

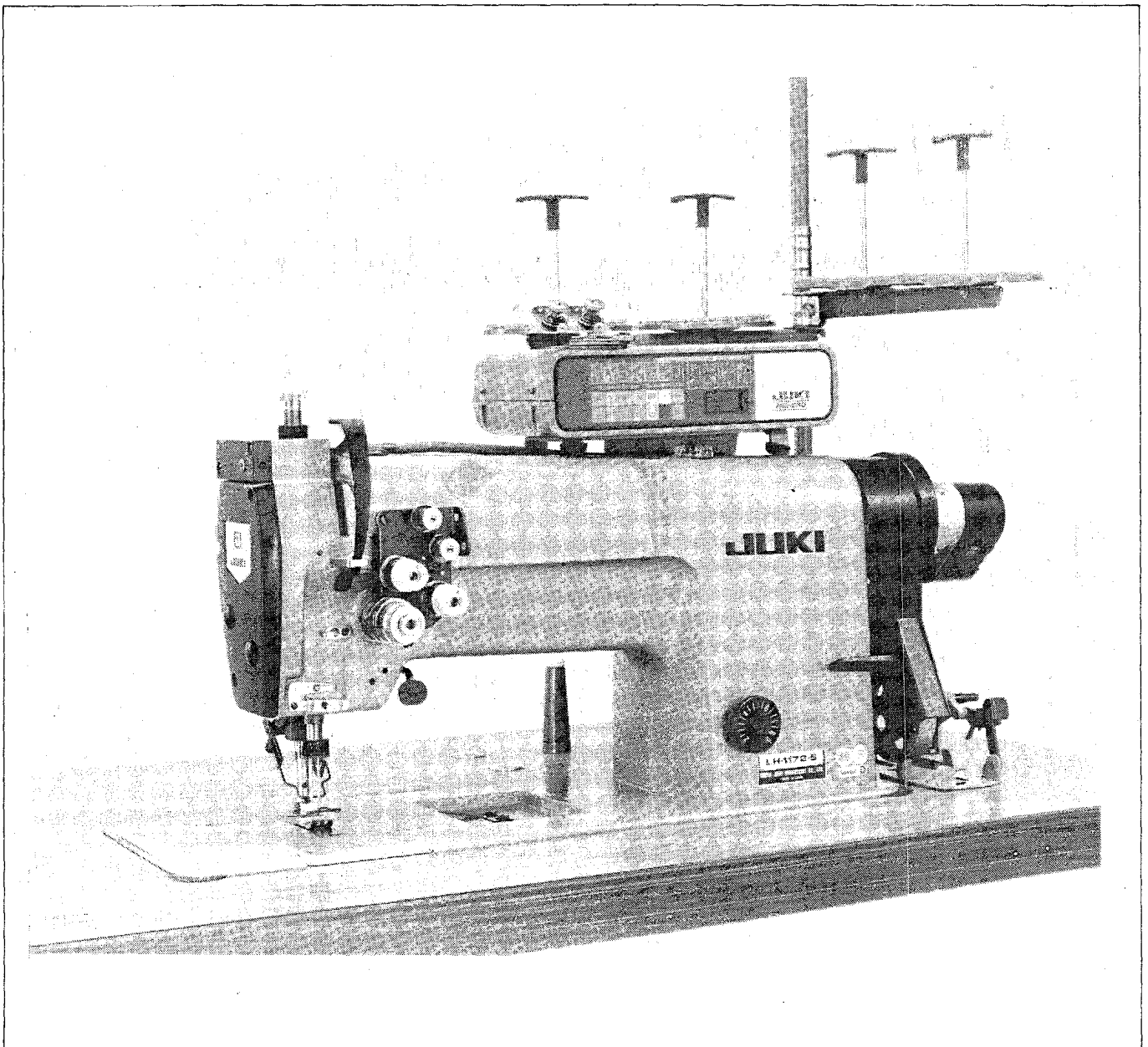
JUKI®

2-Needle, Needle Feed Lockstitcher
with automatic thread trimmer

LH-1172

LH-1172-5-4B

ENGINEER'S MANUAL



29264504
1986. 4

PREFACE

This Engineer's Manual is written for the technical personnel who are responsible for the service and maintenance of the machine.

The Instruction Book for these machines, intended for the maintenance personnel and operators at a garment factory, contains detailed operating instructions. This Engineer's Manual describes "How to adjust" and "Results of improper adjustment" and also other information which are not covered by the Instruction Book.

It is advisable to use the pertinent Instruction Book and Parts Book together with this Engineer's Manual when carrying out the maintenance of these machines.

This manual mainly consists of three sections; "Adjustment Standard", "How to adjust", and "Results of improper adjustment".

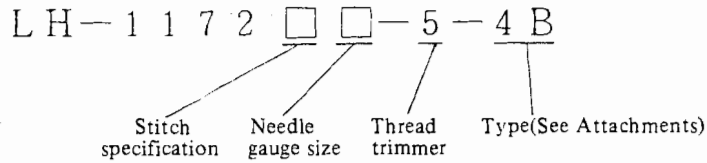
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1. SPECIFICATIONS

No.	Item	Specifications
1	Model No.	LH-1172-5-4B
2	Model description	2-needle, needle feed lockstitcher with automatic thread trimmer, wiper, and large-size hook
3	Uses by type	"S" specification: For medium- and heavy-weight materials.
4	Sewing speed	Max. 2,500 s.p.m. Normal 2,300 s.p.m. (depends on stitch length of type of operation)
5	Needle	DP x 5 #18 ~ #23 (Schmetz System 134)
6	Thread	#30 ~ #8
7	Needle gauge size	3/16" ~ 5/8"
8	Stitch length (Forward x Reverse Stitching)	8 x 4 mm (0.314" x 0.157")
9	Presser foot lift	Hand lifter: 9 mm (0.354") Knee lifter: 10 mm (0.394")
10	Auto-lifter	AK-11 (option)
11	Stitch length regulator	Wing-shape dial
12	Reverse feed system	Externally mounted solenoid magnet with touch back switch and hand lever
13	Thread take-up	Slide type thread take-up
14	Needle bar stroke	33.4 mm (1.314")
15	Hook (2.2-fold capacity)	Vertical axis shuttle race with long-shaft bobbin case
16	Bobbin case opener	Interlocking with hook driving eccentric cam (1:1 principle)
17	Take-up spring	Separated type
18	Feed mechanism	By slide block
19	Hook driving system	Gears
20	Needle feed system	Interlocked with bottom feed system
21	Connection of shafts	Timing belt connects the main shaft and the hook driving shaft
22	Lubrication system	Fully automatic by a plunger pump
23	Oil return flow	Circulated by felts
24	Thread trimmer	Rocks around the hook (cam with safety mechanism)
25	Tension release system	Interlocked with thread trimming clutch
26	Wiper components	Swaying type
27	Motor	400 W 4P (JUKI electronic-stop motor)
28	Control Box	MC-200
29	Lubrication oil	JUKI New Defrix Oil No. 1
30	Bed size	517 x 178 mm (20.354" x 7")
31	Head weight	44 kg

MODEL DESIGNATION



(Example) LH model of "S" specification in 1/4" needle gauge size with thread trimmer (complete)
(LH-1172SF-5-4B)

○ **ATTACHMENTS**

	5 - 2	5 - 4	5 - 2B	5 - 4B
Automatic thread trimmer	○	○	○	○
Wiper		○		○
Automatic reverse feed			○	○
Motor, Stand	○	○	○	○

○ **STITCH SPECIFICATIONS AND PRESENCE OF AUTOMATIC THREAD TRIMMER**

Stitch specification	With Automatic thread trimmer	Without Automatic thread trimmer	Use
S	○	○	For medium- to heavy-weight materials

○ **CODE FOR NEEDLE GAUGE SIZE**

Gauge size	(4.8) 3/16"	(5.6) 7/32"	(6.4) 1/4"	(7.1) 9/32"	(7.9) 5/16"	(9.5) 3/8"	(12.7) 1/2"	(15.9) 5/8"
Code	D	E	F	G	H	K	L	M

(Standard)

Note: The parenthesized figures are mm conversions.

