

MITSUBISHI

Industrial Sewing Machine

TECHNICAL MANUAL

MECHANICAL VERSION

Electronic Pattern Sewing Machine

Model PLK-B1006

FOR YOUR SAFETY!

If you operate the sewing machine first time, please make sure to read the following instructions for your safety and proper operation.

In this technical manual, the notice **CAUTION** is mentioned at some paragraph to attract your attention for the safety. Please keep it in mind whenever you work with the sewing machine.



CAUTION

is used as the notice to warn a possible danger to cause a wound.

- ★ This technical manual explains the instructions how to operate and maintain the sewing machine.
- ★ All information in this technical manual are subject to change without notice.
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Explanations for the warning signs

No.	Warning sign	Meanings of warning sign
1.		Caution for sewing machine operation: Warning to operate the sewing machine without safety guards and to prohibit doing any operation except sewing while the power is turned ON.
2.		Caution for a wound on the fingers: Warning to a possible danger to cause a wound on the fingers under the specified operation.
3.		Caution for the fingers to be caught in the machine: Warning to a possible danger to be caught the fingers in the machine under the specified operation.
4.		Direction of pulley rotation: Indicating the proper rotating direction of the sewing machine pulley.

ENVIRONMENTAL STANDARD



Caution

★For avoiding the sewing machine from the troubles, please do not operate the sewing machine under the following conditions.

(1) Temperature and humidity

(a) During operating:

The atmosphere temperature should not exceeded more 35°C (95°F) or less 5°C (41°F).

During transportation:

The atmosphere temperature should not exceeded more 55°C (131°F) or less -10°C (18°F).

(b) The relative humidity in the atmosphere should not exceeded more 85% or less 45%.

(2) Location of the installation

(a) In the outdoors or in the places are exposed to the sun.

(b) Near a heat generator.

(3) Atmosphere for the machine operation

(a) in the atmosphere filled with dust or corrosive gas.

(b) in the atmosphere filled with flammable or explosive gas.

(4) Power source voltage

(a) In the place where the power fluctuation exceeds more or less 10 % of the fixed power voltage.

(b) In the place where the power source can not supply enough voltage to keep the motor running.

(5) noise

(a) In the place near a high frequency transmitter or a high frequency welder.

(b) In the place filled with strong electromagnetic radiation or magnetic field.

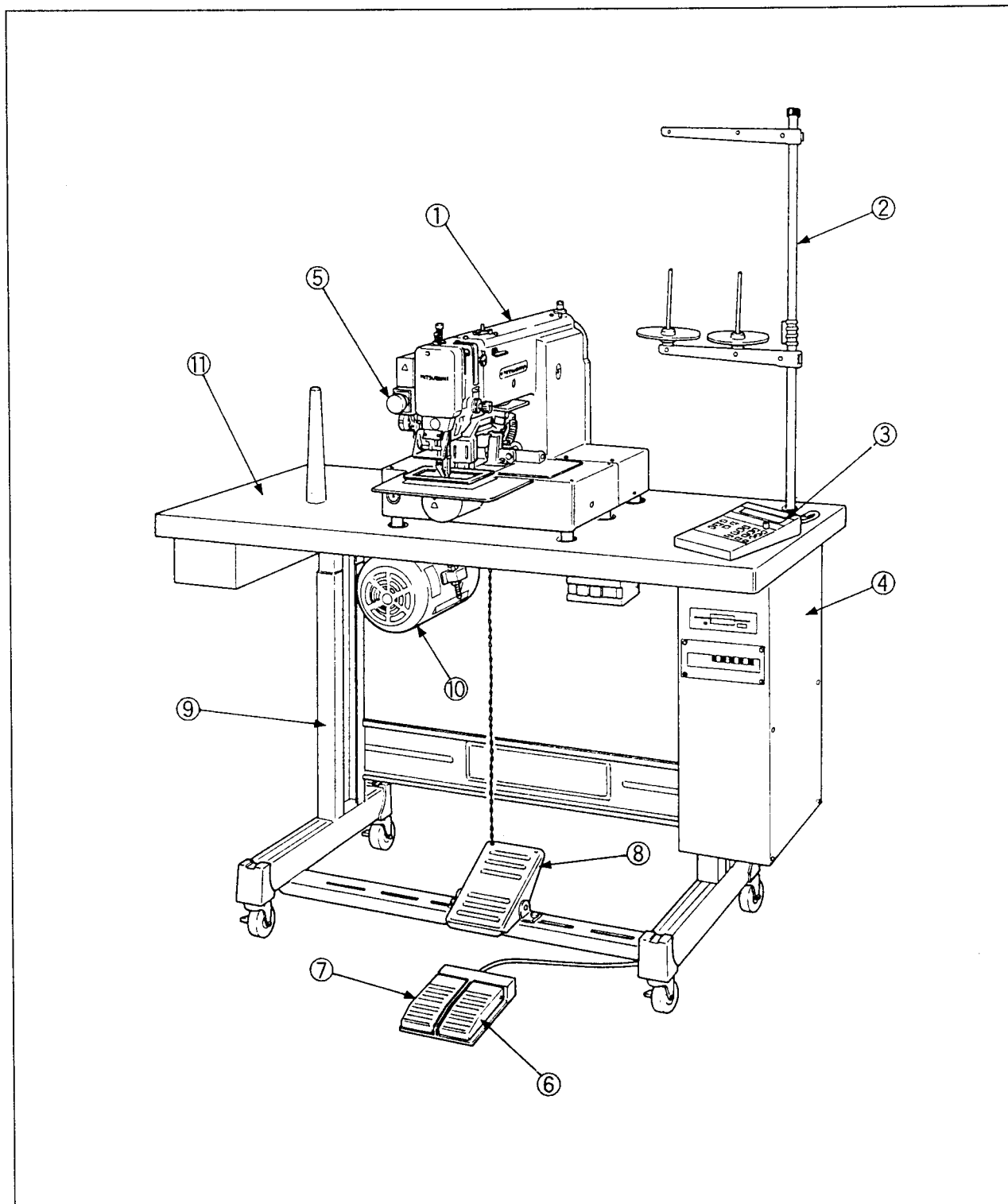
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1 STRUCTURE OF THE MACHINE

The PLK-B1006 electronic pattern sewing machine is constructed with the following main parts.



- ① Sewing machine head. ② Thread stand. ④ Control box. ⑤ Emergency stop switch.
⑥ Work holder foot switch ⑦ Start foot switch. ⑧ Work holder pedal. ⑨ Steel stand.
⑩ Limi-servo motor. ⑪ Wooden table.

Option ③ Teaching panel.

2 SPECIFICATIONS

Machine model	: PLK-B1006
Sewing area	: X Direction (left/right) 100mm : Y Direction (forward/backward) 60mm
Maximum sewing speed	: 2,300 S.P.M. (up to 4mm stitch length)
Sewing speed	: 10 steps variable from 200 S.P.M. to 2,300 S.P.M.
Stitch length	: Adjustable from 0.1mm to 12.7mm by 0.1mm resolution.
Stitch type	: Single needle lockstitch.
Needle bar stroke	: 41.2mm
Thread take up lever stroke	: 68mm
Class of needle	: DP X 17 # 16 (the standard specification)
Wiper system	: Back to forth wiping system (the standard specification) Left to right wiping system (the optional specification)
Work holder lift	: 22mm (max.)
Stepping foot lift * ¹	: 10mm
Stepping foot stroke * ²	: Variable from 4mm to 10mm (4mm is standard)
Hook	: Large size shuttle hook.
Bobbin case	: With non racing spring.
Bobbin	: Large size aluminum bobbin.
Thread trimmer system	: Horizontal engagement with fixed knife and movable knife
Lubrication system	: Manual oiling and replenishment with the oil braids from the oil tanks.
Lubrication oil * ³	: White machining oil.
Machine dimension	: 1,200mm(W) x 565mm(L) x 1,220mm(H)
Steel stand	: T-shape steel stand for the standing or the sitting operation.
Weight	: 140 Kg (total net weight).

* 1 Stepping foot lift means the clearance between the bottom of the stepping foot and the surface of the sliding plate when the sewing machine is stopped running.

* 2 Stepping foot stroke means the vertical movement of the stepping foot during the sewing operation.

* 3 The oil which Japanese manufacture's brand name is "Pulley SF oil" is used to this machine.

3 INSTALLATIONS



Caution

- ★ The machine should be installed by the specialists who have enough experience for the sewing machine installations.
- ★ All the necessary electric wirings should be done by electric engineers who are qualified for the electric wirings.
- ★ If any damage or fault is found on the machine at the installation, please do not operate until it is repaired.
- ★ Please do not operate the sewing machine with excessive modifications from the standard specification.

3-1 Preparation for the table

If the table is not MITSUBISHI original, the thickness of the table is required to have 40mm more.

And please refer to the cut out table drawing for your own preparation.

The cut out drawing is shown on the last page of this technical manual as REF. NO.1 drawing.

3-2 Preparation for the steel stand

If the steel stand is not MITSUBISHI original, please refer to the assembling drawing for your own preparation.

The assembling drawing is shown on the last page of this technical manual as REF. NO.2 drawing.

If the steel stand is MITSUBISHI original, please assemble the steel stand with the assembling instructions enclosed in the packing.

3-3 Installation of the motor

If the motor is purchased without assembling to the table, the motor has to be installed underneath the table.

Please install the motor with the instructions explained in the paragraph [installation of the motor] on the another **CONTROL UNIT** technical manual.

3-4 Installation of the control box

If the control box is purchased without assembling to the table, the control box has to be installed underneath the table.

Please install the control box with the instructions in the paragraph [installation of the control box] on the another **CONTROL UNIT** technical manual.

3-5 Connection of the teaching panel

If the optional teaching panel is purchased for the sewing pattern programming, the teaching panel has to be connected to the control box.

Please connect the teaching panel with the instructions of Teaching Panel Technical manual enclosed in the packing.

3-6 Installation of the power switch

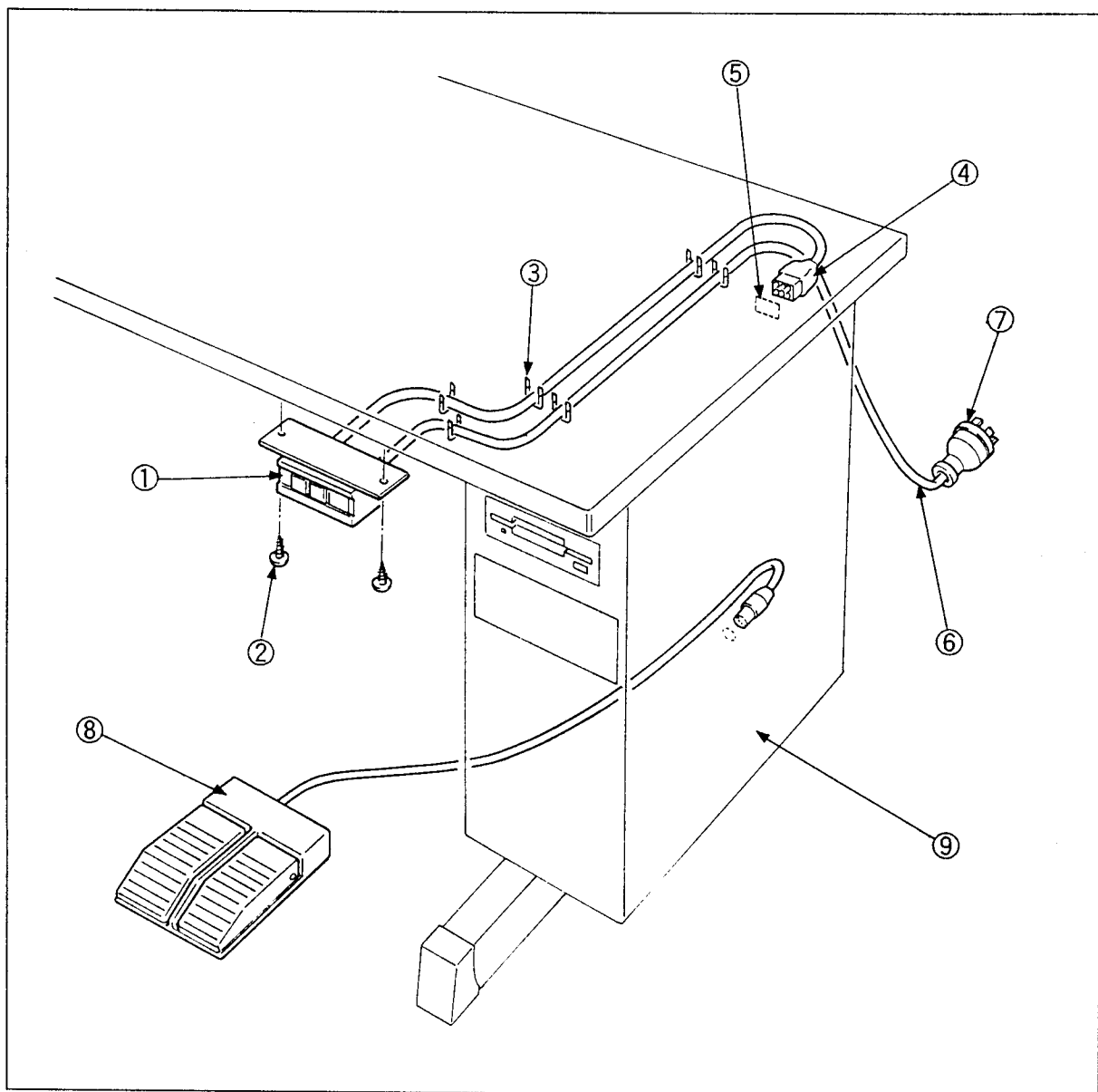
If the power switch is purchased without assembling to the table, the power switch has to be attached with the following procedure.

- (1) Mount the power switch (NO.①) with the wood screw (NO.②) underneath the table as shown on the figure.
- (2) Fix the electric cords with the staples (NO.③) underneath the table.
- (3) Hook up the connector (NO.④) of the power switch (NO.①) to the connector (NO.⑤) of the control box (NO.⑨).
- (4) Attach the power plug (NO.⑦) to the another end of the power switch cord(NO.⑥).

3-7 Connection of the foot switch

Connect the foot switch (NO.⑧) to the control box (NO.⑨).

The foot switch is enclosed in the accessory box



3-8 Installation of the oil pan

- (1) Assemble the oil pan (NO.①) and oil bottle (NO.②), which are enclosed in the accessory box.
- (2) Insert the oil bottle (NO.②) into the table top cut-out hole (NO.③), with facing the oil pan end which has much shorter distance from the bottle center to the front.
- (3) Install the oil pan (NO.①) parallel with the table front edge.
- (4) Fix the oil pan (NO.①) at its four corners on the table top with four staples (NO.④) enclosed in the accessory box.

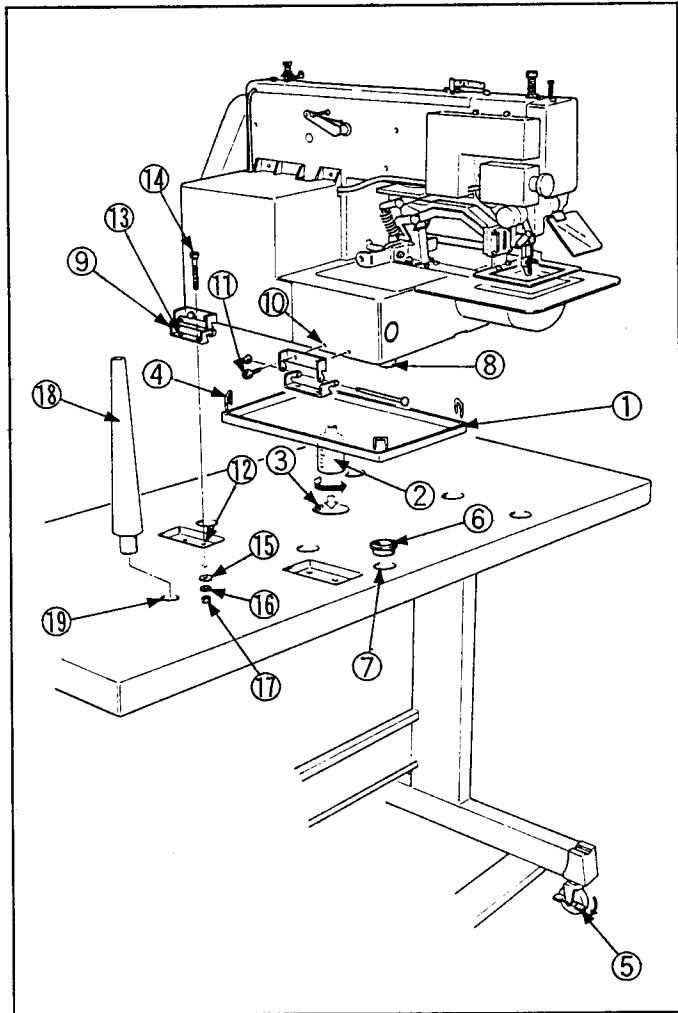
3-9 Installation of the sewing machine head



Caution

★ For the safety, please make sure to carry the sewing machine head by two people at least.

- (1) Make sure to hold the machine table with the caster stopper (NO.⑤)
- (2) Fit the rubber cushion pads (NO.⑥) into the each hole (NO.⑦) on the table top. The rubber cushion pads (NO.⑥) are enclosed in the accessory box.
- (3) Put the sewing machine head on the table top and set the each leg (NO.⑧) to the each rubber cushion pad (NO.⑥).
- (4) Attach two hinges (NO.⑨) temporarily, make the set screws (NO.⑪) fastening with the thread holes (NO.⑩) light, on the left side surface of the machine bed with the hexagonal socket head set screws (NO.⑪).
At this time, take notice of the E- shaped snap ring must be come to the front.
These parts are all enclosed in the accessory box.
- (5) Fit the screw holes (NO.⑬) of the hinges (NO.⑨) to the bolt setting holes (NO.⑫) on the table top then, pass the bolt (NO.⑭) through these holes and fasten the bolt (NO.⑭) to fix the hinges (NO.⑨) with the flat washers (NO.⑮), the spring washers (NO.⑯) and the nuts (NO.⑰).
- (6) Fasten firmly the hexagonal socket head set screws (NO.⑪) which set the hinges (NO.⑨) temporarily at above procedure (4) then, fix the hinges (NO.⑨) perfectly.
- (7) Insert the head rest (NO.⑱) into the hole (NO.⑲) on the table top.



3-10 Putting across the V-belt



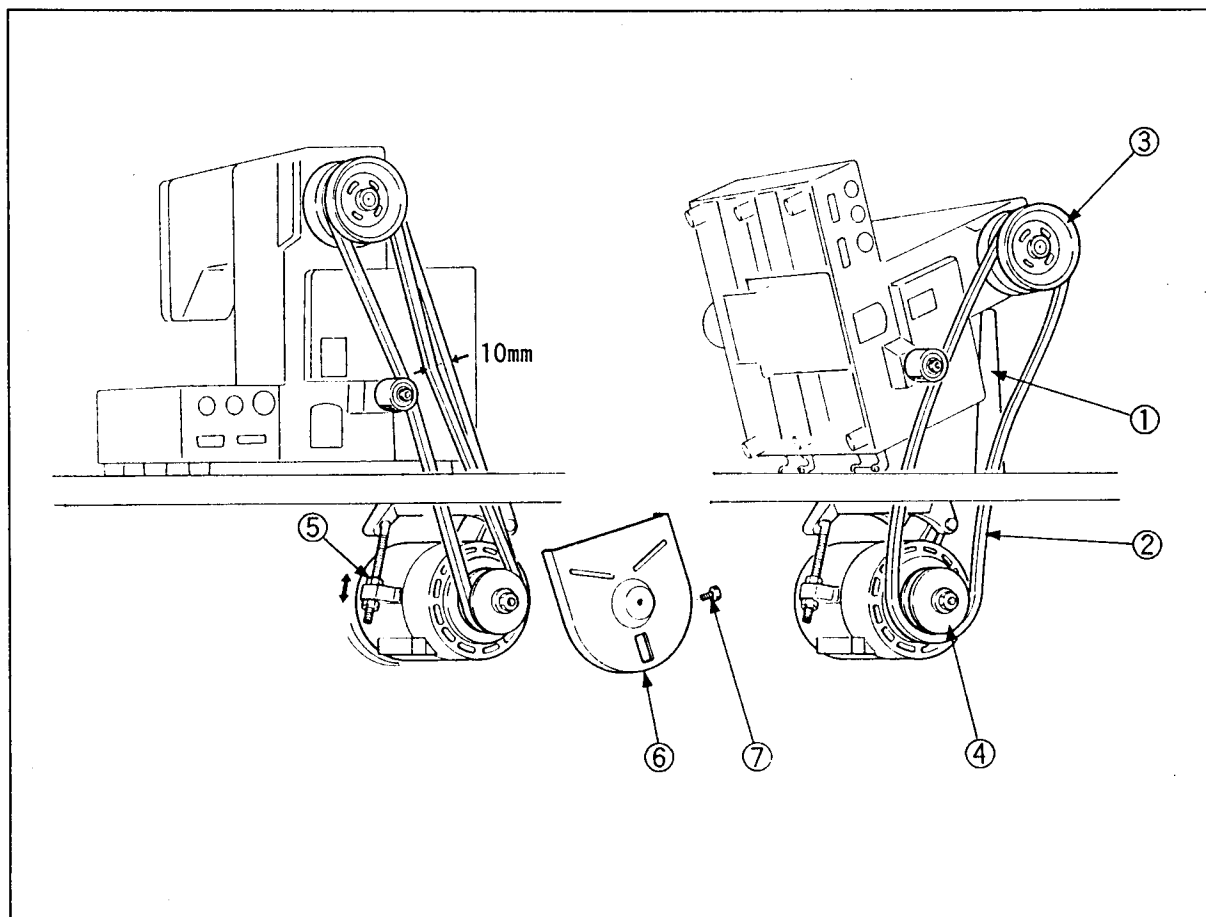
Caution

★ For the safety, when tilt or raise the sewing machine head, please make sure to hold the sewing machine head with both hands by two people at least.

