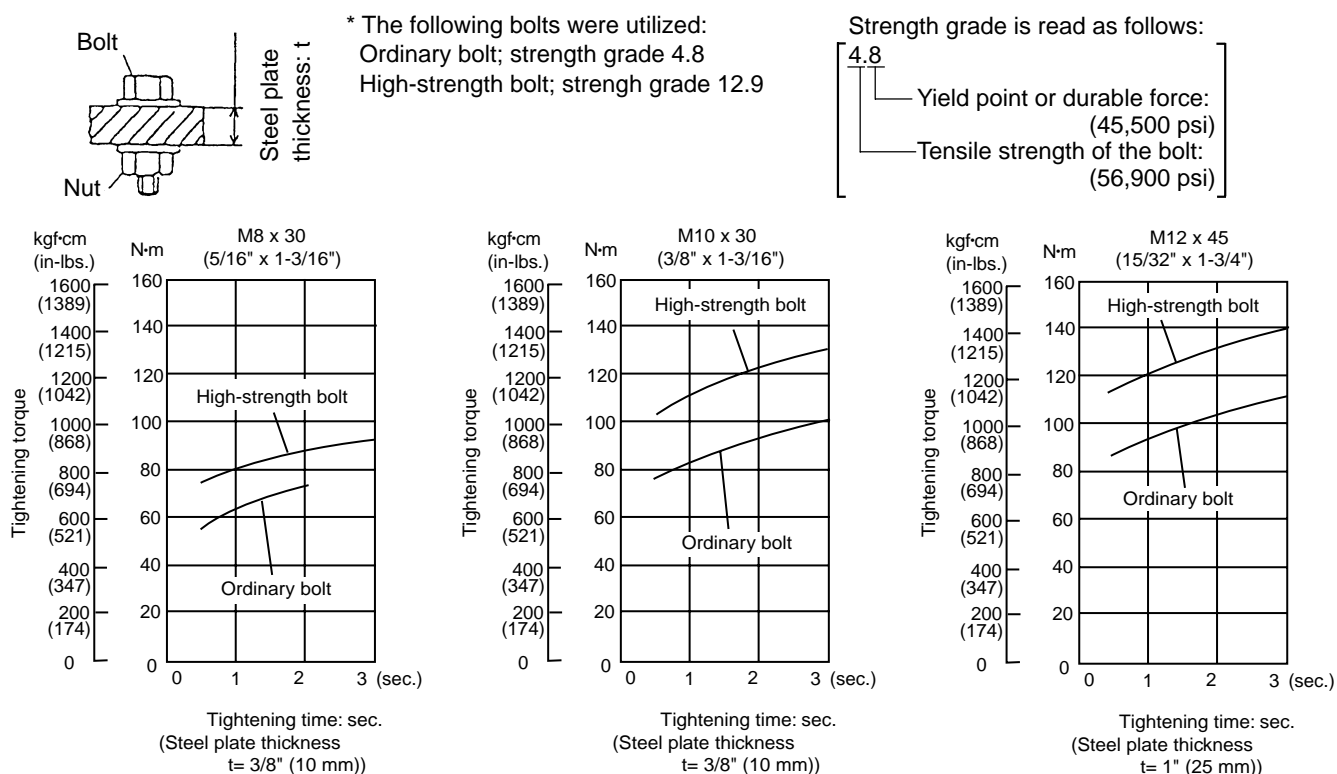


Fig. 4

### 7-3. Number of Screws Driven

#### 7-3-1. Per-charge working capacity comparisons

Test data on the number of screws which can be driven per battery charge by the new model vs. the previous models are shown in the table below. Please note that the data below are intended for general reference only as the number of screws which can be tightened per charge will vary slightly depending on screw tightening conditions, screw sizes, ambient temperatures, and the charging capacity of the battery.

Tightening condition \ Model	HITACHI WH 14DM		C	HITACHI WH 12DH	
Battery	EB 1430H	EB 14B	BH 1420	EB 1230H	EB 1220BL
Wood screw 4.0 mm dia. x 50 mm (5/32" x 1-31/32") (soft wood)	950	630	690	860	570
Wood screw 4.2 mm dia. x 90 mm (11/64" x 3-3/64") (hard wood)	225	150	164	175	115
Wood screw 5.3 mm dia. x 120 mm (1/64" x 4-23/32") (hard wood)	95	65	71	70	45
Machine screw (M8 x 16 mm)	1,890	1,260	1,380	1,920	1,230

Note 1) The Model WH 14DM is equipped with the larger hammer and the higher power motor for the higher tightening speed. Although the higher tightening speed is realized, the Model WH 14DM has the following disadvantage.

- High startup current

The Model WH 14DM consumes higher power than C for driving a short or machine screw because it requires high startup current. Thus the number of machine screws driven per charge is different as shown above.

## **8. PRECAUTIONS IN SALES PROMOTION**

### **8-1. Safety Instructions**

In the interest of promoting the safest and most efficient use of Model WH 14DM by all our customers, it is very important that at the time of sale the salesperson carefully ensures that the buyer seriously recognizes the importance of the contents of the Handling Instructions, and fully understands the meaning of the precautions listed on the Caution Plate and Name Plate attached to each tool.

#### **A. Handling Instructions**

Salespersons must be thoroughly familiar with the contents of the Handling Instructions in order to give pertinent advice to the customer. In particular, they must have a thorough understanding of the precautions in the use of the cordless (battery charger type) electric power tools which are different from those of ordinary electric power tools.

- (1) Before use, ensure that the unit is fully charged.

New units are not fully charged. Even if the units were fully charged at the factory, long periods without use, such as during shipping, cause the storage battery to lose its charge. Customers must be instructed to fully charge the unit prior to use.

- (2) When charging storage batteries, use only the exclusive Model UC 14YF2 Charger provided with the tool.

Because of the designed rapid-charging feature (about one hour), use of other battery chargers is hazardous.

- (3) Follow prescribed steps in using the charger.

First connect the EB 14B or EB 1430H Storage Battery to the Model UC 14YF2 Charger, then plug the charger into an AC outlet (ensuring that the voltage matches that indicated on the unit). If this order is reversed, the charger may not function properly.

- (4) Ensure the power source voltage is the same as that indicated on the Name Plate of the charger. Use of any other power source (DC outlet, fuel powered generator, etc.) will cause the charger to overheat and burn out.

- (5) Do not use any voltage increasing equipment (transformer, etc.) between the power source and the charger.

If the charger is used with voltage over and above that indicated on the unit, it will not function properly.

- (6) Conduct battery charging at an ambient temperature range of 0 °C – 40 °C (32 °F – 104 °F).

Special temperature sensitive devices are employed in the charger to permit rapid charging. Ensure that customers are instructed to use the charger at the indicated ambient temperature range. At temperatures under 0 °C (32 °F), the thermostat will not function properly, and the storage battery may be over-charged. At temperatures over 40 °C (104 °F), the storage battery cannot be sufficiently charged. The optimum temperature range is 20 °C – 25 °C (68 °F – 77 °F).

- (7) The battery charger should not be used continuously.

