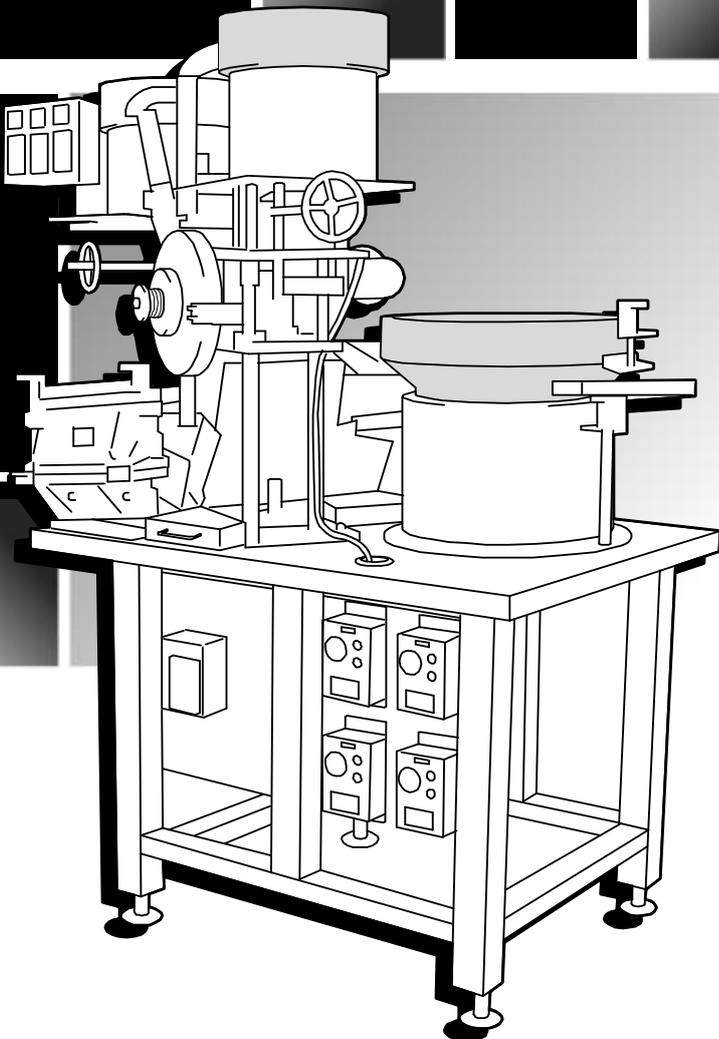


WASHER ASSEMBLY MACHINE **THI-AV** INSTRUCTION MANUAL



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Meanings and dangerous ranks of alarm marks

The alarm marks used in this manual are classified in three stages according to the dangerous rank, and trouble seriousness and possibility.

The alarm marks and their meanings are listed below. Completely understand the meanings of the alarm marks, and be sure to observe the instructions.

Alarm mark	Warning notice	Meaning and dangerous rank of alarm
 DANGER	DANGER	The occurring danger is extremely serious. If any instruction or procedure is not obeyed, it may lead to a death or serious injury.
 WARNING	WARNING	The occurring danger is serious. If any instruction or procedure is not obeyed, it may lead to a serious or slight injury.
 CAUTION	CAUTION	The occurring danger may lead to a middle or slight injury or damage a machine component.

 DANGER	
 Inhibition	<p>Never remove the covers (flywheel cover, pitman wheel cover and others) of the rotating part.</p> <p>If any part of your body touches the running part, you may be caught in, thus causing a serious wound or death accident. If any cover is inevitably removed for maintenance or other purposes, previously turn the primary power source.</p>
	<p>Never open the control panel.</p> <p>Otherwise it may result in an electric shock. The person qualified for electricity must do the breaker check and others.</p>
	<p>Do not run the machine keeping the safety cover and protective cover removed.</p> <p>Otherwise, the arm or hair may be wound in by the rotating part, etc., possibly resulting in a serious human accident.</p>
	<p>During operation of the machine, do not come near any operating section (starter, ram, etc).</p> <p>Otherwise, the hand or arm may be pinched, thus causing a serious human accident.</p>
	<p>Do not operate the machine keeping the interlock of each safety device or safety cover removed.</p> <p>Otherwise, any pinching operation of the rotating or moving part, an electric shock, etc. may occur, possibly resulting in a serious human accident.</p>
	<p>Plural operators do not operate the machine at the same time.</p> <p>If any operator still touches the machine when another operator operates the machine by mistake, the machine, possibly suffering from a serious human accident may wind in the latter.</p>
 Contact inhibition	<p>Never be near the high-speed rotating area of the machine.</p> <p>Otherwise, the hand or arm may be pinched, possibly resulting in a serious human accident. Do not be near any operating part while the machine is running.</p>



DANGER



Obey the instruction

A qualified electrical service person only must maintain or repair the electrical system.

If it is done by any unqualified worker, it may lead to an electric shock or serious human accident.

When removing the flywheel, use the crane or other which sufficiently bear the weight, taking care during the work.

If the flywheel drops, it will cause a serious accident.

When using the crane, press or similar, the qualified worker must do the work. Moreover, take care since the work handles a heavy object.

Otherwise, it may cause a serious human accident.

The battery used in the PLC must be store at the place which cannot be reached by the hand of a child.

If it is drunk by mistake, it may lead to a death.



WARNING



Inhibition

Never rewrite the content of the PLC program.

Otherwise, the machine will unexpectedly operate to possibly lead to a machine trouble. If it is inevitably necessary to rewrite the program, gain the permission of SANMEI or responsible person.

Moreover, be sure to store the content of the written program at each concerned section. If this is skipped, the machine will sometimes become disable to maintain and modify.

Do not replace any battery used in the PLC with one different in the model, polarity or other.

There may be a danger of explosion.

For replacement, use the battery of the model recommended by the maker or equivalent. Dispose of the used battery according to the instruction of the manufacturer.



Ground check

Be sure to ground the machine.

If it is not grounded, the leak breaker will not be activated when electricity leaks.

Do not connect any ground cable to the gas pipe. Otherwise, it may be exploded.

Unless it is grounded, it may cause an electric shock.