- (1) Tilt the sewing machine head to the left, and hold it with the head rest (NO.①).
- (2) Put the V-belt (NO.②) across the sewing machine pulley (NO.③) and the motor pulley (NO.④) with passing it through the slit on the table top.
The V-belt (NO.②) is enclosed in the accessory box.
- (3) Raise the tilted sewing machine head to the original position.
- (4) Push the center portion of V-belt by the finger with the presser of about 1 kg.
If the V-belt tension is proper, it should be yielded about 10mm.
If the V-belt tension is not proper, please adjust it with changing the motor setting position with loosening the nuts (NO.⑤).
- Please make sure to fasten the nuts (NO.⑤) firmly after the adjustment.
- (5) Put the motor pulley cover (NO. ⑥) on the motor with the set screws (NO.⑦).

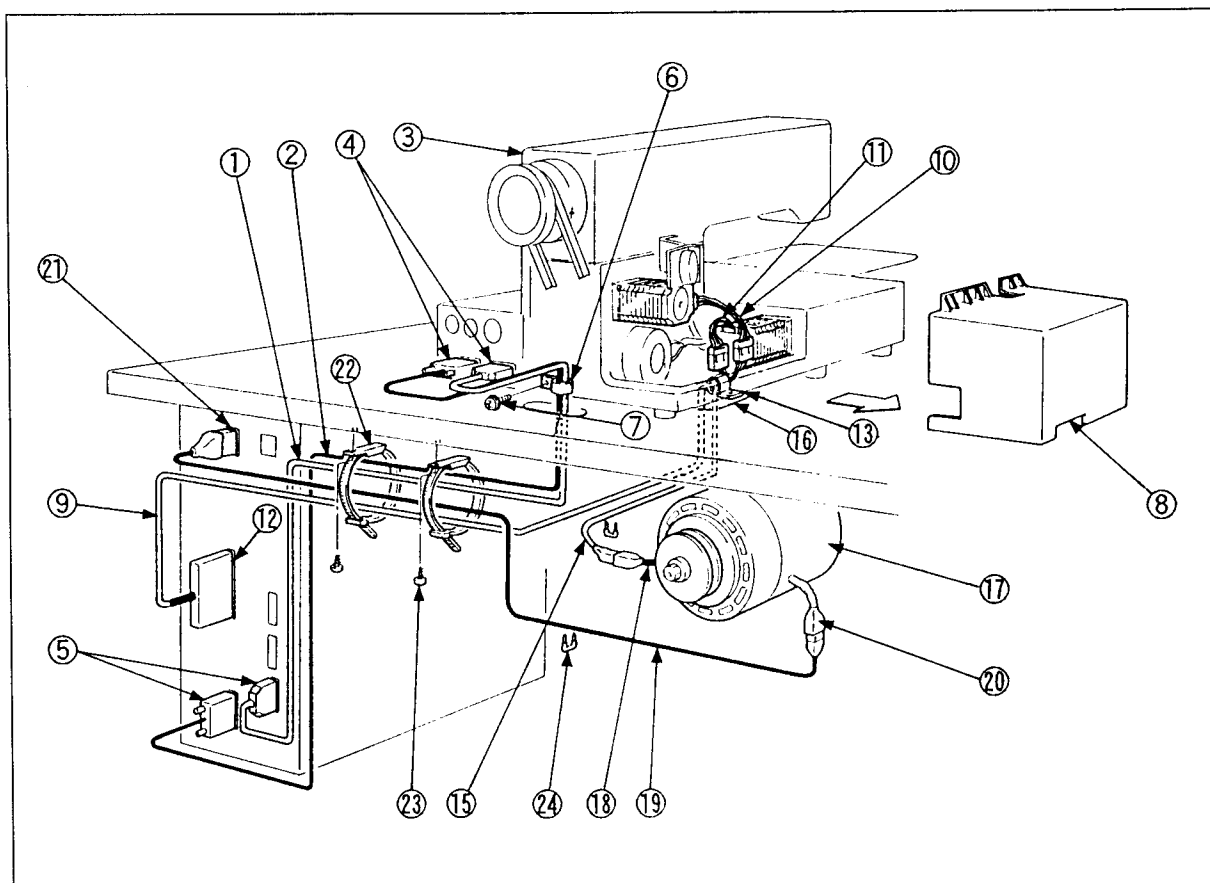
NOTE : The V-belt becomes loose after a long period machine running.

If the looseness is recognized definitely, firstly turn the power OFF then, adjust the V-belt tension again as the above procedure (4).



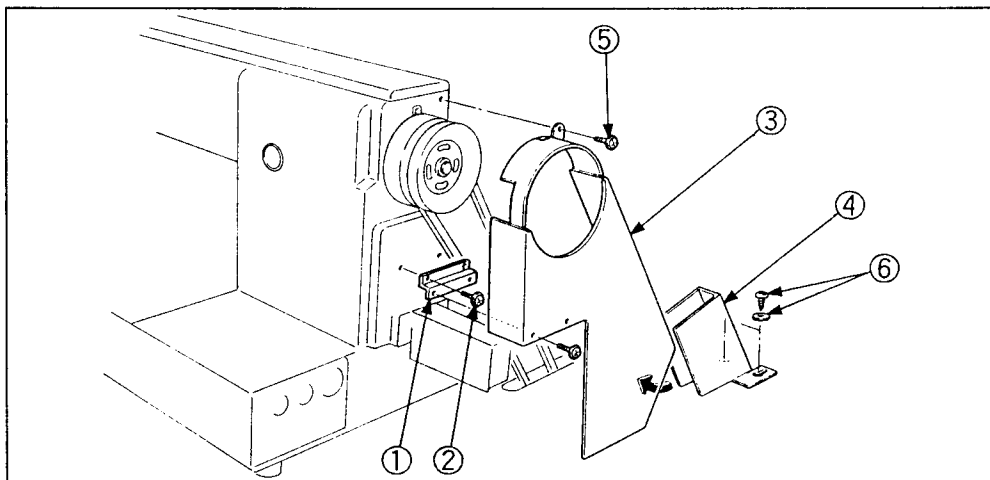
3-11 Connection of the electric cables

- (1) Connect the white color cable (NO.①) and the black color cable (NO.②) across the printed circuit board unit connectors (NO.④) on the sewing machine head (NO.③) rear face and the connectors (NO.⑤) on the control box. At this time, bundle the white color cable (NO.①) and the black color cable (NO.②) with the nylon clip (NO.⑥) and fix them to the sewing machine head (NO.③) rear face with the set screw (NO.⑦). All these parts are enclosed in the accessory box.
- (2) Remove the stepping motor cover (NO.⑧) from the sewing machine head (NO.③).
- (3) Pass upward the cable (NO.⑨) which is attached the two connectors at the end through the cut-out hole (NO.⑬) on the table top then, connect it to the cable (NO.⑩) and (NO.⑪) extended from X and Y stepping motor. At this time, fix this cable with the nylon clip (NO.⑬) provided on the sewing machine head. And also, connect the other end of the cable (NO.⑨) to the connector (NO.⑫) on the control box. The cable (NO.⑨) is enclosed in the accessory box.
- (4) Pass downward the another cable (NO.⑮) which is extended from the sewing machine head through the cut-out hole (NO.⑬) on the table top then, connect it to the cable (NO.⑮) extended from the motor (NO.⑮).
- (5) Connect the last cable (NO.⑮) to the another extended cable (NO.⑮) from the motor then, hook up the other end of the cable (NO.⑮) to the connector (NO.⑮) on the control box. The cable (NO.⑮) is also enclosed in the accessory box.
- (6) Attach the two binder (NO.⑮) underneath the table with the wood screws (NO.⑮) then, bundle and fix all the connected cables with the binders (NO.⑮) and the staples (NO.⑮). The binders (NO.⑮), the wood screws (NO.⑮) and the staples (NO.⑮) are enclosed in the accessory box.



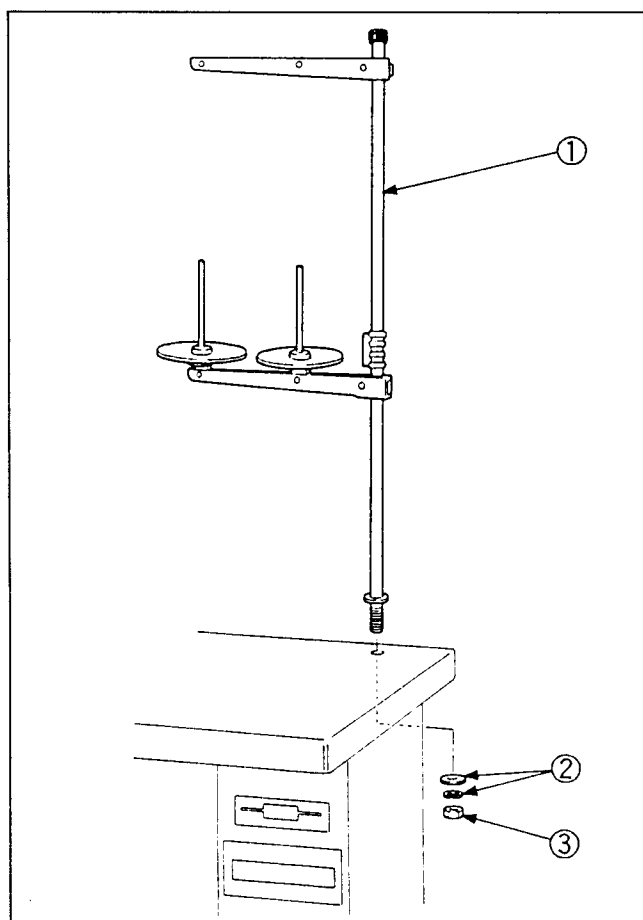
3-12 Installation of the belt cover

- (1) Attach the belt cover mounting plate (NO.①) to the sewing machine head with the set screws (NO.②).
 - (2) Put the large belt cover (NO.③) and small belt cover (NO.④) on the sewing machine head and the table top with the set screws (NO.⑤) and the washers and wood screws (NO.⑥).
- All the necessary parts are enclosed in the accessory box.



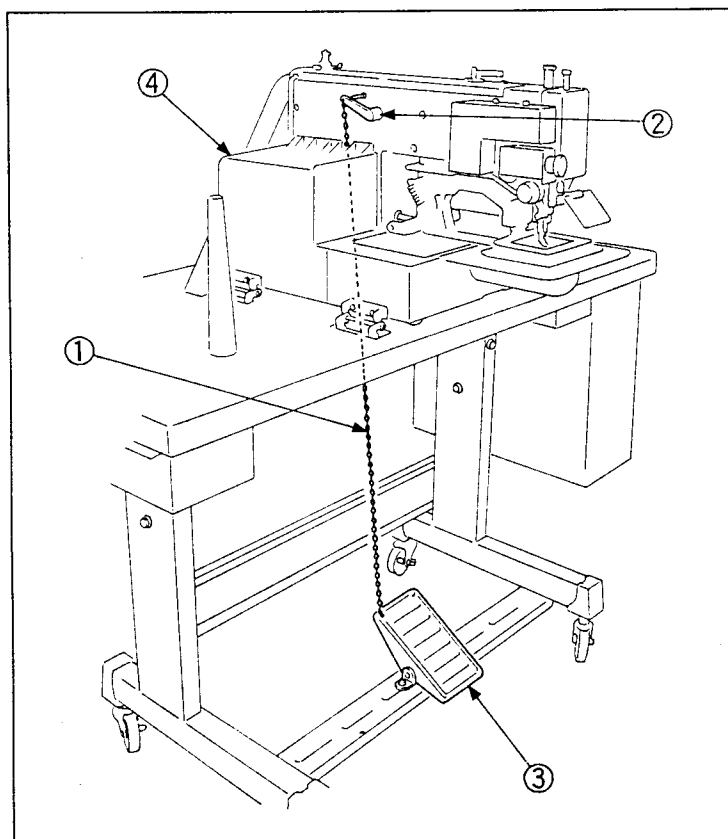
3-13 Installation of the thread stand

- (1) Assemble the thread stand with the instructions enclosed in the packing.
- (2) Fit the thread stand (NO.①) in the thread stand hole on the table top.
- (3) Fix the thread stand (NO.①) firmly from the rear side of the table with tightening the nut (NO.③) and the washers (NO.②)



3-14 Functioning the work holder pedal

- (1) Connect the chain (NO.①) across the lever (NO.②) located at the left side of the sewing machine head and the work holder pedal mounted on the steel stand bottom beam. The chain (NO.①) is enclosed in the accessory box.
- (2) Put the stepping motor cover (NO.④) back on the sewing machine head after the chain (NO.①) connection.



4 LUBRICATION



Caution

- ★ Please make sure to turn the power switch OFF before oiling.
- ★ Please make sure to put some oil before starting the operation of the brand new machine or when the sewing machine is resumed the operation after a long interval.

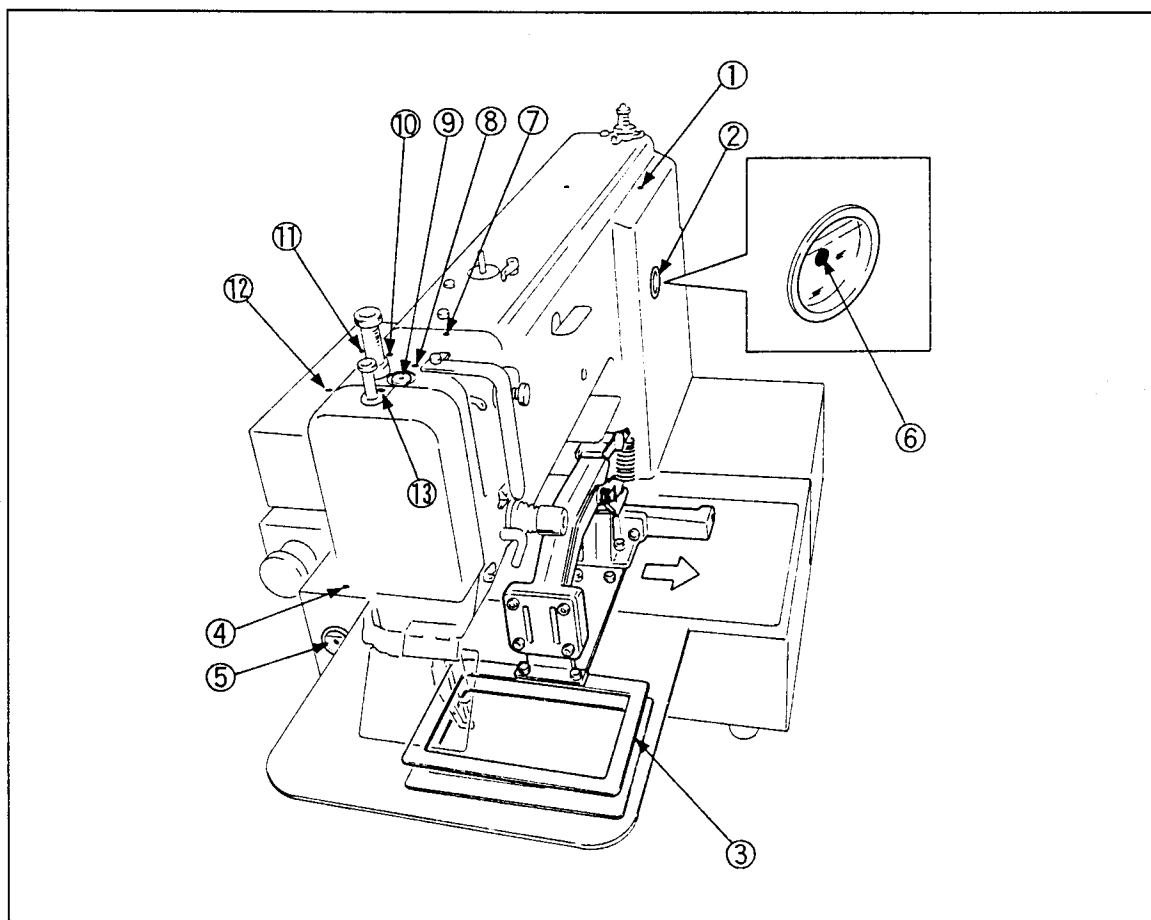
NOTE Please use high quality white machining oil.

4-1 Filling the oil tank

Pour the oil through the oil hole (NO.①) to the oil tank (NO.②) on the machine arm. Move the work holder by hand to the right end then, pour the oil through the oil hole (NO.④) to the oil tank (NO.⑤) on the machine bed. Please fill with the oil over the level mark (NO.⑥) of the oil tank.

4-2 Oiling

Put some oil to the red marked oil holes (NO.⑦~⑬).

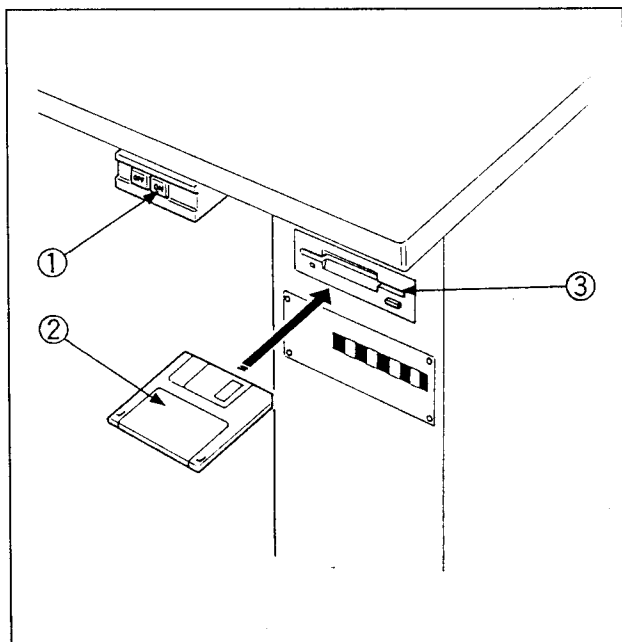


5 PROPER OPERATION

5-1 Loading the system software to the control box

When the brand new machine is operated first time or when the control box is adjusted for the repairing, the system software has to be loaded to the control box.

For this loading, please take the following procedure.



(1) Insert the system floppy disc (NO.②) into the disc drive (NO.③) of the control box. The system floppy disc is enclosed in the accessory box.

(2) Turn the power switch (NO.①) ON.

(3) Load the system software with following the instructions [loading the system software] in the paragraph "Let's start to operate the sewing machine" on the technical manual **CONTROL UNIT**.

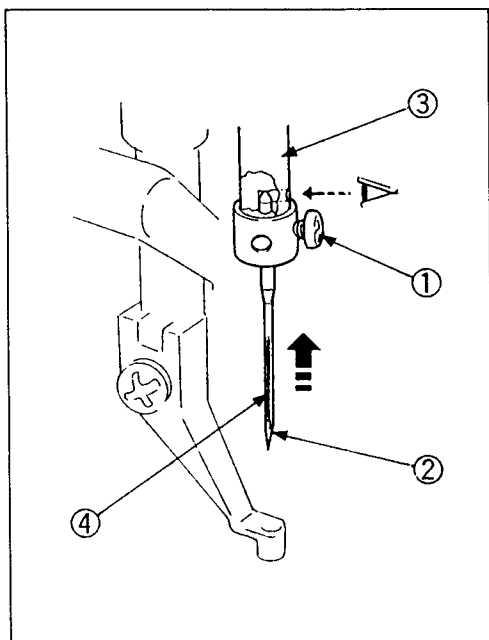
NOTE It takes about 4 to 5 minutes for the loading.

(4) Remove the system floppy disc (NO.②) from the disc drive (NO.③) of the control box and keep it with care.

5-2 Installation of the needle

⚠ Caution

- ★Please make sure to turn the power switch OFF before installing or replacing the needle.
- ★Please pay attention for the fingers not to be wounded by the needle point.



(1) Loosen the needle set screw (NO.①) then, insert the new needle (NO.②) until the needle head is reached the hole end of the needle bar (NO.③).

(2) Fasten the set screw (NO.①) with facing the needle groove (NO.④) to the front.

