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## 1. SAFETY INSTRUCTION

**IT IS IMPERATIVE THAT:**

Every person involved with the installation, start-up, operation, maintenance and repair of this machine start their work with complete understanding of the machine after reading this INSTRUCTION MANUAL carefully.

Inadequate operation and/or maintenance may cause personal injury.

### 1-1. Application of the equipment and liability

This equipment is intended to be used exclusively for the purpose specified in the associated documentation (instruction manual, specification sheet).

Employment of the equipment for any other purpose is regarded as a deviation from the intended application.

Improper usage or employment for a purpose other than the intended one is liable to cause:

- a) Danger to life and limb
- b) Damage to this and/or other equipment and
- c) Impairment of operation and machine capability

DENGENSHA equipment conforms to the latest state of the art and is made to operate safely and reliably. The equipment may be used only for the intended purpose. No liability will be accepted in the event of failure to comply with this condition.

We emphasize that DENGENSHA MFG. CO., LTD. Disclaims all liability for damage and malfunctions resulting from non-compliance with the following instructions in particular:

- a) The instruction manual must be read and strictly understood.
- b) Unauthorized conversion and /or modification affecting the safety of the equipment is not allowed.
- c) The equipment may not be equipped or operated with products of other manufacturers whose use is not expressly permitted in the associated manual.
- d) Improper usage of the equipment or its employment for a purpose other than the intended one is expressly prohibited.
- e) The equipment may not be operated with any control components other than those provided for this purpose.

### 1-2. General

- a) The instructions for installation, operation and maintenance contained in the INSTRUCTION MANUAL for OPERATION & MAINTENANCE must be observed.
- b) The equipment may be operated, maintained and repaired only by authorized, trained and specially instructed personnel.

**1-2-1. Electrical safety**

- A) A protective earth (PE) conductor or an earth terminal which must in all cases be connected to earth electrodes or earth conductors, is provided with the equipment.
- B) The user is responsible for ensuring the correct connection of the electric circuit, as specified, including the electric safeguards, main circuit breaker, fuses, grounding, devices for the fluid supplies and connectors.
- C) It must be ensured that all accessories not supplied by DENGENSHA (for instance, power supply cables, fluid supply hoses, connectors etc.) are rated for the required connected loads.

**1-2-2. Maintenance work**

- A) Before any maintenance and/or repair work, it must be ensured that the power supply has been cut off from all poles and that it cannot be switched on again negligently or without authorization.
- B) Compressed air can cause hoses to be forced off or other unexpected hazards. In order to prevent a risk of injury, maintenance and/or repair work must be performed only following below points:
  - a) The machine has been disconnected from all power supplies.
  - b) The main supplies of compressed air and water have been cut off.
  - c) The pneumatic lines have been de-energized.
- C) The maintenance cycles specified in the INSTRUCTION MANUAL must be strictly observed. Maintenance/repair work must be performed in accordance with the instructions and defective parts must be replaced with the prescribed replacement/wearing parts.
- D) Maintenance/repair work must be performed only by authorized, trained and specially instructed personnel.
- E) The equipment requires supply voltages of up to approx. 115V according to the specification. The maintenance/repair personnel must have received specific instruction with regard to the potential hazards arising from these voltages.

**1-2-3. Accident prevention**

- a) The operating personnel must be informed of the potential hazards presented by peripheral equipment such as resistance welding machines, conveyors and feeding devices.
- b) During welding there is a risk of injury due to molten metal spatter. It is imperative to wear safety goggles.
- c) The customer must check whether the total noise level at the work place (that is, noise level of the machine plus ambient noise level) necessitates the wearing of ear protection.
- d) Resistance welding machines exert very high levels of electrode force such as more than 1KN. It must therefore be ensured that no-one enters the danger zone of the machine, even if it is not moving, until it has been isolated from all electric and stored mechanical energy.
- e) Resistance welding machines create strong magnetic fields around secondary circuit during welding. These fields affect the working of sensitive devices such as watches. For this reason, anyone with a cardiac pacemaker must not be allowed to come within the vicinity of welding machines during operation.

#### **1-2-4. Standards**

This AUTOMATIC NUT FEEDER is manufactured in accordance with DENGENSHA standards based on JIS, UL and European Standards.

EN 50 063 : Safety regulations for the design and installation of electric resistance welding equipment and related technologies

EN 60 204-1 : Electrical equipment for industrial installations and machines

EN292

EN954

EN60947-1/IEC947-1.

#### **1-2-5. Signal words**

As used in this manual, the signal words “DANGER”, “WARNING” and “CAUTION” have the following meanings respectively.

**DANGER** : Imminent dangerous situations which would cause a person to die or to be seriously injured.

**WARNING** : Dangerous situations which may cause a person to die or to be seriously injured.

**CAUTION** : Dangerous situations which may cause a person to be injured or bodily harmed.  
Dangerous situations under which only material damage would be expected.

**NOTE)** : Important instruction to pay special attention to in order to perform installation / start-up / operation / maintenance and repair of the machine in particular

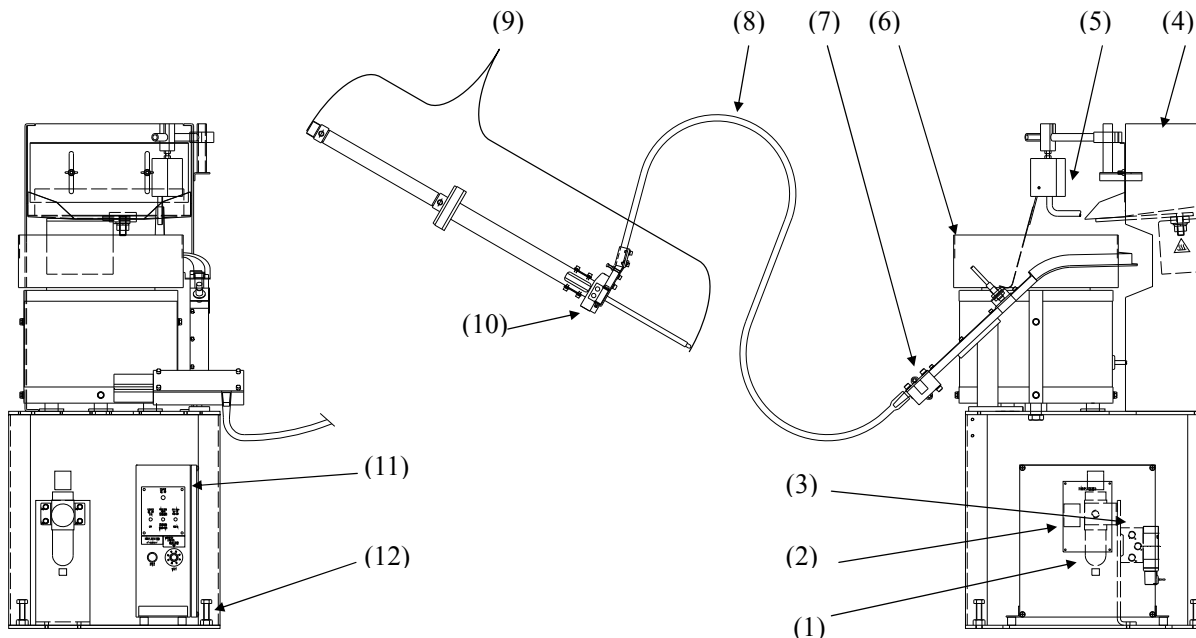
#### **1-2-6. Hazard map and layout of safety labels**

Adhesive labels with safety instructions must not be removed.

New labels can be obtained from DENGENSHA, if necessary.

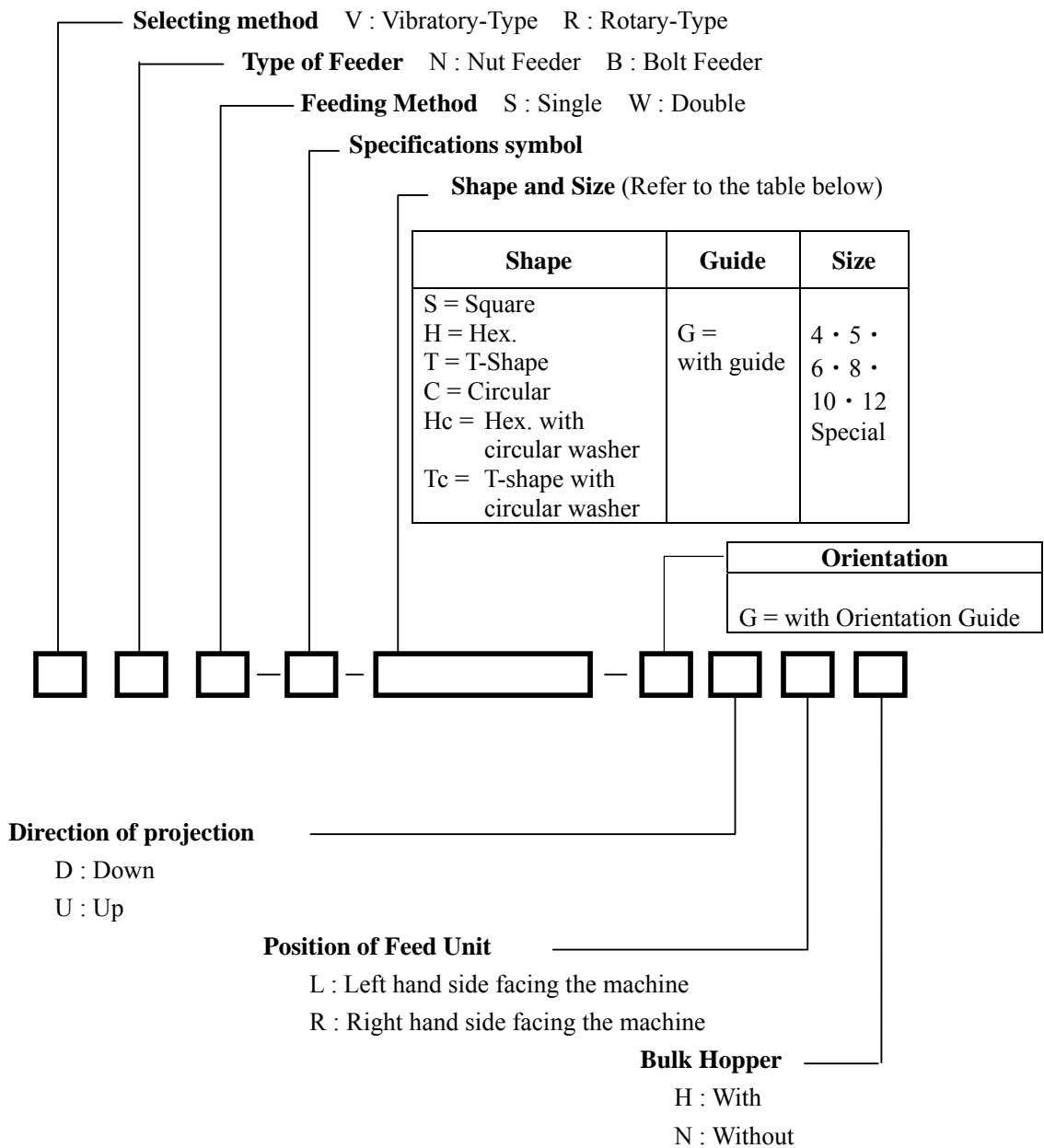
2. DESCRIPTION

2-1. General assembly drawing



1	Air filter regulator	7	Nut separator assembly
2	Pressure gauge	8	Feed tube
3	Solenoid valve	9	Feed unit
4	Bulk hopper	10	Head assembly
5	Level switch	11	Control box
6	Vibratory bowl	12	Adjusting bolt

2-2. Description of Model



### 2-3. General Specification

- (1) This machine is designed to automatically feed the nuts specified in item (10) below to a spot welder.
- (2) This machine is composed of the following components and parts
  - (a) One(1) VIBRATORY BOWL driven by a VIBRATOR
  - (b) One(1) BULK HOPPER driven by a vibrator (Only when choosing “H”)
  - (c) One(1) CHUTE TRACK
  - (d) One(1) NUT SEPARATOR
  - (e) One(1) FEED TUBE with 3 meter length (Standard)
  - (f) One(1) NUT FEED UNIT (Standard, stroke of 200mm)
  - (g) One(1) UNIVERSAL BRACKET
  - (h) One(1) CONTROL EQUIPMENT
  - (i) One(1) PNEUMATIC SYSTEM set (Max. pressure of 1 Mpa)
- (3) Capability of feeding nuts shall be approximately 30 pcs./min. (Feed rate will change depending on Nut shape and size.)
- (4) Air source : 0.4 Mpa to 0.6 Mpa  
AIR INLET :  $\Phi$ 10 quick-joint.
- (5) Noise level : 80-90dB
- (6) Paint color : FRAME, CONTROL PANEL & BULK HOPPER : Munsell 5Y8/1  
UNIVERSAL BRACKET : Black, VIBRATOR : Gray, BOWL : Black
- (7) Direction of feeding nuts :  
Nuts are fed from ( \_\_left/ \_\_right ) side of the operator.
- (8) Power source : Single phase AC 115V, 60Hz, Approx. 500VA
- (9) The weight of this machine including FEED UNIT is Approx. \_\_\_\_Kg.
- (10) Nut applied to this machine :
  - (a) Size : M4 / \_\_M5 / \_\_M6 / \_\_M8 / \_\_M10 / \_\_M12 / \_\_M14 / \_\_Special nuts
  - (b) Configuration : \_\_S : Square / \_\_C : Round / \_\_H : Hexagonal / \_\_T : T-shaped/  
\_\_Sg : ‘S’ with locating collar / \_\_Cg / \_\_Hg / \_\_Tg/  
\_\_Hc : ‘H’ with flange / \_\_Tc / \_\_Td : Diamond shaped T-nut



#### 2-4. General description of the machine

The AUTOMATIC NUT FEEDER is used in combination with a spot welder. It feeds a weld nut to the spot welder automatically every welding operation. Weld nuts loaded in the BULK HOPPER are automatically moved to the VIBRATORY BOWL driven by a VIBRATOR.