At high ambient temperatures, if over three storage batteries are charged in succession, the temperature of the coils on the transformer will rise and there is a chance that the temperature fuse inserted in the interior of the transformer will inadvertently melt. After charging one battery, please charge the next battery after about a fifteen-minute interval.

- (8) The charger case is equipped with air vents to protect the internal electronic components from overheating.

Caution the customer not to allow foreign materials, such as metallic or flammable objects, to be dropped or inserted into the air vents. This could cause electric shock, fire or other serious hazards.

- (9) Do not attempt to disassemble the storage battery or the charger.

Special devices, such as a thermostat, are built into the storage battery and charger to permit rapid charging. Incorrect parts replacement and/or wiring will cause malfunctions which could result in fire or other hazards. Instruct the customer to bring these units to an authorized service center in the event repair or replacement is necessary.

- (10) Disposal of the Type EB 14B or EB 1430H Storage Battery

Ensure that all customers understand that Type EB 14B or EB 1430H Storage Batteries should be turned in to any Hitachi power tool sales outlet or authorized service center when they are no longer capable of being recharged or repaired. If thrown into a fire, the batteries may explode, or if discarded indiscriminately, leakage of the cadmium compound contained in the battery may cause environmental pollution.

## B. Caution Plates

- (1) The following precautions are listed on the Name Plate or Caution Plate attached to the main body of each tool.

For the U.S.A. (excludes French) or Canada

### **WARNING**

- To reduce the risk of injury, user must read and understand Instruction Manual.

### **AVERTISSEMENT**

- Afin de réduire le risque de blessures, l'utilisateur doit lire et bien comprendre le mode d'emploi.

For Oceania

### **CAUTION**

- Read thoroughly HANDLING INSTRUCTIONS before use.

- (2) The following cautions are listed on the Name Plate attached to each Type EB 14B or EB 1430H storage battery.

For Europe

- CAUTION**
- Read thoroughly HANDLING INSTRUCTIONS before use.
  - Do not disassemble nor throw into fire.

For the U.S.A.

### **CAUTION**

- For safe operation, see Instruction Manual.
- Use HITACHI charger UC 12Y, -14Y, -24Y series for recharging.

- (3) The following caution is listed on the Name Plate attached to the Model UC 14YF2 Charger.

For the U.S.A.

### **CAUTION**

- For safe operation, see Instruction Manual.
- Charge HITACHI rechargeable batteries Type EB 7, EB 9, EB 12 and EB 14 series. Other types of batteries may burst causing personal injury and damage.
- Charge between 32 and 104 °F.
- Indoor use only.
- Replace defective cord immediately.

## **8-2. Tightening Torque Inspection prior to Operation**

As described and shown in Para. 7-2-3, the output tightening torque of which the Model WH 14DM is capable in excess of the rated tightening torque of certain bolts and screws. Accordingly, if the tightening time is prolonged for such bolts and screws, it could cause damage to their threads or, in the worst case, cause them to be sheared off. (This phenomenon is common to all existing impact wrenches/drivers.) Particularly when tightening M6 (1/4") or smaller screws, tightening time must be kept extremely short: 0.5 seconds or less. The customer should be advised to carry out several bolt tightening operations and adjust the tightening time as necessary by measuring the tightening torque with an appropriate torque wrench before commencing continuous operation.

## **8-3. Tightening Torque Variation**

The tightening torque of the cordless impact wrench/driver may vary slightly in accordance with the factors described below. Salespersons are requested to advise the customer to confirm that appropriate tightening torque is obtained by measuring the torque with an appropriate torque wrench or torque driver at the beginning of the tightening operations, and as necessary during the tightening operations. In addition, the torque values shown in Para. 7-2-2 above are useful as a handy reference, and may be utilized as tentative standards.

### **(1) Voltage of battery**

Tightening torque is affected by the voltage output of the battery. Tightening torque decreases as the number of bolts tightened increases. This phenomenon is caused by the decline in voltage output of the battery due to the increasing number of bolts tightened. In particular, the tightening torque decreases rapidly just before the battery is fully discharged. As this phenomenon is an inherent drawback in any cordless impact driver, salespersons are requested to ensure that the customer is fully aware of and understands this characteristic.

### **(2) Effects of low ambient temperatures**

The tightening torque required may be reduced at low ambient temperatures or under the influence of grease and different torque coefficients (dependent on manufacturing and finishing processes, and specified by bolt manufacturers).

### **(3) Different bolt diameter**

Differences in bolt diameter will cause variation of the required levels of tightening torque. Generally speaking, tightening torque is higher for large bolts.

### **(4) Different materials being tightened**

When a bolt is tightened into a soft material such as aluminum, plastic, wood, etc., the tightening torque is considerably less than when the bolt is tightened into a hard material such as steel.

### **(5) Different tightening conditions**

The tightening torque may vary in accordance with bolt torque coefficient (dependent on manufacturing process, and specified by bolt manufactures), bolt grade and bolt length, even though the dimensions of the bolts are the same. Tightening torque may also vary depending on the surface finishing state of tightening materials (steel, aluminum, etc.), and materials to be tightened. In addition, if there is seal packing, clearance, etc., between tightening materials, the tightening torque is decreased.



(6) Wear and looseness of the socket

With extended use, the hexagonal portion of the socket which is fitted to the head of the bolt or drill bit, and/or hexagonal portion of the driver chuck which is fitted onto the anvil in the main body will become worn and loose. Wear and looseness will cause a proportionate loss of tightening torque.

In addition, use of an incorrect size socket (slightly larger than the bolt being tightened) will also result in decreased torque.

(7) Bolt and nut rotate together

Tightening torque that can be achieved will be considerably decreased if the bolt and nut rotate together during the tightening operation. The customer should be advised to carefully observe the operation and ensure this does not occur.

#### **8-4. Suggestions and Precautions for the Efficient Use of the Charger**

(1) Batteries may not be rechargeable immediately after use

If the Type EB 14B or EB 1430H Storage Battery is exposed to direct sunshine for an extended period, or if the temperature of the battery is 40 °C (104 °F) or higher immediately after it has been used in the tool, the pilot lamp may not light up when the battery is connected to the Model UC 14YF2 Charger. This is because the built-in thermostat functions to stop the charging when the temperature of the storage battery reaches 40 °C (104 °F) or more. In such a case, the customer should be advised to place the battery in a shaded area with a good airflow, and allow sufficient cooling before recharging.

This phenomenon is common to all existing batteries which employ temperature sensitive overcharge devices. The cooling time required before charging can be accomplished varies from a few minutes to about 30 minutes, depending on the load, duration of use, and ambient temperatures.

#### **9. OTHER PRECAUTIONS**

(1) Check for cracks or other damage on the socket

Cracks or any other faults on the socket are very hazardous. In addition, cracks or other damage to accessories will cause loss of tightening torque efficiency. Advise the customer to inspect accessories often, and ensure there are no abnormalities.

(2) Socket dimensions

Without fail, utilize an appropriate socket which matches the bolt and/or nut dimensions. If the socket dimensions are larger than the bolts or nuts, it will not only cause insufficient tightening torque, but could also easily cause damage to the socket. Please refer to the tables in Para. 6-2 for appropriate socket dimensions.