○ **SOLENOID SPECIFICATIONS**

	Export	Solenoid stroke
Automatic thread trimmer	AC24V 2.5A	4 mm (0.158")
Wiper	AC24V 4.4A	45°
Automatic reverse feed	AC24V 9.2A	8 mm (0.315")

2. ADJUSTMENT STANDARD

Adjustment Standard

(1) Needle bar

1) Needle entry point

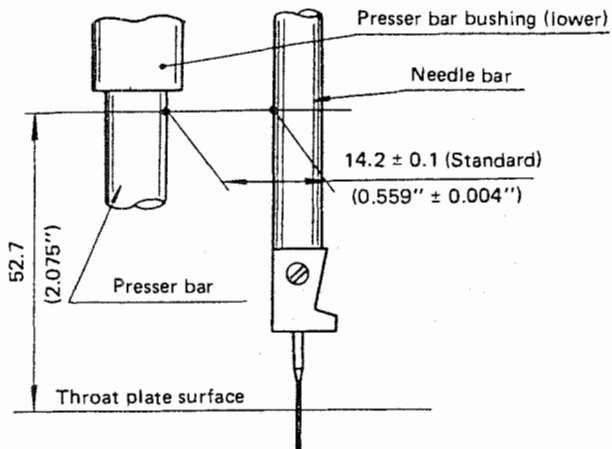


Fig. 1

Requirements;

- Needle bar: In the lowest position
- Stitch length: "0" mm

2) Needle bar height

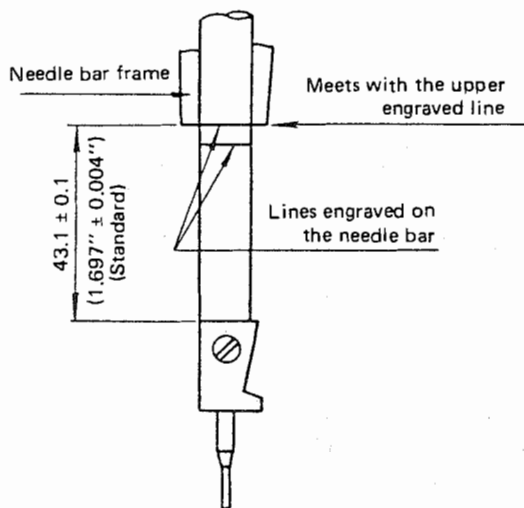


Fig. 3

Requirements;

- Needle bar: In the lowest position
- Stitch length: "0" mm

How to Adjust

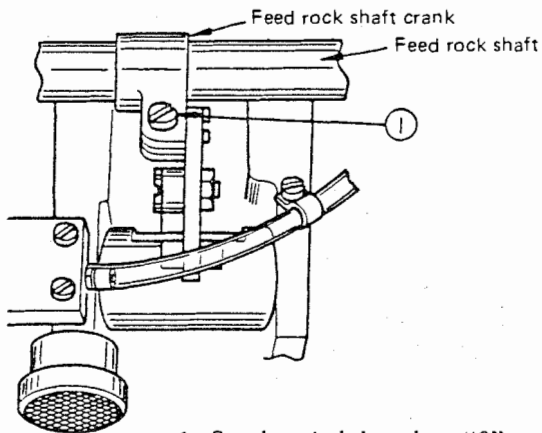


Fig. 2

1. Set the stitch length to "0" mm.
2. Turn the handwheel until the needle bar has come down to the lowest point of its stroke.
3. Loosen screw ① .
4. Provide the specified clearance between the needle bar and the presser bar and tighten screw ① .

Results of Improper Adjustment

If the clearance is too great;

- When the stitch length is set to the maximum, the feed dog will hit the throat plate.
- Stitch skipping or needle breaking may occur.

If the clearance is too small;

- When the reverse stitch is made at a maximum stitch length, the feed dog will hit the throat plate.
- Stitch skipping or needle breaking may occur.
- * Thread trimming failure may occur.

1. Set the stitch length to "0" mm.
2. Turn the handwheel until the needle bar has come down to the lowest point of its stroke.
3. Loosen screw ① .
4. Adjust the needle bar to the specified height, then retighten screw ① .

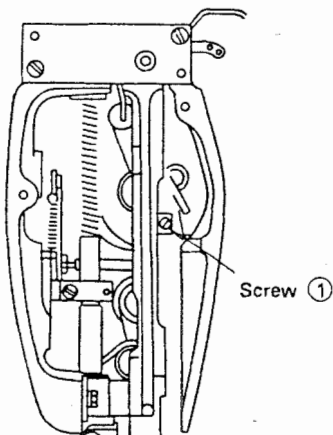


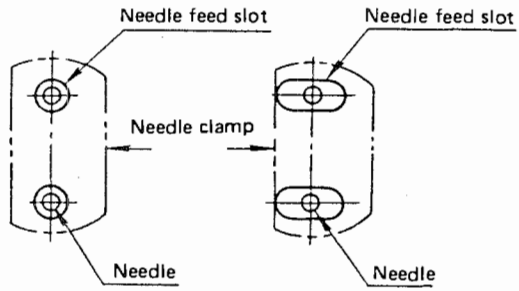
Fig. 4

(Caution) Make sure that the needle runs in the middle of the needle feed slot after the adjustment.

- If the needle bar height is not correct, it may cause stitch skipping or thread breaking.

Adjustment Standard

3) Needle entry in the needle feed slot



Both needles must enter the middle of each needle feed slot.

Requirements;

- Needle bar: In the lowest position.
- Stitch length: "0" mm

Fig. 5

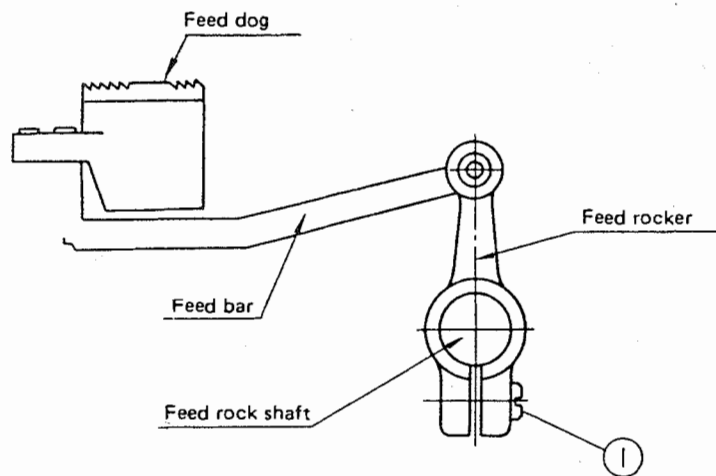


Fig. 6

How to Adjust	Results of Improper Adjustment
<p>If the needle bar is installed twisted:</p> <ol style="list-style-type: none"> 1. Set the stitch length to 0 mm. 2. Turn the handwheel until the needle bar has come down to the lowest point of its stroke. 3. Loosen screw ① (Fig. 4) 4. Turn the needle bar until both needles stay in the middle of their needle feed slots. Tighten screw ① (Fig. 4). <p>(Caution) Take care not to change the height of the needle bar.</p> <ul style="list-style-type: none"> ○ Don't turn the needle clamp before screw ① (Fig. 4) is loosened. Otherwise, the needle clamp may come down accidentally while stitching. <p>If the needle deflects in the lengthwise direction of the needle feed slot:</p> <ol style="list-style-type: none"> 1. Loosen screw ① (Fig. 6) 2. Adjust the position of the feed rocker so that both needles stay in the middle of the slots. 	<ul style="list-style-type: none"> ○ If the needles fail to enter the middle of their slots, stitch skipping, thread breaking or loose stitch may occur. ○ If the needles enter the far end of the elongated slots (2 x 3 mm) viewed from the operator's side, the needle thread forming a stitch comes out too much on the fabric. ☆ If the needles enter the near end of the elongated slot, thread trimming failure may occur.