Apply the ground work of Special Class 3 to keep the ground resistance under 100Ω.

Assure the cross-sectional area of 14mm² or more for the ground cable.



Obey the instruction

When loosening the bolt or removing part, keep the stable posture for the work.

If it is worked in any unstable posture, the body balance will be broken to possibly cause an unexpected injury.

Assure the maintenance area.

Assure the maintenance area (workable space for machine maintenance). Moreover, install it at the place where any interference is not present when the door of the control panel is opened and closed.



CAUTION



Inhibition

Do not climb the machine or place any material on the machine.

If it drops or falls down, it will cause an injury.

Do not disassemble, repair, relocate or discard the machine.

If any defective part is present, it may cause a fire, electric shock or part drop, thus causing a wound.

Do not use any new and old belts together.

Since the length and driving elongation are different between them, it may cause the transmission loss of the power and shorten the life of the belt.



CAUTION

 Inhibition	<p>Any person who is disordered in the acuity, auditory or mental sense must not operate the machine.</p> <p>Otherwise, any machine abnormality or similar will not be sensed, possibly resulting in a serious human accident.</p>
	<p>Do not place any flammable dangerous material around the machine.</p> <p>If it is placed near the machine, it will catch fire to cause an explosion or fire hazard.</p>
	<p>Do not do any welding work or handle fire around the machine.</p> <p>Otherwise, the oil used in the machine may catch fire to cause a fire hazard.</p>
	<p>Do not put on any ring, necklace, watch, etc.</p> <p>Otherwise, it may cause an electric shock or winding-in accident.</p>
	<p>Do not operate the machine, drinking alcohol, chemical, etc.</p> <p>Otherwise, it may cause a wrong judgment, possibly resulting in a serious human accident.</p>
	<p>Do not remove any warning notice sticker.</p> <p>Otherwise, it may cause an accident. If it is removed, contact our company.</p>
 Wet hand inhibited	<p>Do not operate or maintain the machine with wet hand.</p> <p>Otherwise, an electric shock may cause a serious human accident.</p>
 Ground check	<p>Be sure to separately ground the machine.</p> <p>If it is not separately grounded, it is very dangerous since the ground fault current flows into this machine from another machine if the ground terminal, etc. comes into contact failure. When using the frame, etc. of the factory building as the ground pole, be sure to separate it from the ground of an electric welder, electric discharge machine or other noise generating machine. Otherwise, the noise may malfunction the machine.</p>
 Contact inhibition	<p>During setup, do not touch any continuous operation button.</p> <p>If the ram is brought into continuous operation, it may cause such a human accident as the hand or similar is caught in.</p>
 Obey the instruction	<p>When removing the part, take care to prevent the finger or similar from being pinched.</p> <p>Otherwise, it may cause a wound.</p>
	<p>In emergency (malodor, irregular sound, large vibration, etc), stop the operation and turn off the power switch.</p> <p>If the operation is continued in any irregular state, it may cause an electric shock or fire.</p>
	<p>Before replacing the belt, turn off the power source of the machine and clearly notify "Under maintenance".</p> <p>If the machine is carelessly operated during belt replacement, you may be pinched by the flywheel, thus resulting in a serious human accident.</p>
	<p>Carefully set up the set of the dies to precisely adjust the pitch.</p> <p>If this process is skipped, it may cause not only a defectively threaded product but also an accident of the machine breakage due to the pull-back, etc.</p>
	<p>Keep the air pressure on the primary side at 0.4 to 0.6Mpa.</p> <p>If the air pressure drops, it will cause the improper operation of the equipment.</p>



CAUTION



Obey the instruction

Carefully adjust the flow rate of lubricant.

If the flow rate is choked more than necessary, it will cause the slide surface to be seized.

On the oil in use, periodically inspect its properties. If the oil quality varies or any impurity is mixed, immediately remove it and renew the oil.

The deteriorated lubricant causes the friction on the slide surface, thus reducing the precision of the machine.

When operating the machine, be sure to put the earplugs.

Otherwise, the noise may impair the auditory organs.

Make the floor as horizontal as possible, and install it at the place where the ground is sufficiently strong.

Do not install it at any place of the extremely high or low temperature. Do not install it at any place where chips, cutting oil, cooling water, etc. is splashed from another machine. (Ambient temperature: 0° to 45° Ambient humidity: 90% (Note that the temperature must vary without dewing.))

It may cause a wound or accident.

Input the power source, separating it from that of the electric welder, electric discharge machine or similar machine which generates noise.

Otherwise, the noise may cause the machine to malfunction. If the capacity of the power source is insufficient, the voltage may drop to malfunction the machine.

Be sure to lead the power cables directly and separately from the sufficient power source.

Power source voltage : Nominal power source voltage within a fluctuation of -15% to +10%

Power source frequency : Nominal power source frequency within a fluctuation of ±2Hz

When using the machine, operate it within the load capacity specified in the specifications and operation manual.

If any excessive load is applied, the machine may be seriously damaged.

In the rolling process, be sure to use the processing oil.

If it runs at the high speed without use of the processing oil, the accumulated processing heat or other may thermally seize the friction surface or cause another trouble.

Only a person who masters the operation, learns the safety education and is qualified as the operator by the company must operate the machine.

If any unskilled person operates the machine, it may cause a human accident or machine trouble.

Only a person who knows the method to stop the machine in emergency or at the normal time must operate the machine.

If the method of emergency stop in emergency is not known, it may cause a human accident, and if it is not stopped in the proper procedure, it will trouble the machine.

When operating the machine, put on the safety clothing.

Otherwise, it may cause a wound.

Be sure to put on the safety shoes and gloves, and helmet or working cap.

A person with long hair settles the hair with the working cap, and operates the machine.

If any hair is wound in by the machine, it will result in a human accident.

■ **Safety rules for operation (Item to keep)**

Make sure that any working tool or die is not placed on the machine or cover.
Make sure that all adjustment areas are securely fastened.
Clean the working area off waste material and obstacles.
Wipe the floor surface of the working area off oil and similar against the slip.
If any defect, danger or abnormality is present, immediately contact the foreman.