After selecting their up-side/down-side in the VIBRATORY BOWL weld nuts are sent to the NUT SEPARATOR.

A nut is sent from the NUT SEPARATOR to the NUT FEED UNIT through FEED TUBE by air blowing every welding operation.

The NUT FEED UNIT catches a nut magnetically at the NOSE PIN on the end of the SPINDLE and places it accurately on the lower electrode tip of the spot welder. (NUT FEED UNIT : Patented. Refer to Sec. 2.5.4.)



Automatic Nut Feeder combined with Spot welding machine

## 2-5. Mechanical design

### 2-5-1. VIBRATORY BOWL



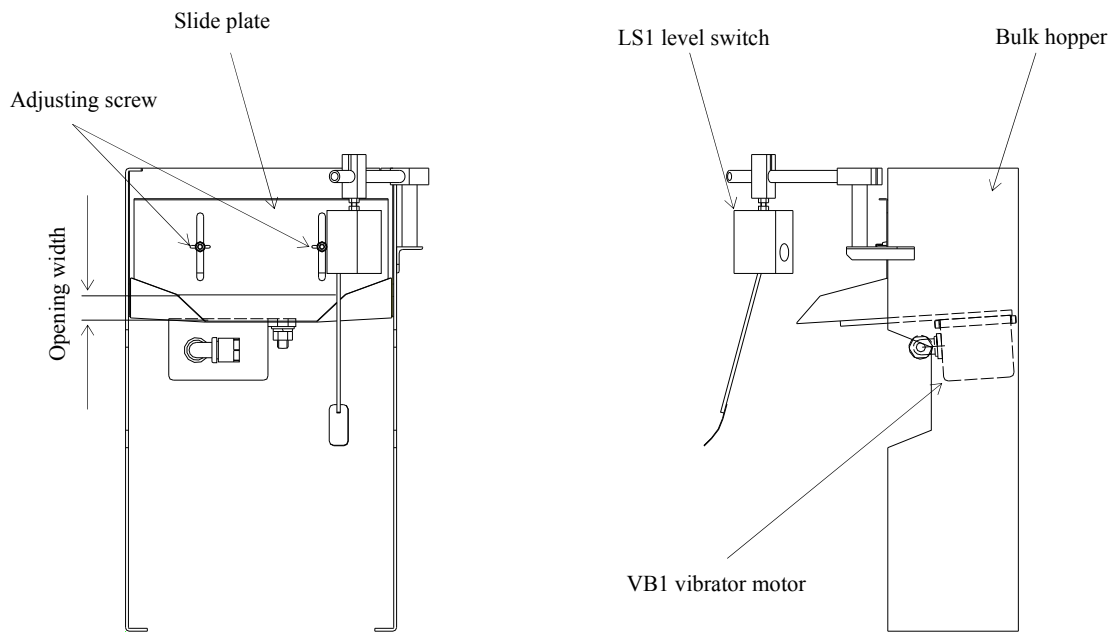
- (1) The VIBRATORY BOWL is fixed by 3 or 4 seat springs. The BOWL vibrates when the electromagnetic coil attracts the COIL, and bolt will move upward on the truck along the wall in a predetermined direction.
- (2) If a rubber shoe is not correctly set in the 3 rings, the outlet of the VIBRATORY BOWL interferes the CHUTE TRACK of the SEPARATOR, resulting in improper vibrations.
- (3) Vibrations can be adjusted by moving vertically the gap adjusting bolt. However, this gap is set to an optimal value by the manufacturer.
- (4) When carrying the VIBRATORY BOWL, be sure to hold it on the body side. A strong force on the BOWL side will result in wrong vibrations.
- (5) The VIBRATORY BOWL is designed to work at 60Hz. The wrong frequency shall result in mis-selection of nuts.

**2-5-2. BULK HOPPER**

The BULK HOPPER has a 7-liter capacity. Detecting a decrease in quantity of weld nuts in the VIBRATORY BOWL, the level switch (LS1) initiates the VIBRATOR (DG-VB1) of the BULK HOPPER and nuts in the BULK HOPPER are supplied to the VIBRATORY BOWL through the adjustable gate. When the quantity of nuts in the VIBRATORY BOWL reaches a sufficient level, LS1 is turned off to stop the vibration of VB1 and the supply of nuts from the BULK HOPPER.

The SLIDE PLATE is provided to adjust the opening width according to the size and shape of nut. The opening width is factory-adjusted, but it may be necessary to be re-adjusted for a more suitable opening width in the production line.

The quantity of nuts in the VIBRATORY BOWL depends on LS1 switch position. Position of the LS1 is adjustable in a vertical plane. Adjust it after the NUT FEEDER is installed on the WELDER.

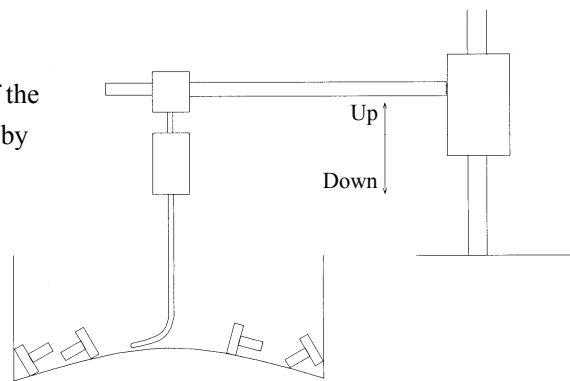


Bulk hopper assembly

**Bulk hopper level adjustment**

Adjust its level to a height at which the center of the bowl can be seen as shown in the right figure, by vertically moving the level switch bracket.

\* Too many nuts in the bowl will result in less selecting capacity.



### 2-5-3. CHUTE TRACK (A) ASSEMBLY

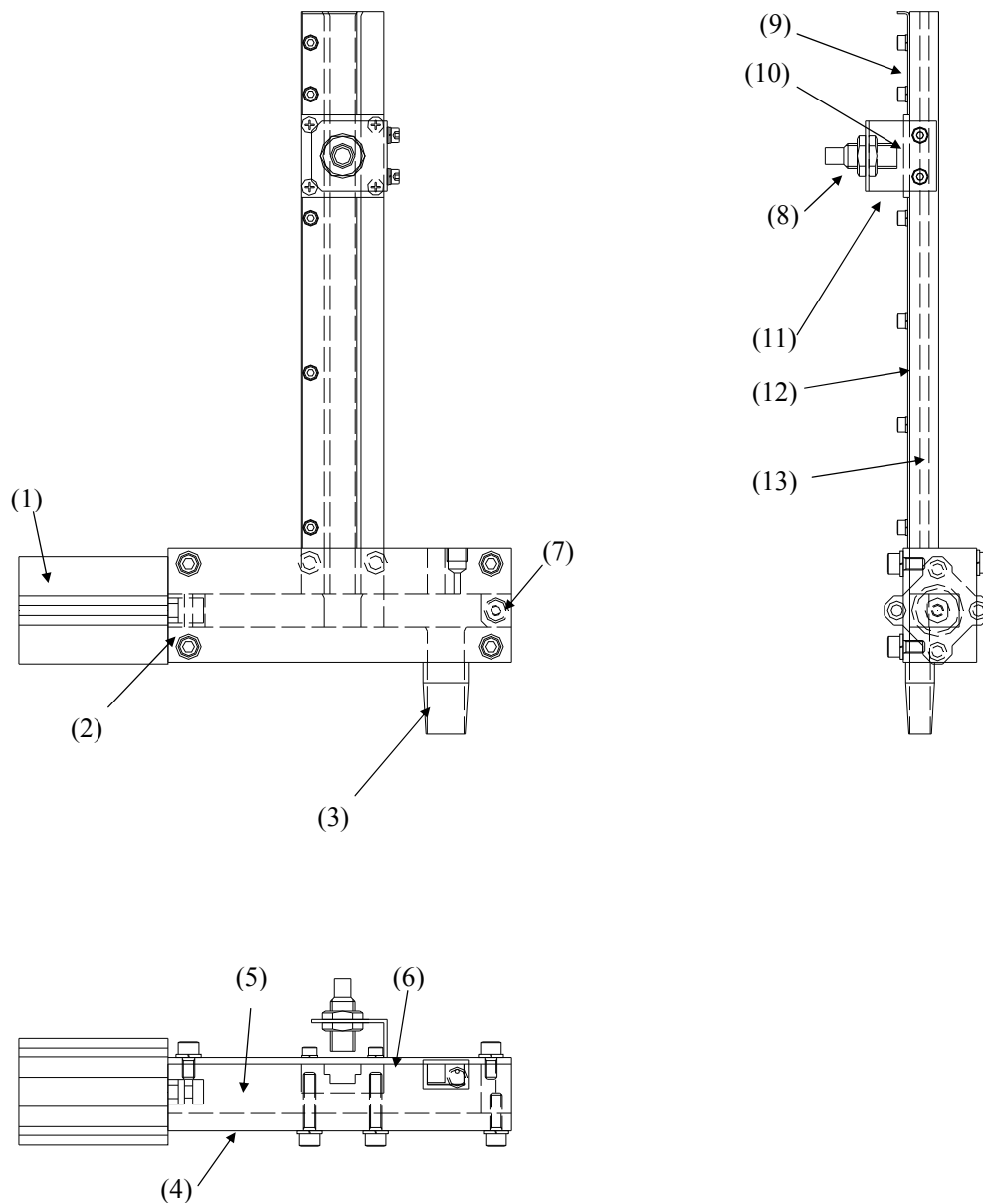
- (1) At first, nut feeding direction is selected by the VIBRATOR, then the CHUTE TRACK (A) is automatically fed with nuts. If oil or rubber is adhered to the CHUTE TRACK, nuts may be stopped halfway in the CHUTE TRACK.
- (2) After the proximity switch for "full of workpieces" confirmation checks that nuts have been accumulated to proximity switch level, the delay timer ends its counting, and finally, the vibrator is stopped to end nut feeding. The timer should be set in such a manner that it stops when 3 or 4 more workpieces are fed after the proximity switch is activated. Nut stock must be stopped within the CHUTE TRACK (A), because a too large value for the delay timer will result in nut accumulation up to a vibrator truck level and this causes higher noises and accelerated truck wear.
- (3) The NUT SEPARATOR UNIT is a device allowing nuts aligned in the CHUTE TRACK to be separated into each nut and allowing this nut to be fed, packed in a feed tube, to the feed unit. Note that this separator has been adjusted to each type of nut and may not to be correctly reassembled once disassembled.

The NUT SEPARATOR UNIT operates in the following manner:

When the separating cylinder advances, the top nut is separated from its group and this nut goes downward in the chute rail until it reaches to a feed tube. Once packed in the feed tube, the nut is fed by air blow.

- (4) A separated nut is by compressed air from the tube joint to the chuck of the FEED UNIT. Change in air blow starting timing T2 allows to nut feeding timing to be adjusted. The optimal setting is that air blow starts just at the time when a nut passes through the tube joint. If air blow starts before a nut starts falling, this nut may be stuck in the tube joint. On the other hand, if this timing is too late, nut feeding will be difficult.
- (5) Tube is so designed that it is fit to nut head diameter, because this tube must allow nut feeding from the tube joint of the SEPARATOR to the FEED UNIT. Nut feeding may be stopped halfway in case of sharp bent. Tube inner diameter is also designed so that it is fit to nut head diameter. A nut with a larger head diameter may be stopped in the tube. In such case, disconnect the tube on the FEED UNIT side and remove this nut.

[CHUTE TRACK (A) ASSEMBLY]



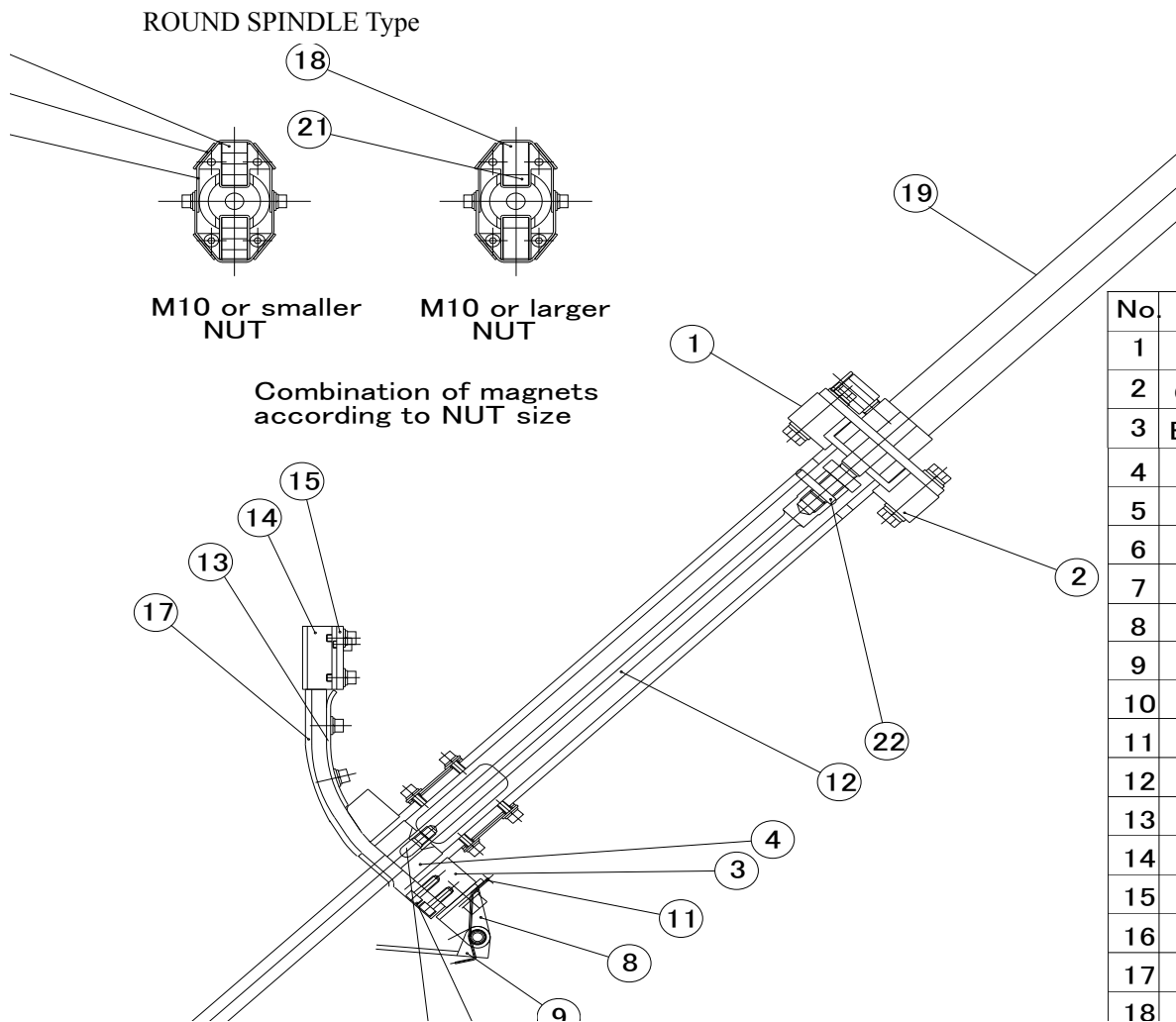
No.	Parts name	No.	Parts name
1	Air cylinder	8	Proximity switch
2	Joint	9	Chute cover
3	Tube joint	10	Acryl cover
4	Body	11	Proximity switch bracket
5	Bar	12	Chute cover
6	Cover	13	Chute track (A)
7	Stopper		