Adjustment Standard

(2) Needle-to-hook relation

1) Rising of needle

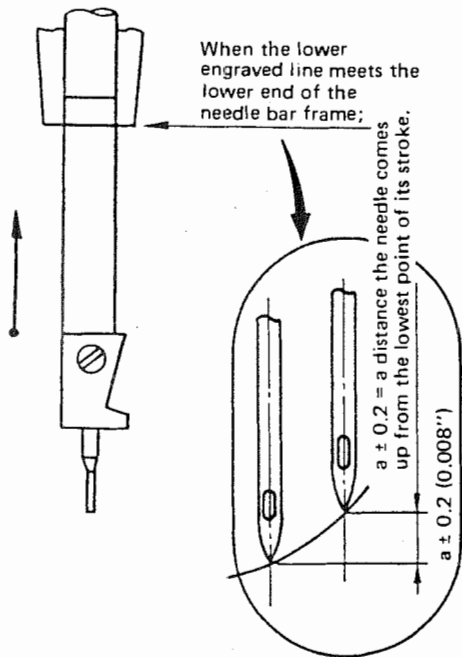


Fig. 7

Specifications	Rising of needle (distance "a")	Hook point height (distance "b")
S	2.5 – 3.2 mm (0.098" – 0.126")	1 – 1.5 mm (0.04" – 0.059")

2) Clearance between the needle and the hook point

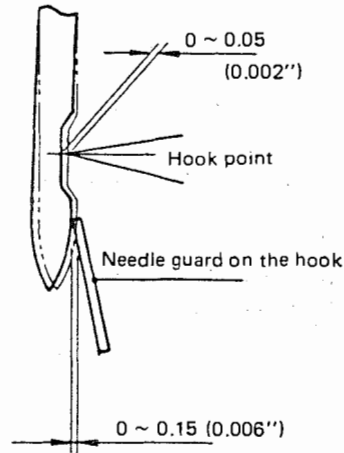


Fig. 8

3) Hook point location above the top end of the needle eye.

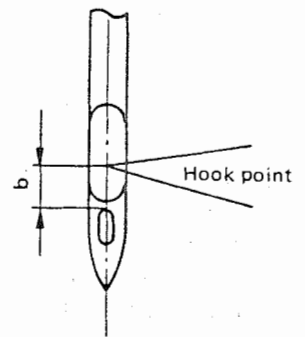


Fig. 9

Requirements;

- The needle bar must be brought up from the lowest point of its stroke.
- Stitch length: S specification: 5 mm (0.197")

(3) Working position of the bobbin case opening lever

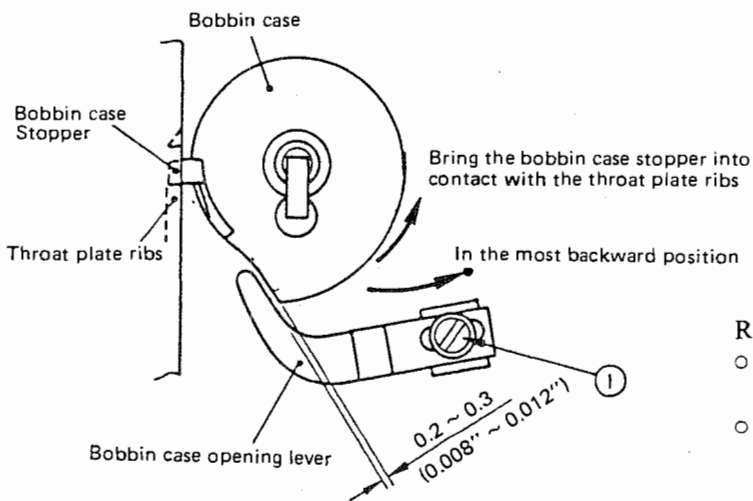


Fig. 11

Requirements;

- The bobbin case opening lever is in the most backward position.
- The bobbin case stopper is in contact with the thread plate ribs.

How to Adjust

1. Set the stitch length to 5 mm (0.197").
2. Turn the handwheel until the needle bar goes up 2.5 (0.098") to 3.2 (0.126") mm (standard: 2.6 mm (0.102")) from its lowest point.
3. Adjustment of the clearance between the needle and the hook point; Loosen screws ① and ② to release the hook driving shaft saddle and move the saddle in the direction of the arrow for the clearance as specified. Tighten two screws ① and ② after the adjustment.
4. Adjustment of the hook point location to the needle eye; Loosen three screws which set the small gear to the hook shaft and align the hook point with the needle center.

(Caution) When you replace the hook, you must adjust the position of the needle guard too.

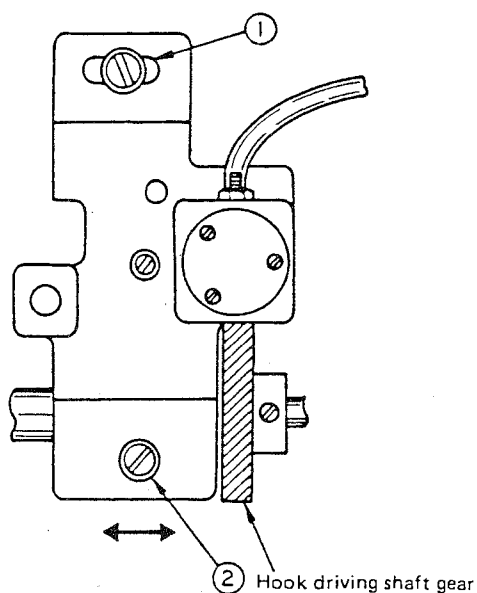


Fig. 10

Results of Improper Adjustment

- If these adjustments are made inaccurately, irregular stitching, stitch skipping or thread breaking may occur.
- ★ Irregular stitches, especially "balloon" stitches, may result if the hook timing is too early or late.
- ★ Irregular stitches may be corrected by slightly delaying the hook timing.

1. Turn the handwheel toward you until the bobbin case opening lever has gone back to the most backward position of its stroke.
2. Turn the bobbin case in the opposite direction to that of the hook until the bobbin case stopper comes into contact with the throat plate ribs.
3. Loosen screw ① and provide a 0.2 (0.008") to 0.3 (0.012") mm clearance between the bobbin case opening lever and bobbin case. Tighten screw ①.

If the clearance is too great;
○ Loose or "balloon" stitch may be formed.

If the clearance is too small;
○ Bobbin case will be damaged while stitching.

Adjustment Standard

(4) Clearance between the throat plate and the bobbin case stopper

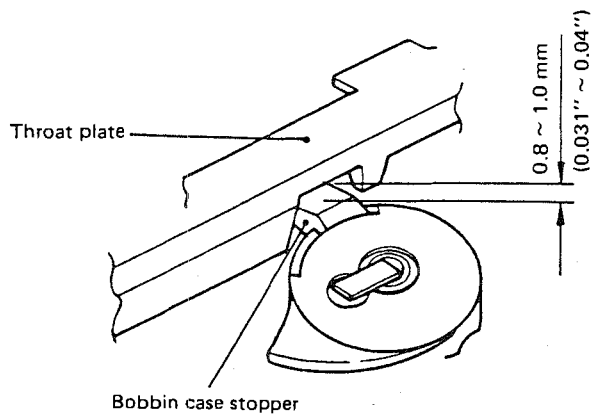


Fig. 12

Requirements;

- Clearance between the upper face of the bobbin case stopper and the throat plate must be $0.8 (0.031'')$ to $1.0 (0.04'')$ mm.

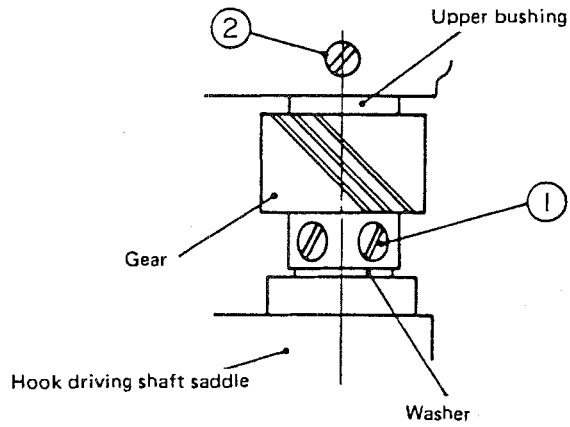


Fig. 13

How to Adjust	Results of Improper Adjustment
<ol style="list-style-type: none"> 1. Remove the throat plate. 2. Remove the bobbin case opening lever. 3. Take off the feed dog and the needles. 4. Loosen screw ① . 5. Turn the handwheel to bring the needle bar to the highest point and remove the hook. 6. Remove the gear from the sewing hook shaft and replace the washer by the one which has a suitable thickness to provide the specified clearance at the throat plate. 7. At the same time, loosen screw ② and adjust the setting position of the upper bushing. 8. After the adjustment check also the working position of the bobbin case opening lever (Adjustment Standard (2-(3)) and 9. 	<p>If the clearance is too great;</p> <ul style="list-style-type: none"> ○ The bobbin case may slip off the throat plate. <p>If the clearance is too small;</p> <ul style="list-style-type: none"> ○ Loose stitch or “balloon” stitch may be formed. ○ The moving knife may hit the hook while the thread trimmer is working.