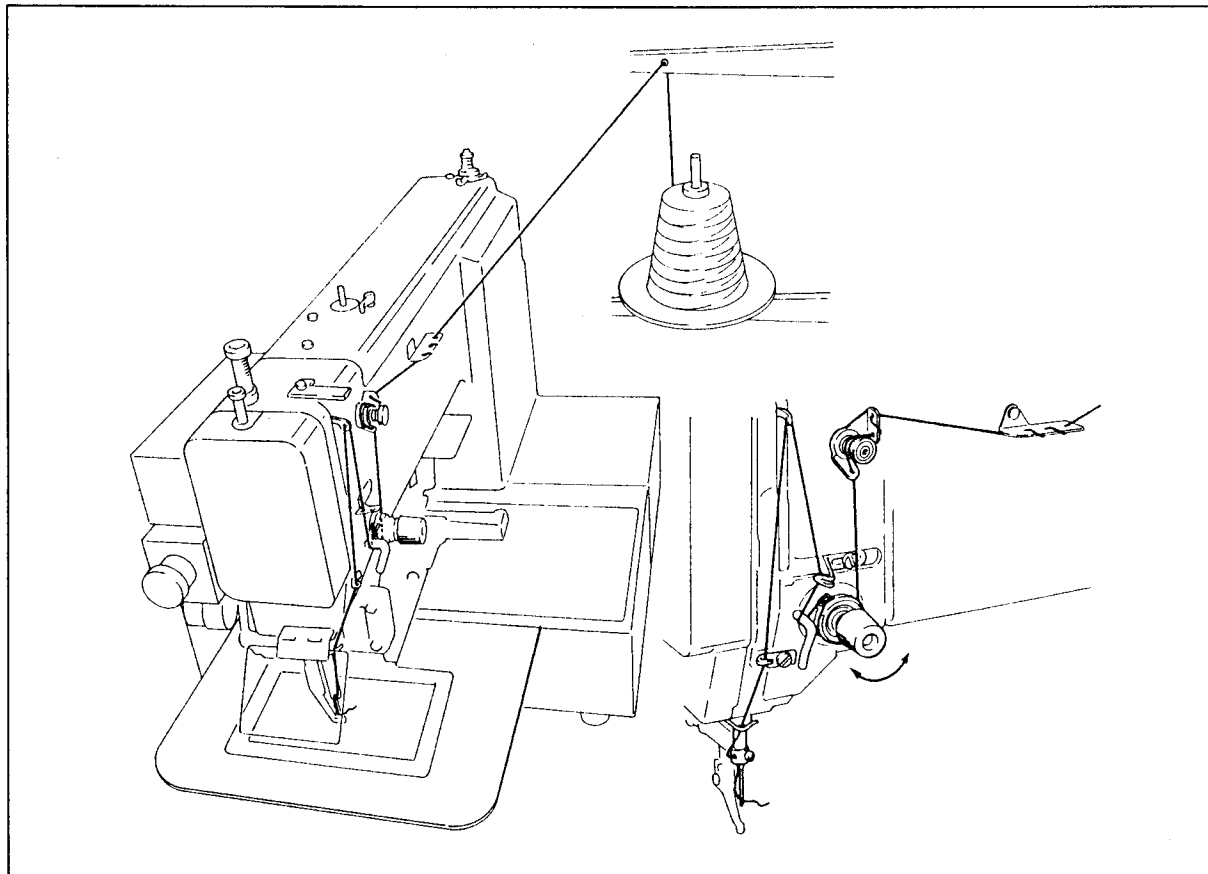
5-3 Threading the upper thread



Caution

★ Please make sure to turn the power switch OFF before threading the upper thread.

Please thread the upper thread with referring to the below figures.



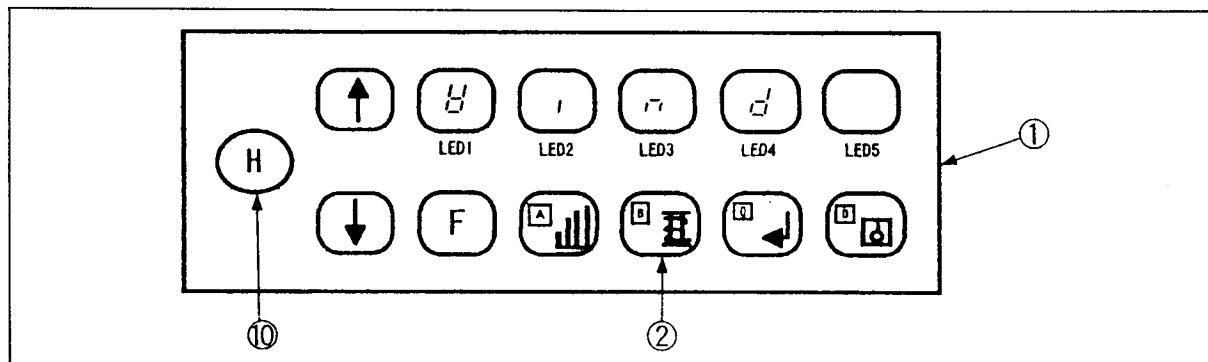
5-4 Winding the bobbin thread



Caution

★ Please make sure to pull the upper thread out of the needle before winding the bobbin thread.

- (1) Turn the power switch ON.
- (2) Set the control box setting panel (NO.①) to the thread winding mode with pushing [B] key (NO.②).



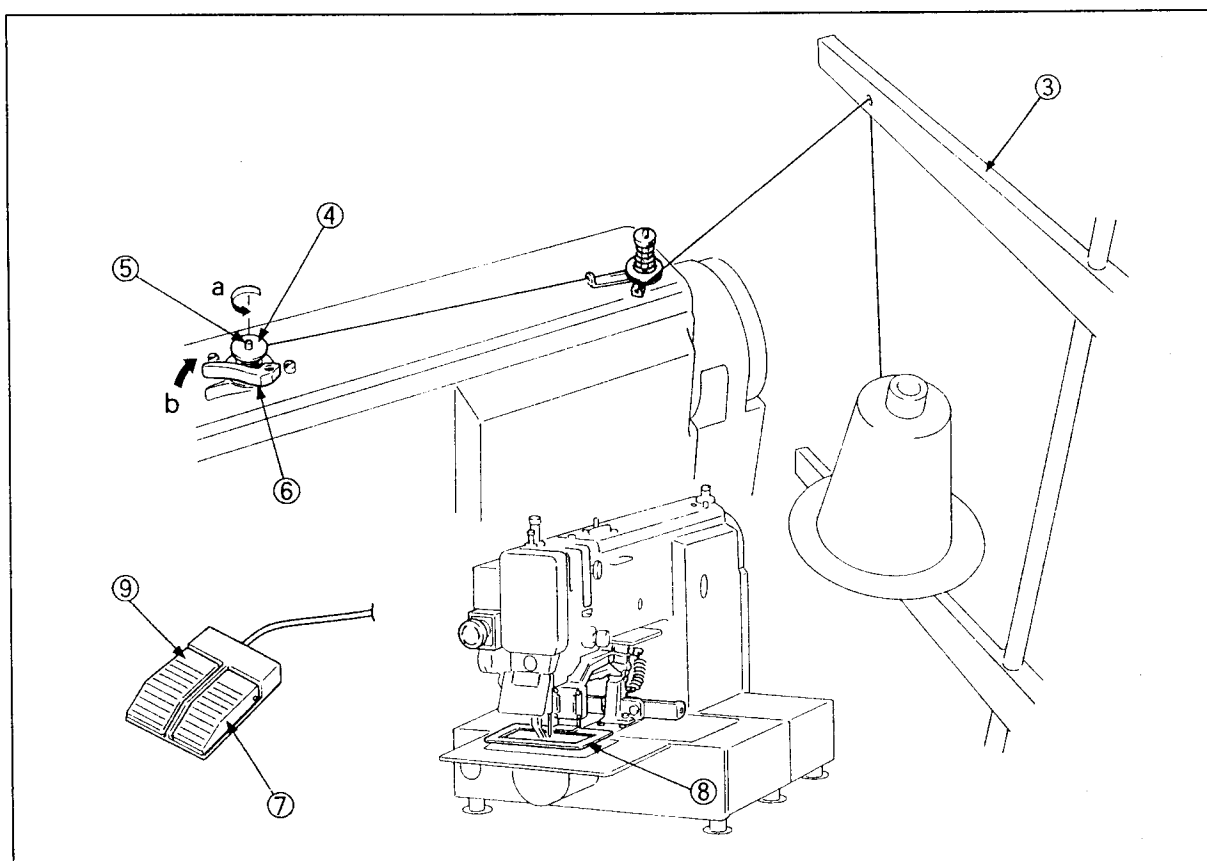
- (3) Pass through the thread from the tread stand (NO.③) as shown on the below figure then, wind the thread to the empty bobbin (NO.④) in the arrow mark "a" direction couple times and insert the bobbin (NO.④) into the bobbin winder (NO.⑤).
- (4) Push the adjust lever (NO.⑥) in the arrow mark "b" direction.
- (5) Down the work holder (NO.⑧) with black color work holder foot switch (NO.⑦).
- (6) Step on the gray color start foot switch (NO.⑨). The thread is kept winding to the bobbin (NO.④) while the gray color start switch (NO.⑨) is stepping on.

NOTE With programming the setting panel(NO.①) of the control box, the bobbin winder (NO.⑤) can be kept winding with only once stepping on the start switch (NO.⑨). For this setting, please refer to the instructions [Bobbin winding operation setting] in the paragraph "Table of program [B] mode function" on the technical manual **CONTROL UNIT**.

- (7) After finished the bobbin winding, the adjust lever (NO.⑥) is returned to the original position and the bobbin winder (NO.⑤) is stopped automatically.

NOTE Under the setting for the bobbin (NO.④) to be kept winding with continuously stepping on the start switch (NO.⑨), the sewing machine is kept running idle even the bobbin winding is finished unless the start switch (NO.⑨) is released. Please make sure to release the start switch (NO.⑨) after finished the bobbin winding so that the sewing machine can stop running idle simultaneously.

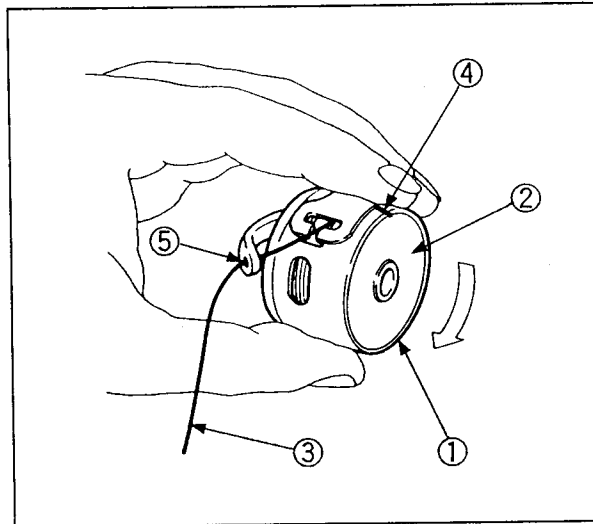
- (8) Return the setting panel (NO.①) of the control box to the normal mode condition with pushing **[H]** (NO.⑩) key after finished the bobbin winding.
- (9) To wind the bobbin thread during the sewing operation, carry out above (3) and (4) procedure then, the bobbin winding is performed automatically.
- (10) Regarding the adjustment for the bobbin thread winding volume, please refer to the instructions in the paragraph [8.the adjustment of the bobbin winder] on **7** STANDARD ADJUSTMENT in the following page.



5-5 Setting the bobbin

- (1) Set the bobbin (NO.②) into the bobbin case (NO.①).
- (2) Pull the bobbin thread (NO.③) into the slit (NO.④) and pass the thread through the thread hole (NO.⑤).

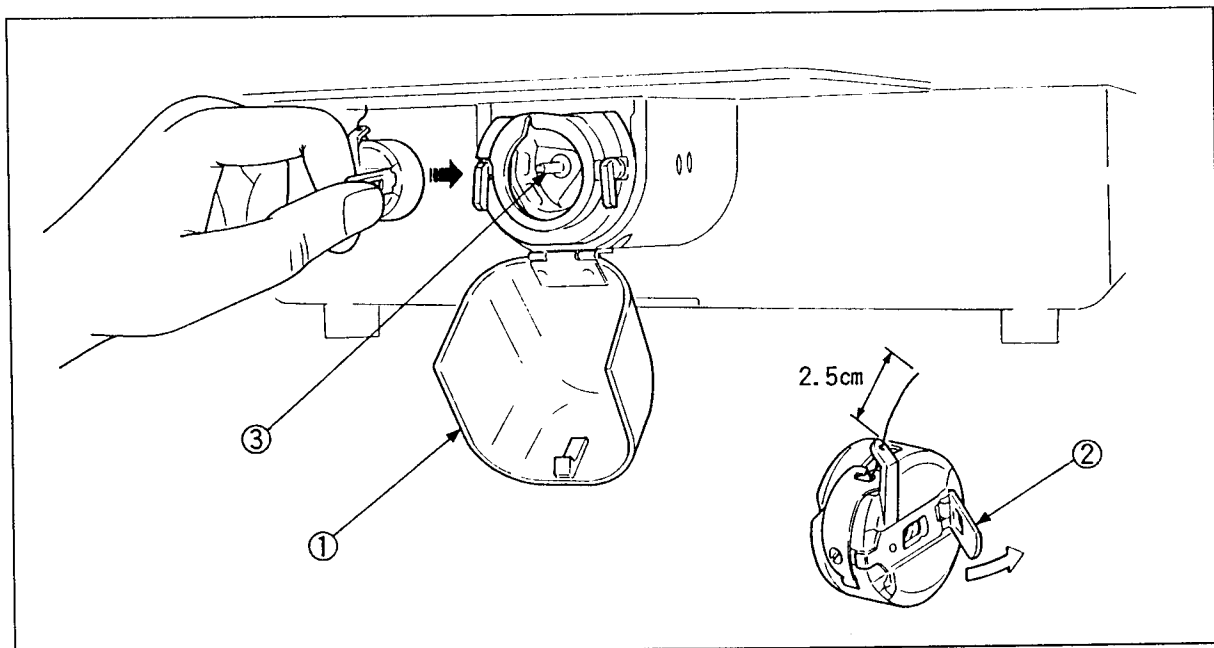
At this time, pull the bobbin thread (NO.③) then, check with the bobbin (NO.②) if it is rotated to the arrow direction. If it is not, set the bobbin (NO.②) into the bobbin case (NO.①) over again to get the proper rotation.



5-6 Setting the bobbin case

- (1) Set the needle bar to its highest position then, open the cylinder cover (NO.①).
- (2) Open the bobbin case latch lever (NO.②) fully then, fit it securely in the inner hook (NO.③).

NOTE Please pull the bobbin thread about 25mm out of the thread hole (NO.⑤) of the bobbin case.



6 PROPER SEWING

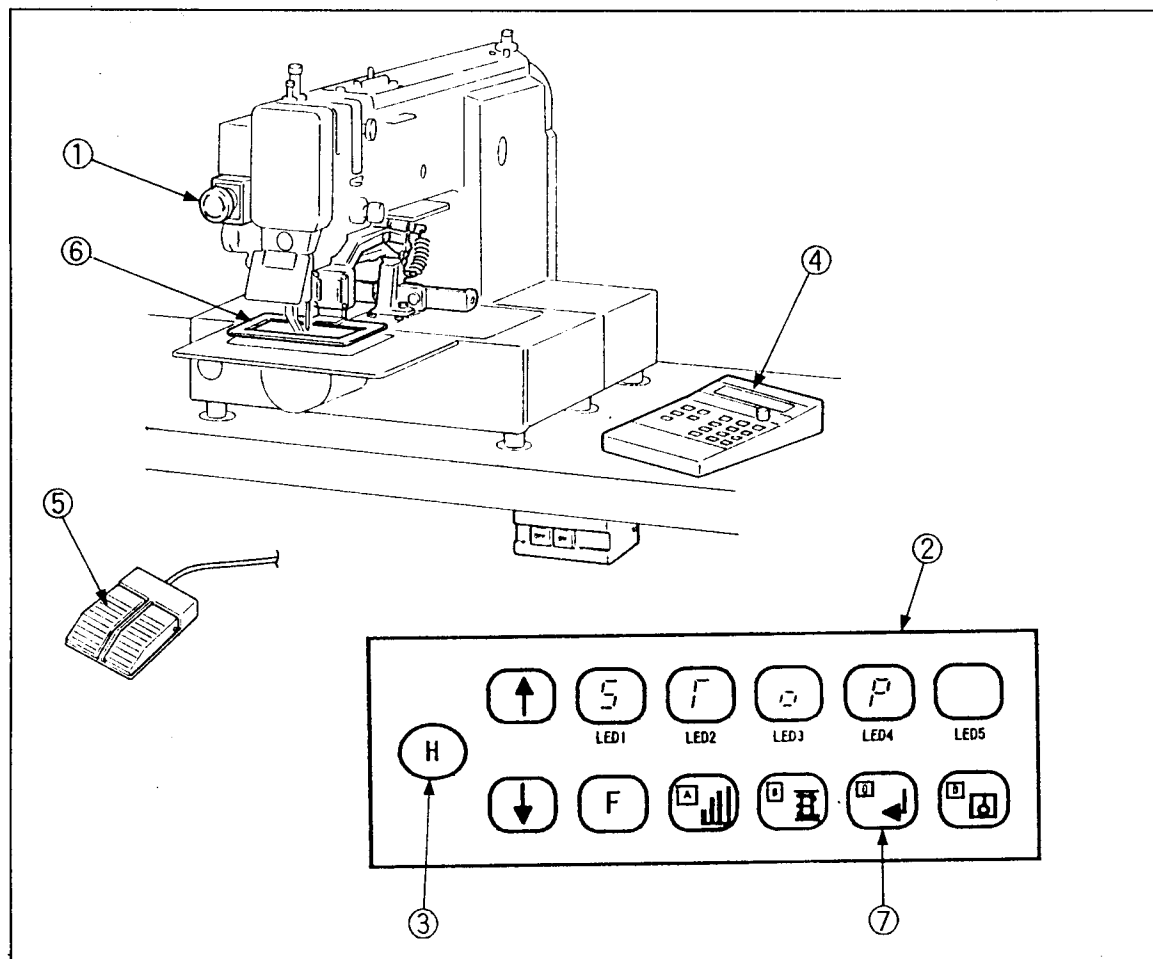
6-1 Operation of the emergency stop switch

If an emergency such as a thread breakage, needle breakage and any other emergency is happened during the sewing operation, please hit immediately the emergency stop switch. The sewing machine running is stopped instantly.

Caution

- ★ Before start the sewing operation, please make sure the location of the emergency stop switch and keep it in mind the function and how to use it.
- ★ Please Keep away the hands and the face from the needle during the sewing operation.

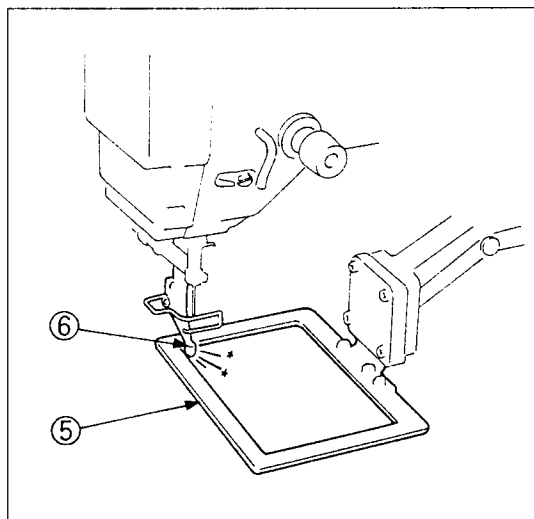
- (1) Press the HALT switch (NO.①). All operations will stop, and the sewing machine will stop at the needle UP state without trimming the thread.
- (2) Remove the cause of the abnormality.
- (3) To continue sewing, turn the HALT switch button to the right.
The switch will be unlocked.
- Next, when the start switch (NO.⑤) (gray foot switch) is pressed again, the operation will resume from the halted position.
- (4) To cancel sewing, turn the HALT switch (NO.①) button to the right, and unlock the switch. Then, press the **[H]** key (NO.③) on the control box's setting panel (NO.②). The work holder (NO.⑥) will return to the home from the stopped position and will stop.



Caution

★ Depending on the shape of the work holder, the collision may be happened with the work holder (NO.⑤) and the stepping foot (NO.⑥) while the work holder is on the way back to the home position. For avoiding this accident, before starting the sewing operation, program the work holder returning home with the setting panel of the control box to trace the sewing pattern.

For this setting, refer to the instruction 6. [HALT mode display and the function each key] on [8] Try operating the setting panel keys of the technical manual **CONTROL UNIT**.



6-2 The sewing operation

Caution

★ It is very dangerous to operate the sewing machine without the safety guards (Eye guard, Belt cover, Link cover, Finger guard etc.).

★ Please make sure to always operate the sewing machine with the safety guards.

Please do not put unnecessary articles except for the sewing operation on the table top.

★ Please keep the hands and the face away from the needle.

(1) Turn the power switch (NO.①) ON.

The work holder (NO.②) automatically stands ready to operate at the home position. (This is the standard set up condition when the sewing machine is shipped from the factory.)

NOTE The collision may be happened with the work holder (NO.②) and the stepping foot (NO.③) depending on the work holder shape when the start set up is prepared.