**2-5-4. NUT FEED UNIT (Patented)**

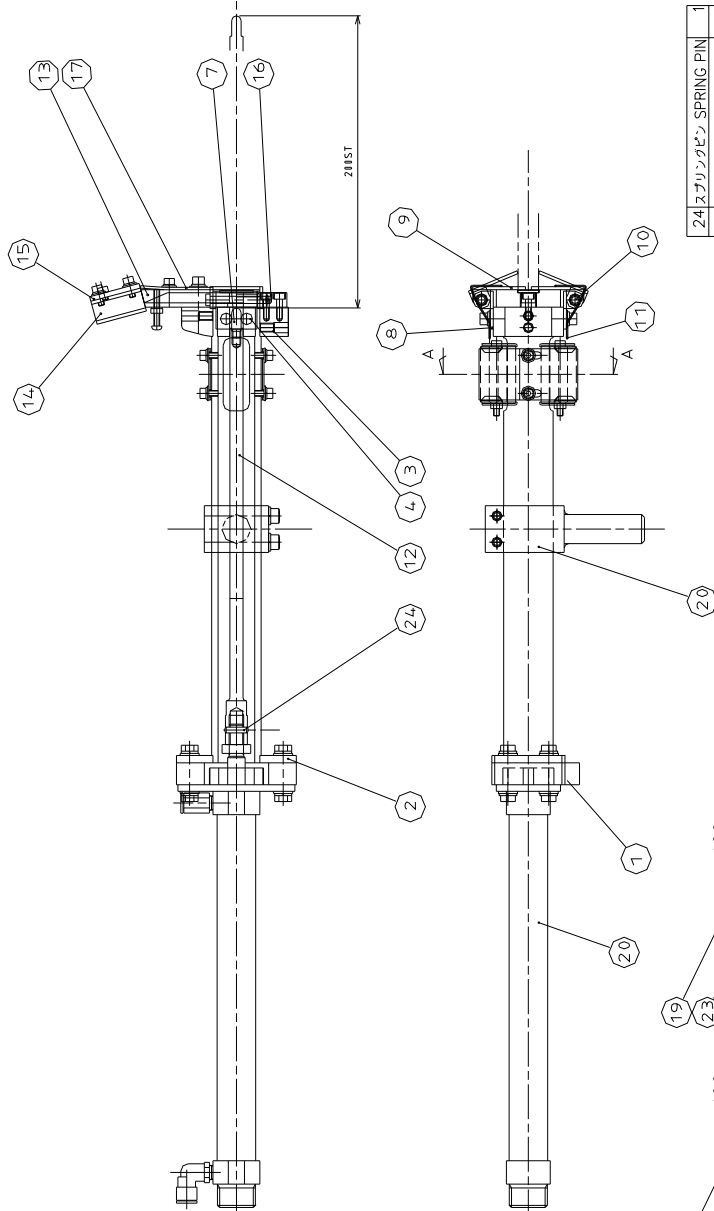
Standard feeding stroke of the NUT FEED UNIT is 200 or 300 mm and its standard feeding angle, 45° (but can be set to 15°, 30° or 60° according to workpiece shape).

The spindle nose, magnetized by permanent magnets mounted on the lower part of the cylinder, attracts nuts and feeds them to a machine. The nuts thus attracted are then set free from the magnetic force of the spindle in an electrode position thanks to a special structure of the spindle.

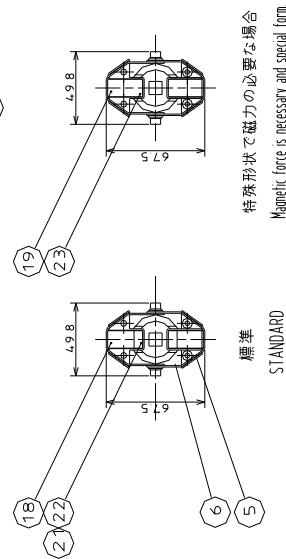
The NUT FEED UNIT is a unit whose structure is standardized. It can be used in combination with any standard welder.



SQUARE SPINDLE Type



24 スプリングピン (N5) 強力マグネット	1
23 強力マグネット (N30) 強力マグネット	2
22 強力マグネット (N30) 強力マグネット	2
21 マグネット MAGNET	8
20 エアシリンダ AIR CYLINDER	1
19 スペース SPACER	2
18 スペース SPACER	2
17 カバー COVER	1
16 ナットストップ NUT STOPPER	1
15 チューブカバー TUBE COVER	1
14 チューブホルダ TUBE HOLDER	1
13 シャフトレール CHUTE RAIL	1
12 スピンドル SPINDLE	1
11 ヒンジバネ HINGE SPRING	2
10 ヒンジピン HINGE PIN	2
9 ヒンジ板 HINGE PLATE	2
8 固定ヒンジ板 FIXED HINGE PLATE	2
7 ノーズピン NOSE PIN	1
6 マグネットホルダ MAGNET HOLDER	2
5 マグネット用 MAGNET LOCK	4
4 ガイドワッシャー GUIDE BUSH	1
3 ブラケット BRACKET	1
2 ガイドシリンダ GUIDE CYLINDER	1
1 シリンドロケット CYLINDER JOINT	1



特殊形状で磁力の必要な場合  
Magnetic force is necessary and special form

標準  
STANDARD

サイズ別マグネット組合せ

Choose the Magnet for each size of nut.

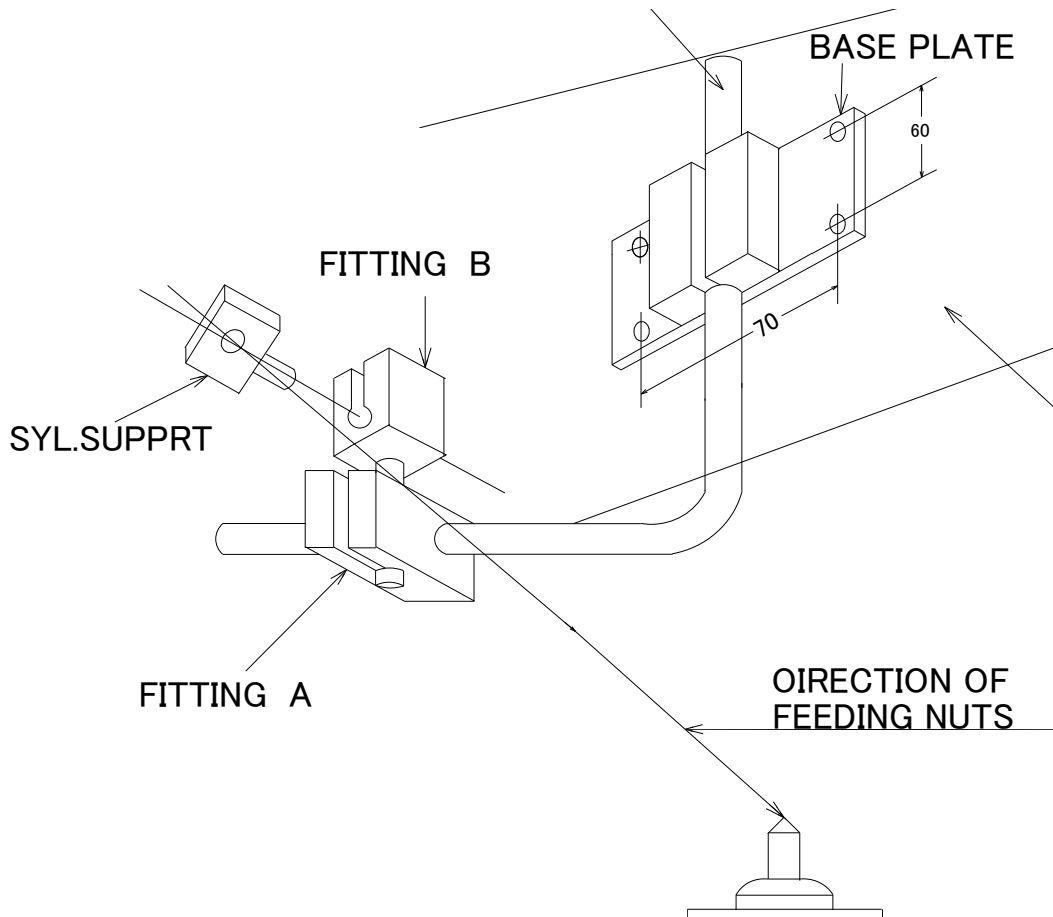
A ~ A SEC

**2-5-5. UNIVERSAL BRACKET**

The UNIVERSAL BRACKET consists of four components –BASE PLATE, “L”ARM, FITTING ”A” and FITTING “B”. They are assembled and installed on the upper arm of the spot welder.

The NUT FEED UNIT is mounted to FITTING “B” by the CYL. SUPPORT which is assembled in the NUT FEED UNIT.

The UNIVERSAL BRACKET enables the NUT FEED UNIT to be freely oriented. Standard angle is 45° but the angle can be set to 15°, 30° or 60° according to workpiece shape.

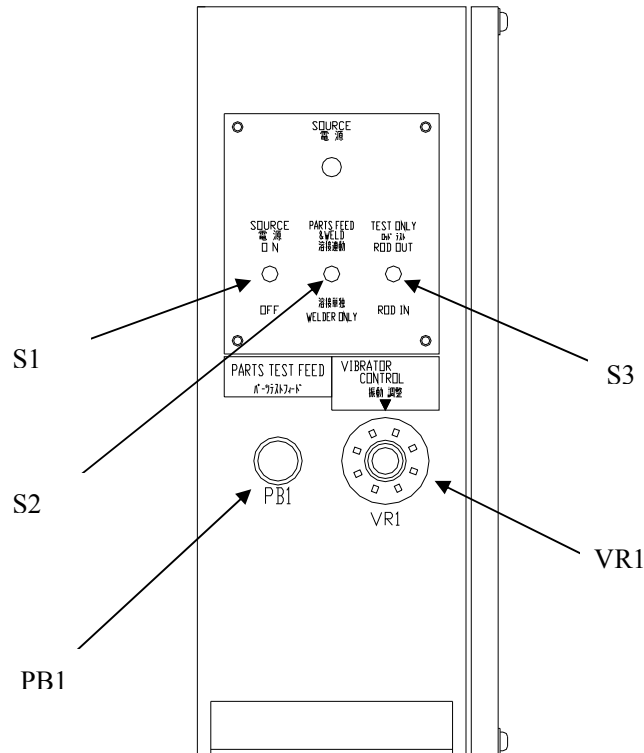




**2-6. CONTROL EQUIPMENT ( Limited to controlled feeder )**

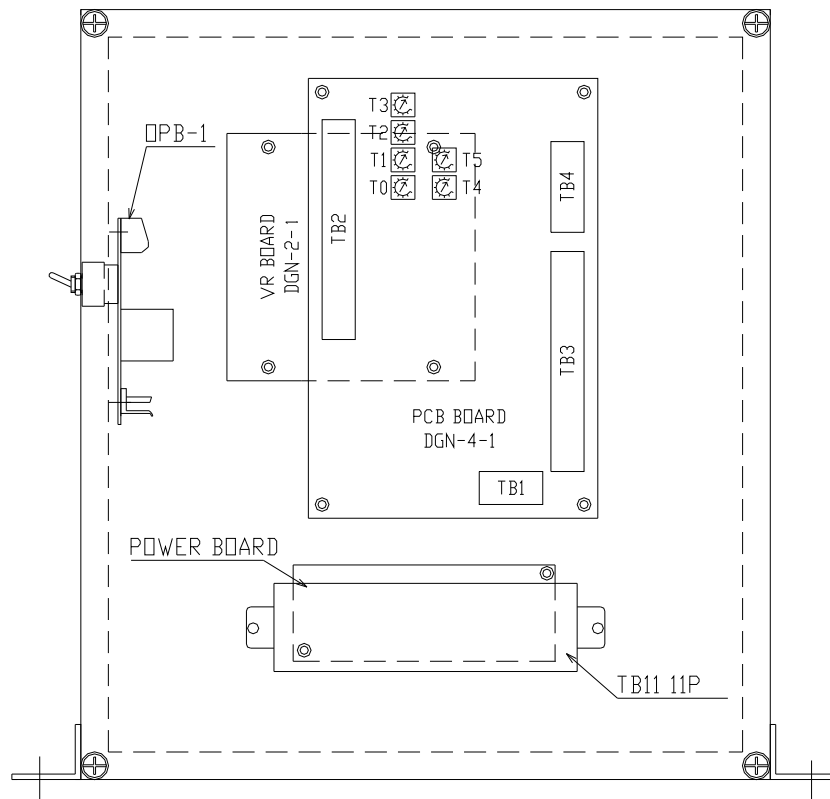
**2-6-1. CONTROL PANEL – Parts arrangement and their function –**