Adjustment Standard

(5) Timing of cloth feed action

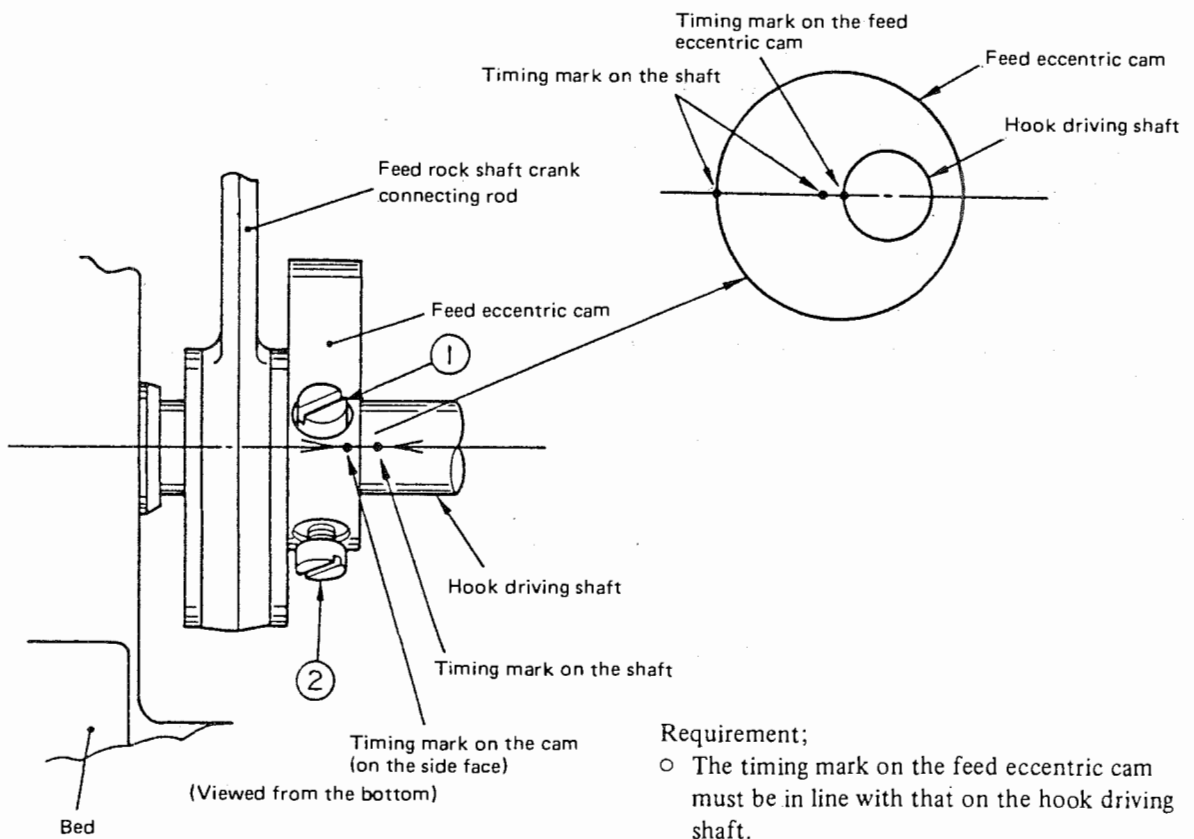


Fig. 14

Requirement;

- The timing mark on the feed eccentric cam must be in line with that on the hook driving shaft.

(6) Height of feed dog

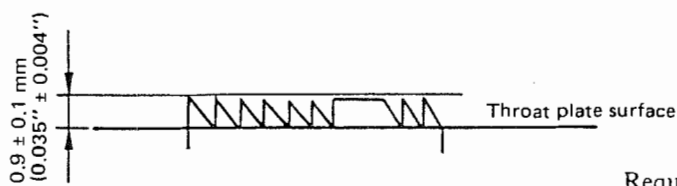


Fig. 16

Requirements;

- Stitch length: 0 mm
- A maximal projection of the feed dog teeth must be $0.9 (0.035") \pm 0.1 \text{ mm } (0.004")$ from the throat plate surface.

How to Adjust

1. Loosen screws ① and ② to set free the feed eccentric cam.
2. Match the timing mark on the feed eccentric cam with that on the hook driving shaft.
Tighten two screws ① and ②.

- (Caution)**
- When aligning the timing marks, look through both marks straight toward the axis of the shaft and carefully fix the eccentric cam.
 - When tightening the screws, set the eccentric cam properly in the direction of the axis of the hook driving shaft, in order to avoid extra load when revolving.

Results of Improper Adjustment

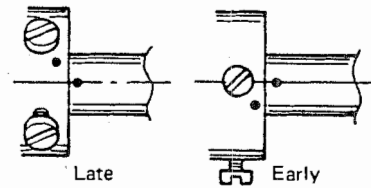


Fig. 15

If the timing is too early;

- Loose stitches may be formed.

If the timing is too late;

- Loose stitches may be formed.
- * Thread trimming failure may occur.

1. Set the stitch length to 0 mm.
2. Turn the handwheel until the feed dog has risen at maximum from the throat plate surface.
3. Loosen screw ① and adjust the height of the feed bar slide fork so that the feed dog teeth projects $0.9 (0.035") \pm 0.1 \text{ mm } (0.004")$ from the throat plate surface.

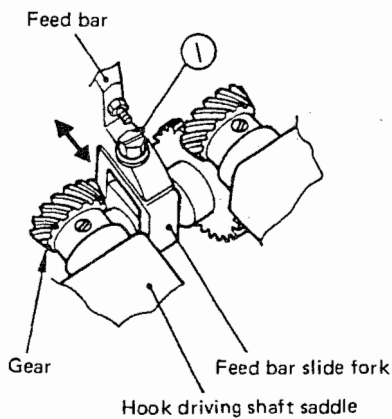


Fig. 17

If the feed dog is too high;

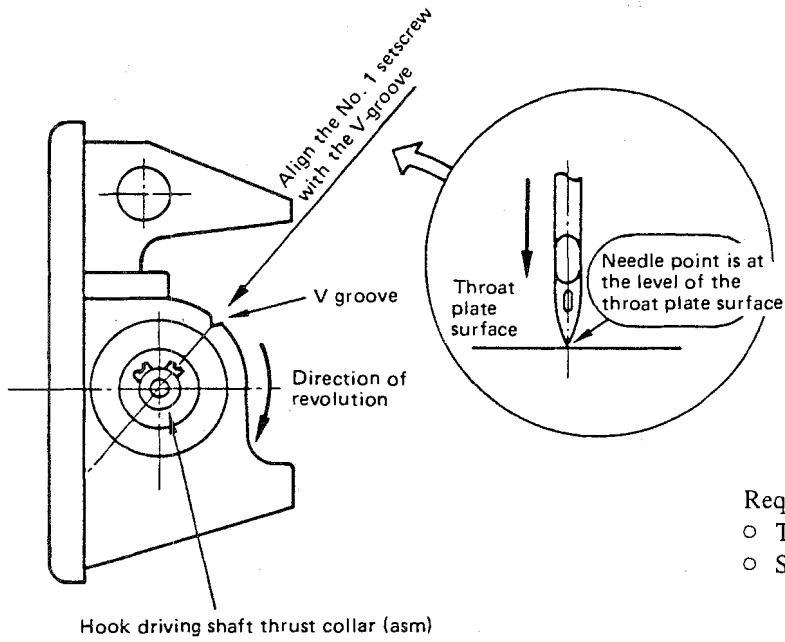
- The stitch length becomes longer than the one set by the stitch dial.
- The feed dog may hit the throat plate.
- The thread trimmer may fail to catch the right needle thread at the time of thread trimming.

If the feed dog is too low;

- The stitch length becomes smaller than the one set by the stitch dial.
- * The moving knife hits the feed dog while the thread trimmer is working.
- * Thread trimming failure may occur.