(3) Hammering section lubrication

Grease (ATTOLUB MS No. 2) is utilized in the hammering section. Frequent or continuous use of the tool will cause excessive temperature rise of the hammering section, resulting in depletion of the grease and subsequent increased wear of components which will, in turn, cause loss of tightening efficiency. Accordingly, it is necessary to periodically replenish the grease in the hammering section to ensure proper lubrication of moving and sliding components.

## 10. REPAIR GUIDE

**WARNING:** Without fail, remove the Type EB 14B or EB 1430H Battery from the main body before starting repair or maintenance work. Because the tool is cordless, if the battery is left in and the switch is activated inadvertently, the motor will start rotating unexpectedly, which could cause serious injury.

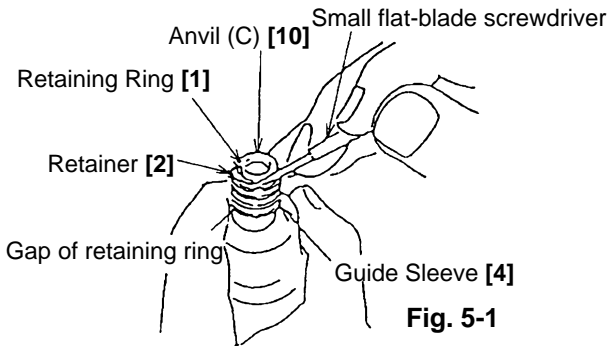
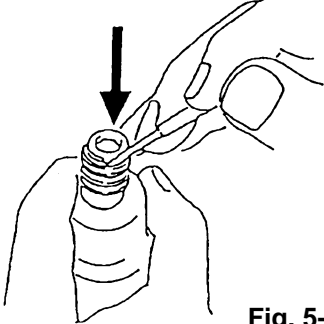
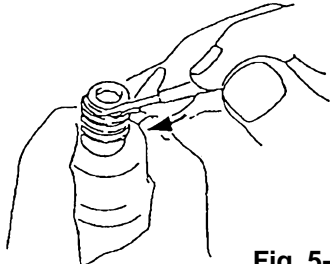
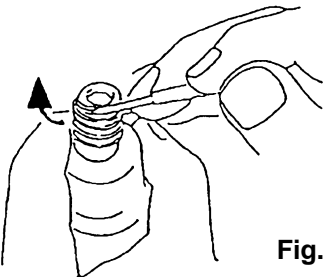
### 10-1. Precautions in Disassembly and Reassembly

The **[Bold]** numbers correspond to the item numbers in the Parts List and the exploded assembly diagram.

#### 10-1-1. Disassembly

##### (1) Removal of Guide Sleeve **[4]**

Remove the Retaining Ring **[1]**, Retainer **[2]**, Guide Spring **[3]** and Guide Sleeve **[4]** in order by following the procedure shown in Figs. 5-1 to 5-4. Be sure not to lose the two Steel Balls D3.97 **[9]** in Anvil (C) **[10]**.

<p>1</p>  <p><b>Fig. 5-1</b></p> <p>Hold the body and adjust the gap of the retaining ring to the groove of anvil (C), then insert a small flat-blade screwdriver into the groove at an angle.</p>	<p>2</p>  <p><b>Fig. 5-2</b></p> <p>Press down the retainer with the small flat-blade screwdriver.</p>
<p>3</p>  <p><b>Fig. 5-3</b></p> <p>Slide the small flat-blade screwdriver under one side of the gap of the retaining ring.</p>	<p>4</p>  <p><b>Fig. 5-4</b></p> <p>Slowly raise the retaining ring using the end face of guide sleeve as a fulcrum.</p>

Then slowly raise the other side of the retainer ring with the small flat-blade screwdriver until it is free. Avoid quickly raising the retainer ring or it may fly out forcefully.

(2) Removal of the Front Cap [5] and the Protector [6]

Remove the Front Cap [5] and Protector [6] from the Hammer Case [8] using a small flat-blade screwdriver.

(3) Removal of the Hammer Case [8] and the hammer assembly

Remove the four Tapping Screws (W/Sp. Washer) D4 x 25 (Black) [7] that connect the Hammer Case [8] with Housing (A).(B) Set [35] and remove the Hammer Case [8] and the hammer assembly from Housing (A).(B) Set [35].

(4) Disassembly of the hammer assembly

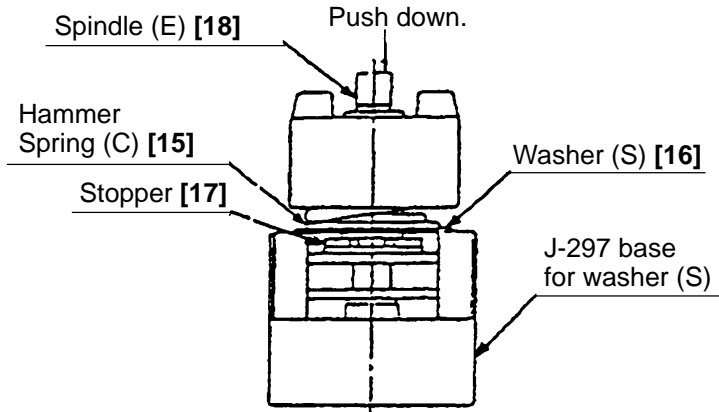


Fig. 6

Mount the hammer assembly onto the J-297 base for washer (S). With a hand press, push down the top of Spindle (E) [18] to compress Hammer Spring (C) [15]. In this position, remove the Stopper [17] with a flat-blade screwdriver, then release the hand press. (See Fig. 6.)

Remove the hammer assembly from the J-297 base for washer (S) and support the end surface of Spindle (E) [18]. With a hand press, push down either of the raised faces of Hammer (E) [12] to compress Hammer Spring (C) [15]. In this position, extract the two Steel Balls D5.556 [11] from the cam grooves of Spindle (E) [18] and Hammer (E) [12] with a small flat-blade screwdriver or a similar tool. Then, slowly release the hand press and lift Hammer (E) [12] and Washer (S) [16] together to extract them from Spindle (E) [18]. Hammer Spring (C) [15] can then be removed.

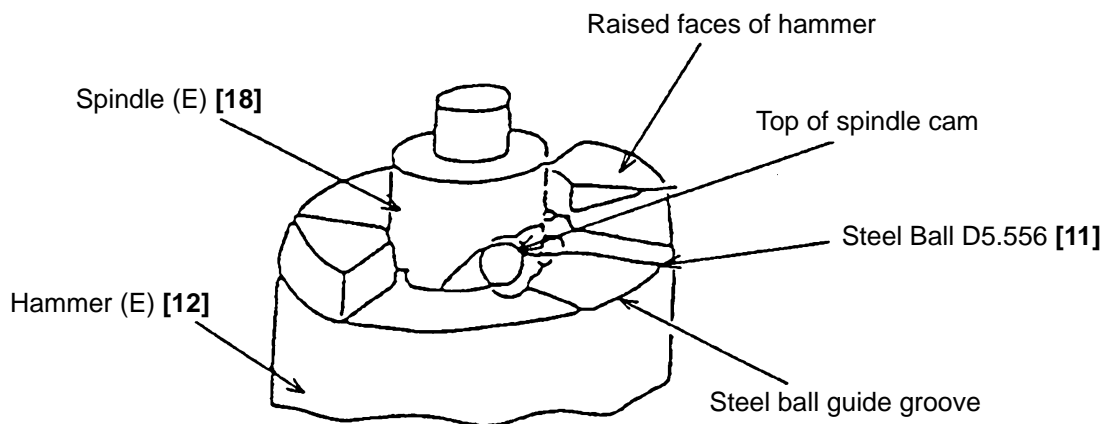


Fig. 7

(5) Removal of the Carbon Brushes 5 x 6 x 11.5 [30]

Remove the two Brush Caps [31]. Catch the flanges of the Carbon Brushes 5 x 6 x 11.5 [30] with a small flat-blade screwdriver or a similar tool and remove the Carbon Brushes 5 x 6 x 11.5 [30] at both sides.