[CONTROL EQUIPMENT] Model : PFE-0101-V-A-PCB



- 1) The box top left stands for a nameplate. It lists the model number, Serial number, DENGENSHA's reference number, and manufacturing date. (Products are controlled by a SERIAL NUMBER. Please reference the SERIAL NUMBER when ordering spare parts.)
- 2) Function of each switch
  - S1 : Power SUPPLY ON-OFF switch for FEEDER.
  - S2 : Selector switch “PARTS FEED & WELD” and “WELDER ONLY”  
(This switch is used when operating the welder only, or in normal use with a bolt feeder, the switch is in position of “PARTS FEED & WELD”)
  - S3 : Selector switch for CYL.ROD test  
(The CYL.ROD extends when ROD test is in the “ROD OUT” position, and the CYL.ROD retracts when it is in the “ROD IN” position.) This system is used to confirm if the FEED UNIT is correctly aligned and if a bolt is correctly set in the PILOT PIN. It should be in the “ROD IN” position in normal use.
  - PB1 : Push button switch which supplies a bolt to the FEED UNIT.
  - VR1 : It is for adjusting vibration of VIBRATOR

**2-6-2. Parts arrangement and their function – Inside the CONTROLLER**



- T0 : VIBRATOR DELAY TIMER controls the time from when the PROXIMITY SWITCH (PXS1) detects nuts in the CHUTE TRACK to stop the VIBRATOR.
- T1 : SPINDLE RETRACT DELAY TIMER controls the time from “foot switch ON”, (That is, the signal to start the AUTOMATIC NUT FEEDER extending the SPINDLE to the SPINDLE retracting).
- T2 : WELD START DELAY TIMER controls the time between SPINDLE to start retracting and the spot welder to start pressing.
- T3 : SEPARATOR DELAY TIMER controls the time a nut takes to pass through the SEPARATOR until starting the AIR BLOW.
- T4 : AIR BLOW TIMER controls the time duration of air blowing to feed a nut through the FEED TUBE from the NUT SEPARATOR to the CHUTE TRACK B and the NUT STOPPER.
  
- PCB : DGN-2-1

The above timers are adjusted adequately at the factory trial, but for more efficient operation, these timers may be re-adjusted after installing the AUTOMATIC NUT FEEDER on a welder.

### 2-6-3. Wiring, piping and connecting methods

#### [Wiring method]

- a) As control power supply, connect a single-phase 115 V, 60 Hz (500VA) power supply to the  $\perp$ -L1-L2 terminal block ( $\perp$  is a grounding wire).
- b) Connect the  $\perp$ -L131-L121 terminals of the 3-conductor cable of the vibrator to the terminal block.
- c) Pull out the metal connector plug of the starting foot switch on welder side and insert it into the  $\varnothing 25 - 3P (2P)$  receptacle for metal connector provided on the control panel on feeder side.
- d) A  $\varnothing 25-3P$  metal connector plug is set on the 3M terminal of the (3) – (4) 2-conductor cable terminal for welder timer start signal. Insert this plug into the metal connector receptacle for welder start.

#### [Piping method]

- a) Connect the 10mm-diameter air hose to the quick joint and supply 0.4 to 0.6Mpa compressed air.
- b) The air flexible tubes (blue and black) for FEED UNIT are connected to a solenoid valve (SOL: 1). Connect these tubes to the cylinder. (blue tube on piston side and black tube on rod side).

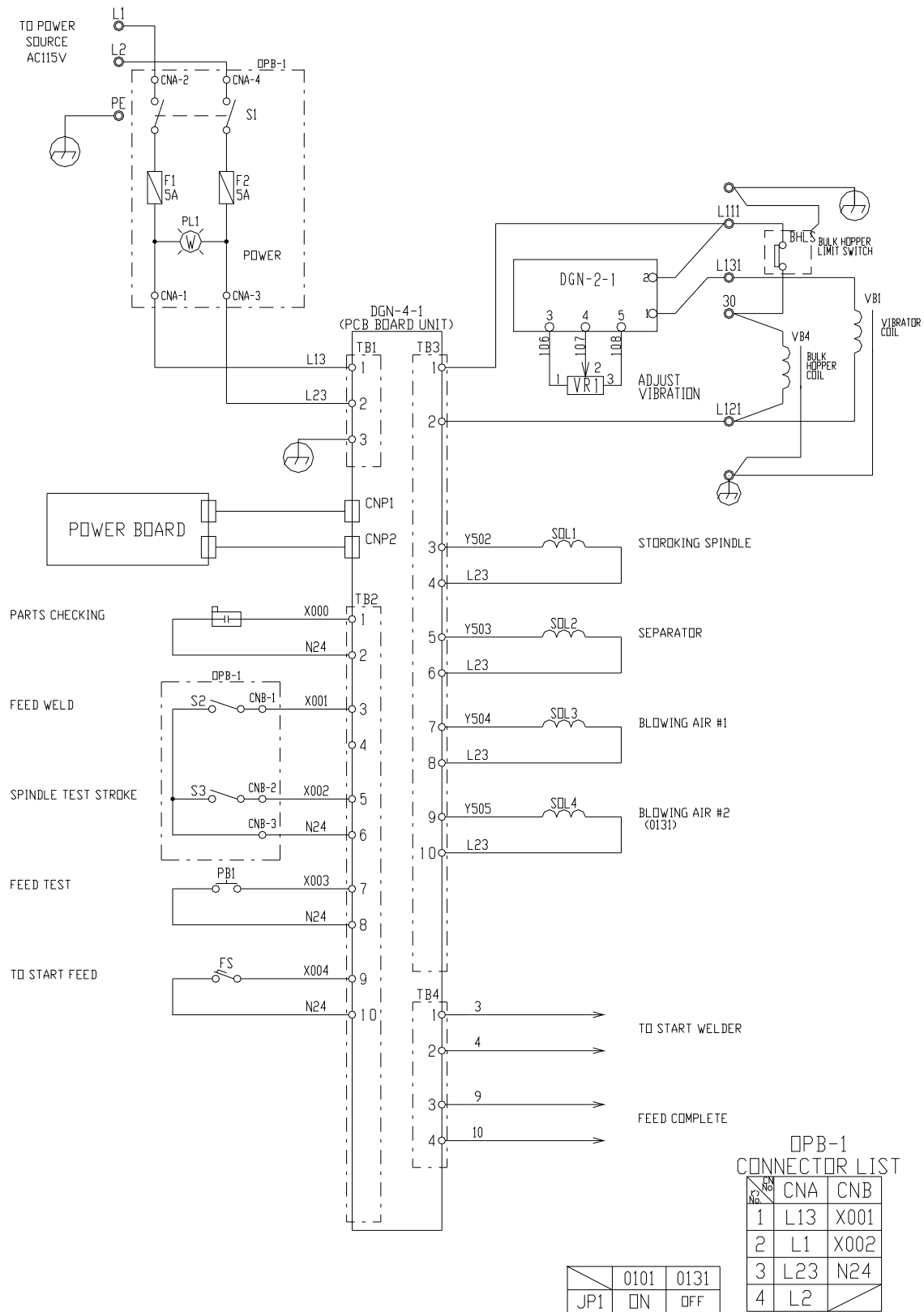
#### [Piping method for square section tube]

- a) Fit the supply flexible tube (square section tube) into the supply head and the outlet of the chute rail and secure them with a flexible tube band. Note that this flexible tube is provided with a slip-off preventing hole on one side and that this side should be connected to the supply head.

#### [Vibrator ball connection method]

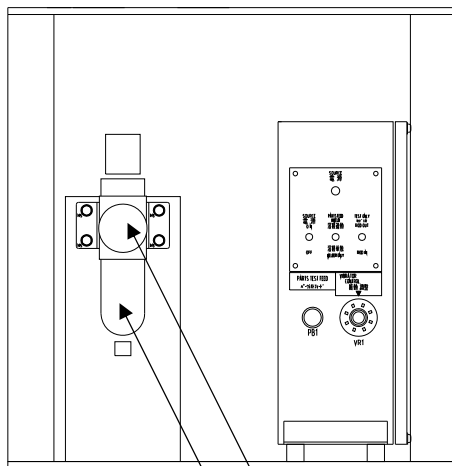
- a) Install a vibrator ball on the top of the FEEDER and connect the L131, L121 and  $\perp$  wires to the terminals inside the FEEDER control panel (for vibrator type only).
- b) Connect a 115V receptacle to the mains of the factory. This completes all wire and piping procedure. When carrying out this operation, be sure to turn off the WELDER and the FEEDER.

**2-6-4. Electrical circuit diagram**



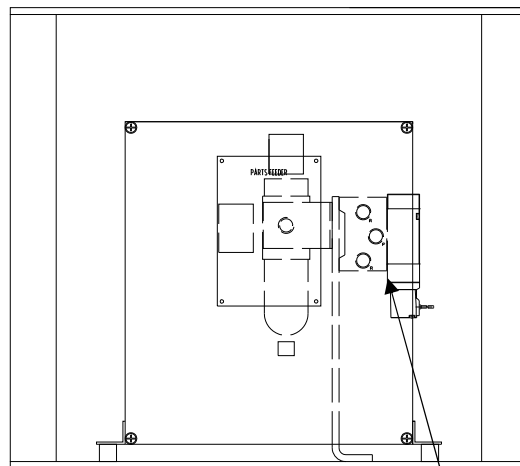
## 2-7. Pneumatic equipment

### 2-7-1. Parts arrangement and their function



Pressure gauge

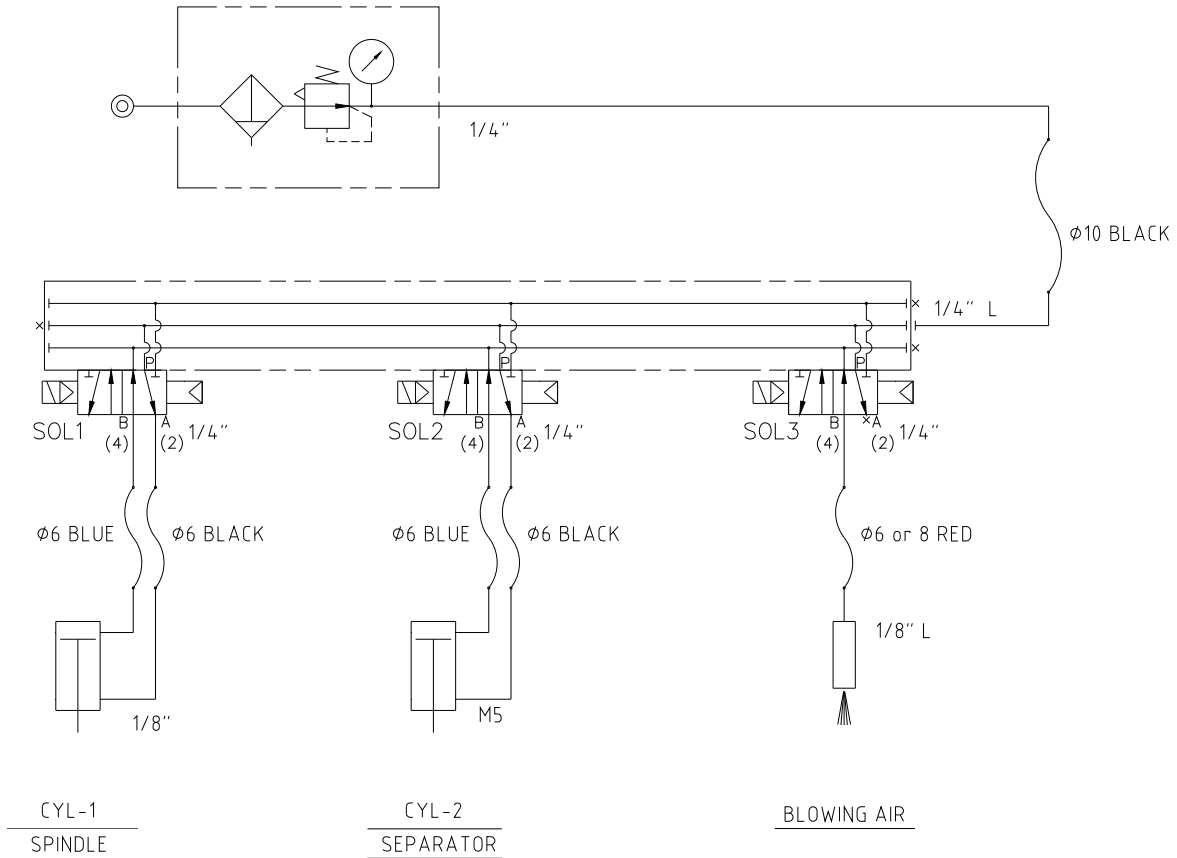
Air filter regulator



Solenoid valve

- SOL1 : Is a solenoid valve for driving a cylinder (CYL1) of the NUT FEED UNIT.
- SOL2 : Is a solenoid valve for driving cylinders (CYL2) of the NUT SEPARATOR.
- SOL3 : Is a air blow solenoid valve in the NUT SEPARATOR.
- PG : Pressure gauge
- AFR : Air filter regulator
- AIR INLET :  $\Phi 10$  quick-joint.