Adjustment Standard

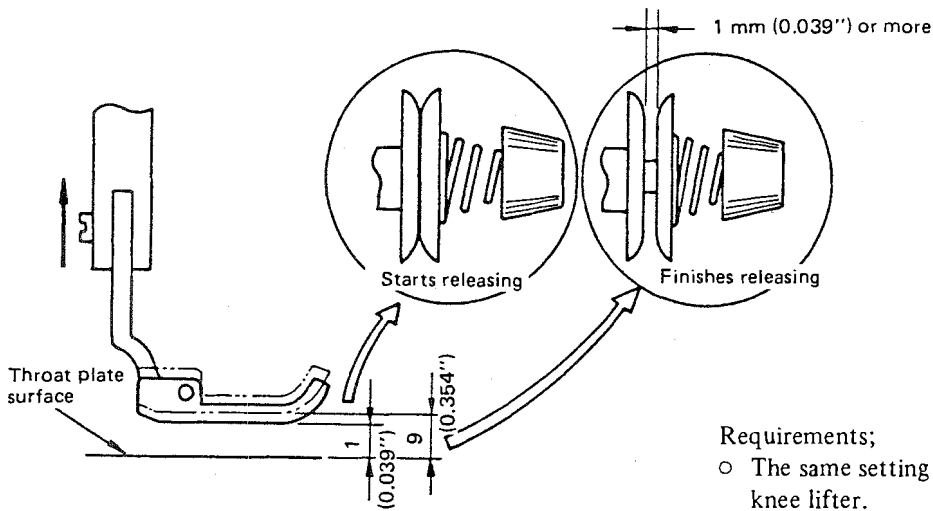
(7) Relation between the main shaft and the hook driving shaft



- Requirements;
- The needle to be lowered.
 - Stitch length: 0 mm

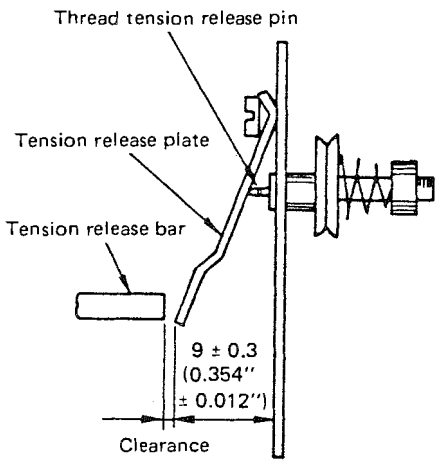
Fig. 18

(8) Timing to release thread tension



- Requirements;
- The same setting for the hand lifter and knee lifter.

Fig. 19

How to Adjust	Results of Improper Adjustment
<ol style="list-style-type: none"> 1. Set the stitch length to 0 mm. 2. Disengage the timing belt from the sprocket wheel of the hook driving shaft. 3. Turn the handwheel toward you until the needle point has come down at the level of the throat plate surface. (At this time, the top face of the feed dog should be about 0.4 mm (0.016") below the throat plate surface.) 4. Turn the hook driving shaft toward you to align the No. 1 setscrew of its thrust collar with the V groove on the machine bed. 5. Mesh the timing belt with the sprocket wheel on the hook driving shaft and let them firmly engage with each other by turning the handwheel. 	<ul style="list-style-type: none"> ○ If the timing of the hook driving shaft to the main shaft is incorrect, loose stitches may be formed.
<p>When the presser foot has risen 9 mm (0.354") above the throat plate, and the clearance between the thread tension discs is 1 mm (0.039") or less;</p> <ol style="list-style-type: none"> 1. Check whether or not the thread tension release plate is distanced 9 ± 0.3 mm ($0.354" \pm 0.012"$) from its mounting base. 2. If the distance is smaller than 9 ± 0.3 mm, ($0.354 \pm 0.012"$) replace the thread tension release pin to meet the requirement. <p>Thread tension release pin Left: B3127051000 Right: B3127527000</p> <ol style="list-style-type: none"> 3. After replacement, confirm that a clearance is left between the tension release plate and the tension release bar.  <p style="text-align: center;">Fig. 20</p>	<p>If the clearance between the thread tension discs is too small;</p> <ul style="list-style-type: none"> ○ Thread does not pass smoothly through the thread tension controller. <p>If the clearance between the thread tension discs is too large;</p> <ul style="list-style-type: none"> ○ Loops of thread are produced on the fabric while a corner is being stitched <p>★ If the proper clearance shown in Fig. 20 is not provided, the tension discs will be released, which may cause loose starting stitches after thread trimming or may cause the needle thread to wind round the hook.</p>

Adjustment Standard

(9) Lubrication

1) How to judge the lubrication of the components in the face plate:

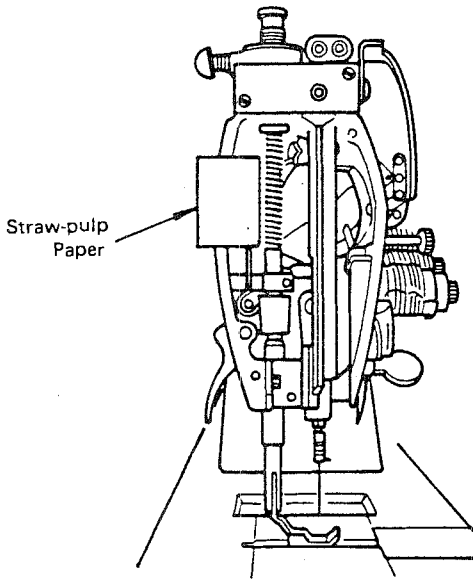
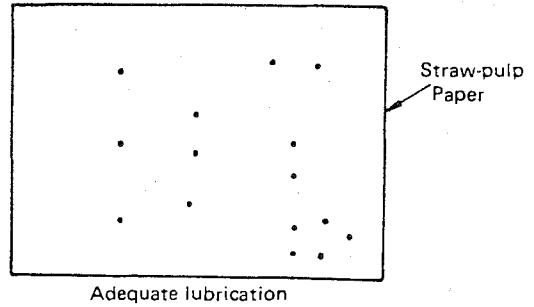


Fig. 21



Requirements;

- Sewing speed: 2,300 s.p.m.
- 5 sec. on and 5 sec. off for 2 min.

2) How to judge the lubrication of the hooks:

Requirements;

- Sewing speed: 2,300 s.p.m.
- Let the machine idle for 30 seconds and hold a piece of paper 10 mm (0.39") away from the side face of the hook, and the oil lines will be drawn on the paper in 5 seconds if both hooks are properly lubricated.

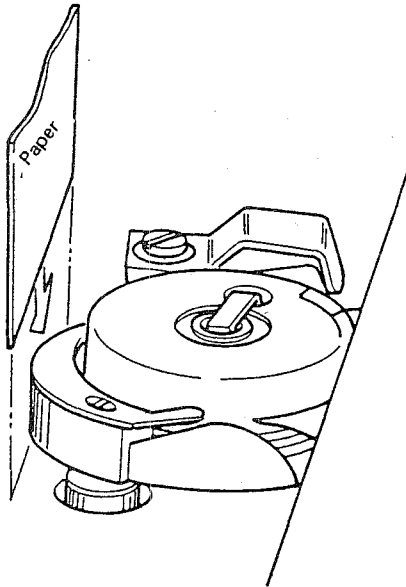
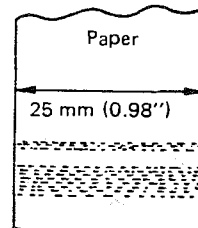


Fig. 23



How to Adjust

Oil flow adjustment for the face plate components:
Loosen the oil adjusting screw locknut shown in Fig. 22, and turn the oil adjusting screw either clockwise or counterclockwise for an optimum oil amount. (The components beyond the thread take-up support shaft is lubricated by oil wick, and the amount of lubricating oil is adjusted merely by the stiffness of the oil wick. As the oil wick is made stiffer, the amount of the lubricating of decreases, and vice versa.)

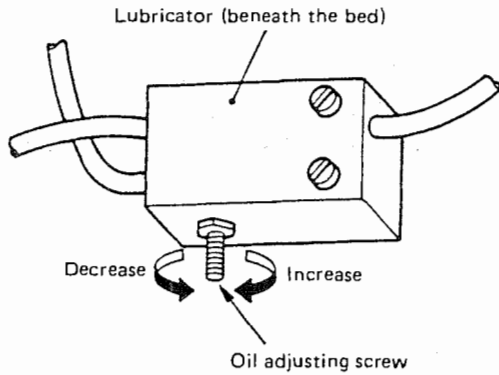


Fig. 22

Results of Improper Adjustment

- If the oil amount is too small, the needle bar crank rod or the neighboring parts may seize while running.
If the oil amount is too much, oil leakage may occur.