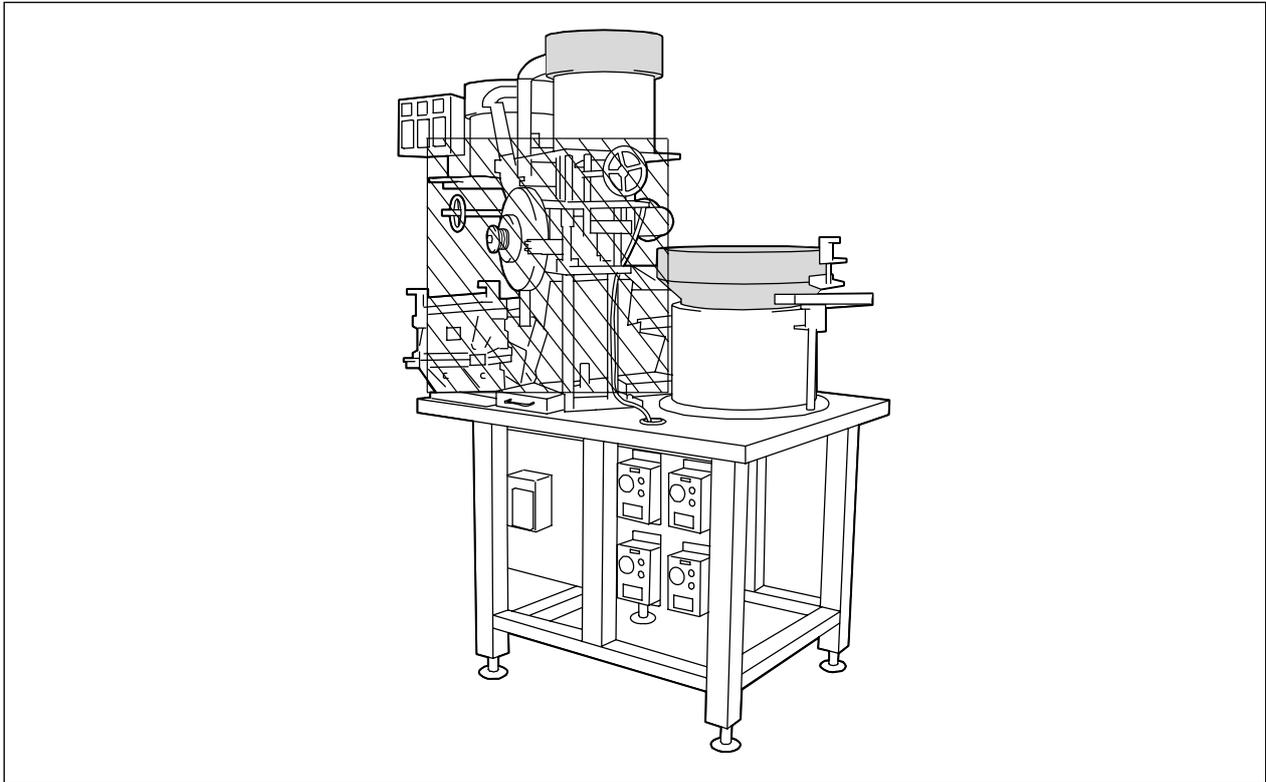
■ **Safety rules for setup (Items to inhibit)**

Do not use any mismatched tool, spanner, wrench or other tool.
Do not use any pliers instead of the spanner and wrench.
Do not use any wider-mouthed spanner or round-cornered wrench.
Do not use any screwdriver instead of the wedge and chisel.
Do not hit any spanner or wrench with the steel-made hammer.
(If it is necessary to hit it, use copper hammer.)
Do not tighten any screw, bolt, nut or similar using the pipe which breaks the thread.
Do not forcibly turn any bolt or nut which may be thermally seized.

a. Dangerous area (AV type)

Though care is taken for safety during design and manufacture of the equipment, the dangerous areas are inevitably remained. During the work, take sufficient care for the access to the head dial area, the operation and the contact.

The dangerous areas of this machine are hatched in the following drawing.



	<h2 style="margin: 0;">DANGER</h2>
<p>Do not touch any operating area. The machine rotates at a high speed. If any part of the human body touches the operating area, the body will be wound in, possibly resulting in a serious injury or death. During continuous operation, never be near any operating area (hatched in the drawing).</p>	

	<h2 style="margin: 0;">DANGER</h2>
<p>Never remove any cover of the rotating part. If any cover is inevitably removed for the maintenance or other purpose, be sure to turn off the power source on the primary side.</p>	

2. Before Operating the Machine

AV

Thank you very much for purchasing our machine.

Special care is taken for the safety in the design and manufacture stages of the machine.

However, to safely operate and maintain the machine, it is necessary for the operators and maintenance service person to observe the safe rules.

■ For proper operation, refer to the Instruction Manual.

Even if the machine is designed and manufactured with sufficient care, the component may be broken or troubled due to the carelessness or mistake of the operator or service person, possibly leading to a human accident in the worst case.

Accordingly, the operators and service person must read through this Instruction Manual and observe the instructions.

■ After understanding, operate the machine.

When reading the Instruction Manual to the last, read the cautionary items once again and completely understand the content. Then operate the machine.

Store this Instruction Manual without dirtiness, and at the accessible place in order to refer to it at all times.

■ Take the daily care, and keep the rules.