(6) Removal of the Hook Ass'y [41]

Remove Special Screw (A) M5 [48] with a flat-blade screwdriver or a coin and remove the Hook Ass'y [41] and the Hook Spring [47].

(7) Removal of Housing (B) [35]

Remove the seven Tapping Screws (W/Flange) D4 x 20 (Black) [32] and a Machine Screw (W/Washers) M4 x 25 [46] from the main body. After removal of the Machine Screw (W/Washers) M4 x 25 [46], the Strap (Black) [44] and the Sleeve [45] can be removed. Before removing Housing (B) [35], be sure to remove the Brush Caps [31] because Housing (B) [35] cannot be removed if the Brush Caps [31] are mounted.

(8) After removal of Housing (B) [35], Inner Cover [25], Armature DC 14.4V [26], Magnet (C) Ass'y [27], Brush Block [29] and DC-Speed Control Switch [38] can be removed in a piece. The Pushing Button [39] can also be removed. The FET of the DC-Speed Control Switch [38] is firmly inserted in the housing. To remove the FET easily, raise the piece of Inner Cover [25], Armature DC 14.4V [26], Magnet (C) Ass'y [27] and Brush Block [29] from the housing. At this time, be careful not to break the three legs coming from the FET to avoid malfunction of the switch.

(9) Removal of the switch assembly

Remove the two Machine Screws (W/SP. Washer) M3 x 5 [37] that secure the flag terminal and then disconnect the internal wires (purple and black) of the Brush Block [29] from the DC-Speed Control Switch [38].

**(Note)** Do not disconnect the three FET internal wires soldered to the DC-Speed Control Switch [38].

(10) Removal of Magnet (C) Ass'y [27] and the Dust Guard Fin [28] and Washer (M) [51]

Remove Magnet (C) Ass'y [27] in the "B" direction (see Fig. 8) holding the Inner Cover [25] securely because Magnet (C) Ass'y [27] has a strong magnetism. The Dust Guard Fin [28] and Washer (M) [51] can be easily removed from Magnet (C) Ass'y [27] by pulling it in the "B" direction (see Fig. 8) because it is mounted to Magnet (C) Ass'y [27] magnetically.

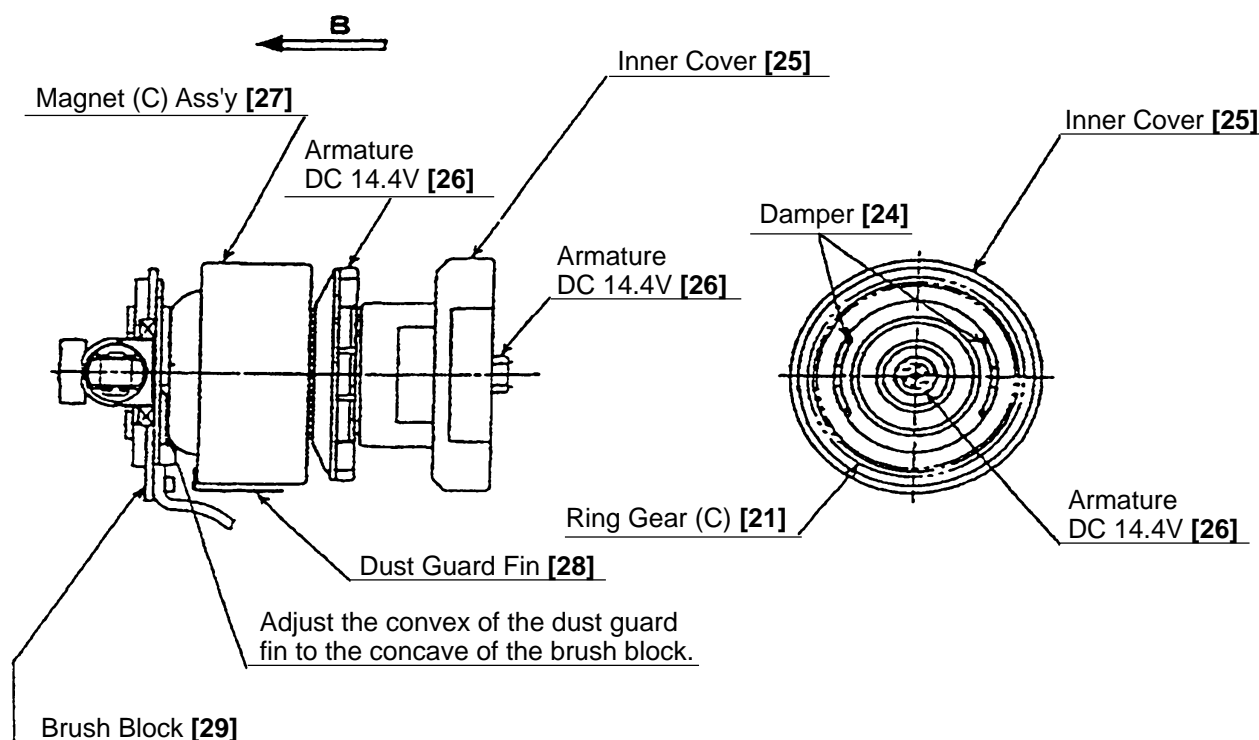


Fig.8

(11) Removal of the Armature DC 14.4V [26]

Support the Inner Cover [25] so that it does not contact the fan of the Armature DC 14.4V [26]. With a hand press, push down the tip portion of the Armature DC 14.4V [26] (pinion) to remove it.

(12) Removal of Ring Gear (C) [21] and the Damper [24]

Remove the Ring Gear (C) [21] from the Inner Cover [25] and remove the Damper [24] with a small flat-blade screwdriver.

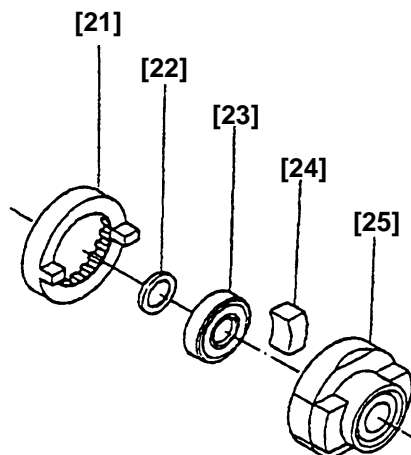


Fig. 9

### 10-1-2. Reassembly

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

(1) Reassembly of the housing assembly

- (a) Be sure to follow the wiring diagram (Fig. 10) for proper wiring.
- (b) When connecting the internal wires of the Brush Block [29] to the DC-Speed Control Switch [38], fasten them with the Machine Screws (W/Sp. Washer) M3 x 5 [37] paying attention to the direction of the flag terminal (Fig. 10).