Oil flow adjustment for the hook:
A maximal amount of oil is fed to the hook when oil adjusting screw ② (Fig. 24) is fully tightened.

1. Loosen oil adjusting screw locknut ①.
2. Turn oil adjusting screw ② for an optimum oil amount and tighten locknut ①.

(Caution) Don't tighten locknut ① too much, or it may break the thread of oil adjusting screw ②.

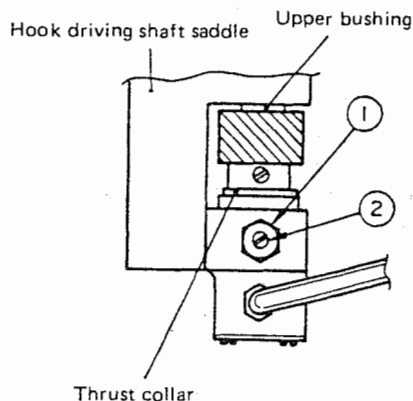


Fig. 24

- If the oil amount is too small, loose stitches may be formed or the hook may wear or seize.
- If the oil amount is too much, the sewing thread and cloth may be stained with surplus oil.

Adjustment Standard

(10) Sway of the needles

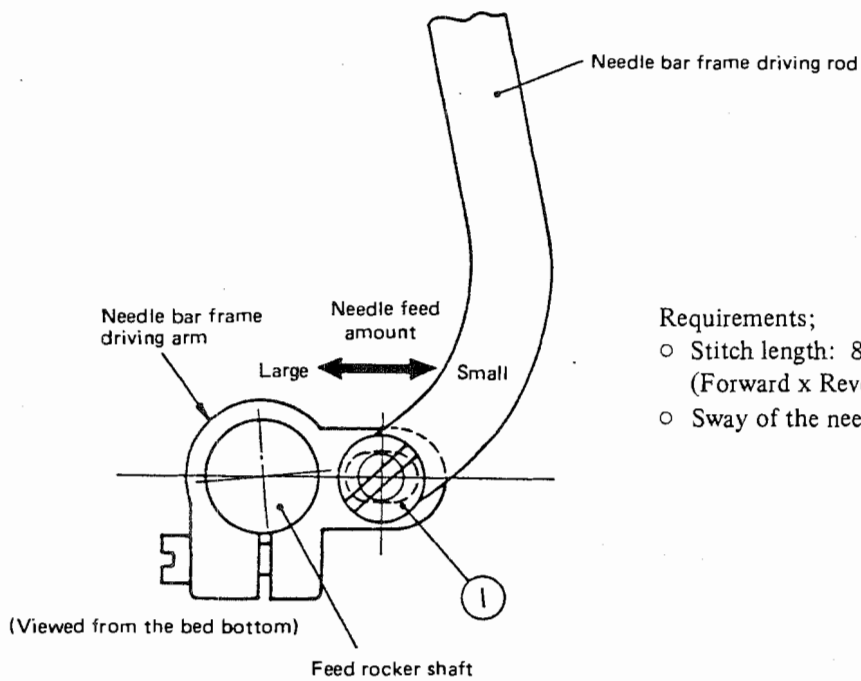


Fig. 25

Requirements;

- Stitch length: 8 x 4 mm (0.314" x 0.157") (Forward x Reverse stitching)
- Sway of the needle must be reduced to minimum

(11) Stitch length in the forward and reverse feed

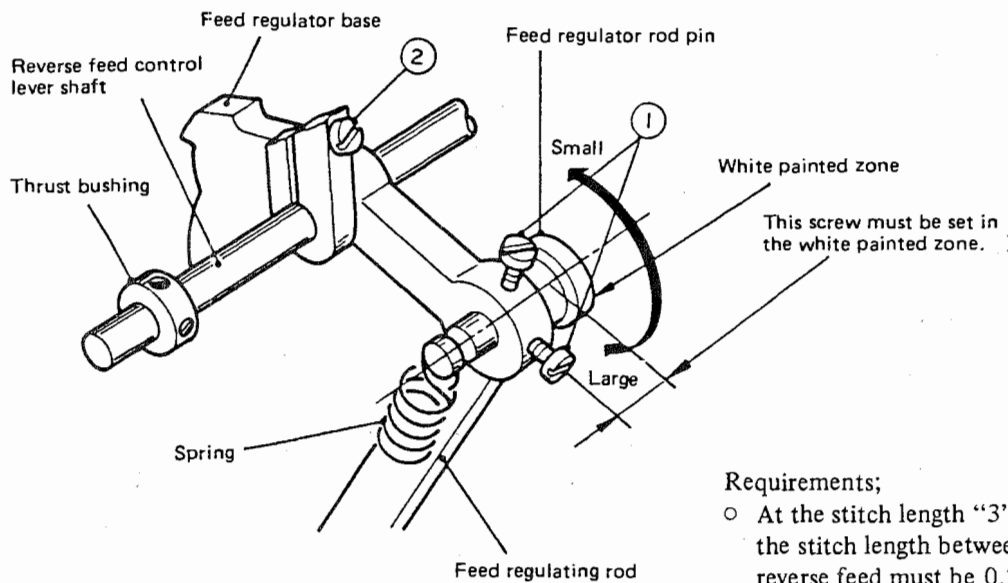


Fig. 26

Requirements;

- At the stitch length "3", the difference in the stitch length between the forward and reverse feed must be 0.2 mm (0.008") or less.

How to Adjust	Results of Improper Adjustment
<p>1. Set the stitch dial to the maximum.</p> <p>2. Loosen screw ① shown in Fig. 25, and move the needle bar frame driving rod to make adjustment.</p> <p>3. Tighten screw ①, and turn the handwheel by hand to check the sway of the needles. Position the needle bar frame driving rod so that the needle sway is minimized. Then fix the rod to the needle bar frame driving arm.</p> <p>(Note) 1) After this adjustment, the position of the needle center with respect to the needle feed slots must be readjusted.</p> <p>2) The specified distance (14.2 (0.559") ± 0.1 (0.04")) mm between the presser bar and needle bar is also disturbed in making the above adjustment. Readjust the distance.</p>	<ul style="list-style-type: none"> ○ Needle breaking may occur. ○ Stitch skipping may occur.
<p>1. Loosen screws ① which fix the feed regulator base.</p> <p>2. Turn the feed regulator rod pin in the direction of the arrow to make adjustment. Tighten screws ①.</p>	<ul style="list-style-type: none"> ○ It is not adjusted properly, the stitch length of the reverse feed differs from the forward feed.

3. ADJUSTMENT STANDARD FOR THE ATTACHMENTS

Adjustment Standard

(1) Thread trimmer

1) Height of the moving knife

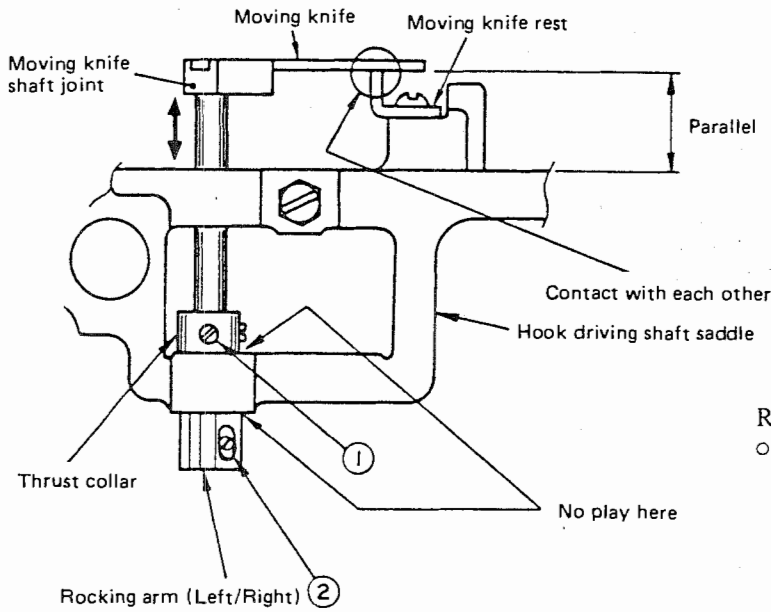


Fig. 27

Requirements;

- With the fixed knife removed, the moving knife must be in contact with the moving knife rest and must be parallel to the upper face of the hook driving shaft saddle.