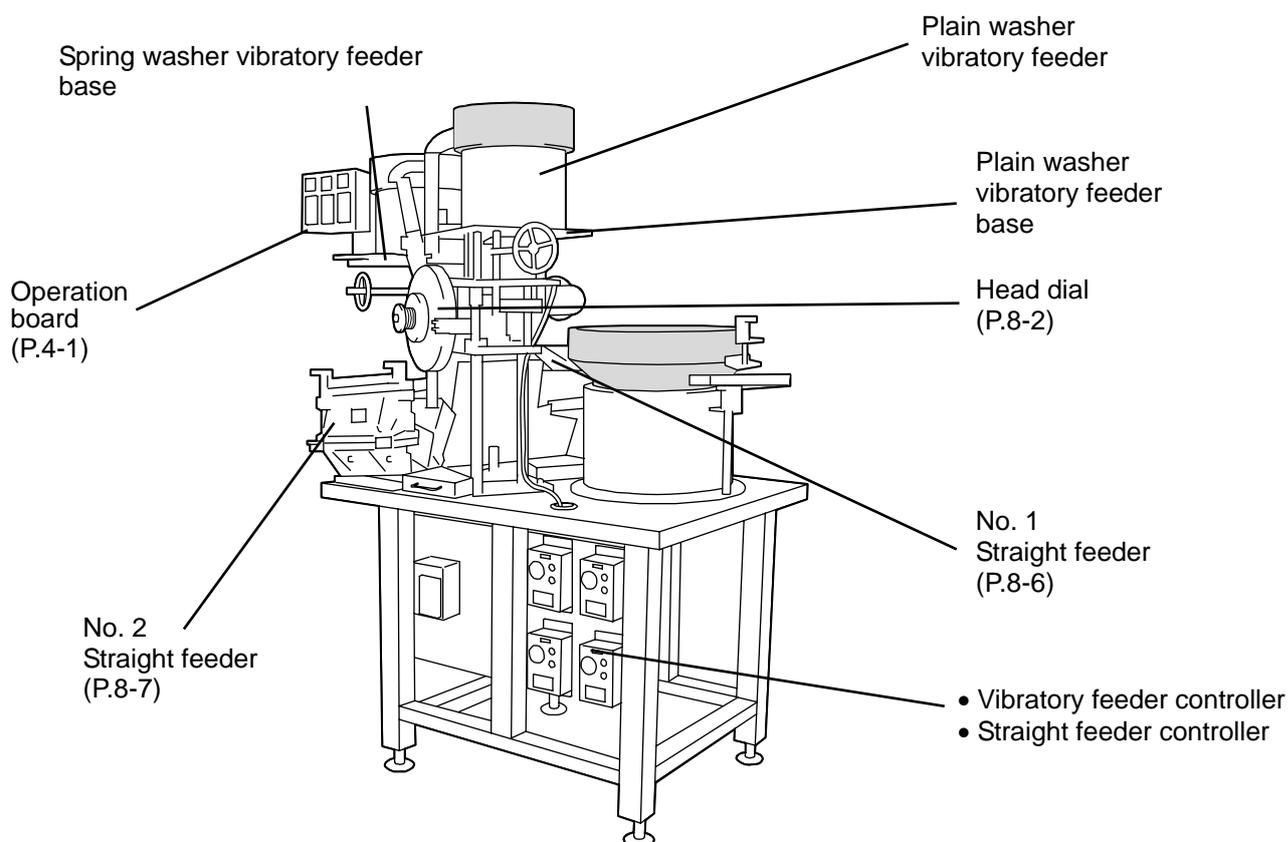
Copy "6. Periodic Inspection Table", and use it for the daily maintenance.

It is also requested to observe the safe rules which are specified by the safety laws and your company.

* If any doubtful point is found in the instruction manual, consult the business man of SANMEI WORKS.

3. Outline and Specifications of Machine

AV

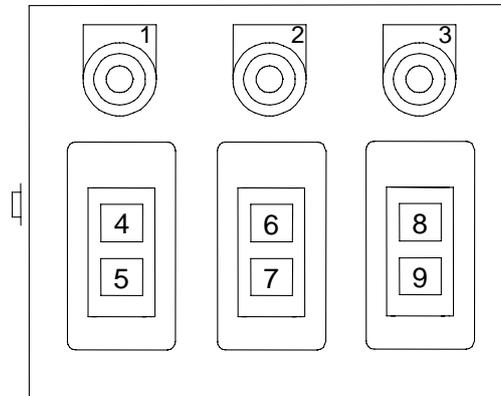


■ Washer assembly machine THI-AV combination machine specifications

Item	Specifications
Maximum combinable nominal diameter	M2 to M12
Combinable screw length	5mm to 75mm
Combinable washers (example)	PW MAX ø28 SW, SLW CW and others
Combination performance (per minute)	60 to 300 pieces
Transmission	Inverter
Supply device	Slide conveyor/straight feeder
Motor applied and others	Fuji Electric Totally enclosed fan-cooled type 200V 3-phase 4P 100W
Machine dimension	W850xL1100xH2200mm

4-1. Description of operation board

For details, refer to the drawing in each board.



Operation board

■ Indication lamp (Indication color: G = Green)

Indication lamp	Lamp color	Name	Operation description
1	G	Benly	Lighted when the power supply of the index is turned on.
2	G	Washer	Lighted when the power supply of the washer vibratory feeder is turned on.
3	G	Hopper	Lighted when the power supply of the rivet vibratory feeder is turned on.

■ Operation switches (Indication color: B = Black, R = Red)

Indication lamp	Lamp color	Name	Operation description
4	B	Benly ON	Press it, and head dial will be turned.
5	R	Benly OFF	Press it, and head dial will stop turning.
6	B	Washer ON	When it is pressed, the power supply of the washer vibratory feeder is turned on.
7	R	Washer OFF	When it is pressed, the power supply of the washer vibratory feeder is turned off.
8	B	Hopper ON	When it is pressed, the power supply of the rivet vibratory feeder is turned on.
9	R	Hopper OFF	When it is pressed, the power supply of the rivet vibratory feeder is turned off.

5. Machine Starting Method after Long Holidays

AV

After a halt of a long time, verify that the head dial normally rotates, keeping the rivet not supplied. Even after a halt of a long time, there is not any area which requires special care during start of the next operation.

6. Periodic Inspection Table



The periodic maintenance and inspection are recommended to maintain the machine precision and safely operate the machine. Since the periodic inspection table is shown below, refer to it.

Machine No. :
 Inspection date :
 Service person : Sign

Inspection item	Inspection method	Inspection interval	Result	Remarks
Vibration of rivet vibratory feeder	Visual check	Every day		
Operation of sensor and controller of rivet vibratory feeder	Visual check	Every day		
Vibration of washer vibratory feeder	Visual check	Every day		
Operation of sensor and controller of washer vibratory feeder	Visual check	Every day		
Vibration of straight feeder rail	Visual check	Every day		
Operation of controller of straight feeder rail	Visual check	Every day		
Wear of straight feeder rail	Visual check	Half a month		
Wear of inlet work stopper	Visual check	Half a month		
Wear of head dial band	Visual check	Half a month		
Wear of head dial and outer drum	Visual check	Half a month		
Wear of washer rail	Visual check	Half a month		
Wear of washer rail outlet	Visual check	Half a month		
State of motor (shaft bending, etc.)	Visual check	Half a month		
Looseness and bending of reduction gear handle	Visual check	Half a month		
Reduction gear lubrication oil	Visual check	Every 3 months		

7. Description of Terms Used

The terms used in this manual are described as follows.