For avoiding this accident, turn the power switch ON after moved the work holder by hand to the home position then, program [HPC] prohibition of the automatic returning home function with selecting the program mode **A** on the setting panel of the control box.

For the detail of this setting, please refer to the instructions [Prohibition of automatic home return operation after power ON] in the paragraph of the program mode **A** on the [16] table of program mode function of the technical manual **CONTROL UNIT**. Under this setting, even after the power switch is turned ON, the work holder does not stand ready automatically at the home position unless the re-set key **H** of the setting panel (NO.④) of the control box is pushed.

(2) Program the required sewing pattern.

The sewing pattern programming can be performed with the optional teaching panel (NO.⑥). For the details of the sewing patten programming, please refer to the instructions on the another technical manual **TEACHING PANEL**.

- For the detail of this pattern selection, please refer to the instructions [5.Display and function of each key in the pattern mode] in the paragraph [8] Try operating the setting panel keys of the technical manual [CONTROL UNIT].

- For the detail of the speed setting, please refer to the instructions [3. Display and function of each key in speed setting mode] in the paragraph [8] Try operating the setting panel keys of the technical manual **CONTROL UNIT**.

- NOTE** If the sewing material has to be reset, step the black color foot switch (NO.⑧) again then, the work holder goes up to release the sewing material.

- (7) After finished the sewing, the work holder is lifted automatically then, the sewing material is released.

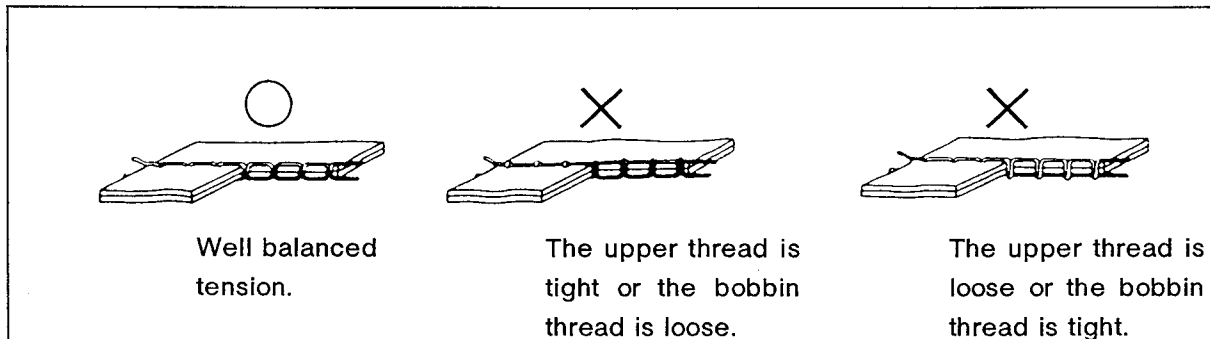


6-3 Adjustment of the thread tension

The thread tension between the upper and bobbin thread should be balanced in the best condition.

When the upper thread tension is well balanced with the bobbin thread tension, the both threads are interlocked along the center line of fabric layers as shown on the below figures.

NOTE The thread tension balance should be adjusted according to the sewing materials.



(1) Bobbin thread tension

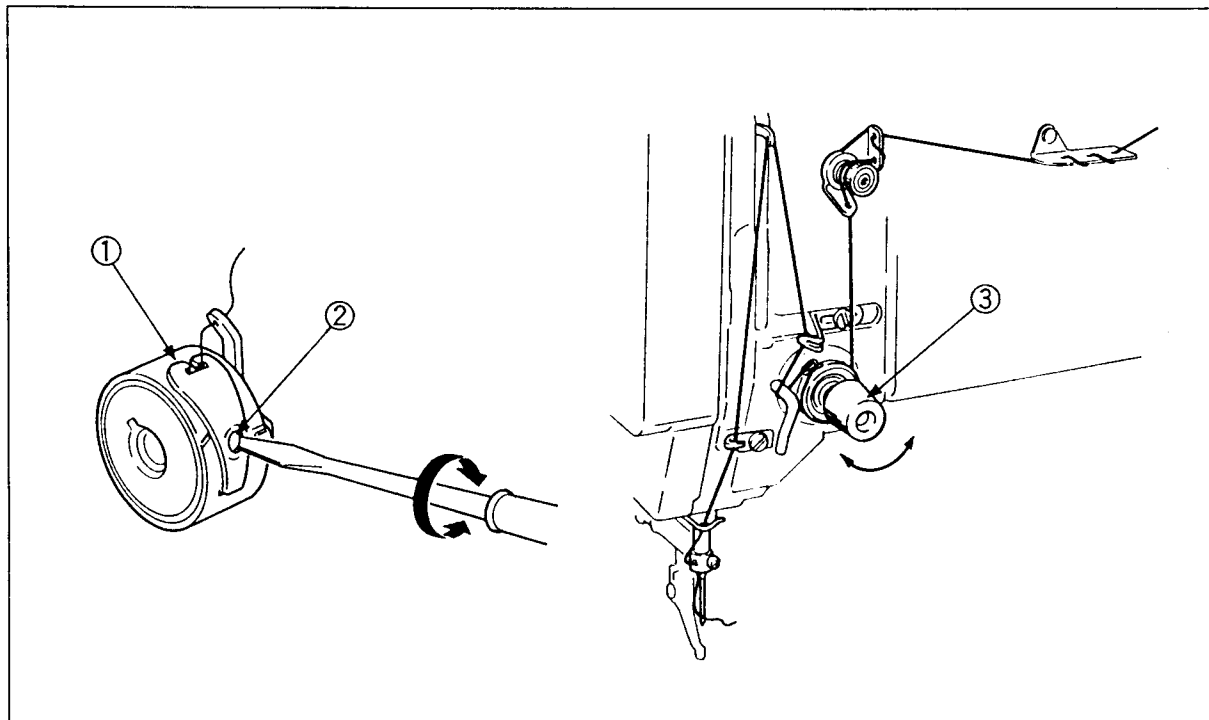
Adjust the bobbin thread tension with the thread tension adjusting screw (NO.②) on the bobbin case (NO.①). The thread tension becomes loose if turn the thread tension adjusting screw (NO.②) to the counter clockwise, and the thread tension becomes tight if turn it to the clockwise.

(2) Upper thread tension

Adjust the upper thread tension based on the bobbin thread tension.

For this adjustment, turn the thread tension adjusting nut (NO.③).

The upper thread tension becomes tight if turn the thread tension adjusting nut (NO.③) to the clockwise, and the upper thread tension becomes loose if turn it to the counter clockwise.



7 STANDARD ADJUSTMENT

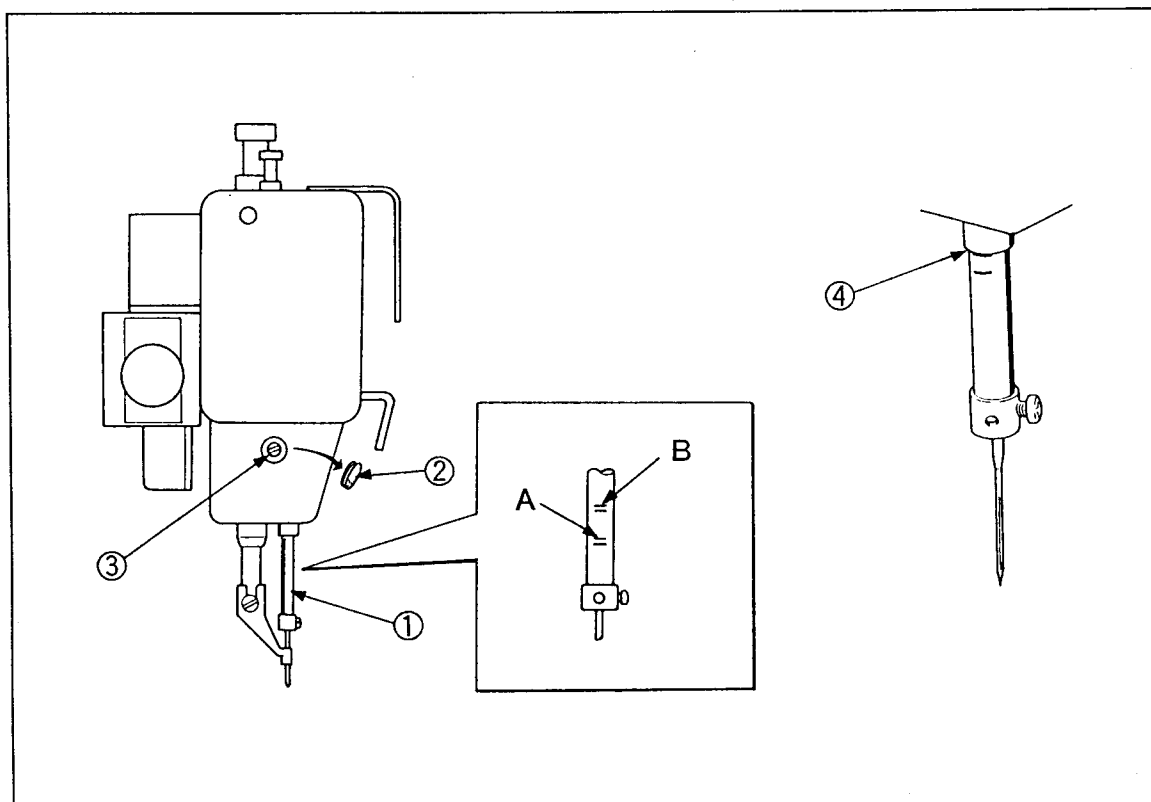
Caution

- ★ Please make sure to turn the power switch OFF before adjust the sewing machine.
- ★ If the adjustment is required under the power switch is ON, keep the start foot switch away from the foot.
- ★ Be careful not to be wounded by the needle or the inner hook point.
- ★ Please make sure to put the safety guards (Eye guard, Belt guard, Link cover and finger guard etc.) back on the original location after the sewing machine adjustment.

7-1 Adjustment the needle bar position

- (1) Turn the power switch OFF.
- (2) Turn the sewing machine pulley by hand then, stop the needle bar (NO.①) at the lowest position.
- (3) Remove the rubber plug (NO.②) from the face plate then, loosen the needle bar holder set screw (NO.③).
- (4) Move the needle bar (NO.①) to the position where the needle bar timing mark A is matched to the needle bar bushing bottom line (NO.④) then, tighten the needle bar holder set screw (NO.③).

NOTE If the needle class is DP x 5, match the needle bar timing mark B to the needle bar bushing bottom line (NO.④).



Caution

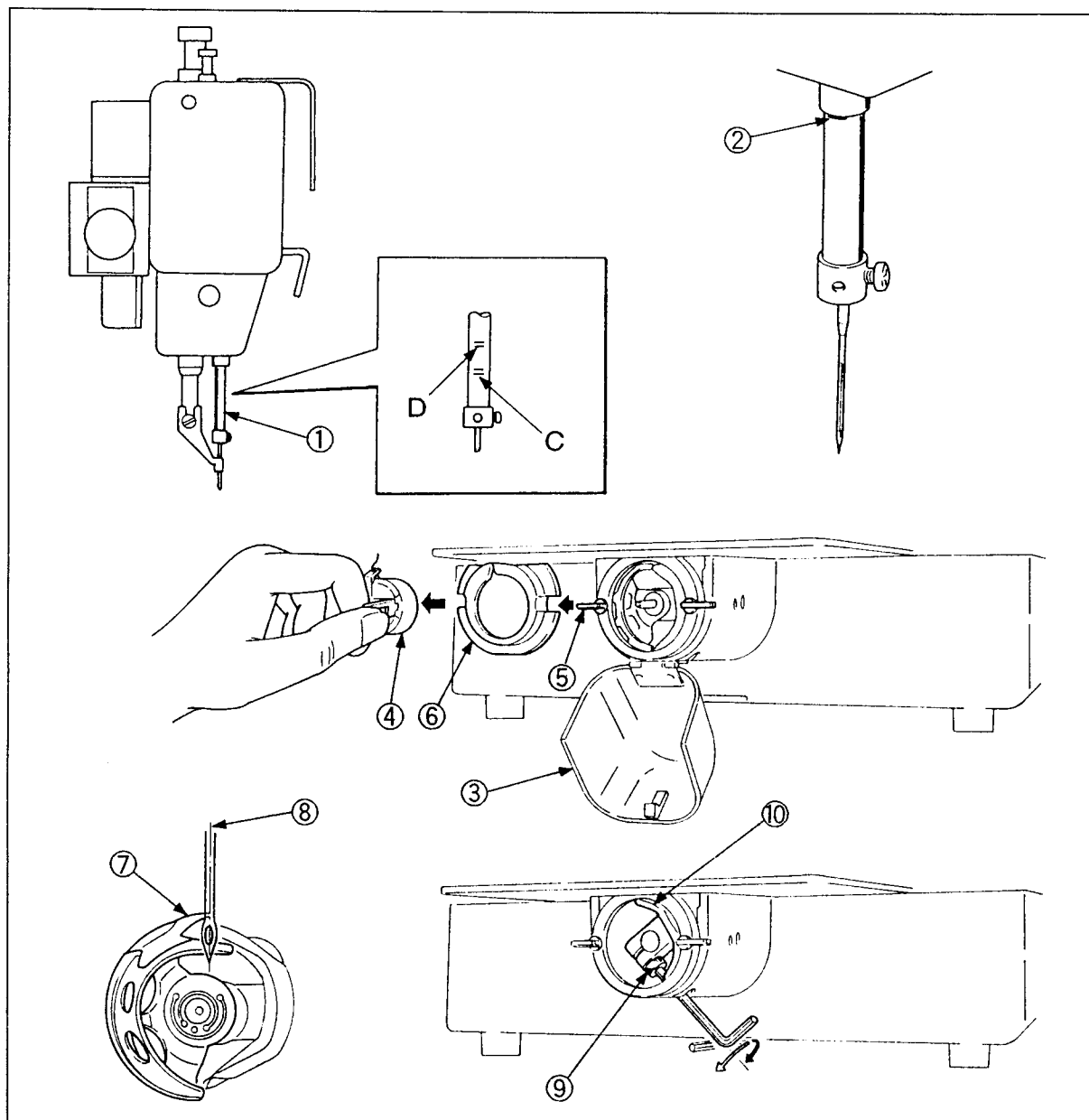
- ★ For the safety, when tilt or raise the sewing machine head, please make sure to hold the sewing machine head with both hands by two people at least.

7-2 Adjustment of the position between the needle and the shuttle hook.

- (1) Turn the power switch OFF.
- (2) Turn the sewing machine pulley by hand then, move up the needle bar (NO.①) from the lowest position and stop it at the position (NO.②) where the needle bar timing mark C is matched to the needle bar bushing bottom line.

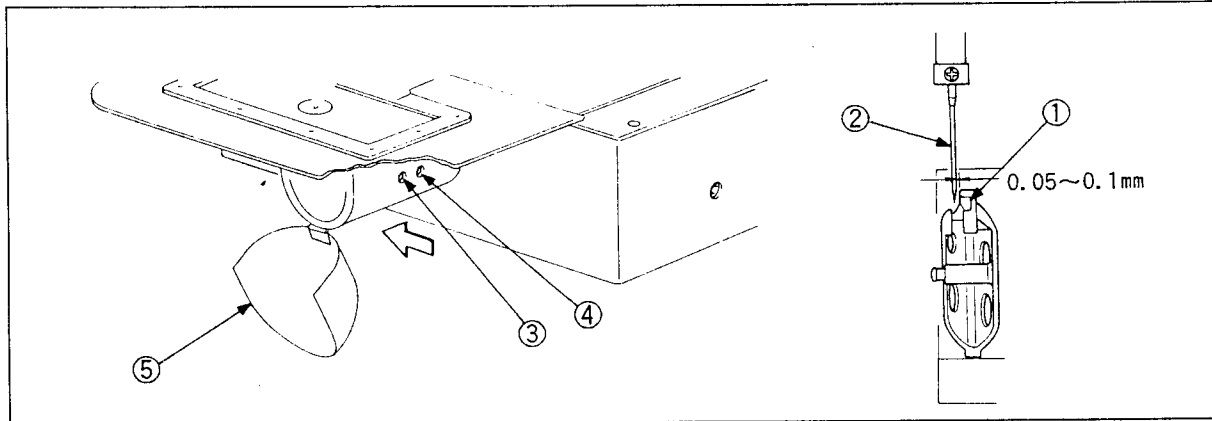
NOTE If the needle class is DP x 5, match the needle bar timing mark D to the needle bar bushing bottom line (NO.②).

- (3) Open the cylinder cover (NO.③).
- (4) Remove the bobbin case (NO.④).
- (5) Turn the hook retainer lever (NO.⑤) then, remove the hook retainer (NO.⑥).
- (6) Loosen the driver set screw (NO.⑨) then, move the driver (NO.⑩) and adjust the shuttle hook point (NO.⑦) to be matched with the center line (NO.⑧) of the needle.
- (7) After the adjustment, tighten the driver set screw (NO.⑨) and put the bobbin case (NO.④), the hook retainer (NO.⑥) and the hook retainer lever (NO.⑤) back to the original location then, close the cylinder cover (NO.③).



7-3 Adjustment of the clearance between the shuttle hook and the needle

- (1) Please take the same procedures as above paragraph 7-2. from (1) to (5).
- (2) Loosen the outer hook set screw (NO.③) and turn the eccentric pin (NO.④) so that the clearance between the shuttle hook point and the needle becomes 0.05~0.1mm.
- (3) After the adjustment, securely tighten the outer hook set screw (NO.③) and put the hook retainer and the bobbin case back to the original location then, close the cylinder cover(NO.⑤).



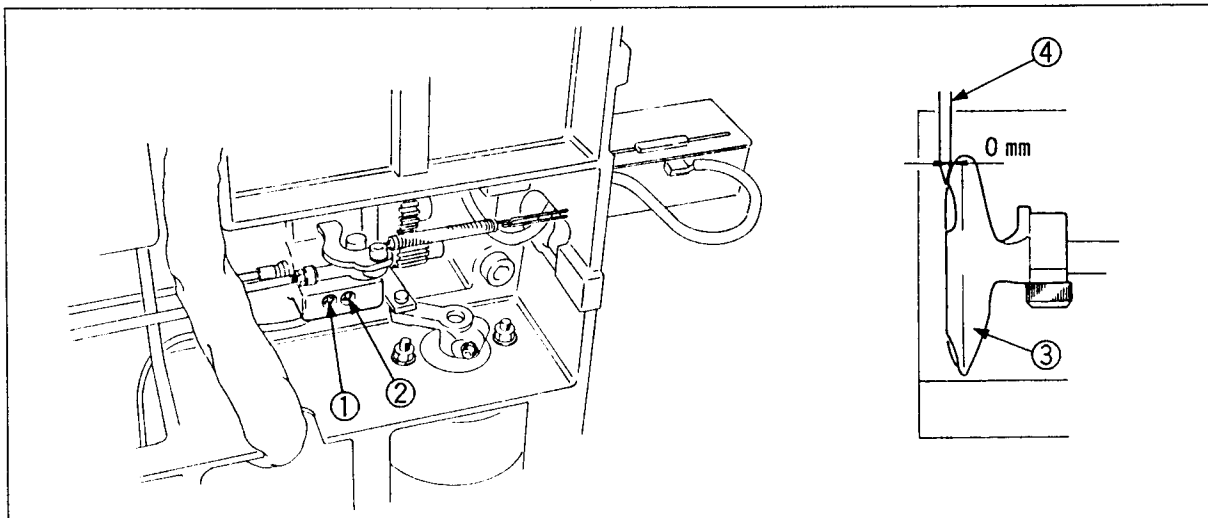
7-4 Adjustment of the clearance between the driver and the needle

- (1) Please take the same procedures as above paragraph 7-2. from (1) to (5).
- (2) Please make sure the clearance between the shuttle hook point and the needle has been adjusted 0.05~0.1mm at above procedure 7-3 Adjustment of the clearance between the shuttle hook and the needle
- (3) Tilt the sewing machine head to the left so that the bottom components of the sewing machine can be seen.