**(Note)** If the flag terminal is mounted in wrong direction, the flag terminal may be damaged due to contact with the housings. In addition, the gap between housings (A) and (B) is widened and dust may get into housings (A) and (B).

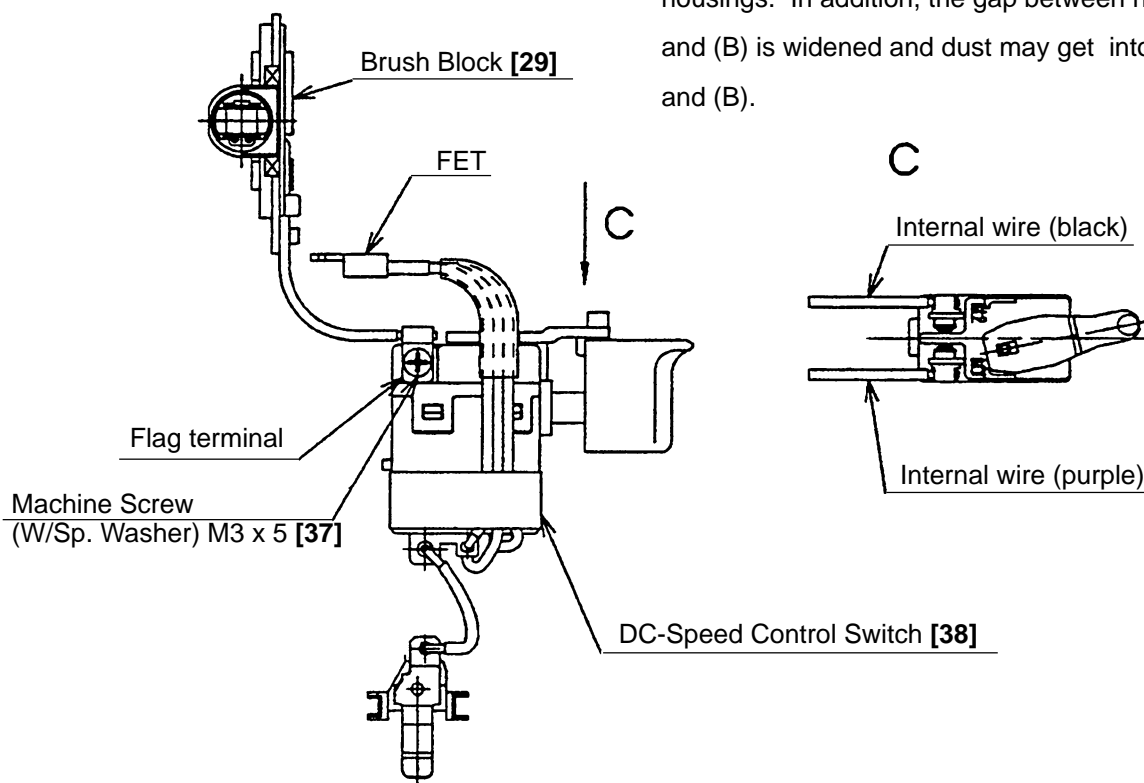


Fig. 10

(c) Mount a unit of the Inner Cover [25] (including the Armature DC 14.4V [26]), Magnet (C) Ass'y [27] (including the Dust Guard Fin [28] and Washer (M) [51]) and Brush Block [29] into Housing (A) [35] (See Fig. 14). Pay attention to the following items.

- Adjust the protrusion of the Dust Guard Fin [28] to the notch of Magnet (C) Ass'y [27] when mounting the Dust Guard Fin [28] to Magnet (C) Ass'y [27] (See Fig. 11).
- Adjust the convex portion of Washer (M) [51] to the concave portion of Magnet (C) Ass'y [27] when mounting Washer (M) [51] to Magnet (C) Ass'y [27] (See Fig. 12).
- Insert the two Dampers [24] so that they fit into the Inner Cover [25]. Fit the locking rib of Ring Gear (C) [21] to the concave portion of the Damper [24]. Press-fit the Armature DC 14.4V [26] into the Inner Cover [25].
- Adjust the convex portion of the Dust Guard Fin [28] to the concave portion of the Brush Block [29] (See Fig. 11).
- Adjust the notch (for locking) of Magnet (C) Ass'y [27] to the protrusion of Housing (A) [35] (See Figs. 11 and 13).
- Position the plate of the Dust Guard Fin [28] under the rib of Housing (A) [35] (See Fig. 14).