**2-7-2. Pneumatic circuit**



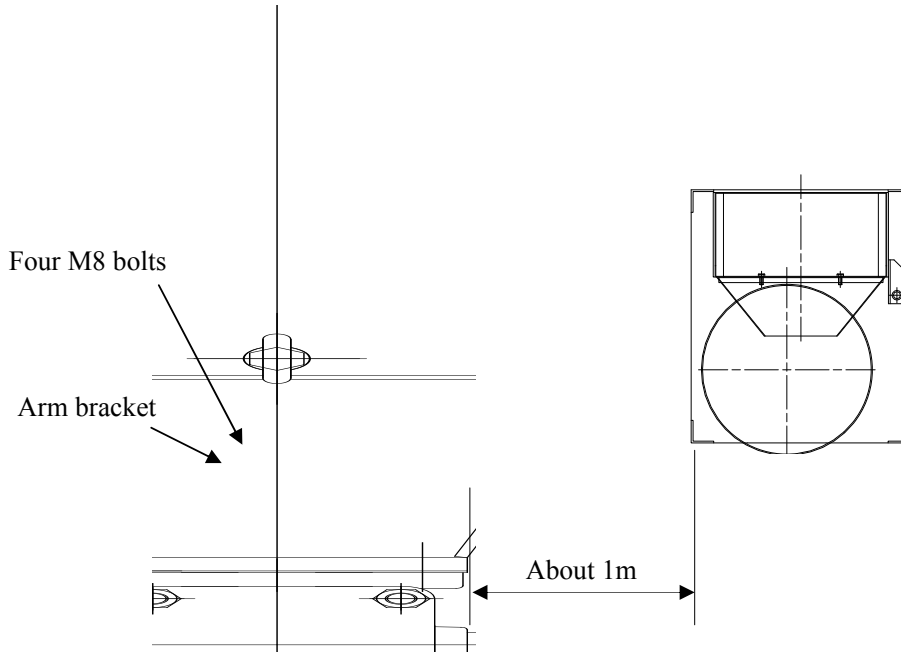
溶接 WELDER			WELDER START SIGNAL
スピンドル SPINDLE	SOL1	ON	T002
		OFF	
セパレータ SEPARATOR	SOL2	ON	
		OFF	
エアブロー BLOWING AIR	SOL3	ON	T001 T003 T004
		OFF	

- CYL1 : Cylinder for NUT FEED UNIT
- CLY2 : Cylinder for NUT SEPARATOR
- SOL1 : Solenoid valve for NUT FEED UNIT
- SOL2 : Solenoid valve for NUT SEPARATOR
- SOL3 : Solenoid valve for air blow
- AFR : Air filter regulator
- PG : Pressure gauge

### 3. INSTALLATION

#### 3-1. Installation of UNIVERSAL BRACKET and NUT FEED UNIT

- (1) Install the mount (of the FEEDER) on the left or right of the welder and within the reach of the feeding flexible tube.



- (2) If the vinyl flexible tube is 3.0m long, which is a standard length, the distance between the FEEDER and the welder should be 1.0m.
- (3) The floor on which they are to be installed should have a flat concrete surface (and be solid, because a weak floor cannot make correct vibrations.)
- (4) Make the mount roughly horizontal by adjusting it with the leveling adjusting bolts provided on the lower surface of the feeding mount. To achieve this horizontality, be sure that all of the four bolts are in contact with the ground (if not, correction vibrations cannot be obtained).
- (5) The FEED UNIT should be mounted on the left or right of the welder by driving four M8 bolts into the holes for UNIVERSAL BRACKET.

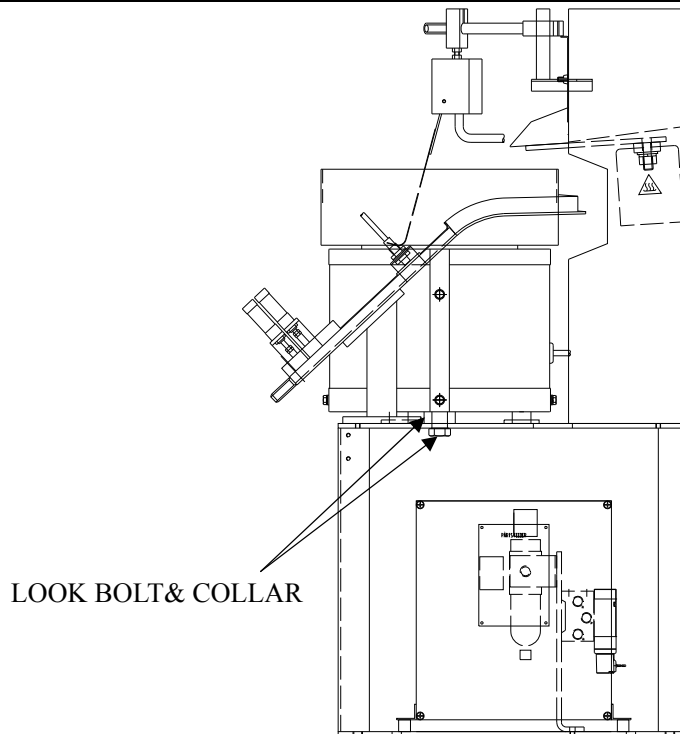
### 3-2. Installation of AUTOMATIC NUT FEEDER

#### NOTES:

- (1) Sharp bend of the FEED TUBE will prevent smooth feeding of the nuts and result in excessive wear within the FEED TUBE.
- (2) If the FEED TUBE is too long to install in a smooth arc, move the stand of the AF so that the tube has room to be installed with smooth arcs. (Approximately 300mm Radius)
- (3) When inserting the FEED TUBE to the TUBE JOINT of the CHUTE TRACK (A), it may be necessary to warm and soften the FEED TUBE end with hot water or hot air by a hair drier. Insert the FEED TUBE fully to the TUBE JOINT and tighten it with a tube clamp.
- (4) Observe the FEED TUBE carefully to determine if it has any deformation that will prevent smooth feeding of nuts. Deformation may be repaired by warming the tube and allowing it to regain its original shape.
- (5) When inserting the FEED TUBE into the TUBE HOLDER of CHUTE TRACK (B), it is necessary to align the position of hole in the tube with the set-screw of the tube holder. Inserting the set-screw prevents the FEED TUBE from coming off. Confirm that the FEED TUBE is not coming out by pulling firmly on the tube.
- (6) Loosen and remove the vibrator bowl lock bolt (M18) & collar which are located under the mount.  
(When it is fixed with a rock bolt)

#### Caution

These LOCK BOLT & COLLAR is only used to keep the vibrator bowl immobilized during its transportation. If it is kept unscrewed, it prevents vibrator bowl vibrations, that is, correct operation of the vibrator bowl.





**3-3. Connection of electrical wiring (Refer to page 19.)**

- (1) Connect 3P-cable with more than 1.25mm<sup>2</sup>/P for 115V AC power supply through the cable clamp located under the CONTROL PANEL to Terminals No.L1 and L2 in the CONTROL PANEL.
- (2) Connect the protective earth (PE) conductor to PE terminal (⊥).
- (3) Connect Terminals No.3 and 4 to weld start terminal of the spot welder.  
Connect Terminals No. N24 and X004 to the start switch for the AUTOMATIC NUT FEEDER and SPOT WELDER.  
(In most cases, disconnect the foot switch of the spot welder and connect the foot switch to terminals No. N24 and X004. The terminals of the welder from which the foot switch has been disconnected should be connected Terminals No.3 and 4.)

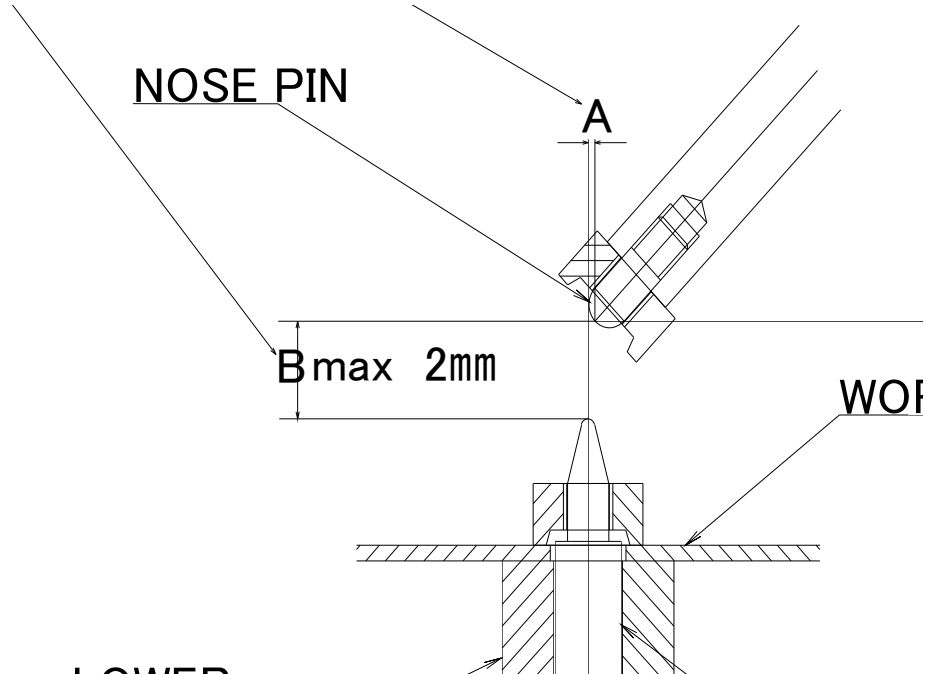
**3-4. Connection of compressed air hose**

- (1) Air inlet is provided on the air filter located under the CONTROL PANEL
- (2) Connect the 10mm-diameter air hose to the quick joint and supply 0.4 to 0.6Mpa compressed air.
- (3) Two air hoses are connected beforehand to solenoid valves SOL1, located under the CONTROL PANEL, these hoses shall be connected to the hose nipples on the cylinder of the NUT FEED UNIT. The hoses are provided with quick-joints, so the operator can connect them easily only by pushing quick-joints against the hose nipples.

Hose connection:      Blue hose    : to the piston side of CYL1  
                                 Black hose    : to the rod side of CYL1

### 3-5. Alignment of the NUT FEED UNIT to the spot welder

The relative position of the NUT FEED UNIT to the lower electrode shall be set as follows with power supply OFF and compressed air released from the pneumatic line.



- (1) With air hoses removed from the cylinder, pull out the SPINDLE of the NUT FEED UNIT by hand using the PILOT PIN.
- (2) At the stroke end of the SPINDLE, the relative position of the NOSE PIN to the PILOT PIN for lower electrode is illustrated below.
- (3) The NOSE PIN shall be positioned to aim at the top of the PILOT PIN.  
It is important to adjust distance "A" and "B". Basically "A" and "B" shall be adjusted so their values are near each to the other as much as possible. The NOSE PIN shall not hit the PILOT PIN. "B" shall be adjusted easily by the lower electrode holder of the spot welder.
- (4) Following process is required to be certain a nut can be placed smoothly onto the PILOT PIN.
  - 1) Open the HINGE PLATE by hand.
  - 2) Insert a nut to the NOSE PIN. The nut shall be attracted by magnetic force.
  - 3) Close the HINGE PLATE.
  - 4) Stroke the SPINDLE manually while holding the PILOT PIN.
  - 5) The nut shall be transferred to the PILOT PIN at the end of the stroke.
  - 6) If the nut is placed diagonally on the top of PIN, "A" and "B" should be increased a little more. Then repeat from step 1).

**CAUTION**

The angle of the SPINDLE, shape and size of weld nuts, and length and shape of the PILOT PIN allow for much adjusting variety.

However, the adjusting procedure described above is very important to obtain accurate automatic nut feeding. Be sure to follow it exactly.

- (5) The positioning adjustment following below, should be done when the 115V AC is supplied, compressed air has been supplied, and some nuts are aligned in the CHUTE TRACK (B).
- 1) Set the direction of the NUT FEED UNIT so as not to hit the PILOT PIN.
  - 2) Set the selector switch S3 in “ROD OUT” position and the SPINDLE is extended from the cylinder.
  - 3) Distance “A” and “B” shall be adjusted in this condition.
  - 4) Set the selector switch S3 in “ROD IN” position then the SPINDLE is retracted by the cylinder.
  - 5) The following process is required to make sure a nut can be placed smoothly onto the PILOT PIN.
    - a) Press push button switch PB1, a nut shall be fed from the NUT SEPARATOR to the NUT FEED UNIT.
    - b) If the nut is placed slantwise on the top of PIN, “A” and “B” should be increased a little more. Then try again as described above.

**WARNING**

This adjusting procedure described in item (5), must be carried out only after the AUTOMATIC NUT FEEDER has been checked by authorized personnel with power supply and compressed air supplied. Otherwise an unexpected situation, or danger, may exist.