Caution

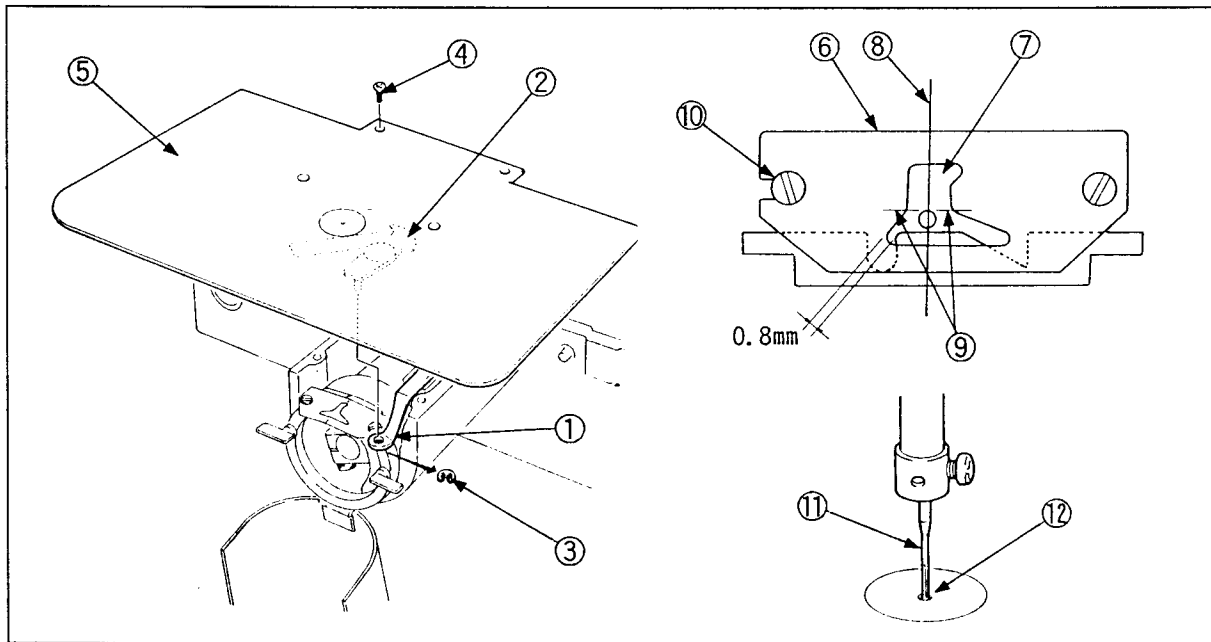
★ Please make sure to remove the small belt cover from the table top before tilting sewing machine head.

- (4) Loosen the driver set screw (NO.①) and turn the eccentric pin (NO.②) so that the clearance between the driver (NO.③) and the needle (NO.④) can become 0.
- (5) After the adjustment, securely tighten the driver set screw (NO.①) and raise the sewing machine head back to the original position, and put the hook retainer and the bobbin case back to the original location then, close the cylinder cover.



7-5 Adjustment of the thread guide

- (1) Remove the E shaped snap ring (NO.③) which is engaging the movable knife (NO.②) and the link (NO.③) then, loosen the set screws (NO.④) and remove the sliding plate (NO.⑤).
- (2) Loosen the set screws (NO.⑩) and move the thread guide (NO.⑥) to the position where the needle center line (NO.⑧) divides the needle groove (NO.⑦) evenly and the rear side line (NO.⑨) of the needle is aligned with the shoulder (NO.⑨) of the thread guide (NO.⑥). At this time, make sure that there is some clearance between the hook retainer and the thread guide (NO.⑥) at least the upper thread can be passed smoothly through it (standard clearance is 0.8mm).
If this clearance is too wide, it causes the trimming failure and if this clearance is too narrow, it causes the sewing condition disturbance, the trimmed upper thread tail uneven and the locking up the hook with the upper thread.
- (3) After the adjustment, engage the link (NO.①) of the trimmer mechanism with the movable knife (NO.②) with the E shaped snap ring (NO.③) and put the sliding plate (NO.⑤) back on the original location then, tighten the set screws (NO.④). At this time, set the sliding plate (NO.⑤) so that the needle (NO.⑪) can come down to the center (NO.⑫) of the needle hole of the needle plate.



7-6 Adjustment of the stepping foot

NOTE The stepping foot is a very important part to form the fine stitches. It moves simultaneously with the needle and stabilize the needle penetrating area of the sewing material with pressing down it, when the needle sticks into or pulls out the sewing material and prevent the skip stitch or the over penetration happening. Please adjust the stepping foot properly to the sewing materials with the following instructions.

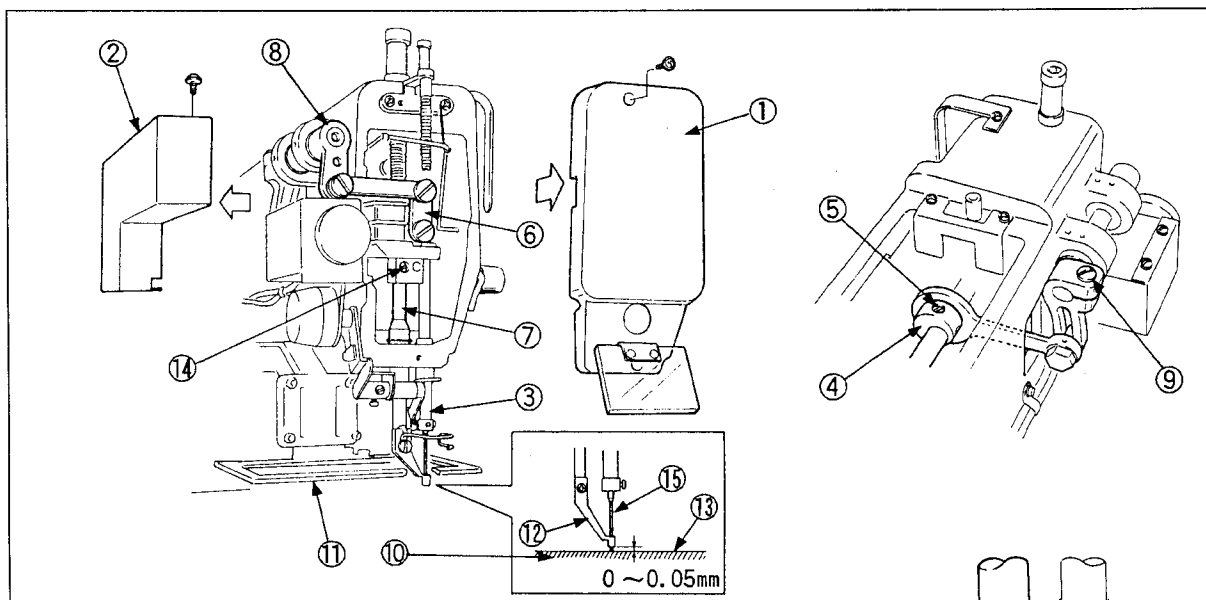
7-6-1 Adjustment of the stepping foot position

NOTE Please always adjust the stepping foot position when the thickness of the sewing material is changed.

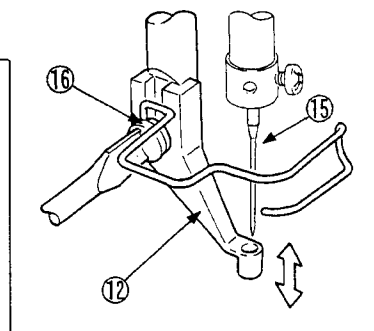
- (1) Turn the power switch OFF.
- (2) Remove the face plate (NO.①) and the link cover (NO.②).

- (3) Turn the sewing machine pulley by hand and stop the needle bar (NO.③) at the lowest position. At this time, make sure the set screw (NO.⑤) of the eccentric cam (NO.④) is positioned right beside the center line of the upper shaft. This is the standard position of the eccentric cam (NO.④). If the eccentric cam (NO.④) is off from this position, set it back to the standard position with the instructions on the paragraph [7-6-3. Adjustment of the stepping foot timing] in the following page.
- (4) Turn the sewing machine pulley by hand and stop the needle at the highest position (this is also the thread take up lever's highest position). At this time, loosen the set screw (NO.⑨) of the upper feed lock crank shaft (NO.⑧) and adjust the center line of the bell crank (NO.⑥) to be parallel with the presser foot bar (NO.⑦).
- (5) Insert the sewing material (NO.⑩) under the work holder (NO.⑪) and turn the sewing machine pulley by hand then, stop the stepping foot (NO.⑫) at the lowest position.
- (6) Loosen the presser foot bar set screw (NO.⑭) and move the presser foot bar (NO.⑦) then, adjust the stepping foot (NO.⑫) position to become the clearance between the bottom surface of the stepping foot (NO.⑫) and the surface of the sewing material 0~0.5mm. At the same time, rotate the presser foot bar (NO.⑦) for the needle (NO.⑮) to come down to the center of the needle hole of the stepping foot. (NO.12)
- (7) After the adjustment, put the face plate (NO.①) and the link cover (NO.②) back on the original location.

NOTE The lower position of the stepping foot, the more effective for the skip stitches. However, if the stepping foot becomes to press the sewing material, the movement of the stepping foot mechanism generates a slight noise. And also, the stepping foot stays longer to hold the sewing material, so the upper thread tension becomes loose or the sewing pattern forming gets out of shape because the stepping foot catches the surface of the sewing material. For avoiding these troubles, please lower the stepping foot as small as possible.



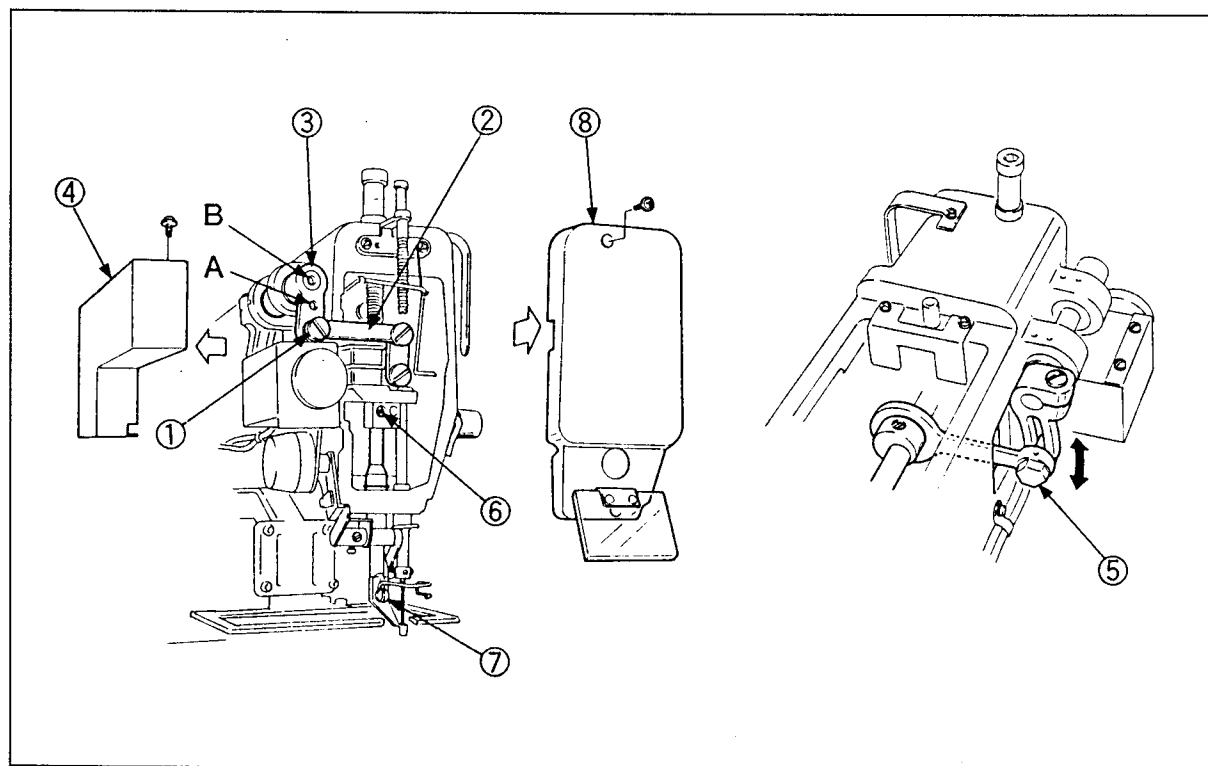
NOTE If the thickness of the sewing material changes very often, it is recommended to take the easy way for the adjustment of the stepping foot position with the method that change only the fixed position of the stepping foot after fixed the presser foot bar at higher position. For this adjustment, loosen the set screw (NO.⑯) then, move the stepping foot (NO.⑫) up and down.



7-6-2 Adjustment of the stepping foot lift during the sewing

NOTE The stepping foot lift during the sewing can be adjusted 0 and 2~10mm.

- (1) The stepping foot lift during the sewing becomes 4 ~ 10mm at the condition which the connection of the link (NO.②) and the lever (NO.③) with the shoulder screw (NO.①) is as shown on the figure and it becomes 2 ~ 4mm if the connection is made with A hole, and it becomes 0 mm if the connection is made with B hole.
- (2) The stepping lift is adjusted 4mm when the sewing machine is shipped from the factory.
- (3) For the adjustment at the each range of the stepping foot lift, remove the link cover (NO.④) then, loosen and move the adjust bolt(NO.⑤). If move the adjust bolt (NO.⑤) upward, the stepping foot lift becomes higher.
- (4) If the link (NO.②) connection is changed to A or B hole, the stepping foot position is also changed. So reset the stepping foot position with adjusting the position of the presser foot bar or the stepping foot itself with loosening their set screws (NO.⑥) or (NO.⑦).
- (5) Regarding the running noise and the vibration, the higher lift effects worse. So adjust the stepping foot lift during the sewing as small as possible.
- (6) After the adjustment, put the link cover (NO.④) and the face plate (NO.⑧) back on the original location.



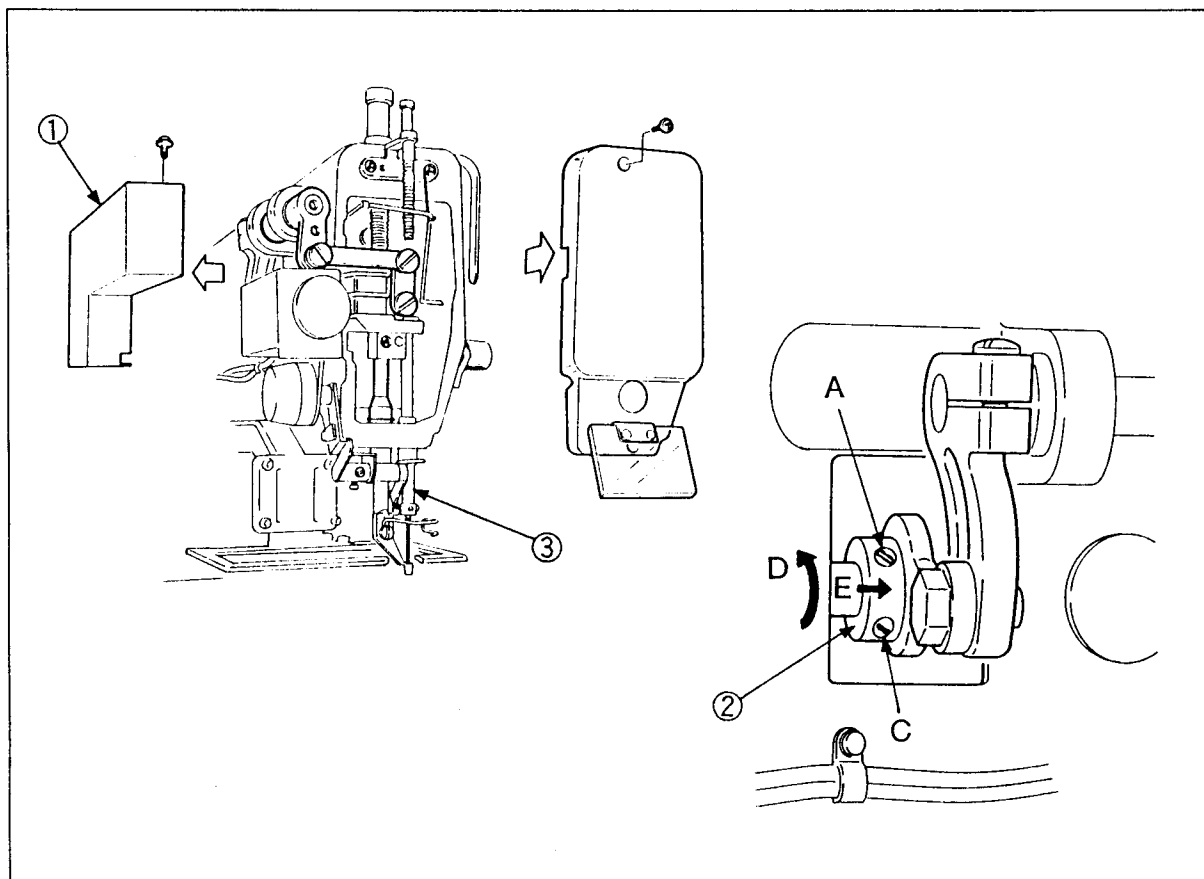
7-6-3 Adjustment of the stepping foot timing

NOTE The stepping foot up and down movement during the sewing synchronizes with the needle up and down movement.

With changing this synchronized timing to the sewing materials, the skip stitches can be prevented or the seam tightness can be improved.

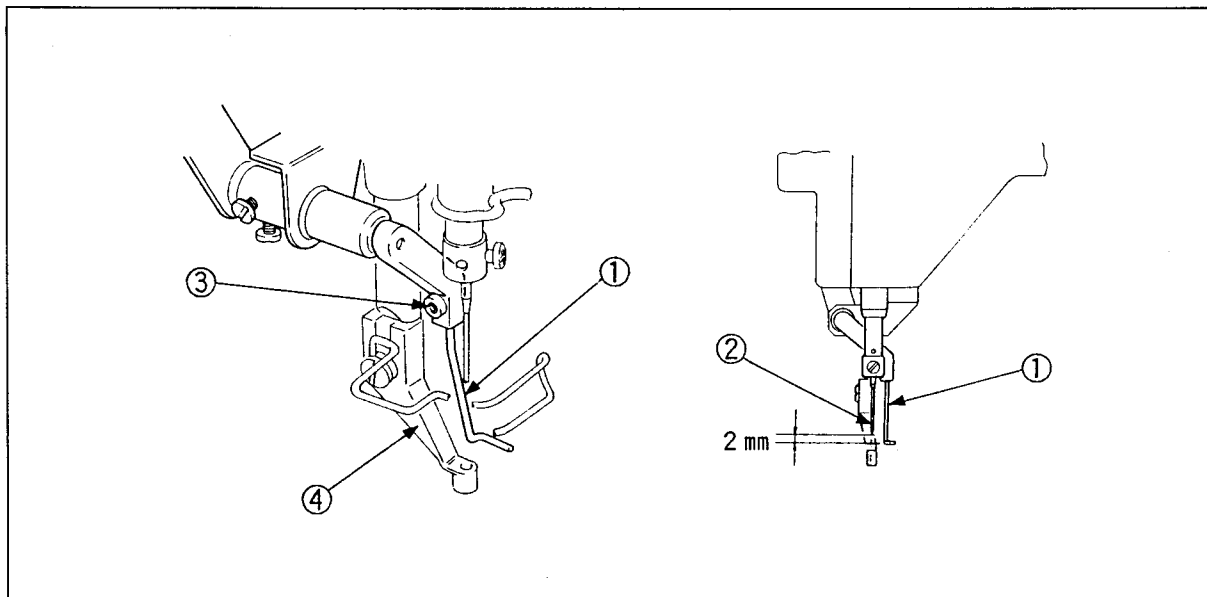
For example, the delay of the stepping foot timing against the needle movement prevents the skip stitches especially to the thin materials, and the advance of the stepping foot timing can improve the seam tightness especially to the thick materials.

- (1) Remove the link cover(NO.①).
- (2) Loosen the set screw "C" of the eccentric cam (NO.②).
- (3) Turn the sewing machine pulley by hand and stop the needle bar (NO.③) at the lowest position. At this stage, the set screw "A" of the eccentric cam (NO.②) is positioned right beside the center line of the upper shaft. This is the standard position for the eccentric cam (NO.②).
- (4) Loosen the set screw "A" of the eccentric cam (NO.②).
- (5) Hold the eccentric cam (NO.②) and turn the sewing machine pulley slowly by hand. If turn the sewing machine pulley to the arrow direction "D", the stepping foot timing against the needle movement is delayed, and if turn the pulley to the opposite direction, the timing of the stepping foot is advanced.
- (6) After the adjustment, tighten the set screw "A" and "C" in turn with slightly pushing the eccentric cam (NO.②) to the arrow direction "E".
- (7) Put the link cover (NO.①) back on the original location.



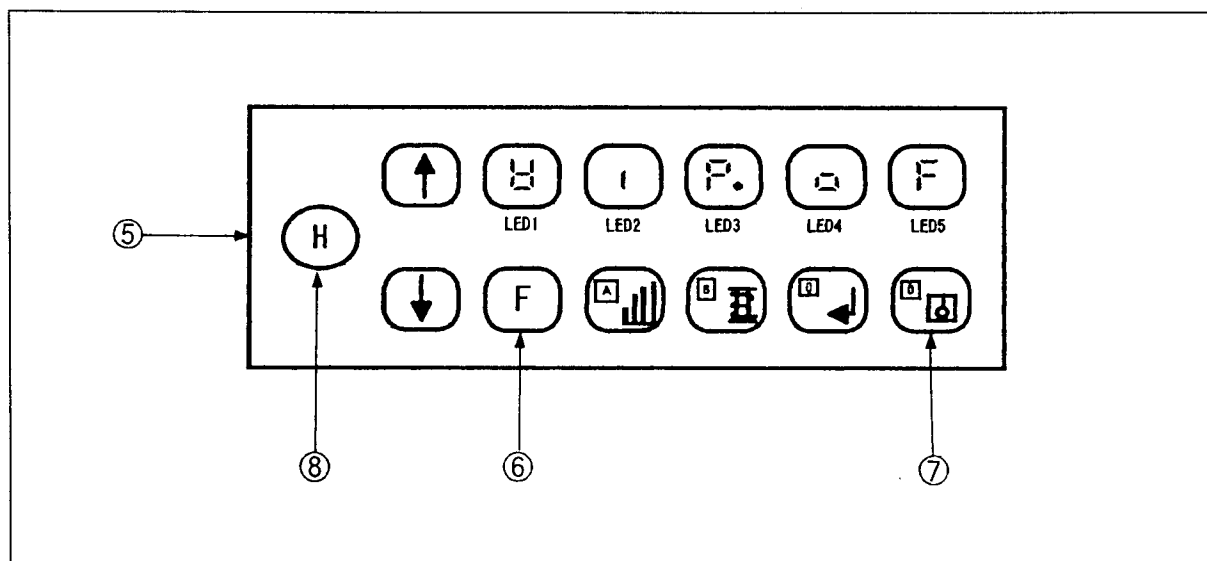
7-7 Adjustment of the wiper

- (1) Loosen the wiper set screw (NO.③) and adjust the wiper (NO.①) to be positioned where the wiper (NO.①) passes under the needle point (NO.②) with about 2 mm clearances right after the sewing machine is stopped running at the needle upper position (the thread take up lever's highest position).