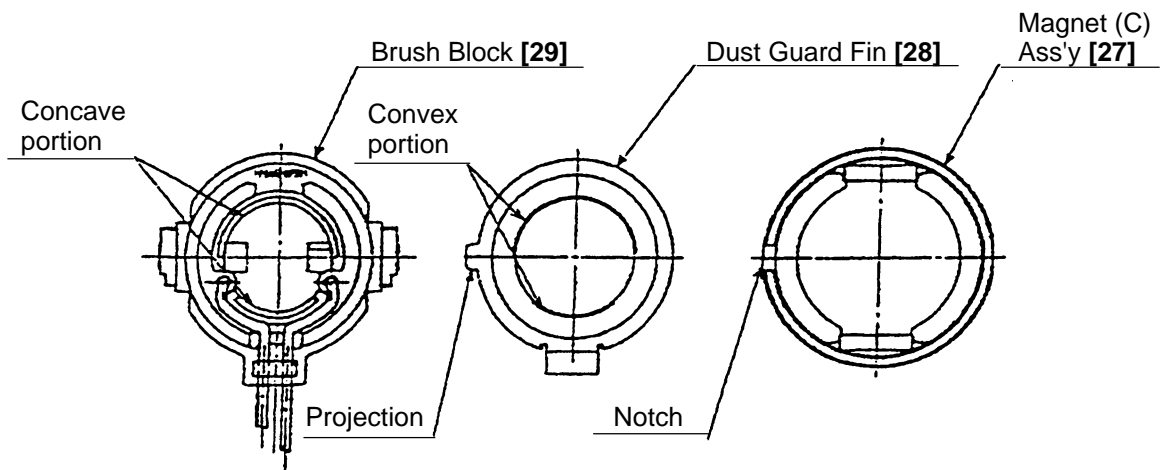


Fig. 11

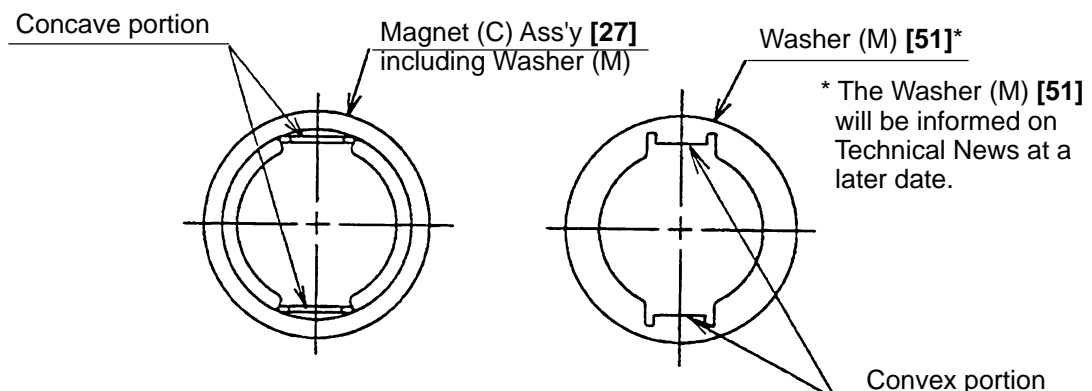
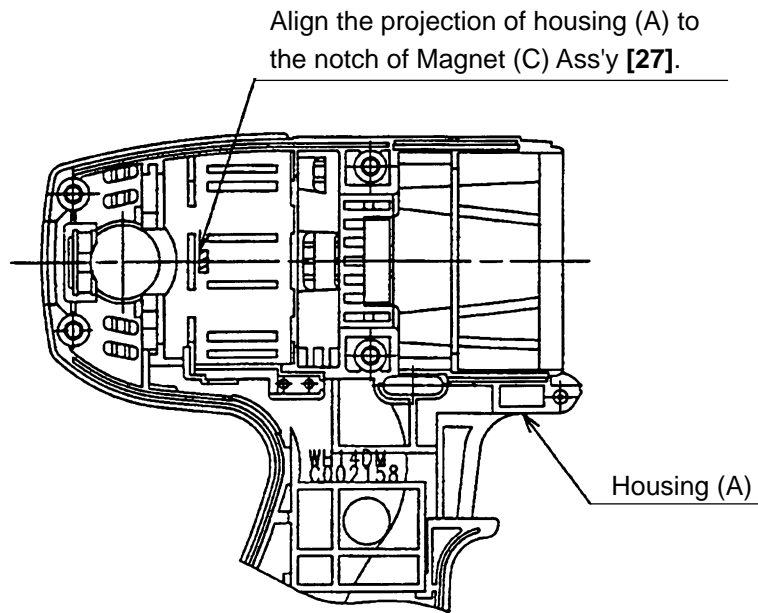


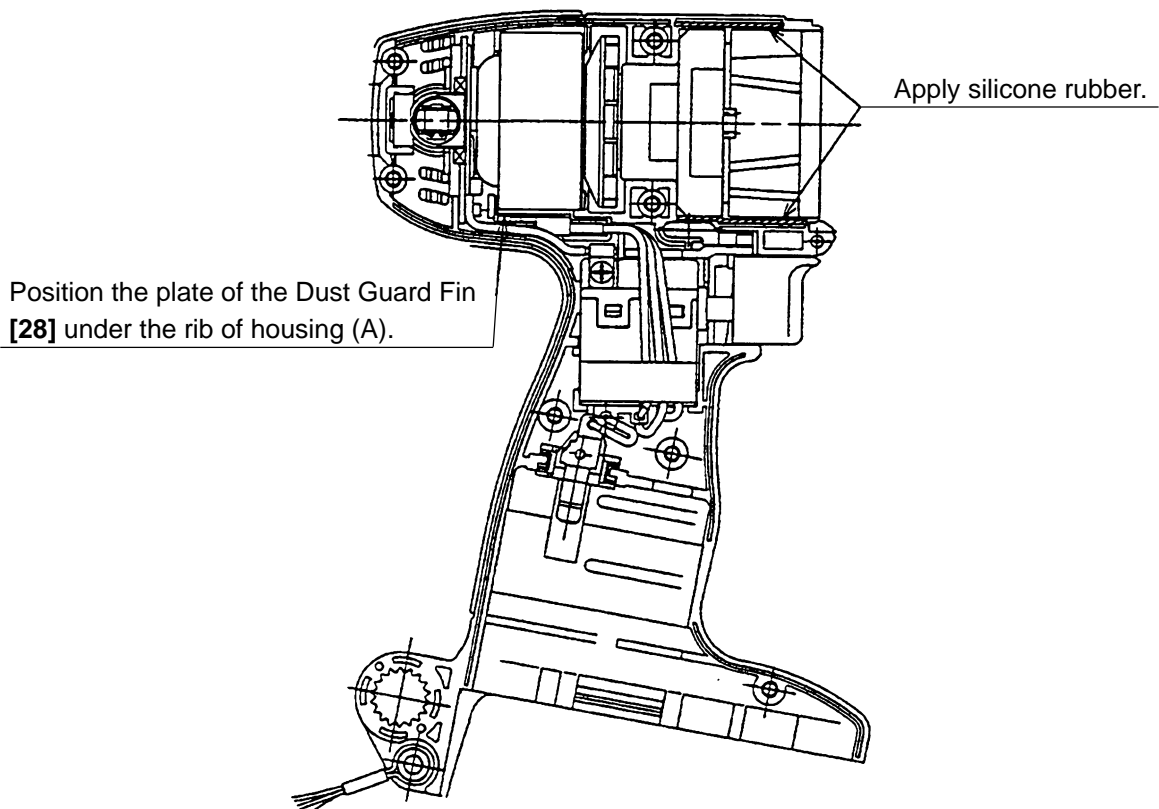
Fig. 12



**Fig. 13**

(d) Mount the DC-Speed Control Switch [38] to housing (A) so that the protrusion of the forward/reverse lever at the top of the switch is inserted into the U-shaped groove of the Pushing Button [39]. Apply silicone grease (KS609, Shin-Etsu Chemical Co., Ltd.) to the contacting surfaces of the FET of the DC-Speed Control Switch [38] and the Dust Guard Fin [28] then mount them to Housing (A) [35].

(Note) The temperature of the FET may be high if the silicone grease is not applied. Make sure that the three internal wires from the FET are passed above the DC-Speed Control Switch [38] (See Fig. 14).



**Fig. 14**

- (2) Apply silicone rubber (ThreeBond 1211) to Housing (A) [35] as shown in Fig. 16. Mount housing (B) to housing (A) and secure them with seven Tapping Screws (W/Flange) D4 x 20 (Black) [32]. Wipe the silicone rubber coming out of the housing with cloth. Insert the Sleeve [45] into the Strap (Black) [44] and tighten the Machine Screw (W/Washers) M4 x 25 [46].
- (3) Mounting the mechanical parts
- Mount Hammer (E) [12] containing the twenty-eight Steel Balls D3.175 [13], Washer (J) [14], Hammer Spring (C) [15] and Washer (S) [16] to Spindle (E) [18].
  - Align the top of the cam groove on Spindle (E) [18] with the steel ball guide groove on Hammer (E) [12] as illustrated in Fig. 7. Press down either of the raised faces of Hammer (E) [12] with a hand press to compress Hammer Spring (C) [15] until the end surface of Hammer (E) [12] contacts Spindle (E) [18].
  - Insert the two Steel Balls D5.556 [11] into the steel ball guide groove. Check that the steel balls are properly inserted in the cam groove. Then release the hand press.
  - Mount the hammer assembly onto the J-297 base for washer (S). With a hand press, push down the top of Spindle (E) [18] to compress Hammer Spring (C) [15]. On this condition, mount the Stopper [17] onto the spindle shaft and then release the hand press.
- (4) Mounting the hammer assembly to the housing
- Raise the housing assembled in step (2) and mount the hammer assembly to the housing being careful of proper engagement between the Idle Gear Set (2 pcs.) [19] of the hammer assembly (check that Washer (E) [22] is mounted on Spindle (E) [18]) and Ring Gear (C) [21]. After mounting, check that the hammer assembly turns. If the hammer assembly does not turn, the gears engage improperly.
- (5) Mounting the hammer case
- Put Anvil (C) [10] on Spindle (E) [18]. Cover it with the Hammer Case [8] and secure with the four Tapping Screws (W/Sp. Washer) D4 x 25 (Black) [7].