■ Machine and concerned

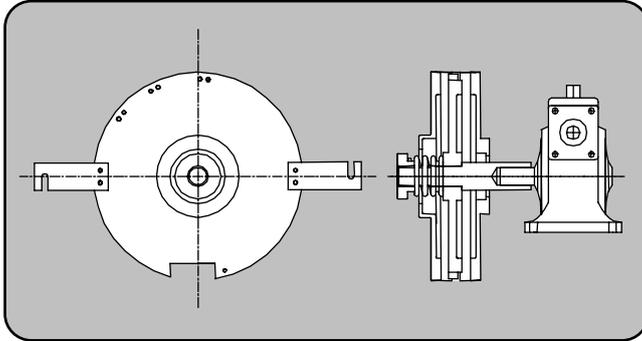
Term	Description
Outer drum	This disc is positioned on the outer side of the head dial, working as a guide for rivets.
Head dial drum	This disc catches the heads of rivets one by one, and rotates to feed the products.
Inner drum	This disc is positioned on the inner side of the head dial, working as a guide for rivets. It is fastened on the frame.
Drum band	This is a guide plate for the rivets, being made of steel plate and being bonded on the outer drum and inner drum.
Drum holder	This is a plate which fastens the outer drum on the inner drum.
Vibratory feeder	This is an equipment to feed the rivets and washers with the vibration motion.
Washer pusher	This is a guide plate which feeds the washer to the root of the rivet after assembling the washer on the rivet.
Washer rail	This is a guide to transfer the washer from the vibratory feeder to the assembling area.
Reduction gear (Worm gear transmission)	This equipment reduces the revolution speed of the motor.

■ Electricity and concerned

Term	Description
Electric circuit	It is a path where electricity flows.
Voltage	It is a pressure which drives the electricity to flow. (Unit: volt (V))
Current	It is the pressure of the electric current when the electricity flows. (Unit: ampere (A))
Alternate current (AC)	The strength of the voltage and current, and the current direction alternate at the constant intervals.
Direct current (DC)	The strength and direction of the current are continuously constant.
Electromagnetic switch (magnet)	When it is energized, the switch opens and closes the electric circuit with the force of the electric magnet. It is mainly used for the electricity of a large capacity.
Relay	When it is energized, the relay opens and closes the electric circuit with the force of the electric magnet. It is used to control the electricity such as signals.
Electromagnetic valve (solenoid valve)	When it is energized, the device opens and closes the valve with the force of the electric magnet. It is used to control the flow of the fluid such as an air and oil, etc.
Electromagnetic switch protective circuit (thermal relay)	The device protects the rotary component and others from the overcurrent, etc. If any overcurrent is detected, the circuit will be shut down.
Transformer	The device converts the AC voltage.

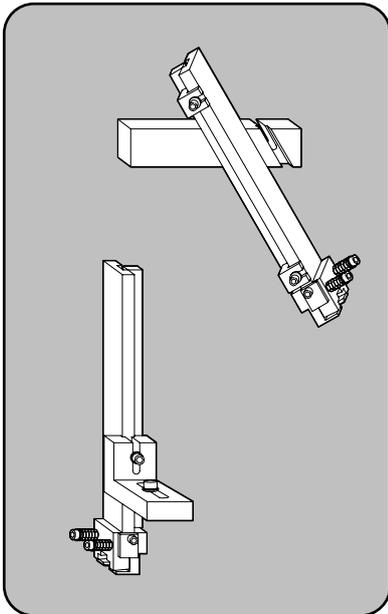
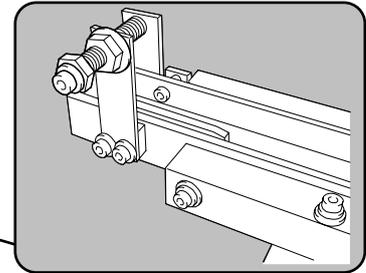
8. Adjusting Method of Each Component

- a. Replacement of head dial (P.8-2)
- b. Replacement of drum spacer (P.8-3)

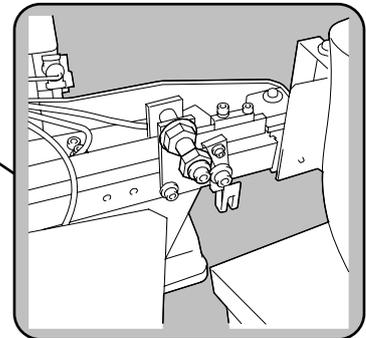


- d. Adjusting method of washer rail (P.8-5)

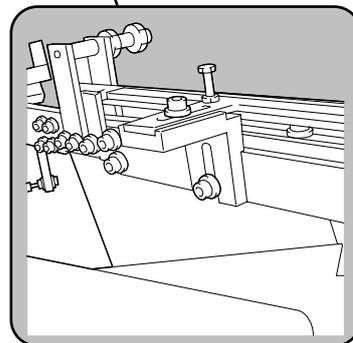
- e. Adjusting method of No. 1 straight feeder (P.8-6)



- c. Replacement of washer rail (P.8-4)



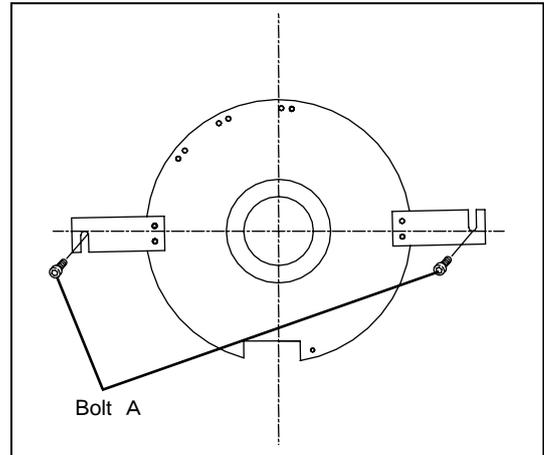
- f. Adjusting method of No. 2 straight feeder (P.8-7)