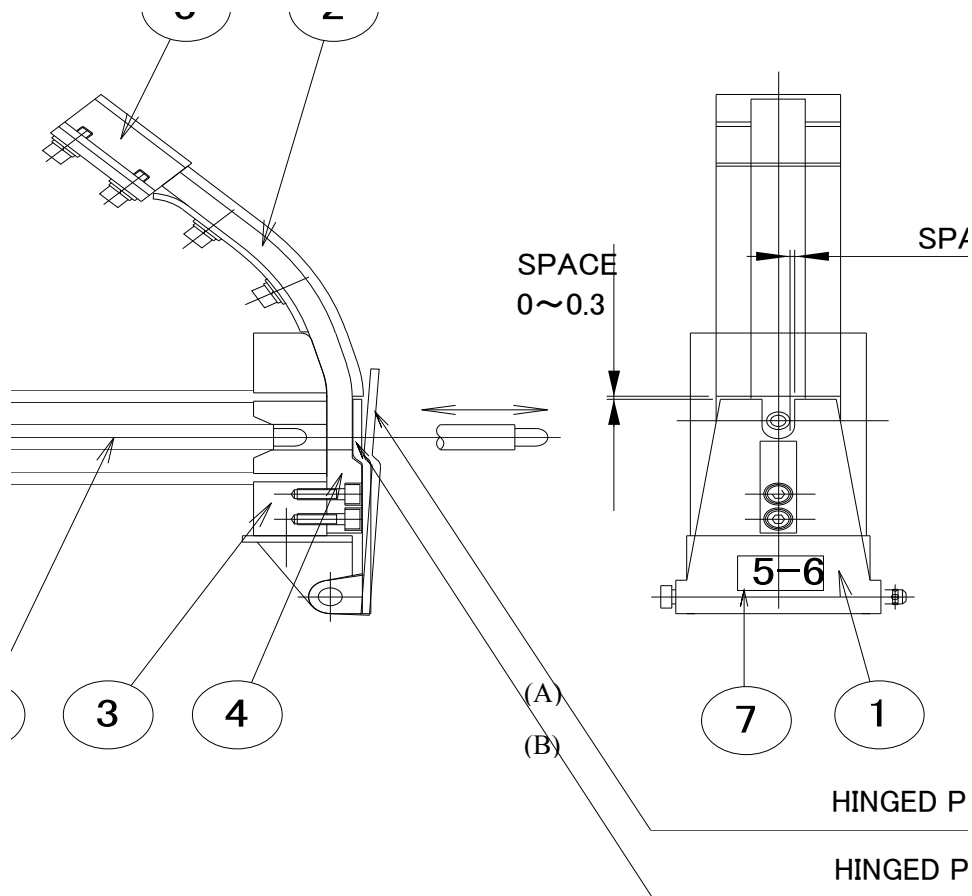
## 4. OPERATION

- (1) A check should be carried out by authorized personnel to see that wiring and piping are correct.
- (2) Supply compressed air with electric power OFF and confirm that the pressure gauge indicates the proper operation of the air regulator.
- (3) When air is supplied, the SPINDLE of the NUT FEED UNIT may be inadvertently stroked. Be sure the selector switch S3 is in the “ROD IN” position. If the spindle strokes in this position, release air pressure to air regulator, de-energize the system and change the connection of air hoses to air cylinder CYL1.
- (4) Supply power AC 115V for the AUTOMATIC NUT FEEDER with switches as follows:  
S1 : OFF  
S2 : PARTS FEED & WELD position  
S3 : ROD IN position
- (5) Turn on the switch S1 Power Switch to the ON position.
- (6) The VIBRATORY BOWL starts operating.
- (7) The SPINDLE is stroked to extend from the air cylinder, when the switch S3 turned in “ROD OUT” position, and the SPINDLE retracts when the switch S3 is turned to “ROD IN” position.  
Switch S3 shall be used to confirm finally that nuts can be placed accurately on the lower electrode, and it shall be in “ROD IN” position with the switch S2 in “PARTS FEED & WELD” position for automatic nut feeding and welding operation.
- (8) When pressing push button switch PB1, a nut shall be fed from the NUT SEPARATOR to the NUT FEED UNIT through the FEED TUBE.
- (9) “PARTS FEED & WELD” position of the selector switch S2 is used for automatic nut feeding in a typical welding operation.  
“WELDER ONLY” operation of S2 is used to operate only spot welding without feeding nuts. This acts as a by-pass of the AF when only wanting to operate the welder with out disconnecting the AF.
- (10) Supply power, compressed air, and water for the spot welder according to the manual of the spot welder.
- (11) Set welding parameters on the welder for the weld nut and step on the foot switch, then a nut shall be fed and welded automatically.

## 5. MAINTENANCE OF NUT FEED UNIT

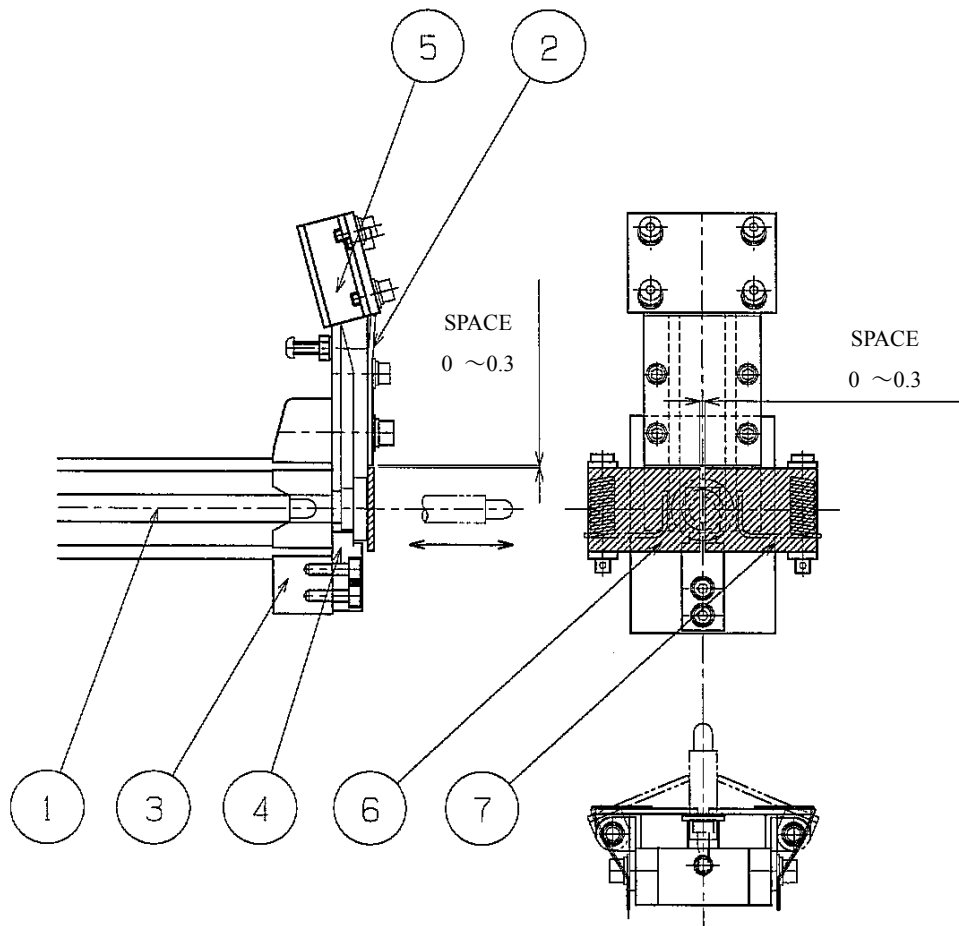
### 5-1. INSTALLATION METHOD OF HINGE PLATE FOR ROUND SPINDLE TYPE

- 1) The spare HINGE PLATE should be installed after adjusting it to fit the size of the weld nuts.
- 2) (A)The hinge plate is not machined to size when it arrives, when the HINGE PLATE ① is put on the Bracket ③, it will be longer than necessary.
- 3) The name plate ⑦ on the HINGE PLATE describes the designated nuts size and diameter of SPINDLE.
- 4) For example, Chart below shows that it is the HINGE PLATE for nut size “M5” and diameter of SPINDLE “ $\phi$  6”.
- 5) Adjust the space between CHUTE TRACK B ② and the HINGE PLATE and the HINGE PLATE and the SPINDLE ⑥, referring to the tolerance listed in the figure below.
- 6) Shave the space between CHUTE TRACK B ② and the HINGE PLATE and the HINGE PLATE and the SPINDLE ⑥ by using files or portable disc sanders. Then assemble it to the bracket for final adjustment.
- 7) Check all spaces by stroking the SPINDLE using the PILOT PIN.
- 8) Tighten the mounting screws after confirmation that the SPINDLE makes a full stroke and does not interfere with the closing of the HINGE PLATE.



**5-2. INSTALLATION METHOD OF HINGE PLATE FOR SQUARE SPINDLE TYPE**

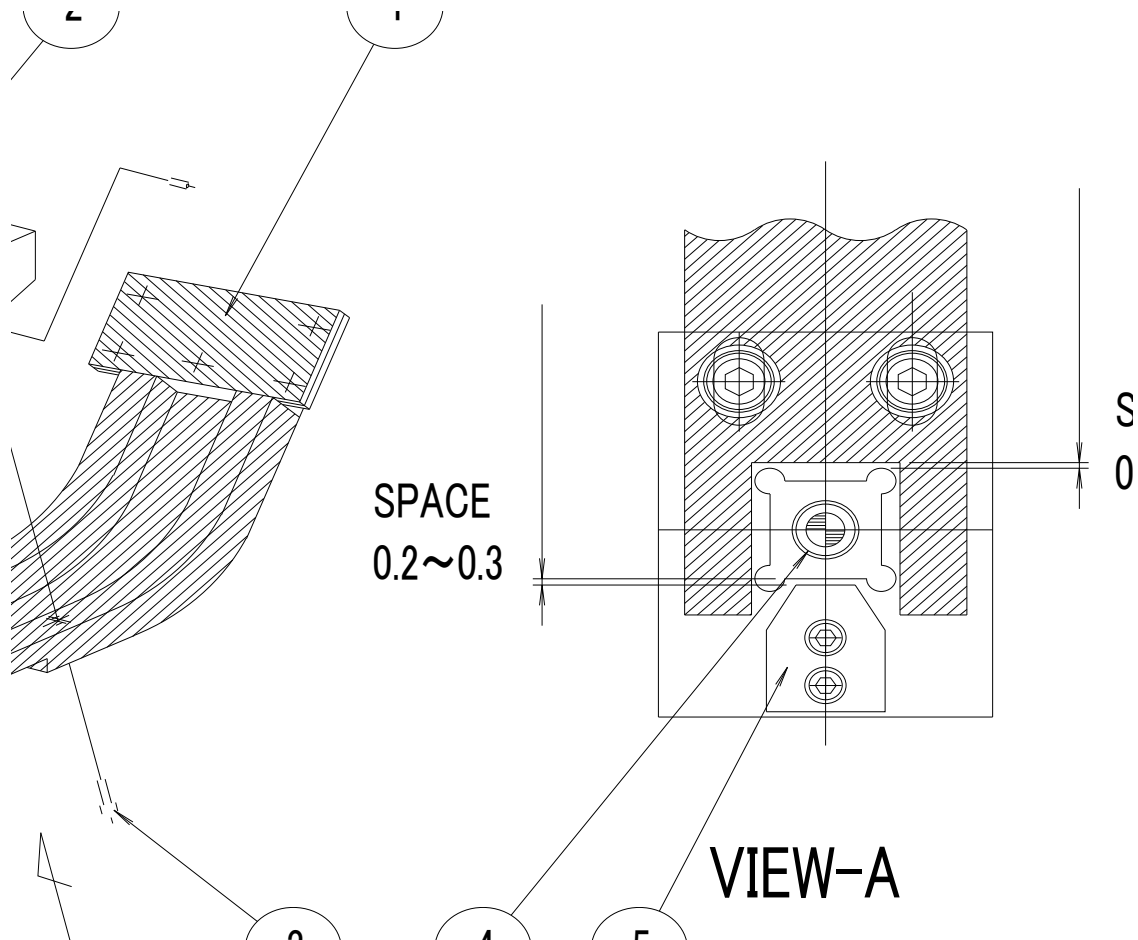
- 1) The spare HINGE PLATE should be installed after adjusting it to fit the size of the weld nuts.
- 2) The hinge plate is not machined to size when it arrives, when the HINGE PLATE ① is put on the Bracket ③, it will be longer than necessary. Please coordinate distance of hinge plate ⑦ with hinge plate ⑥ to 0.3 from 0.
- 3) Please coordinate numerical value in a figure with HINGE PLATE ⑥, ⑦ with an aim at the interval of COVER of CHUTE TRACK B ②.
- 4) Shave the space between CHUTE TRACK B ② and the HINGE PLATE and the HINGE PLATE and the SPINDLE ⑥ by using files or portable disc sanders. Then assemble it to the bracket for final adjustment.
- 5) Check all spaces by stroking the SPINDLE ① using the PILOT PIN.
- 6) Tighten the mounting screws after confirmation that the SPINDLE makes a full stroke and does not interfere with the closing of the HINGE PLATE.



①:SPINDLE    ②:COVER of CHUTE TRACK B    ③:FITTING PLATE  
 ④:NUT STOPPER    ⑤:TUBE HOLDER    ⑥:HINGE PLATE 1    ⑦:HINGE PLATE 2

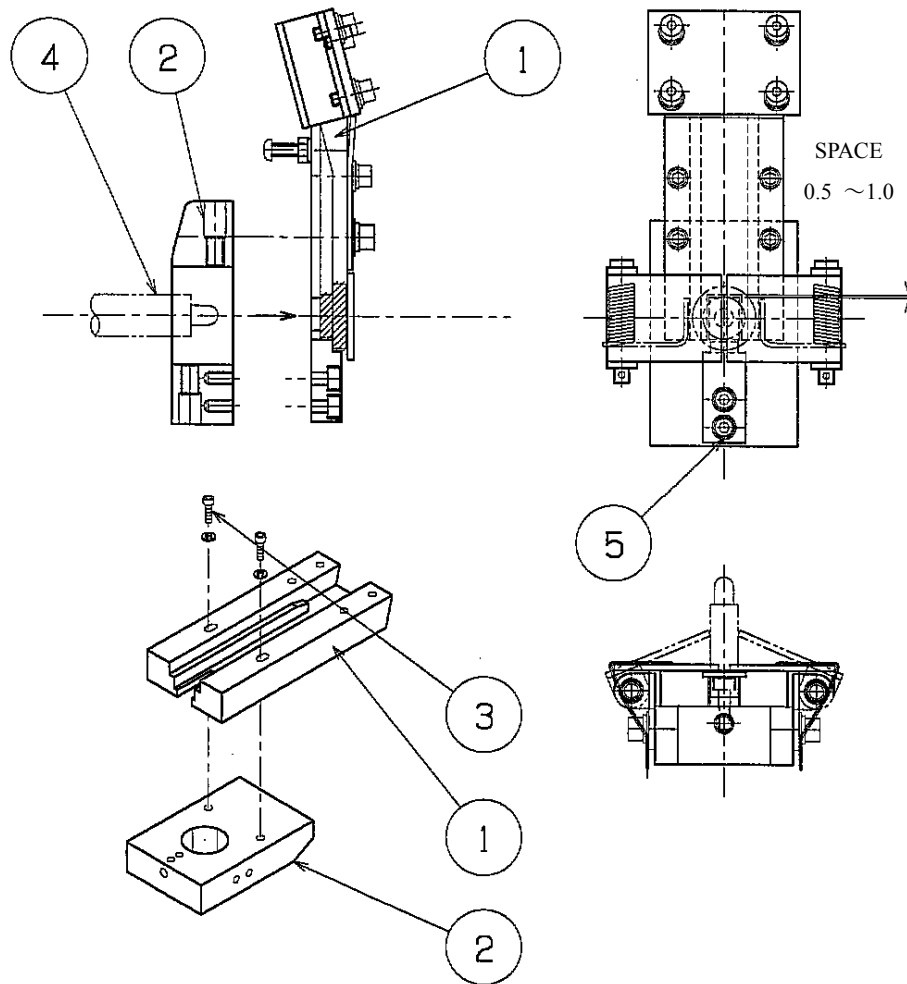
### 5-3. INSTALLATION OF CHUTE TRACK B FOR ROUND SPINDLE TYPE

- 1) Replacement of CHUTE TRACK B ① should be done after adjusting the position of the CHUTE TRACK to fit the size of the weld nuts.
- 2) Fit the CHUTE TRACK B ① on the FITTING PLATE ② and loosely attach it with the Hex. Bolts.
- 3) Adjusting the CHUTE TRACK B ① enables appropriate positioning due to the elongated holes.
- 4) Align the nut against the NUT STOPPER, which is positioned so the NOSE PIN ④ is concentrically located, then center it with the CHUTE TRACK B ①.
- 5) After confirmation that nuts are picked up by the nose pin one by one, tighten the bolts fully.