(6) Mounting Guide Sleeve [4]

Insert the two Steel Balls D3.97 [9] into the hole of Anvil (C) [10]. Mount the Guide Sleeve [4], Guide Spring [3] and Retainer [2] in sequence. Mount the Retaining Ring [1] into the groove of anvil using J295 jigs (A) and (B) for retaining ring as illustrated in Fig. 15.

(NOTE) Be sure to replace the Retaining Ring [1] with new one because the Retaining Ring [1] may be deformed at disassembly and the Guide Sleeve [4] may come off if the deformed Retaining Ring [1] is used again.

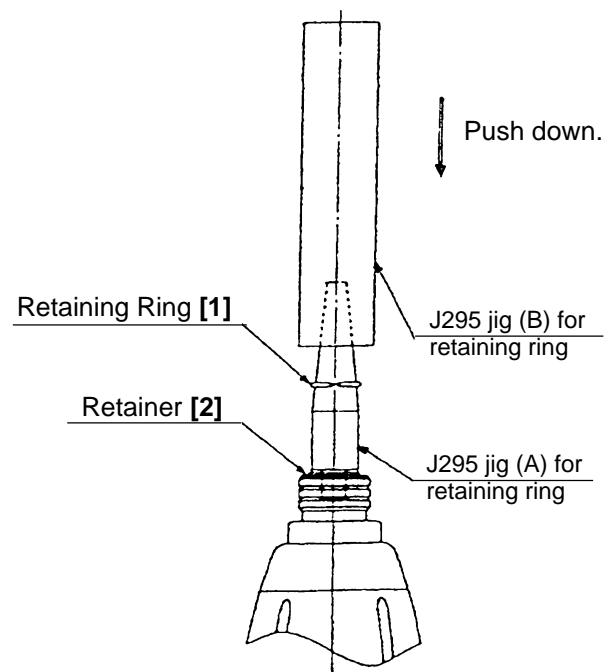


Fig. 15



(7) Reassembly of the hook

Check that the V-Lock Nut M5 [42] is mounted into the Hook Ass'y (W/Light) [41]. Mount the Hook Spring [47] and secure it with the Special Screw (A) M5 [48]. (Make sure to mount the Hook Spring [47] with its larger diameter side pointing inward the housing.)

(8) Checking the direction of rotation

Check whether the direction of rotation of Anvil (C) [10] coincides with the directional markings on the push-on side of the Pushing Button [39]. When the Pushing Button [39] is turned to (R) side, the direction of rotation of Anvil (C) [10] should be clockwise, as viewed from behind.

(9) Lubrication

(a) ATTOLUB MS No. 2

- Pinion tooth flanks of the Armature DC 14.4V [26], tooth flanks of Ring Gear (C) [21], tooth flanks of the Idle Gear Set (2 pcs.) [19]
- Twenty-eight Steel Balls D3.175 [13]

(b) MOLUB-ALLOY 777-1

- All around the Needle Roller [20]
- 5 mm diameter hole of Idle Gear Set (2 pcs.) [19]
- Cam groove and sliding section of Spindle (E) [18]
- Cam groove and oil groove of Hammer (E) [12]
- 8 mm diameter hole of Anvil (C) [10], sliding section between Anvil (C) [10] and the metal, and upper surface of the claw
- Two Steel Balls D5.556 [11]
- Metal oil groove of the Hammer Case [8]

(b) HITACHI MOTOR GREASE No. 29

- Two Steel Balls D3.97 [9]
- Sliding section between Anvil (C) [10] and Guide Sleeve [4]

(10) Screw tightening torque

- Tapping Screw (W/Sp. Washer) D4 x 25 (Black) [7] .....  $1.96 \pm 0.49 \text{ N}\cdot\text{m}$  ( $20 \pm 5 \text{ kgf}\cdot\text{cm}$ ,  $17.4 \pm 4.3 \text{ in}\cdot\text{lbs.}$ )
- Tapping Screw (W/Flange) D4 x 20 (Black) [32] .....  $1.96 \pm 0.49 \text{ N}\cdot\text{m}$  ( $20 \pm 5 \text{ kgf}\cdot\text{cm}$ ,  $17.4 \pm 4.3 \text{ in}\cdot\text{lbs.}$ )
- Machine Screw (W/Washers) M4 x 25 [46] .....  $1.27 - 1.96 \text{ N}\cdot\text{m}$  ( $13 - 20 \text{ kgf}\cdot\text{cm}$ ,  $11.3 - 17.4 \text{ in}\cdot\text{lbs.}$ )
- Machine Screw (W/Sp. Washer) M3 x 5 [37] .....  $0.29 - 0.39 \text{ N}\cdot\text{m}$  ( $3 - 4 \text{ kgf}\cdot\text{cm}$ ,  $2.6 - 3.5 \text{ in}\cdot\text{lbs.}$ )
- Special Screw (A) M5 [48] .....  $1.96 \pm 0.49 \text{ N}\cdot\text{m}$  ( $20 \pm 5 \text{ kgf}\cdot\text{cm}$ ,  $17.4 \pm 4.3 \text{ in}\cdot\text{lbs.}$ )
- Brush cap [31] .....  $0.78 \pm 0.10 \text{ N}\cdot\text{m}$  ( $8 \pm 1 \text{ kgf}\cdot\text{cm}$ ,  $6.9 \pm 0.9 \text{ in}\cdot\text{lbs.}$ )

## 10-2. Precautions in Disassembly and Reassembly of Battery Charger

Refer to the Technical Data and Service Manual for precautions in disassembly and reassembly of the Model UC 14YF2 battery charger.