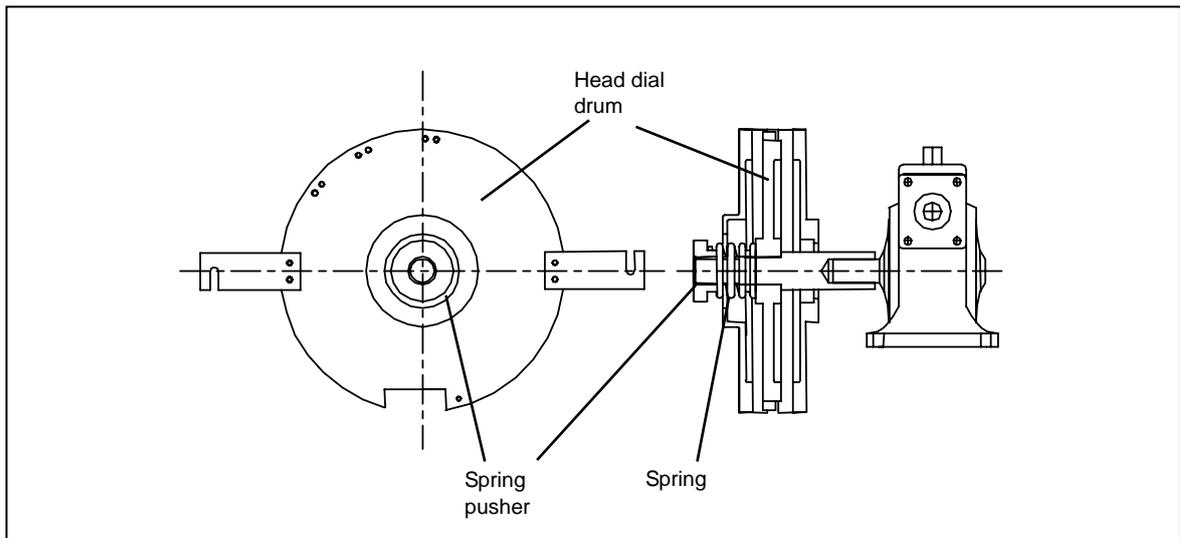
- g. Adjusting method of equipment which skips the missed washer (P.8-7)

a. Replacement of head dial

- (1) Loosen two bolts A as shown in the figure.
- (2) Turn the outer drum clockwise for removal.
(It is unnecessary to pull out the bolts A.)



- (3) Loosen the bolts, pull off the spring washers, and remove the springs. In this state, the head dial drum can be pulled out. Gradually pull out the head dial drum horizontally against the shaft, preventing it from being inclined.
- (4) After replacing the head dial drum, assemble it by reversing the above procedure.



WARNING

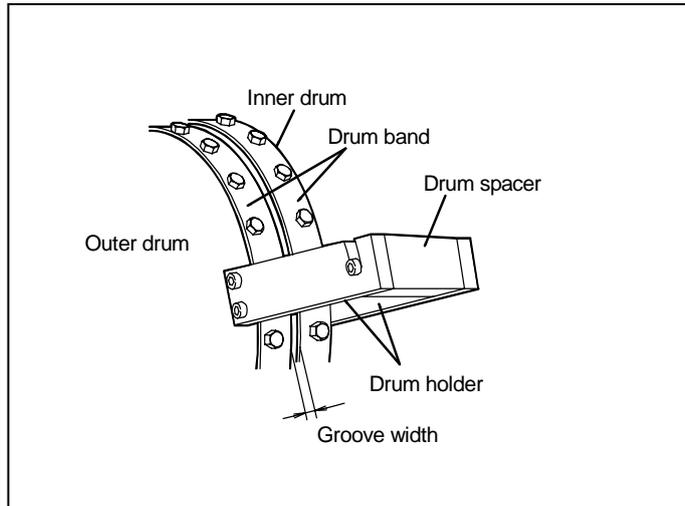
Work in the stable posture.

If you work in the unstable posture, you may lose the balance to cause an unexpected wound.

b. Replacement of drum spacer (Assembling the washers of different nominal diameters)

When replacing the head dial drum of a different nominal diameter, it is necessary to adjust the groove width which the rivet passes between the inner drum and outer drum, according to the nominal diameter.

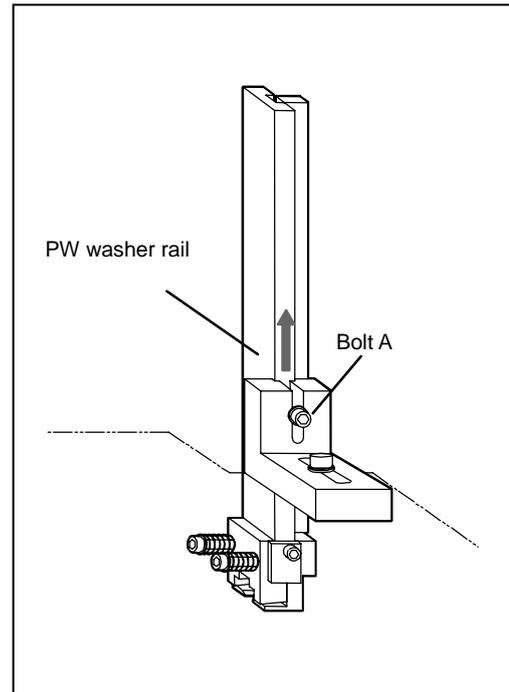
- (1) When assembling the outer drum after replacing the head dial, replace the drum spacer shown in the right figure with that which matches the nominal diameter.



c. Replacement of washer rail (Assembling the washers of different nominal diameters)