2) Initial position of the moving knife

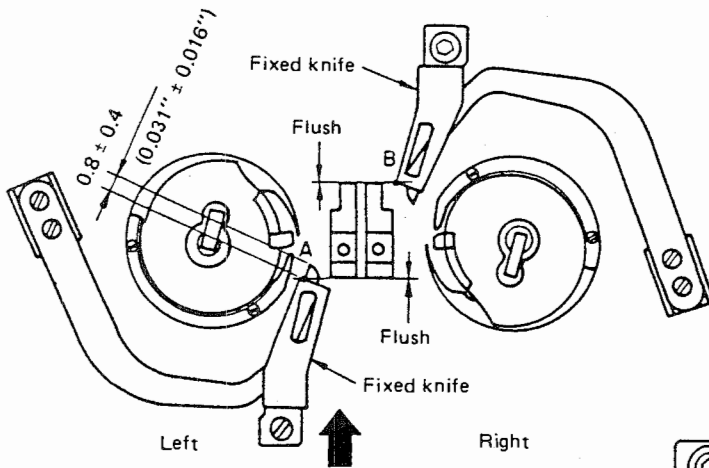


Fig. 28

The feed dog end surfaces should be flush with A and B of the fixed knives.

(Note) Position the fixed knives first and then the moving knives.

Requirements;

1. Stitch length: 0 mm (Needle bar at the lowest point).
2. Distance between the needle bar and presser bar: 14.2 ± 0.1 mm ($0.559'' \pm 0.004''$) (at 52.7 mm (2.075'') above the throat plate surface).
3. Needle center meets the center of each needle feed slot.

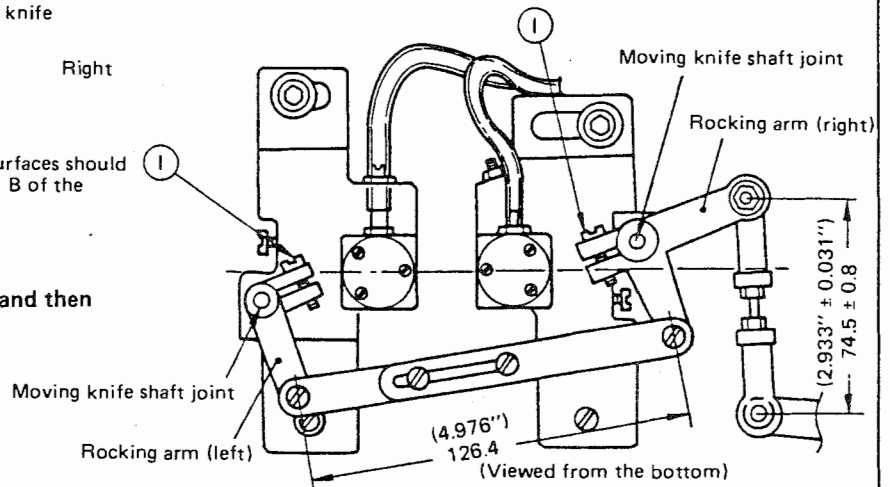


Fig. 29

How to Adjust

1. Remove the fixed knife from the hook shaft saddle.
2. Loosen two screws ① to release the thrust collar from the moving knife shaft.
3. Loosen screw ② to release the rocking arm.
4. Move the moving knife shaft joint up and down to bring the moving knife rest. Tighten screws.

(Caution) When you fix the thrust collar and rocking arm to the moving knife shaft, take care not to leave any clearance at the hook driving shaft saddle.

Results of Improper Adjustment

- If the moving knife is lower than the top end of the moving knife rest;
- The moving knife hits the moving knife rest when it works, If it is too low, it may lock up the thread trimming mechanism.
 - The thread trimmer fails to sharply cut the thread.
 - The thread trimmer fails to cut the thread (thread trimmer fails to catch the thread).

- If the moving knife is higher than the top end of the moving knife rest;
- The thread trimmer fails to sharply cut the thread.
 - The thread trimmer fails to catch the thread.

1. Loosen screws ① to release rocking arm (Fig. 29).
2. Adjust the position of the moving knife to the moving knife rest.
3. After the adjustment, push the pushing plate in the direction of the arrow in Fig. 30 and turn the handwheel toward you to check that the requirements have been met. (Repeat this procedure several times to make sure.)

(Caution) When tightening screw ① to fix the rocking arm, make sure that there is no clearance at the surface of the hook driving shaft saddle.

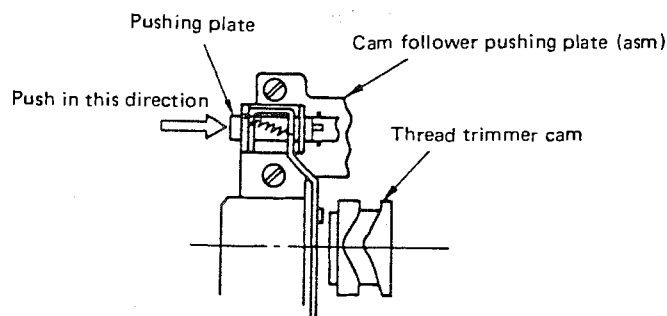
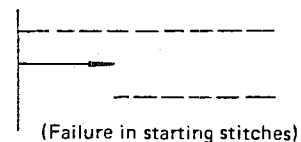


Fig. 30

- If the moving knife juts out too much from the fixed knife;
- Thread trimming failure may occur.
 - The thread trimmer may fail to catch the thread.

- If the moving knife juts out too little from the fixed knife;
- The thread trimmer may fail to catch the thread.
 - The machine may fail in making some starting stitches as illustrated below;



* If bobbin thread catching failures occur when the feed dog has been replaced (especially when the feed dog with a round hole has been replaced by one with a slot), readjust the position of the moving and fixed knives (decrease the dimension 0.8 ± 0.4 ($0.031'' \pm 0.016''$))