NOTE When the stepping foot position or the stepping foot lift is changed, the wiper (NO.①) may collide with the stepping foot (NO.④). In that case, please do not use the wiper (NO.①).

- (2) If do not use the wiper (NO.①), cancel the wiper function with **[F]** (NO.⑥) and **[D]** keys (NO.⑦) on the setting panel (NO.⑤) of the control box. For this cancellation, push **[F]** (NO.⑥) key then, press **[D]** keys (NO.⑦) for more than 2 seconds until the display **W I P o F** is appeared on the setting panel.



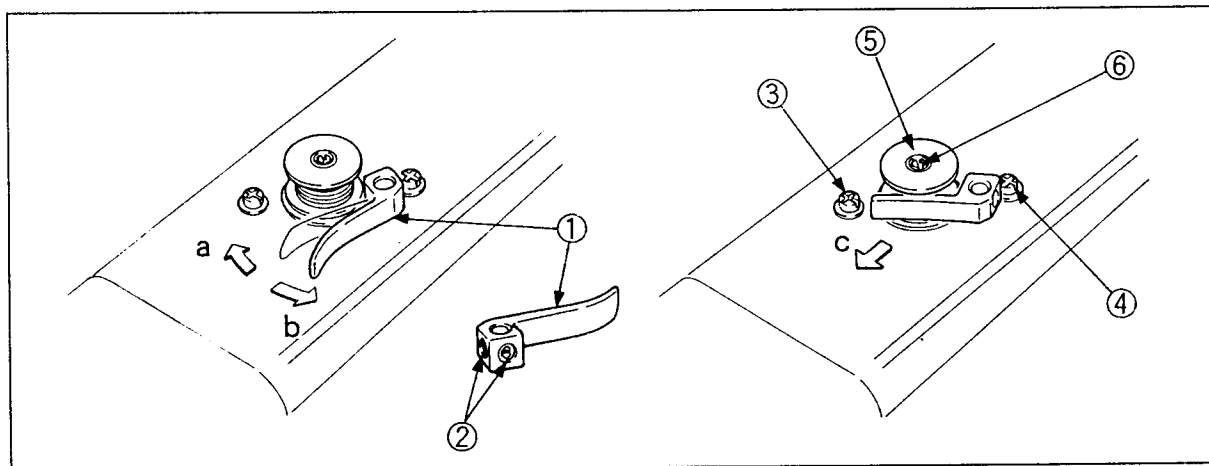
7-8 Adjustment of the bobbin winder

(1) Adjustment of the winding volume

Loosen the set screw (NO.②) of the adjusting lever (NO.①) and adjust the position of the adjusting lever (NO.①). If move the adjusting lever (NO.①) to the arrow direction "a", the winding volume is reduced, and if move the adjusting lever (NO.①) to the arrow direction "b", the winding volume is increased. The winding volume is adjusted 80 % of the full volume when the sewing machine is shipped from the factory.

(2) Adjustment of the proper position of the bobbin winder

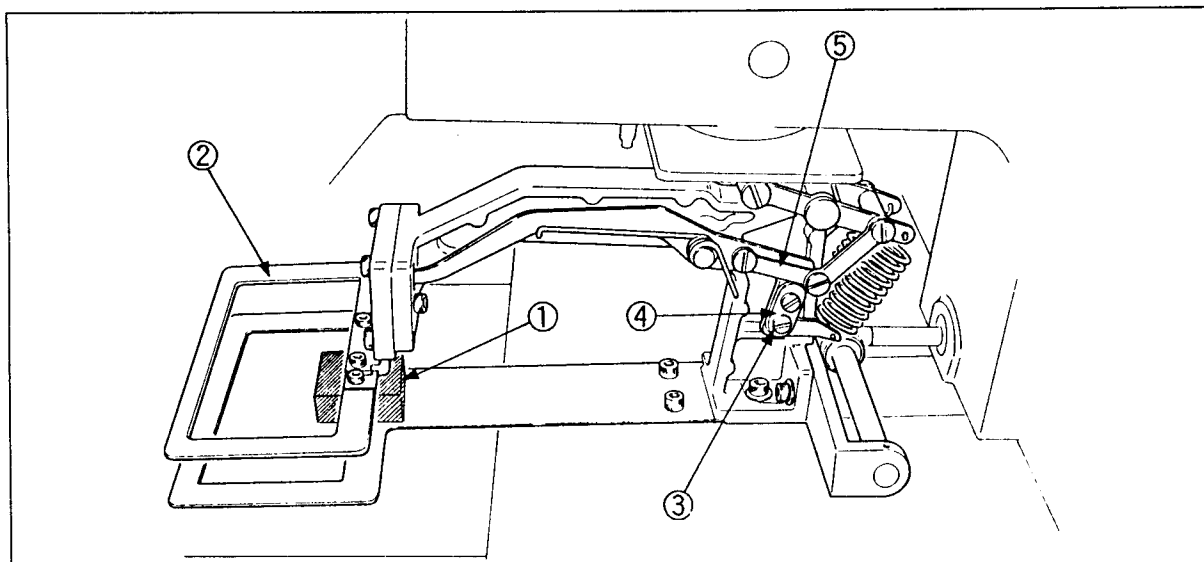
Firstly, loosen the set screws (NO.③) and (NO.④) of the bobbin winder and put the empty bobbin (NO.⑤) on the rotating shaft (NO.⑥) then, push the adjusting lever (NO.①) to the arrow direction "a". Secondary, move the whole bobbin winder to the arrow direction "c" and stop it at the position where the empty bobbin is rotated then, tighten the set screws (NO.③) and (NO.④) of the bobbin winder. This is the proper position of the bobbin winder.



7-9 Adjustment of the work holder presser

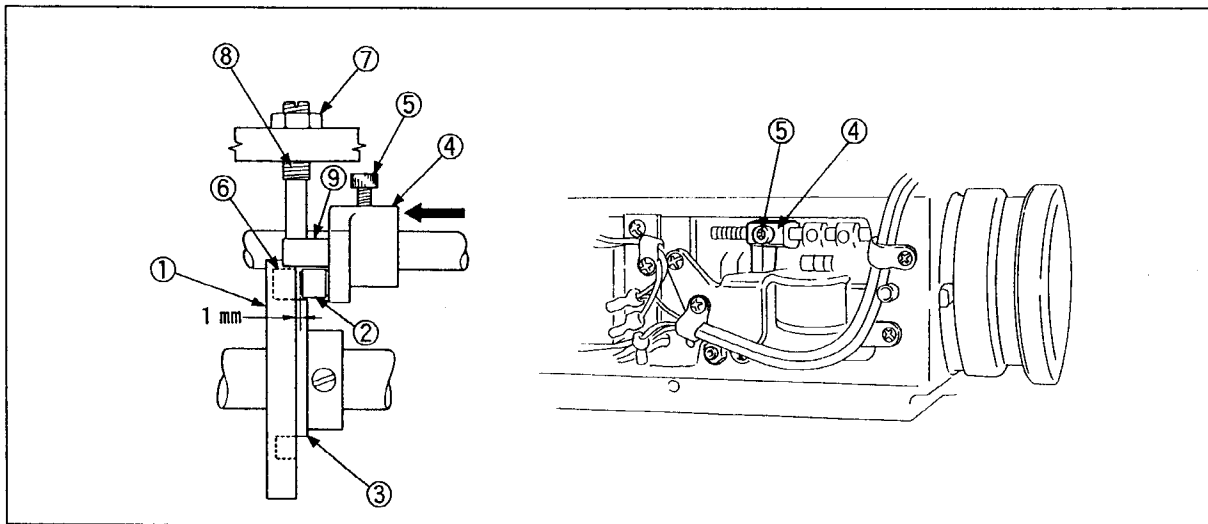
If the sewing material is thick and the work holder does not press it strong enough, adjust the work holder presser as follows.

- (1) Insert the sewing material (NO.①) under the work holder (NO.②).
- (2) Turn the power switch ON and lower the work holder (NO.②) with the work holder foot switch (black color foot switch).
- (3) Loosen the 2 of the set screws (NO.③) and move the adjusting plate (NO.④) until it touches with the link (NO.⑤) then, tighten the 2 of the set screws (NO.③).



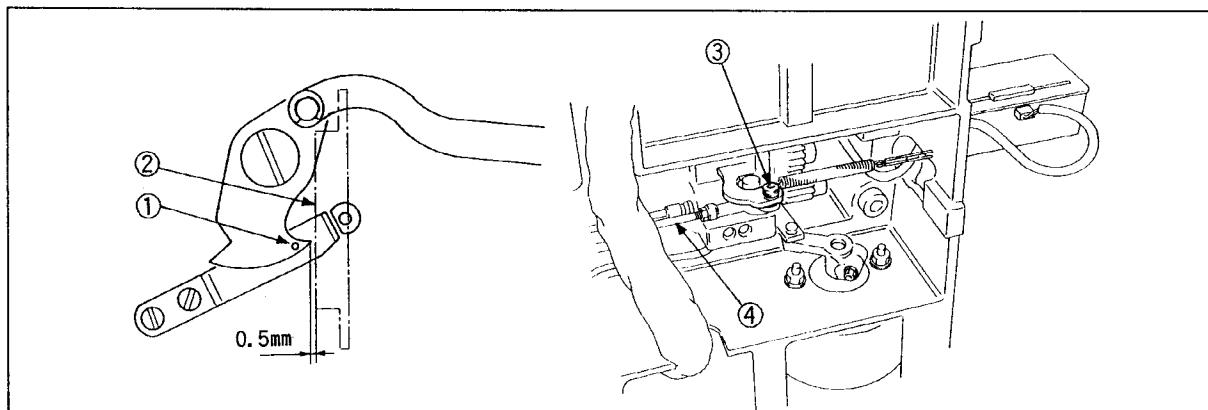
7-10 Adjustment of the trimmer cam follower

- (1) Turn the power switch OFF and remove the top cover.
- (2) Under the sewing machine regular stop condition (the needle stop position is upper and the take up lever stop position is highest), loosen the set screw (NO.⑤) of the cam follower lever (NO.④) and adjust the cam follower (NO.②) to be positioned to contact with the shoulder portion (NO.③) of the trimmer cam (NO.①) with having about 1mm clearance between the cam follower (NO.②) and the trimmer cam (NO.①). After this adjustment, tighten the set screw (NO.⑤) of the cam follower lever (NO.④).
- (3) Push the cam follower lever (NO.④) by hand to the ← arrow direction and make sure that the cam follower (NO.②) is engaged into the cam groove (NO.③) smoothly.
- (4) If the cam follower (NO.②) is not engaged smoothly, under confirming with the condition which the cam follower (NO.②) contacts with the shoulder portion (NO.②) of the trimmer cam (NO.①), loosen the nut (NO.⑦) and tighten the stopper screw (NO.⑧) until it touches with the stopper (NO.⑨) of the cam follower lever (NO.④) then, loosen the stopper screw (NO.⑧) back about 1/3 turn and fix the nut (NO.⑦) firmly.



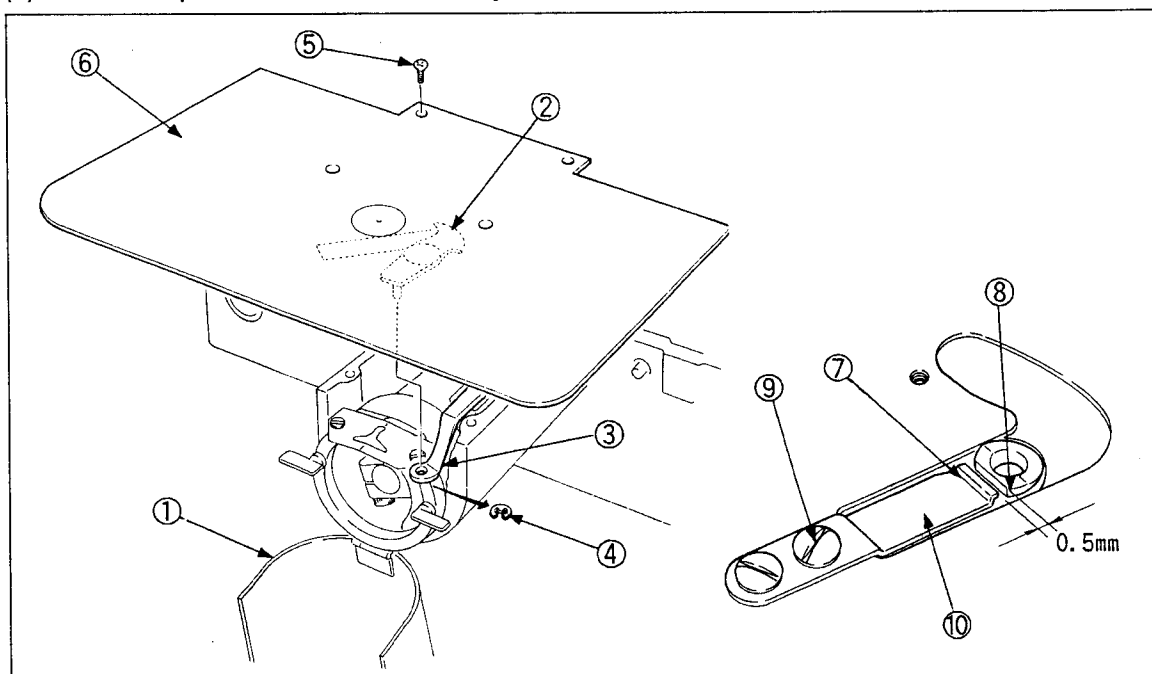
7-11 Adjustment of the position for the movable knife point

- (1) Tilt the sewing machine head to the left to be able to see the bottom component parts.
- (2) Open the cylinder cover.
- (3) Check with the point (NO.①) of the movable knife whether it is located at the position apart 0.5mm from the front face (NO.②) of the hook retainer.
- (4) For the adjustment of the movable knife point (NO.①), loosen the adjusting screw (NO.③) and move the rod end (NO.④) right and left then, adjust the position of the movable knife point.
- (5) After the adjustment, tighten the adjusting screw (NO.③) securely.



7-12 Adjustment of the fixed knife position

- (1) Open the cylinder cover (NO.①).
- (2) Remove the E shaped snap ring (NO.④) which engages the movable knife (NO.②) and the link (NO.③).
- (3) Loosen the set screws (NO.⑤) then, remove the sliding plate (NO.⑥).
- (4) Turn the sliding plate (NO.⑥) upside down and loosen two set screws (NO.⑨) then, adjust the fixed knife (NO.⑩) position to be positioned for the blade edge (NO.⑦) to have the clearance 0.5mm from the edge of the needle plate (NO.⑧).
- (5) After the adjustment, tighten the set screws (NO.⑨) securely.
- (6) Put all the parts removed for this adjustment back to the original locations.



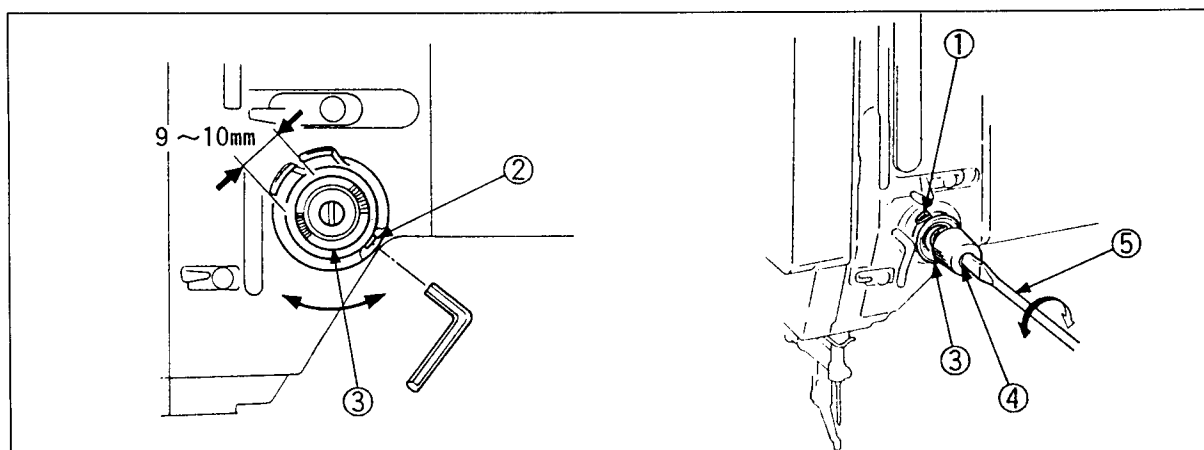
7-13 Adjustment of the thread take up spring swing stroke

Loosen the set screw (NO.②) and turn the whole thread tension regulator (NO.③) then, adjust the thread take up spring swing stroke to become 9~10mm. After the adjustment, tighten the set screw (NO.②) securely.

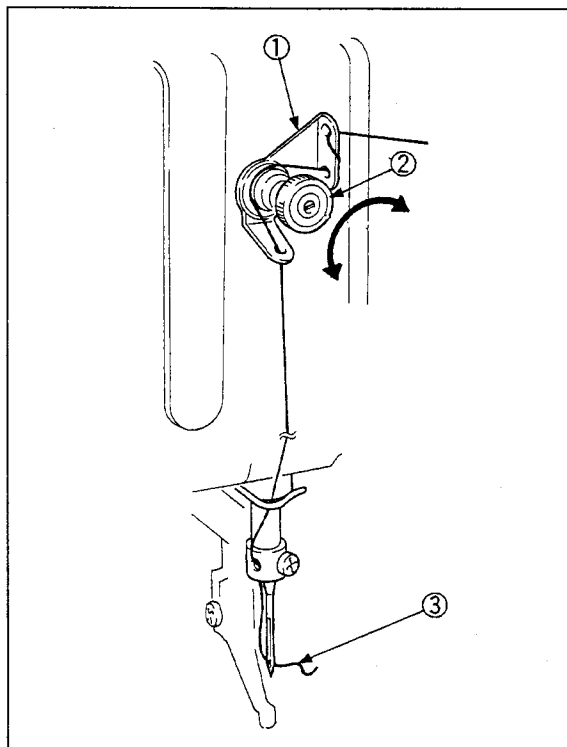
7-14 Adjustment of the thread take up spring tension

Insert the screw driver (NO.⑤) into the slit (NO.④) of the thread tension regulator (NO.③) and adjust the thread take up spring (NO.①) tension.

If turn the screw driver to the clockwise, the thread take up spring tension becomes tight, and if turn the screw driver to the counter clockwise, the thread take up spring tension becomes loose.



7-15 Adjustment of the thread tail (NO.③) after the trimming



Adjust the thread tail (NO.③) from the needle after the trimming with turning the nut (NO.②) of the pre-tension (NO.①).

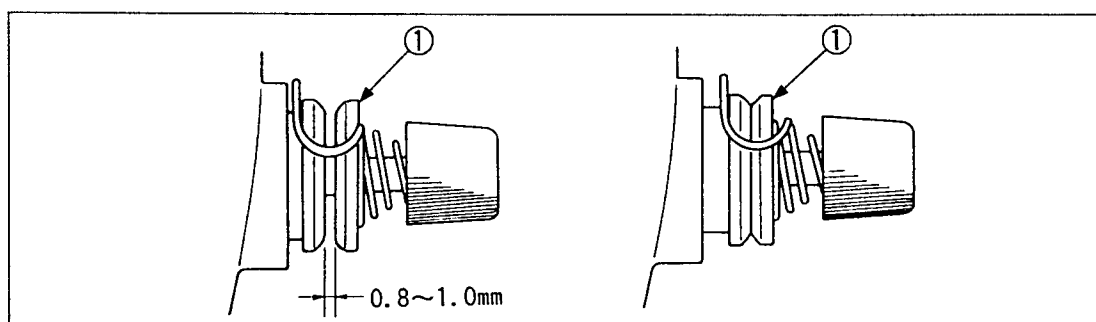
If turn the nut (NO.②) to the clockwise, the thread tail becomes shorter and if turn the nut (NO.②) to the counter clockwise, the thread tail becomes longer.