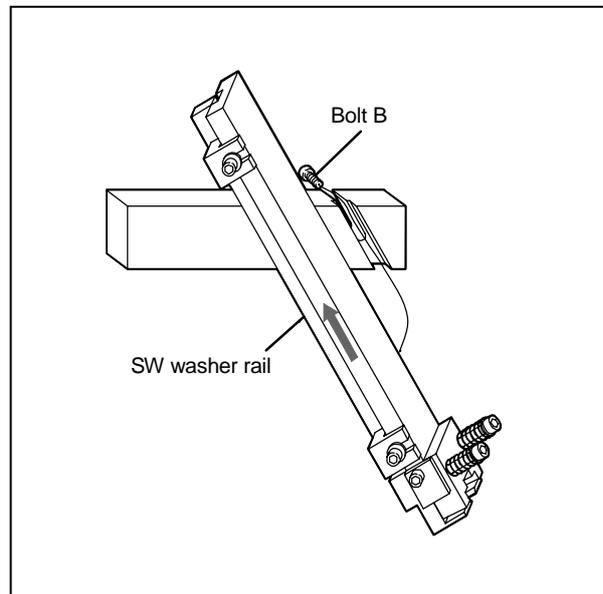
■ Replacement of PW washer rail

- (1) Remove the bowl of the vibratory feeder, loosen the bolt A in the figure (it is unnecessary to pull it out).
- (2) Pull off the washer rail upward.
- (3) Temporarily install the new washer rail, and replace the bowl of the vibratory feeder.
- (4) Aligning to the outlet of the bowl, fasten the washer rail .



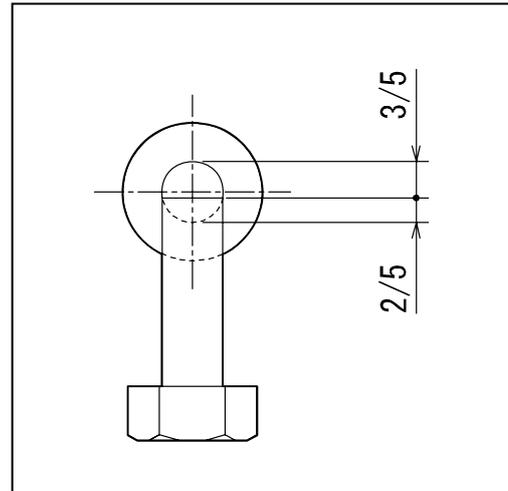
■ Replacement of SW washer rail

- (1) Remove the bowl of the vibratory feeder, loosen the bolt B in the figure (it is unnecessary to pull it out).
- (2) Slantly pull off the washer rail.
- (3) Temporarily install the new washer rail, and replace the bowl of the vibratory feeder.
- (4) Aligning to the outlet of the bowl, fasten the washer rail .

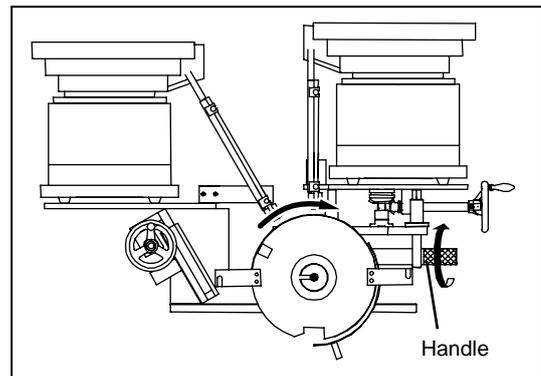


d. Adjusting method of washer rail

- (1) Charge the washers on the washer rail.
- (2) Set the leg of the rivet to be slightly lower than the center of the washer.
- (3) Turn the handle of the head dial with hand. Where the least assembling resistance is felt, fasten the vibratory feeder base.

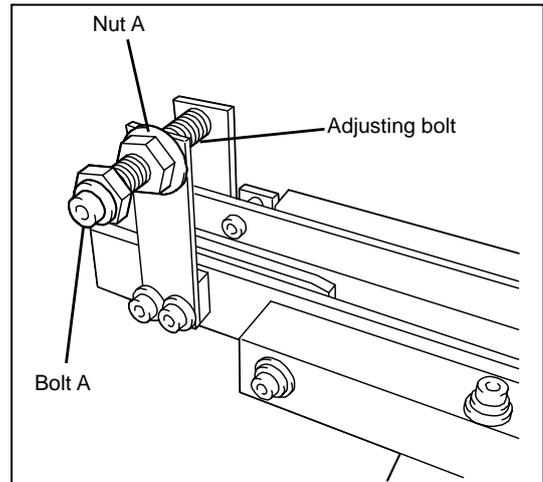


As the handle of the head dial is turned inward as shown, the head dial rotates in the forward direction.



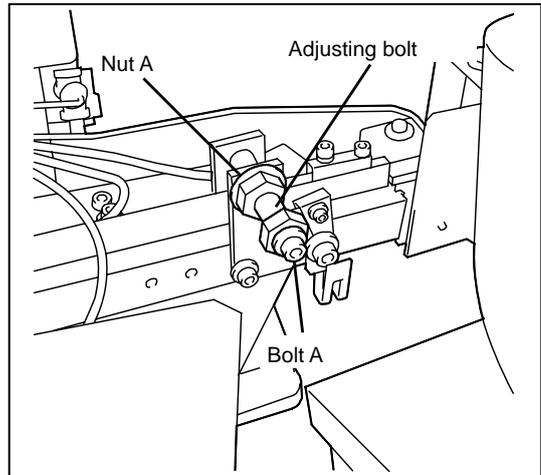
e. Adjusting method of No. 1 straight feeder

- (1) As shown in the figure, loosen the bolt A, and next loosen the nut A.
- (2) Turn the adjusting bolt to adjust the rail width. Turn the adjusting bolt clockwise to increase the rail width and counterclockwise to decrease it.
- (3) When the adjustment is completed, tighten the bolt A, and next tighten the nut A for locking.



f. Adjusting method of No. 2 straight feeder

- (1) As shown in the figure, loosen the bolt A, and next loosen the nut A.
- (2) Turn the adjusting bolt to adjust the rail width. Turn the adjusting bolt clockwise to increase the rail width and counterclockwise to decrease it.
- (3) When the adjustment is completed, tighten the bolt A, and next tighten the nut A for locking.



g. Adjusting method of equipment which skips the missed washer

- (1) Loosen the bolts A and B as shown in Fig. 1.
- (2) As shown in Fig. 2, adjust the head retainer into such a position as the washer-assembled product is prevented from dropping.
- (3) After verifying that the product without washer drops and is eliminated, tighten the bolts A and B.