**5-4. INSTALLATION OF CHUTE TRACK B FOR SQUARE SPINDLE TYPE**

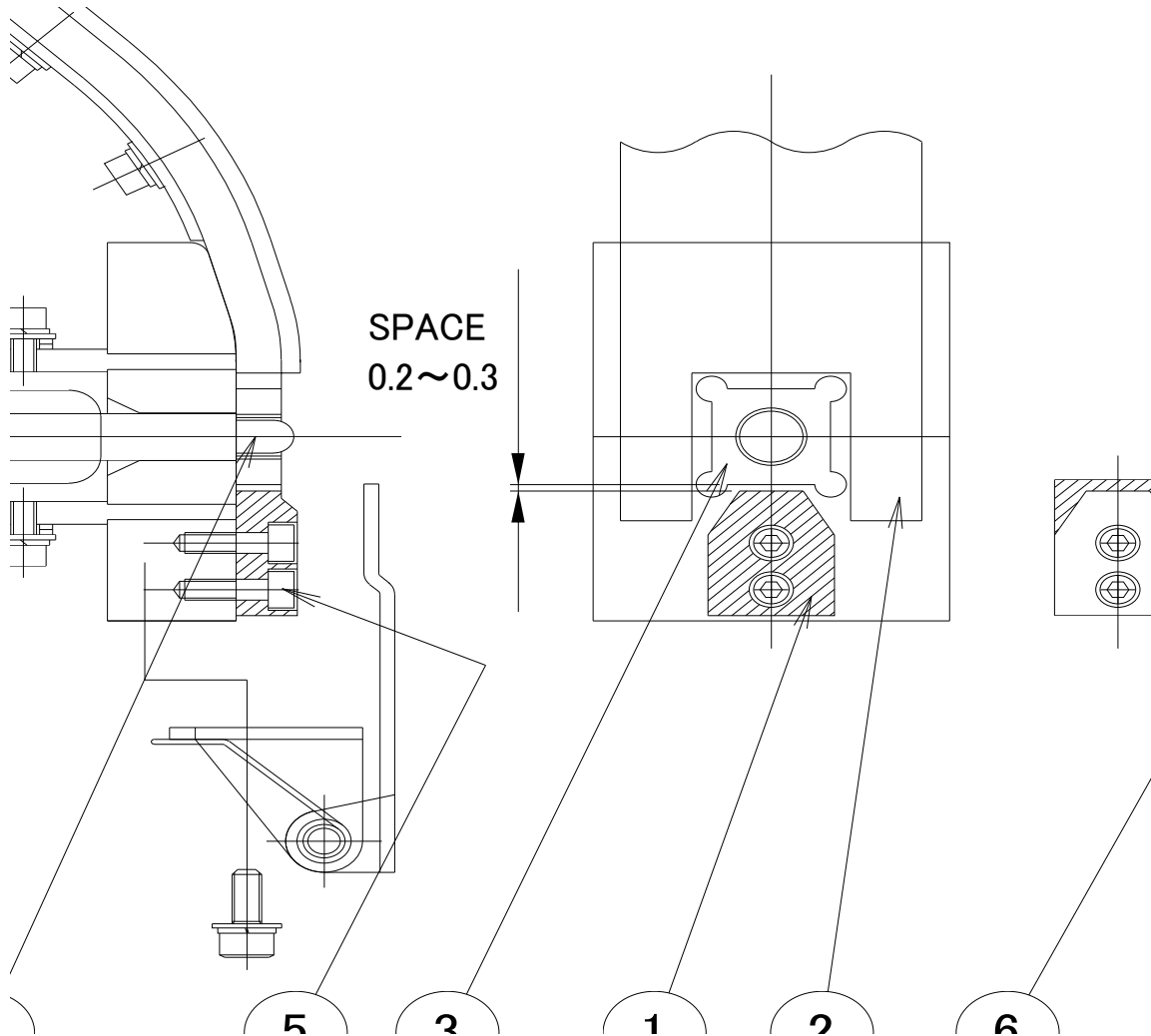
- 1) Replacement of CHUTE TRACK B ① should be done after adjusting the position of the CHUTE TRACK to fit the size of the weld nuts.
- 2) Fit the CHUTE TRACK B ① on the FITTING PLATE ② and loosely attach it with the Hex. Bolts.
- 3) Adjusting the CHUTE TRACK B ① enables appropriate positioning due to the elongated holes.
- 4) Align the nut against the NUT STOPPER, which is positioned so the NOSE PIN ④ is concentrically located, then center it with the CHUTE TRACK B ①.
- 5) Please adjust the CHUTE TRACK and the gap of the SPINDLE to 0.5 to 1.0mm.
- 6) After confirmation that nuts are picked up by the nose pin one by one, tighten the bolts fully.





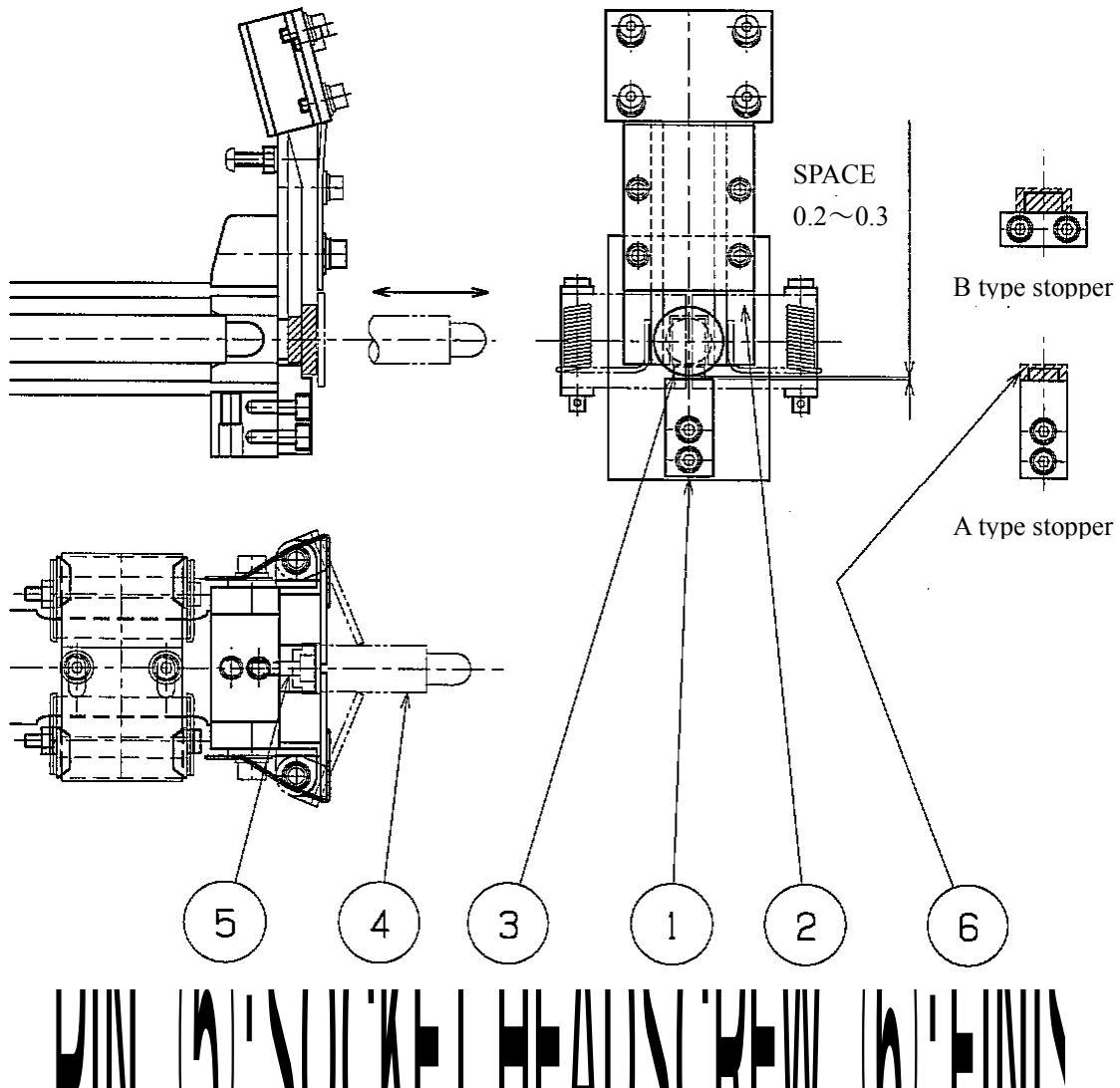
**5-5. INSTALLATION METHOD OF NUT STOPPER FOR ROUND SPINDLE TYPE**

- 1) The NUT STOPPER replacement should be made after adjusting to fit the size of the weld nuts.
- 2) Mount the NUT STOPPER ① to the CHUTE TRACK B ②, and put nuts ③ in the proper position by locating the nuts on the NOSE PIN ④.
- 3) The NUT STOPPER ① should be finished having clearance of 0.2 to 0.3mm between the nuts and itself.
- 4) If the surface the nut is not hitting flat against the NUT STOPPER, chamfer the hatched part ⑥ shown on the figure below at the end of NUT STOPPER ①.
- 5) Tighten the NUT STOPPER ① loosely to the FITTING PLATE ② with the Hex. Bolts ⑤.
- 6) After confirmation that nuts are picked up smoothly by the NOSE PIN, firmly tighten the bolts.



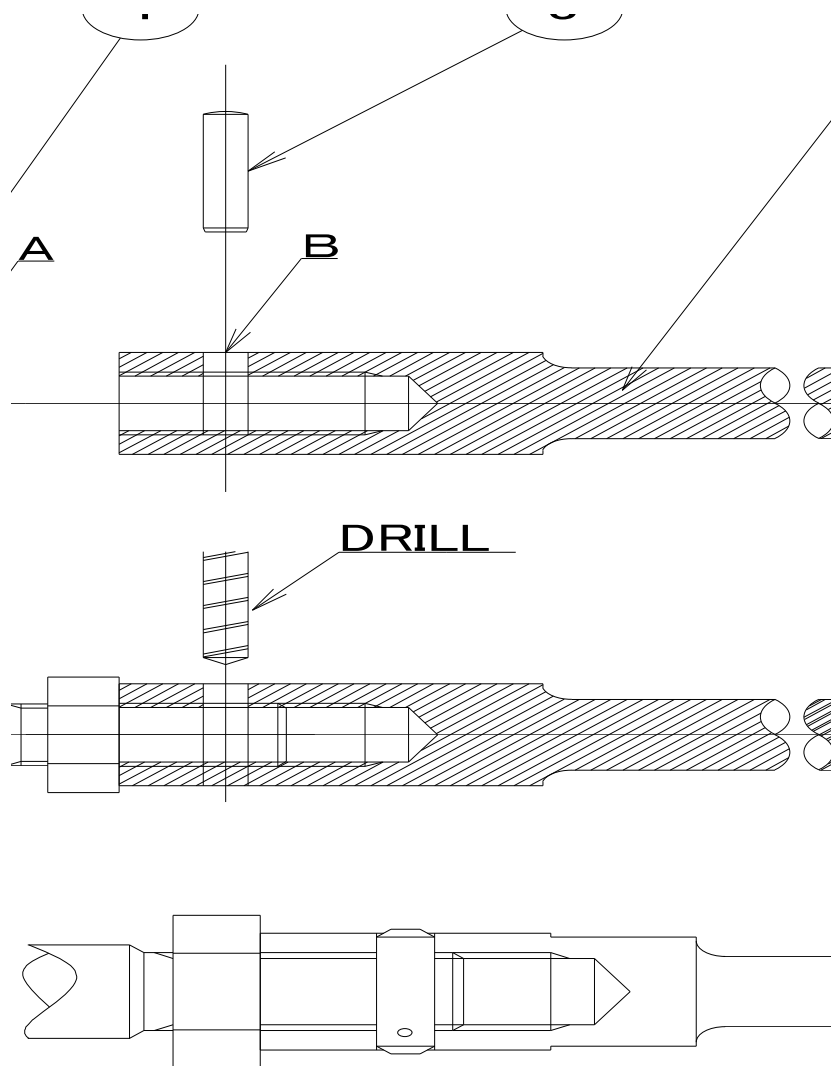
**5-6. INSTALLATION METHOD OF NUT STOPPER FOR SQUARE SPINDLE TYPE**

- 1) The NUT STOPPER replacement should be made after adjusting to fit the size of the weld nuts.
- 2) There are two kinds of the NUT STOPPER ①. Under  $\phi$  30mm are A type. More than  $\phi$  30mm are B type.
- 3) Mount the NUT STOPPER ① to the CHUTE TRACK B ②, and put nuts ③ in the proper position by locating the nuts on the NOSE PIN ④.
- 4) The NUT STOPPER ① should be finished having clearance of 0.2 to 0.3mm between the nuts and itself.
- 5) When straight a nut external form. Please finish hatching department ⑥ of the stopper tip.
- 6) Tighten the NUT STOPPER ① loosely to the FITTING PLATE ② with the Hex. Bolts ⑤.
- 7) After confirmation that nuts are picked up smoothly by the NOSE PIN, firmly tighten the bolts.