7-16 Cancellation of the trimming function

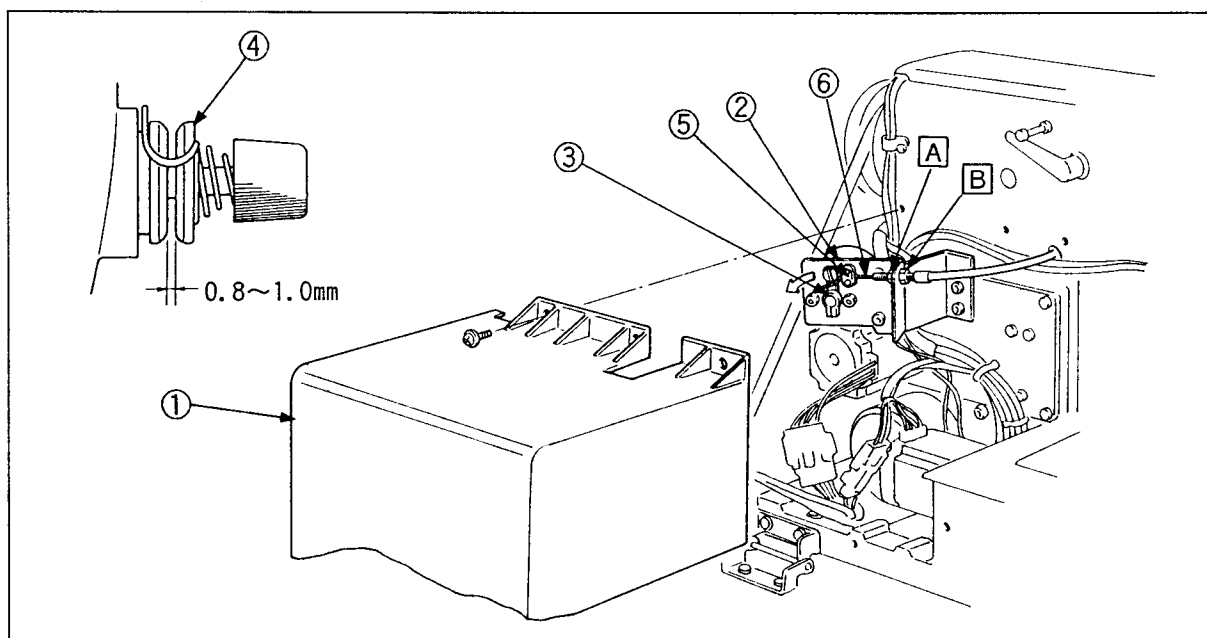
If the automatic trimming is not required during the sewing operation, cancel the trimming function with the setting panel of the control box. For the detail of this instructions, please refer to the paragraph [4.Program 4 mode display] on [9] Basic mode operation of the technical manual **CONTROL UNIT**.

7-17 Adjustment of the upper thread tension release

- NOTE**
- (a) The upper thread tension release works when the upper thread is trimmed automatically or the stepping foot is lifted during the work holder feeding.
 - (b) If the upper thread tension release does not work properly when the upper thread is trimmed automatically, the thread tail from the needle becomes shorter then, it induces the skip stitch happening or pulling the thread tail out of the needle at the start of the sewing.
 - (c) During the sewing operation, the discs (NO.①) of the thread tension regulator is closed while the stepping foot is moving up and down. If the discs (NO.①) of the thread tension regulator is not closed, the upper thread tension becomes loose and the proper stitch condition can not be obtained.
 - (d) When the upper thread tension release is activated, the discs (NO.①) of the upper thread tension regulator opens 0.8~1.0mm. This is the normal condition of the discs (NO.①) opening. For this adjustment, take the following procedure.



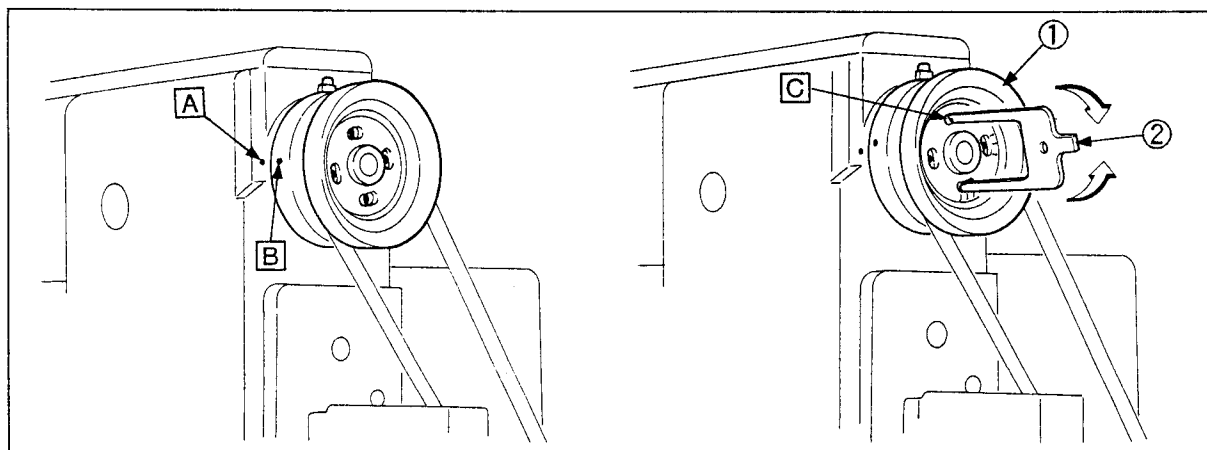
- (1) Remove the stepping motor cover (NO.①).
- (2) Fully turn the crank (NO.③) of the rotary solenoid (NO.②) in the arrow direction. At this time, adjust the upper thread tension release for the discs to be opened 0.8~1.0mm.
- (3) For this adjustment, loosen the nut [A] then, if tighten the nut [B], the discs opening becomes wider and if loosen the nut [B], it becomes narrower.
- (4) If the normal opening of the discs can not be obtained with the nut adjustment, loosen the wire fix screws (No.⑤) and adjust the tension of the wire (NO.⑥).
- (5) The wire (NO.⑥) may be got longer over a long period machine operation. At that time, adjust the upper thread tension release again.



7-18 Adjustment of the synchronizer

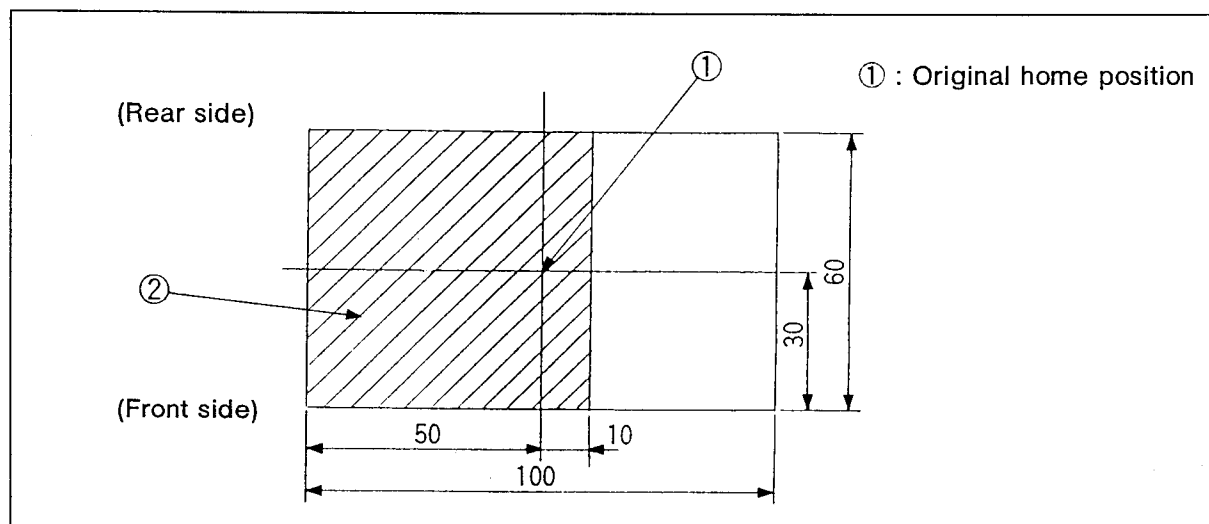
- NOTE** (a) When the sewing is finished, the arm timing mark [A] and the pulley timing mark [B] are matched with each other then, the sewing machine is stopped the running. This is the normal condition.
- (b) If these timing mark [A] and [B] get out of the matching more than 3mm, adjust the timing mark matching.

Hold the sewing machine pulley (NO.①) by hand and insert the angle adjuster (NO.②) into the hole [C] then, turn the angle adjuster (NO.②). If turn the angle adjuster (NO.②) to the clockwise, the pulley timing mark [B] goes up and if turn it to the counter clockwise, the pulley timing mark [B] comes down. The angle adjuster (NO.②) is enclosed in the accessory box.

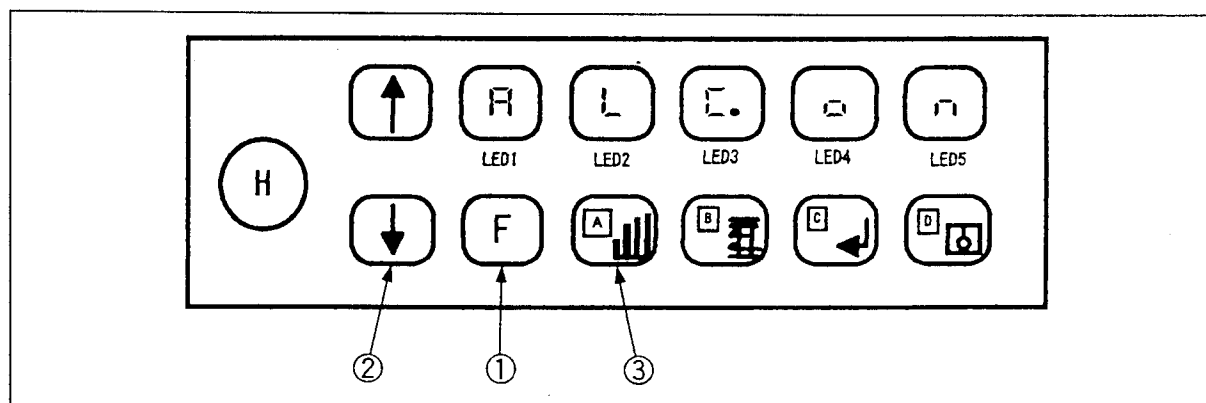


7-19 Adjustment of the mechanical home position

NOTE The mechanical home position is fixed at the center of the sewing area when the sewing machine is shipped from the factory. However, it can be moved within the area covered with diagonal lines.

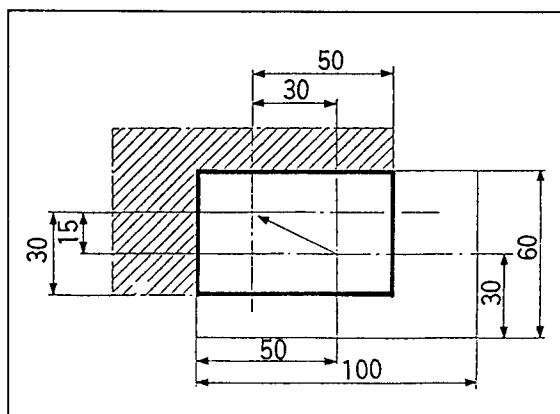


- Turn the power switch ON and cancel the sewing area limit with the setting panel of the control box. For this cancellation, at the normal mode condition of the setting panel, push **[F]** key (NO.①) then, press **[↓]** key (NO.②) and **[A]** Key (NO.③) at the same time for more than 2 seconds. The display **A L C o n** is appeared and the sewing area limit is canceled.



NOTE If do not cancel the sewing area limit, shifting the mechanical home position make the effective sewing area narrower than the original.

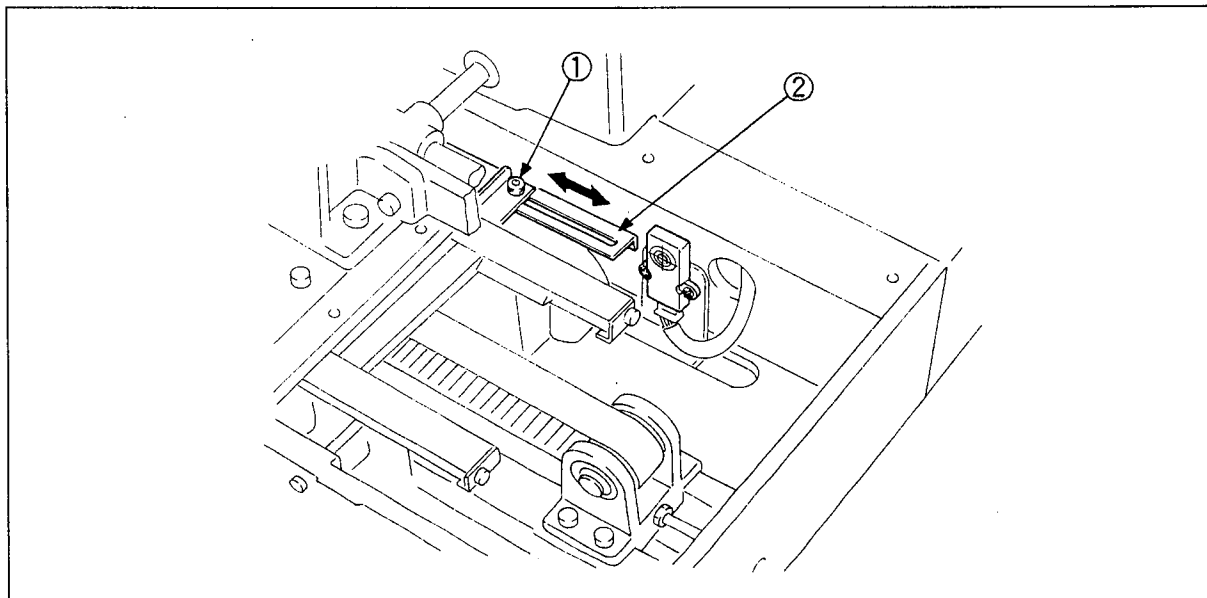
(Example) If shift the mechanical home position to the X direction 30mm, the Y direction 15mm without canceling the sewing area limit, the area covered with diagonal lines becomes invalid and the effective sewing area becomes narrower as a bold rectangle shown on the figure.



- After the cancellation of the sewing area limit, once, turn the power switch OFF.

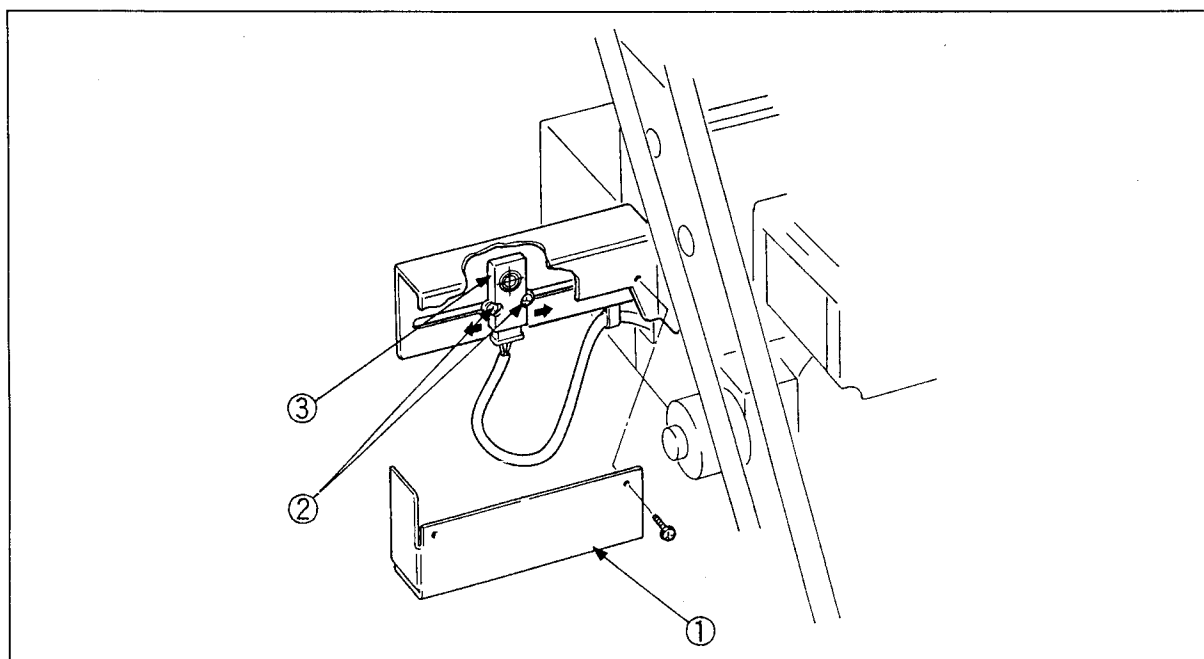
7-19-1 Shifting the mechanical home position to the X direction

- (1) Remove the X-Y cover (right), (left) and X cover plate.
- (2) Loosen the detector plate fix screws (2 pieces) (NO.①). If move the detector plate (NO.②) to the right, the mechanical home position is shifted to the left and if it is moved to the left, the mechanical home position is shifted to the right.
- (3) After the mechanical home position shifting, tighten the detector plate fix screws (2 pieces) securely.



7-19-2 Shifting the mechanical home position to the Y direction

- (1) Remove the Y detector protection cover (NO.①).
- (2) Loosen the Y detector set screws (2 pieces)(NO.②). If move the Y detector (NO.③) to the right, the mechanical home position is shifted to the backward and if move it to the left, the mechanical home position is shifted to the front.
- (3) After the mechanical home position shifting, tighten the detector set screws (2 pieces) (NO.②) securely.



7-19-3 Fine adjustment of the mechanical home position in the X, Y direction

NOTE When the original mechanical home position is shifted to the another position or it is required to move a little, a fine adjustment of the mechanical home position in the X, Y direction can be done with the setting panel of the control box. For this fine adjustment, refer to the instructions [1. Program 1 mode display and the function of each key] in the paragraph [9] Basic mode operation of the technical manual **CONTROL UNIT**.

7-20 Adjustment of the X-Y detector clearance

NOTE The work holder stop position which is the mechanical home position is detected by the X-Y detectors. If the clearance between the detector and the detector plate is changed, the mechanical home position is also changed. If such aberration is happened, make the following adjustment. Please keep it in mind if the detector senses the home position, the red pilot light of the detector goes on each time.

7-20-1 Adjustment of the X detector clearance

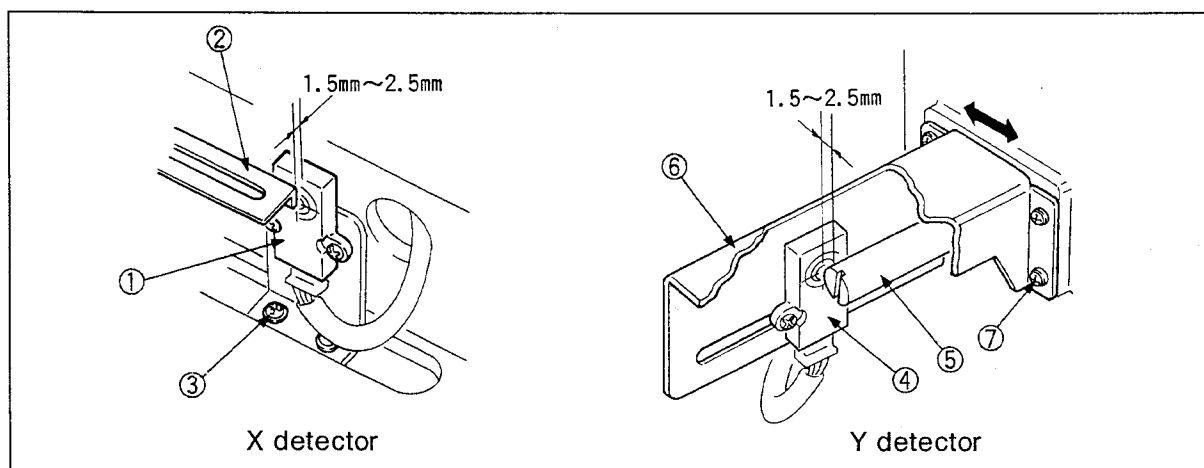
- (1) Remove the X cover (right) and the X cover plate (right).
- (2) Check the clearance between the surface of the detector (NO.①) and the detector plate (No.②). If this clearance is about 1.5~2.5mm, it is the normal condition.
- (3) If this clearance is out of the normal condition, loosen the detector set screws (NO.③) and move the detector by hand then, adjust the clearance to be proper.
- (4) After the adjustment, make the detector surface (NO.①) parallel with the detector plate (NO.②) then, tighten the detector set screws (NO.③) securely.