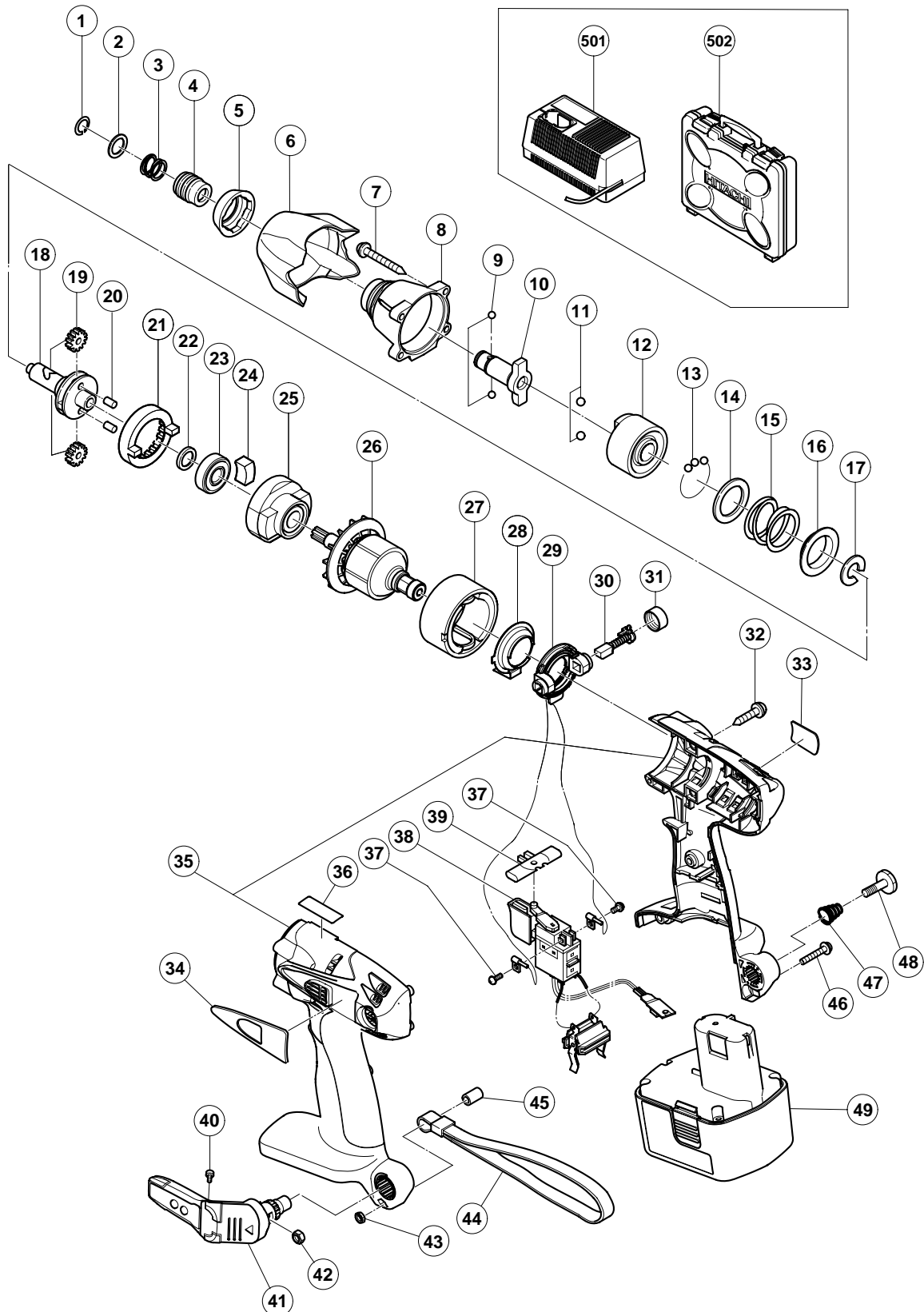
# 11. STANDARD REPAIR TIME (UNIT) SCHEDULES

MODEL	Variable		10	20	30	40	50	60 min.
	Fixed							
WH 14DM		Work Flow						
		DC-Speed Control Switch Hook Ass'y			Housing (A).(B) Set			
				Inner Cover Armature Magnet (C) Ass'y				
		General Assembly	Guide Sleeve	Hammer Case Anvil (C) Ring Gear	Hammer (E) Steel Ball Hammer Spring (C)  Spindle (E) Idle Gear Set Needle Roller Ball Bearing (6901VV)			

## ELECTRIC TOOL PARTS LIST

**■ CORDLESS IMPACT DRIVER**  
**Model WH 14DM**

**2003 • 6 • 5**  
**(E1)**



# PARTS

WH 14DM

ITEM NO.	CODE NO.	DESCRIPTION	NO. USED	REMARKS	
1	317-530	RETAINING RING	1		
2	318-394	RETAINER	1		
3	317-528	GUIDE SPRING	1		
4	322-077	GUIDE SLEEVE	1		
5	320-418	FRONT CAP	1		
6	322-076	PROTECTOR	1		
7	319-917	TAPPING SCREW (W/SP. WASHER) D4X25 (BLACK)	4		
8	322-075	HAMMER CASE	1		
9	959-155	STEEL BALL D3.97 (10 PCS.)	2		
10	322-072	ANVIL (C)	1		
11	959-154	STEEL BALL D5.556 (10 PCS.)	2		
12	322-069	HAMMER (E)	1		
13	959-148	STEEL BALL D3.175 (10 PCS.)	28		
14	315-978	WASHER (J)	2		
15	320-879	HAMMER SPRING (C)	1		
16	316-172	WASHER (S)	1		
17	316-171	STOPPER	1		
18	322-068	SPINDLE (E)	1		
19	319-913	IDLE GEAR SET (2 PCS.)	2		
20	319-914	NEEDLE ROLLER	2		
21	320-877	RING GEAR (C)	1		
22	319-911	WASHER (E)	1		
23	690-1VV	BALL BEARING 6901VVCMP2L	1		
24	322-143	DAMPER	1		
25	319-908	INNER COVER	1		
26	360-613	ARMATURE DC 14.4V	1		
27	320-916	MAGNET (C) ASS'Y	1		
28	319-907	DUST GUARD FIN	1		
29	320-876	BRUSH BLOCK	1		
30	999-054	CARBON BRUSH 5X6X11.5 (1 PAIR)	2		
31	319-918	BRUSH CAP	2		
32	302-086	TAPPING SCREW (W/FLANGE) D4X20 (BLACK)	7		
* 33		NAME PLATE	1		
34		HITACHI LABEL	1		
35	322-074	HOUSING (A).(B) SET	1		
* 36		CAUTION PLATE	1		
37	994-532	MACHINE SCREW (W/SP. WASHER) M3X5	2		
38	321-533	DC-SPEED CONTROL SWITCH	1		
39	320-512	PUSHING BUTTON	1		
40	321-672	TAPPING SCREW D2X6	2		
41	321-918	HOOK ASS'Y (W/LIGHT)	1	INCLUD. 40, 42	
42	320-288	V-LOCK NUT M5	1		
43	949-565	LOCK NUT M4 (10 PCS.)	1		
44	306-952	STRAP (BLACK)	1		
45	320-882	SLEEVE	1		
46	676-386	MACHINE SCREW (W/WASHERS) M4X25	1		
47	319-926	HOOK SPRING	1		
48	320-881	SPECIAL SCREW (A) M5	1		
* 49	318-372	BATTERY EB 1430H (W/ENGLISH N.P.)	2		
* 49	315-130	BATTERY EB 14B (W/ENGLISH N.P.)	2		
* 49	315-129	BATTERY EB 14B (W/ENGLISH N.P.)	1	FOR USA, CAN	

**WH 14DM**

## OPTIONAL ACCESSORIES

**6 - 03**