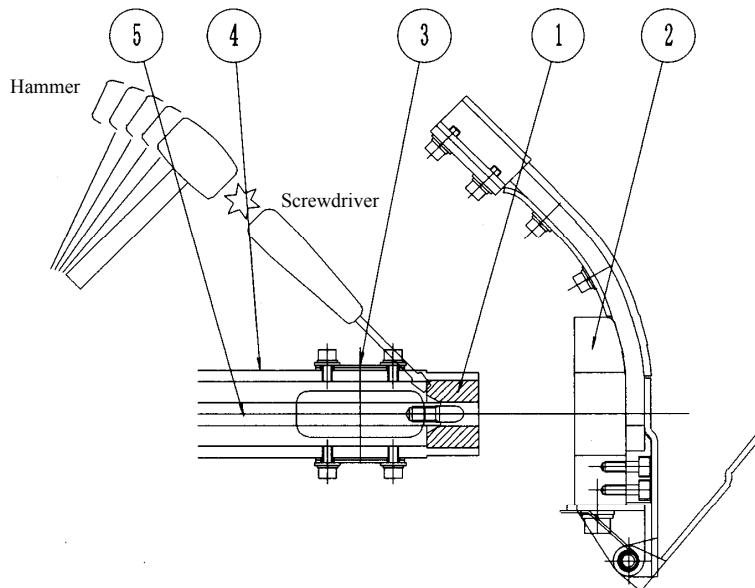
### 5-7. INSTALLATION METHOD OF SPINDLE

- 1) The SPINDLE ① is installed after processing to fit the pre-designed cylinder.
- 2) Screw the SPINDLE on the CYLINDER ROD ④ to align PIN HOLE (A) and PIN HOLE (B), which is made on only on one side of the SPINDLE ①.
- 3) Tighten the nut on CYLINDER ROD ④ until it is tight against the SPINDLE ①. Then drill a pilot hole until it reaches through the other side of the spindle. The next step is to ream the hole for insertion of the GUIDE PIN.
- 4) Adjust vibration of top within 0.2 at each position with operating to turn SPINDLE ①.
- 5) After confirmation that nuts slip one by one smoothly, tighten the screw.



### 5-8. INSTALLATION METHOD OF GUIDE BUSHING

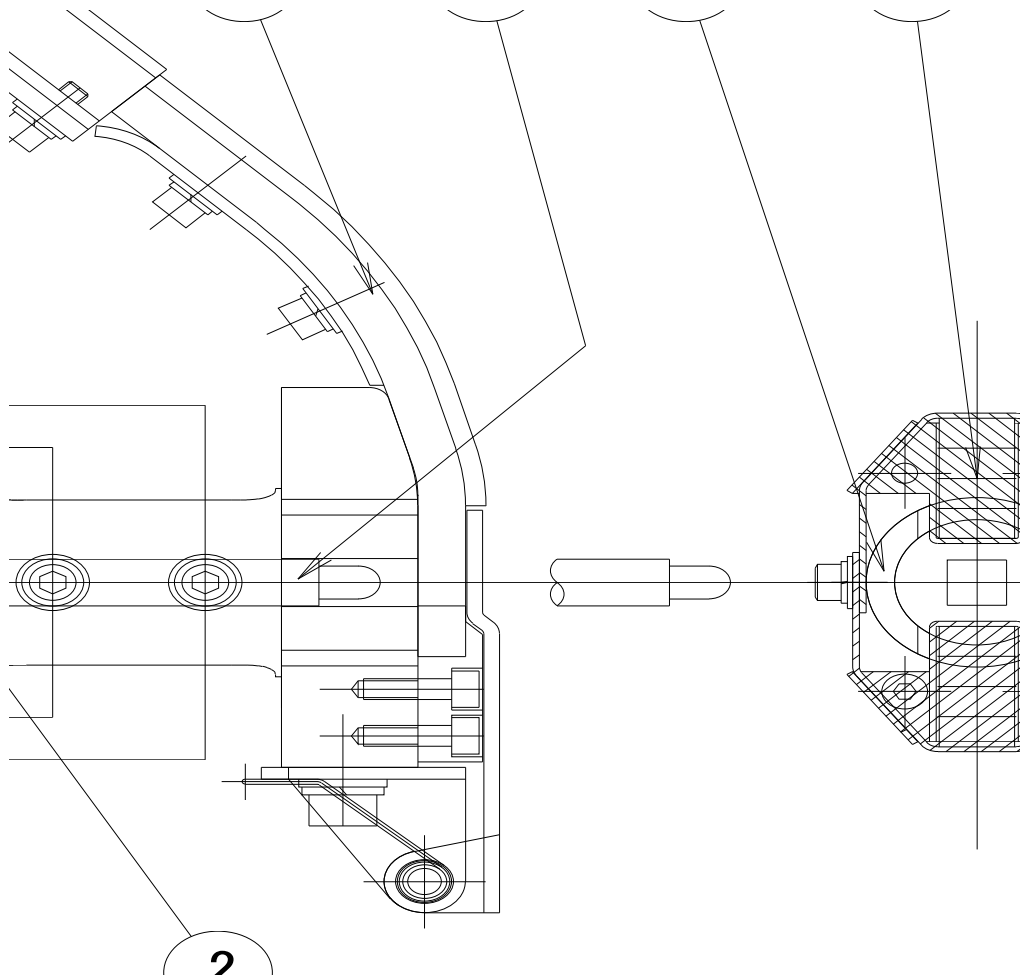
- 1) The GUIDE BUSHING ① is installed on the pre-designed CYLINDER ④ by press fitting.
- 2) Remove the GUIDE CYLINDER ④ from the BRACKET ② and MAGNET ③ from the GUIDE CYLINDER ④.
- 3) When GUIDE BUSHING ① is taken out of the GUIDE CYLINDER ④, be careful not to damage the SPINDLE ⑤.
- 4) Strike the GUIDE BUSHING ① with a screw driver or other tool, which has a very thin top.
- 5) Press-fit the new GUIDE BUSHING ① with a plastic or something malleable in order not to damage it.
- 6) Re-assemble by reversing the order of removal.
- 7) After confirming that SPINDLE ⑤ moves smoothly, tighten its screws.



( ① : GUIDE BUSHING ② : BRACKET (HEAD ASSY) ③ : MAGNET )  
( ④ : GUIDE CYLINDER ⑤ : SPINDLE )

### 5-9. INSTALLATION METHOD OF MAGNET

- 1) The MAGNET ① should be installed with the pre-designed GUIDE CYLINDER ②.
- 2) Move SPINDLE ④ forward, and dis-assemble the MAGNET paying attention to the location of the nuts holding the assembly together.
- 3) The MAGNET ① is a set of two. Mount the MAGNET ①, which has “0” mark ⑥ on it inside the other half of the set.
- 4) Tighten the Hex. Bolt ⑤ loosely, operate the SPINDLE ④ to full stroke. It is important that the magnet does not contact the spindle.
- 5) After confirmation of smooth movement at all positions, tighten the bolts fully.



## 6. PERIODICAL CHECK LIST

### Daily check:

- (1) Drain water from drain cock on the bottom of the air filter.

### Weekly check:

- (1) Lubricate the GUIDE BUSHING of the NUT FEED UNIT with one drop of light machine oil.
- (2) Remove oil dust and dirt in the VIBRATORY BOWL. Then wipe with a small quantity of kerosene on a cloth. This shall help to dissolve the accumulated residue in the BOWL. Be sure the BOWL is dry before filling with nuts.

### Monthly check:

- (1) Check wear of GUIDE BUSHING and NUT STOPPER and confirm the SPINDLE and nuts are aligned concentrically.
- (2) Check timing of timers T1, T2 and T3.  
When their timing is not correct, a nut may not be fed.
- (3) Confirm four (4) M12 adjusting bolts on base plate are set against the floor and the stand is level.

## 7. THE KNACK OF OPERATION

- (1) The lower electrode is recommended to have a pilot pin with conical top of 60 degrees. A pilot pin with a radius top is likely to miss receiving the nut.
- (2) The strength of vibration of the VIBRATORY BOWL is recommended to be adjusted as weak as possible still allowing a supply of enough nuts for welding operation cycles.
- (3) Too many nuts in the VIBRATORY BOWL may cause a reduced selection of nuts or mis-selecting of nuts. It is recommended to always fill the BOWL with nuts while allowing space on the bottom of the BOWL free of nuts as shown on page 11.
- (4) Irregular vibration in the BOWL will take place and continuous out-put of nuts from the VIBRATORY BOWL will not be obtained, if AC 115V power source for the AUTOMATIC NUT FEEDER fluctuates more than  $\pm 10\%$ .
- (5) When one of four (4) M12 adjusting bolts on the base plate of the AUTOMATIC NUT FEEDER is not set firmly on the floor, vibration will be weakened. Confirm that all four (4) bolts are set firmly against the floor and the stand is level.
- (6) A small amount of oil and dust mixture can cause sticking of nuts in the VIBRATORY BOWL. The BOWL should be regularly wiped clean to ensure trouble free operation.
- (7) The FEED TUBE must be installed in a smooth arc. Sharp bends will prevent smooth feeding of nuts and result in excessive wear within the TUBE.

## 8. TROUBLESHOOTING

- (A) Nuts are not supplied from the VIBRATOR BOWL to the CHUTE TRACK.
- (1) Check the nuts. Their size may be different from the designated nut.
  - (2) Check if the size of the BOWL outlet fits to the size of the CHUTE TRACK inlet.
  - (3) It may be caused by too strong or too weak vibration. Vibration can be controlled to not mis-select nuts by the DIAL on the CONTROL PANEL.
  - (4) Nuts with too much oil are easy to be mis-selected. Clean nuts and the BOWL with kerosene. (Refer to page 38, weekly check (2))
  - (5) Too many nuts or fewer nuts in the VIBRATORY BOWL may cause mis-selection. It is always recommended to fill the BOWL with nuts to about 20-30% of BOWL capacity.
- (B) Nuts are being blocked in the CHUTE TRACK
- (1) Check if the CHUTE TRACK is stained heavily with oil. If so, wipe it off with a cloth.
  - (2) A nut selected by error in a reversed position may be stopped by the nut stopper located in the rail.
  - (3) Some different size of nuts may be blocked in the CHUTE TRACK.
- (C) Nuts are staying in the FEED TUBE
- (1) Check if air pressure is reduced.
  - (2) Nut may not attain the FEED UNIT if air blow time is too short. (Refer to the timer setting procedure to set a longer blow time. (Refer to page 18))



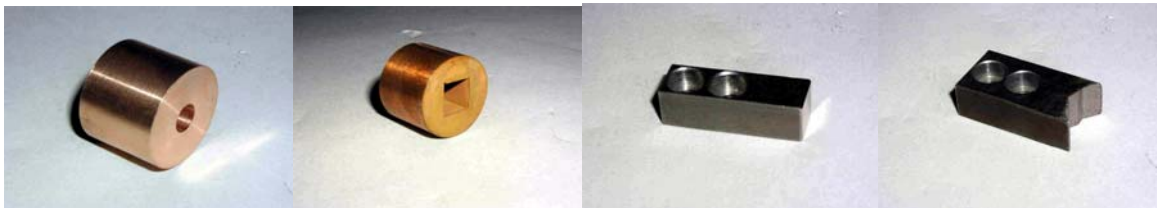
**9. SPARE PARTS AND MAINTENANCE PARTS**

The following lists shows the recommended items and quantity to be stocked by the customer in order to maintain the machine. When placing an order for spare parts and/or maintenance parts, please show the “SERIAL NUMBER” clearly with your order number to be sure to obtain the correct parts.

Quantity in ( ) shows numbers of the item used in the machine.

**9-1. SPARE PARTS LIST**

No.	PARTS NAME	IN WHICH PARTS	Q'ty	MODEL
				【Serial No.】 【DG No.】
1	ROUND BUSHING	PART OF FEED UNIT		PFU-0005-
2	SQUARE BUSHING	”		PFU-0006-
3	NUT STOPPER	”		PFC-0022
4	NUT STOPPER	”		PFC-0023
5	NUT STOPPER	”		PFC-0024
6	ROUND SPINDLE ASSY	”		PFU-00
7	SQUARE SPINDLE ASSY	”		PFU-00
8	SINGLE HINGED ASSY	”		PFU-0014-2
9	DOUBLE HINGED ASSY	”		PFU-0023
1 0	HEAD ASSY	”		PFU-00
1 1	MAGNET ASSY	”		PFU-0007
1 2	VINYL TUBE	”		-



No.1

No.2

No.3

No.4



No.5

No.6

No.7

No.8



No.9

No.10

No.11

No.12

SAMPLE : PFU-0010-DIA.OF NOSE PIN - DIA.OF SPINDLE - HEIGHT OF NUT





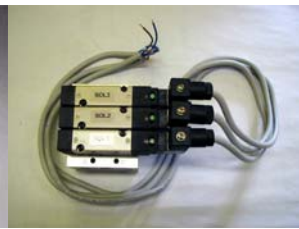
No.1 No.2



No.3



No.4



No.5



No.6



No.7 No.8



No.9 No.10



No.11



No.12



No.13



No.14



No.15



No.16



No.17



No.18



No.19



No.20



No.21



No.22



No.23