7-20-2 Adjustment of the Y detector clearance

- (1) Remove the Y detector cover.
- (2) Check the clearance between the detector surface (NO. ④) and the Y driving shaft (NO. ⑤). If this clearance is about 1.5~2.5mm, it is the normal condition.
- (3) If this clearance is out of the normal condition, loosen the set screws (NO.⑦) and reset the detector mounting plate (NO.⑥) to the proper position to be able to get the normal detector clearance.
- (4) After the adjustment, tighten the set screws (NO.⑦) of the detector mounting plate (NO.⑥) securely.

Caution

★ If the detector clearance becomes more than 2.5mm, the work holder stop position becomes unstable, furthermore, if the clearance becomes far bigger than 2.5mm the work holder does not stop and becomes out of control.



7-21 Adjustment of the X-Y table contact presser

NOTE When take the X-Y table apart or the X-Y table became weak in the joints, adjust the X-Y table contact presser. The adjustment should be made the X-Y table movement as smooth as possible without having play. If the X-Y table contact presser is too tight, the over presser induces the out of control on the X-Y table movement.

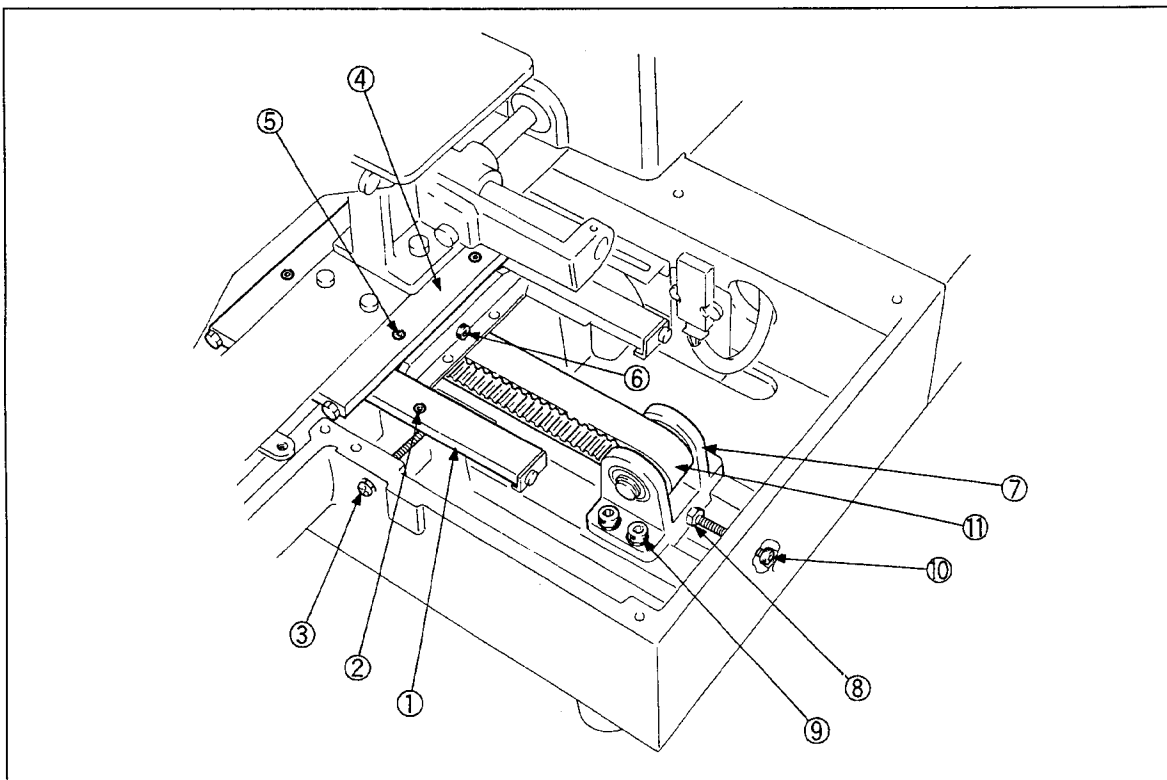
- (1) Remove the right and left X-Y covers and the right X cover plate.
- (2) Loosen the set screws (2 pieces) (NO.②) so that the X fixed race (NO.①) can be moved slightly.
- (3) If tighten the both right and left contact presser adjusting screws (NO.③), the X table contact presser is increased.
- (4) Loosen the set screws (2 pieces) (NO.⑤) so that the Y fixed race (NO.④) can be moved slightly.
- (5) If tighten the contact presser adjusting screws (NO.⑥), the Y table contact presser is increased.
- (6) After the adjustment, tighten the set screws (NO.②) and (NO.⑤) securely.

7-22 Adjustment of the X-Y timing belt tension

NOTE The proper condition of the X-Y timing belt tension is standing that they will not be got any yield even it is slightly pushed by hand.

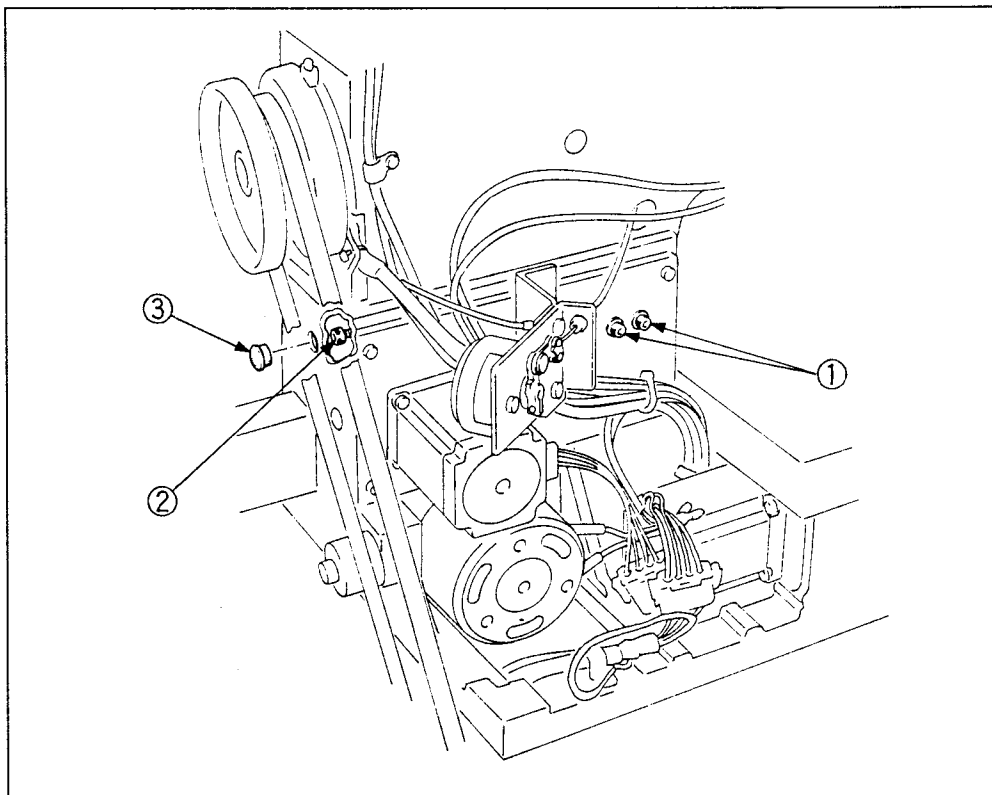
7-22-1 Adjustment of the X timing belt tension

- (1) Remove the right X cover and the right X cover plate.
- (2) Loosen the nut (NO.⑧) and the set screw (NO.⑨) of the bracket (NO.⑦).
- (3) If tighten the tension adjust screw (NO.⑩), the X timing belt (NO.⑪) tension will be increased.
- (4) After the adjustment, securely tighten the nut (NO.⑧) and the set screw (NO.⑨) of the bracket (NO.⑦) and put the right X cover and the right X cover plate back on the original locations.



7-22-2 Adjustment of the Y timing belt tension

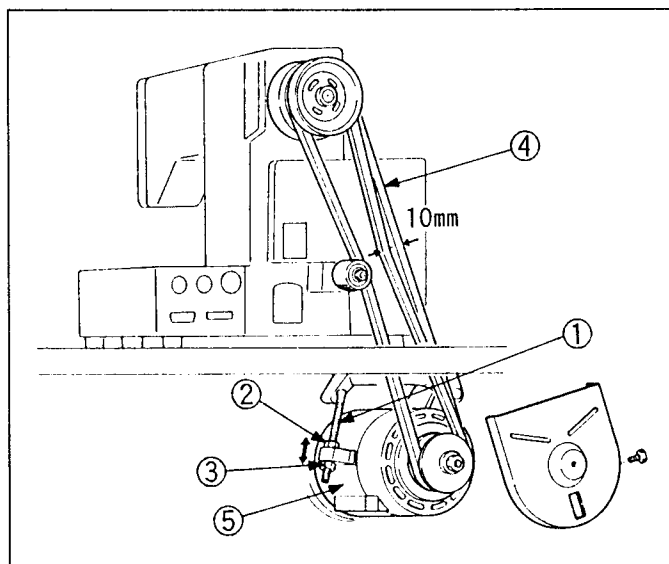
- (1) Remove the stepping motor cover and the V belt covers.
- (2) Loosen the bracket set screws (NO.①).
- (3) Remove the rubber plug (NO.③) and tighten the tension adjust screw (NO.②). The Y timing belt tension will be increased.
- (4) After the adjustment, tighten the bracket set screws (NO.①) securely and put the rubber plug (NO.③), the stepping motor cover and the v belt cover back to the original locations.



7-23 Adjustment of the V belt tension

NOTE After operated the sewing machine for a long period, the V belt tension becomes loose. Adjust the V belt tension periodically. The proper V belt tension is standing that it is bent about 10mm with the hand presser of 1.0kg as it shown on the figure.

- (1) Turn the power switch OFF.
- (2) Remove the V belt covers.
- (3) Loosen two nut (NO.②) on the motor position adjust bolt (NO.①).
- (4) Fix the motor (NO.⑤) position with putting the tension to the V belt by its weigh and firstly, tighten the upper nut (NO. ②) then secondly, tighten the lower nut (NO.②).



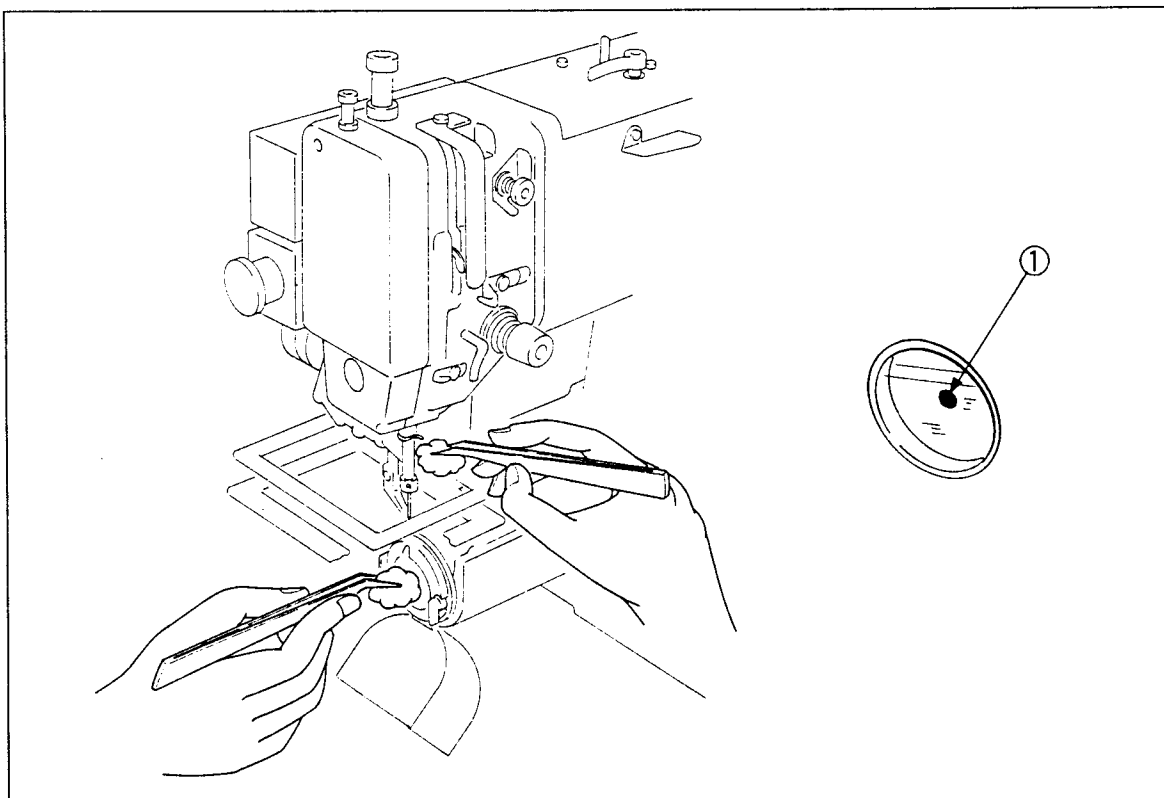
8 MAINTENANCE

Caution

- ★ Please make sure to turn the power switch always OFF when clean up the sewing machine.
- ★ Before or after the sewing operation, clean up the sewing machine and check the oil level in the oil tank.

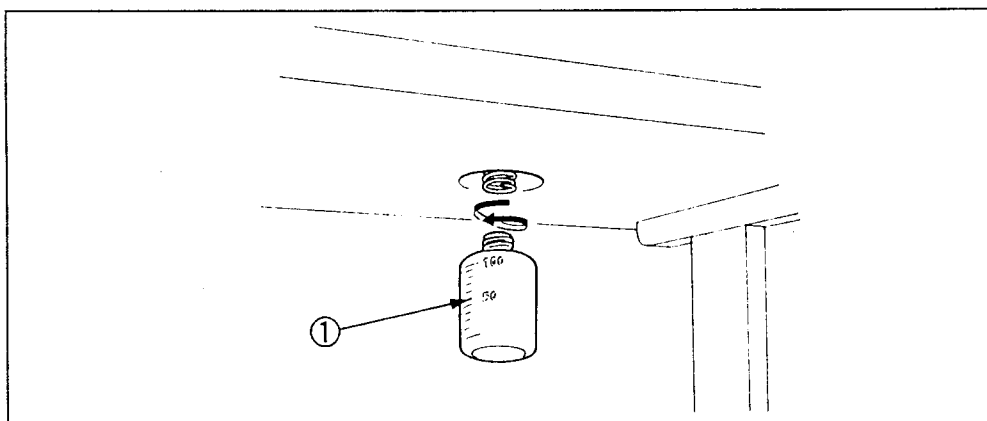
8-1 Cleaning

- (1) Turn the power switch OFF.
- (2) Remove the dust and the thread waste sticking around the threading parts or the shuttle hook area.
- (3) Check the oil level in the oil tank. If the oil is under the red mark level supply the oil to be over the red mark level.



8-2 Disposing of oil waste

If the waste oil is full filled in the oil bottle (NO.①), remove the oil bottle (NO.①) then, dispose of the waste oil.



9 BAD SEWING CONDITION & ITS CAUSE AND REMEDY

NOTE Please fix the troubles during the sewing machine operation with referring to the following instructions.

Beside, if the trouble conditions are not coming under these classification, please contact the sewing machine dealers nearby.

Bad condition	Cause	Remedy	Ref.page & item
1. Upper thread breakage often happens	Poor thread quality	Use better quality thread	—
	Tight upper thread tension	Adjust thread tension	P18-6-3.(2)
	Strong thread take up spring	Adjust thread take up spring properly	P29-7-14.
	Upper thread is thicker than needle size	Change needle to suitable size	—
	Damages on shuttle hook or driver	Change them new ones or grind them with buffing wheel or grind stone	—
	Damages inside stepping foot needle hole	Change it new one or grind it with buffing wheel	—
	Needle touches with stepping foot needle hole	Move stepping foot position	P22-7-5.(3)
	Needle and shuttle hook are not in proper timing	Adjust the timing	P20,21
	Thread melts with needle heat	Slow down sewing speed	P17(4)
		Use silicon oil	—
		Use needle cooler	—
2. Upper thread is pulled out from needle	Thread tension discs are not opened at trimming	Adjust thread tension release	P30-7-17.
	Thread take up spring swings too much	Adjust thread take up spring's swing stroke	P29-7-14.
	Upper thread is broken before regular trimming	Adjust fixed knife and needle plate position	P29-7-12.
	Needle size is bigger than thread size	Change needle to suitable size	—
	Pre-tension is too tight	Adjust pre-tension	P30-7-15.
	Thread guide is in wrong position	Adjust thread guide position properly	P22-7-5.
	Needle and shuttle hook are in bad timing	Adjust the timing properly	P20,21
	Trimmer timing is not correct	Adjust trimmer cam position	P28-7-10.
		Adjust movable knife position	P28-7-11.
		Adjust synchronizer position	P31-7-18.
3. Skip stitch happens at start sewing	Too short bobbin thread by bobbin spinning at trimming	Use non racing spring with bobbin	—
	Bobbin thread tension is too tight	Loosen bobbin thread tension spring	P18-6-3.(1)
	Thread tail from needle is very short after trimming	Decrease pre-tension	P30-7-15.
		Adjust trimmer cam position	P28-7-10.
		Adjust synchronizer position	P31-7-18.
		Make thread take up swing stroke smaller	P29-7-14.
	Thread tail from needle is very short after trimming	Advance thread tension release timing	Control unit
		Adjust thread guide position properly	P22-7-5

Bad condition	Cause	Remedy	Ref.page & item
4. Thread tail from needle is too long after	Pre-tension is too loose	Make pre-tension tighter	P30-7-15.
	Trimmer timing is delayed	Adjust trimmer cam position	P28-7-10.
		Adjust synchronizer position	P31-7-18.
	Upper thread tension release timing is too fast	Delay tension release timing	Control unit
5. Trimming is not functioned	Thread guide is in wrong position	Adjust thread guide position properly	P22-7-5
	Trimmer function is canceled	Resume trimmer function	Control unit
	Fixed knife is dull	Change it new knife	P29-7-12.
	Movable knife is in wrong position	Adjust movable knife position properly	P28-7-11.
	Skip stitching happens at trimming	Fix skip stitching	P39-6.
	Trimmer solenoid is out of order	Change it new solenoid	—
	Trimmer timing is wrong	Adjust trimmer cam position	P28-7-10.
		Adjust synchronizer position	P31-7-18.
6. Skip stitching often happens	Needle and shuttle hook clearance is too big	Adjust needle and shuttle hook clearance properly	P21-7-3.
	Needle and shuttle hook timing is not correct	Adjust needle and shuttle hook timing properly	P20-7-2.
	Needle is bent	Change it new needle	P11-7-2.
	Needle is bent by driver	Adjust needle and driver clearance properly	P21-7-4.
	Needle is in wrong position	Amend needle position	P11-7-2.
	Stepping foot position is not correct	Adjust stepping foot position properly	P22-7-6-1
7. Stitch forming is loose	Upper thread tension is not tight enough	Increase upper thread tension	P18-6-3.(2)
	Thread tension regulator's discs are opened during sewing	Adjust tension regulator position properly	P30-7-17.
		Adjust upper tension release position properly	P30-7-17.
	Stepping foot position is not correct	Adjust stepping foot position properly	P22-7-6-1
	Driver and shuttle hook clearance is very small	Change shuttle hook	—
	Stepping foot up and down timing is not proper	Adjust stepping foot timing properly	P25-7-6-3
8. Sewing machine does not work even start switch is turned ON	Cables wiring is disconnected	Connect all cables precisely	P7-3-11.
	System software is not loaded	Load system software to control box	P11-5-1.
	Emergency stop switch is kept ON	Release emergency stop switch lock	P15-6-1.(3)
	Start switch is out of order	Change it new start switch	—

Bad condition	Cause	Remedy	Ref.page & item
9. Sewing machine runs idle at high speed when power switch is turned ON	Synchronizer cable is disconnected	Connect synchronizer cable precisely	Control unit
	Synchronizer is out of order	Change it new synchronizer	—
10. Work holder does not work	Work holder activate cable is disconnected	Connect the cable precisely	Control unit
	Work holder presser is not strong enough	Increase work holder presser	P27-7-9.
	Work holder switch is out of order	Change it new work holder switch	—
11. Sewing pattern is distorted	X-Y table have a play	Adjust X-Y table sliding contact presser properly	P35-7-21.
	Work holder presser is not strong enough	Increase work holder presser	P27-7-9.
	Sewing material weight is very heavy	Slow down sewing speed	P17-(4)
		Slow down feeding speed	Control unit
		Select sewing material weight level at feeding	Control unit
	X-Y timing belts are loose	Adjust X-Y timing belt tension properly	P35-7-22-1 P36-7-22-2
12. Work holder does not stop at home position	X-Y detector cables are disconnected	Connect X-Y cables precisely	Control unit
	X-Y detectors are out of order (Red pilot lamps do not go on at home position)	Change them new detectors (Make sure red pilot lamps go on at home position)	P34-7-20.
	Detector and detector plate clearance is too big	Adjust the clearance properly	P34-7-20.
13. Work holder stops at not original home position	Detector or detector plate mounting is loose	Check set screws and tighten them securely	P34-7-20.
	Detector and detector plate clearance is bigger than standard	Adjust detector and detector plate clearance properly	P34-7-20.
	Home position correction function is in working	Cancel home position correction function	Control unit