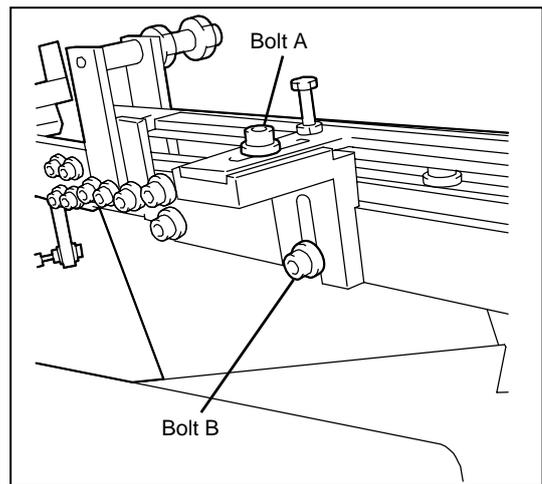


Fig. 1

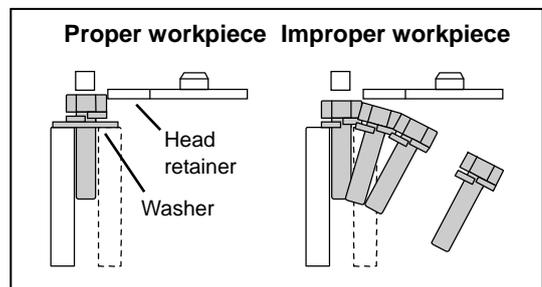


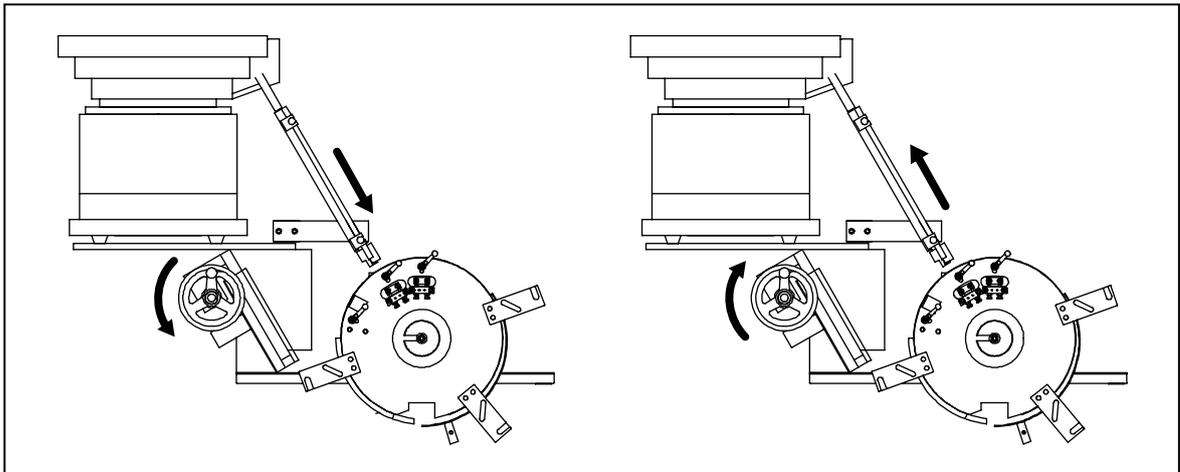
Fig. 2

h. Up/down adjustment of washer vibratory feeder base

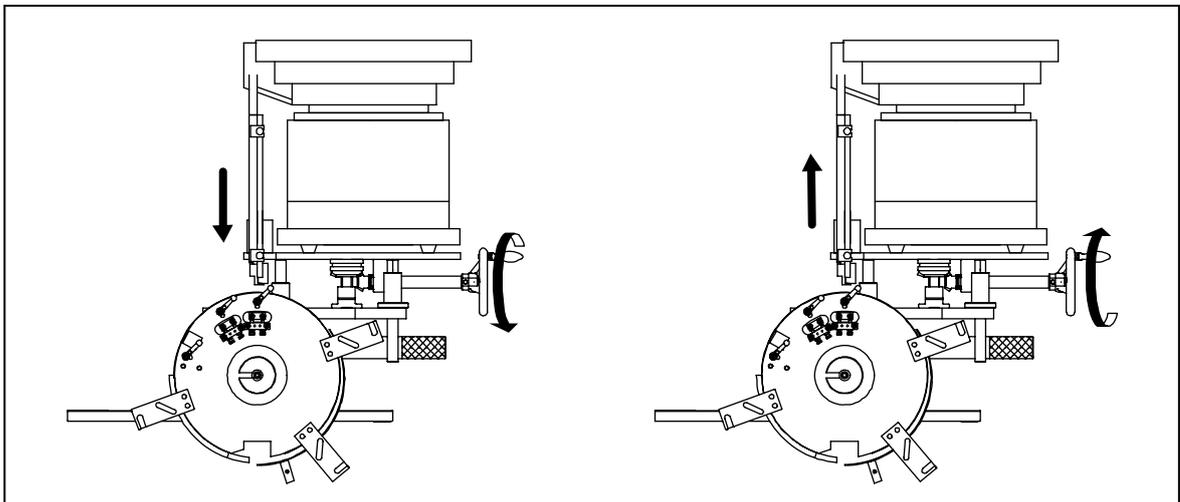
In order to align the position of the washer rail to the shank length of the rivet, it is constructed to move up and down the washer vibratory feeder base which is provided with the washer rail. As the method to adjust up and down the vibratory feeder base, first loosen the lock bolts of the up/down adjusting handwheels.

Next, turn the handwheel clockwise to raise the washer vibratory feeder base, and counterclockwise to lower it. The relationship of the handwheels on SW and PW sides to the base elevation is shown below.

■ Up/down adjustment of SW washer vibratory feeder base



■ Up/down adjustment of PW washer vibratory feeder base



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THI-AV Instruction Manual

October, 2004 (1st edition)

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