Adjustment Standard

3) Position of the thread presser

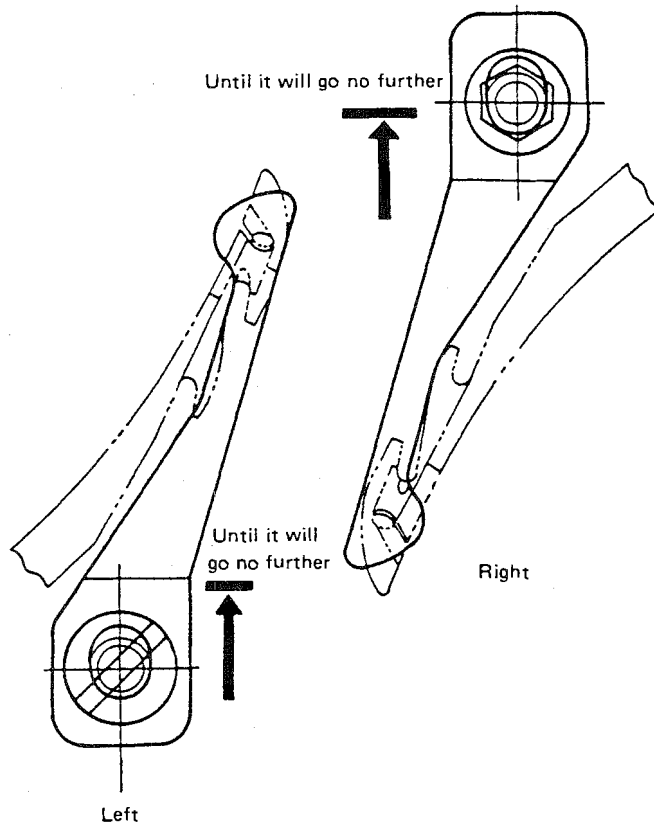


Fig. 31

4) Clamping pressure

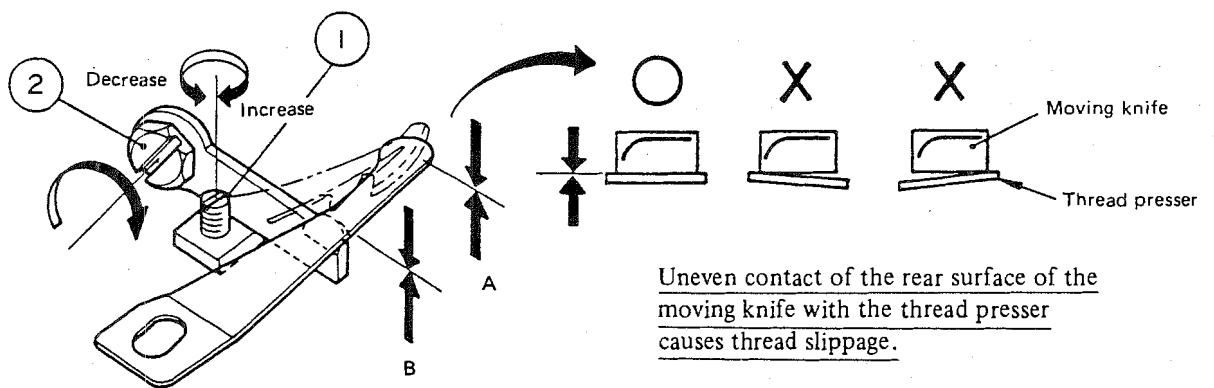
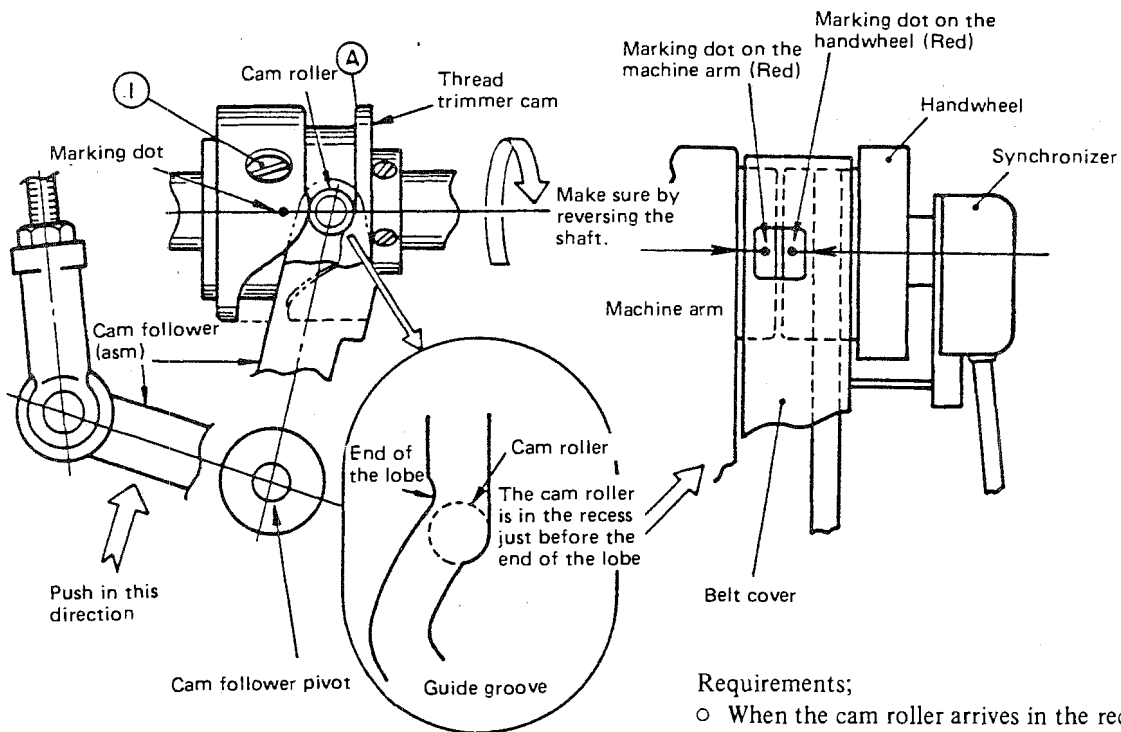


Fig. 32

How to Adjust	Results of Improper Adjustment
<p>1. Loosen the setscrews of the fixed knife (Fig. 28)</p> <p>2. Move the right and left thread pressers in the same direction until they will go no further as shown in Fig. 31. Then retighten the setscrews of the fixed knives.</p> <p>(Note) The fixed knives may be moved while making this adjustment.</p>	<ul style="list-style-type: none"> ○ The machine may fail in making some starting stitches. ○ When a thick thread is used, it may be entangled with the hook, causing the mechanism to lock.
<p>1. The rear surfaces of the moving knives are in contact with the thread pressers when the thread presser, moving knives, and fixed knives are installed.</p> <p>2. Under the above conditions, bring the thread presser adjusting fixtures in contact with the thread pressers. To do this, loosen screw ②, and turn screw ① to make adjustment. After adjustment, tighten screw ②.</p> <p>If threads are not clamped even after the above adjustment is made;</p> <p>1) Loosen screw ②, and turn screw ① to adjust the clamping pressure. After adjustment, tighten screw ②.</p>	<p>If the thread presser clamping pressure is inadequate;</p> <ul style="list-style-type: none"> ○ Starting stitches are skipped when a thick thread has been replaced by a thin thread. <p>If the thread clamping pressure is too high;</p> <ul style="list-style-type: none"> ○ Several starting stitches are skipped.

Adjustment Standard

5) Timing of thread trimming action



Requirements;

- When the cam roller arrives in the recess of the guide groove just before the end of the lobe, the marker dot on the machine arm aligns with the red or yellow marker dot on the hand wheel.

Fig. 33

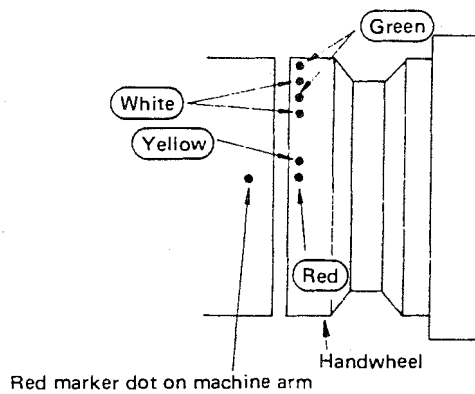


Fig. 34

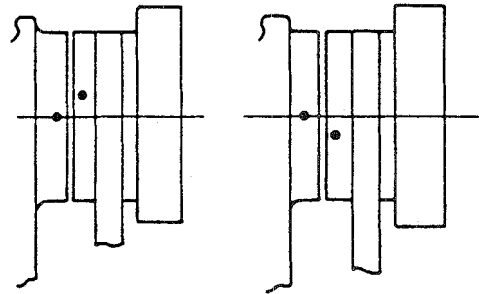
(Note) The thread trimming timing and the stop position depend on the adjustment of the hook timing. Perform adjustment in accordance with the following table.

Hook timing	Handwheel marker dots vs. Machine arm marker dot	
	Thread trimming timing	Stop position
2.6 mm (0.102") or less	Dot on arm aligns with red dot on handwheel.	Dot on arm is located between two white dots on handwheel.
2.6 mm ~ 3.2 mm (0.102" ~ 0.126")	Dot on arm aligns with yellow dot on handwheel	Dot on arm is located between two green dots on handwheel.

How to Adjust

1. Loosen two screws ① to release the thread trimmer cam.
2. Match the marking dot (red) on the handwheel with that (red) on the machine arm.
3. Put the cam roller of the cam follower (asm) in the guide groove of the thread trimmer cam (push the cam follower in the axial direction of the cam follower shaft).
4. Turn by hand the thread trimmer cam until the cam roller arrives in the recess of the guide groove just before the end of the lobe and fix the cam.
When tightening the two screws, hold the roller pressing against the side ② of the guide groove.

Results of Improper Adjustment



Early timing

Late timing

If the timing is too early;

- The thread slips from the needle eye.
- The thread trimmer may fail in cutting right or left, needle or bobbin thread.
- The right needle thread may not be caught at the time of thread trimming when cotton thread is used.

If the timing is too late;

- The wiper hits the needle
- The thread trimmer malfunctions.

Adjustment Standard

6) Position of the thread trimmer cam

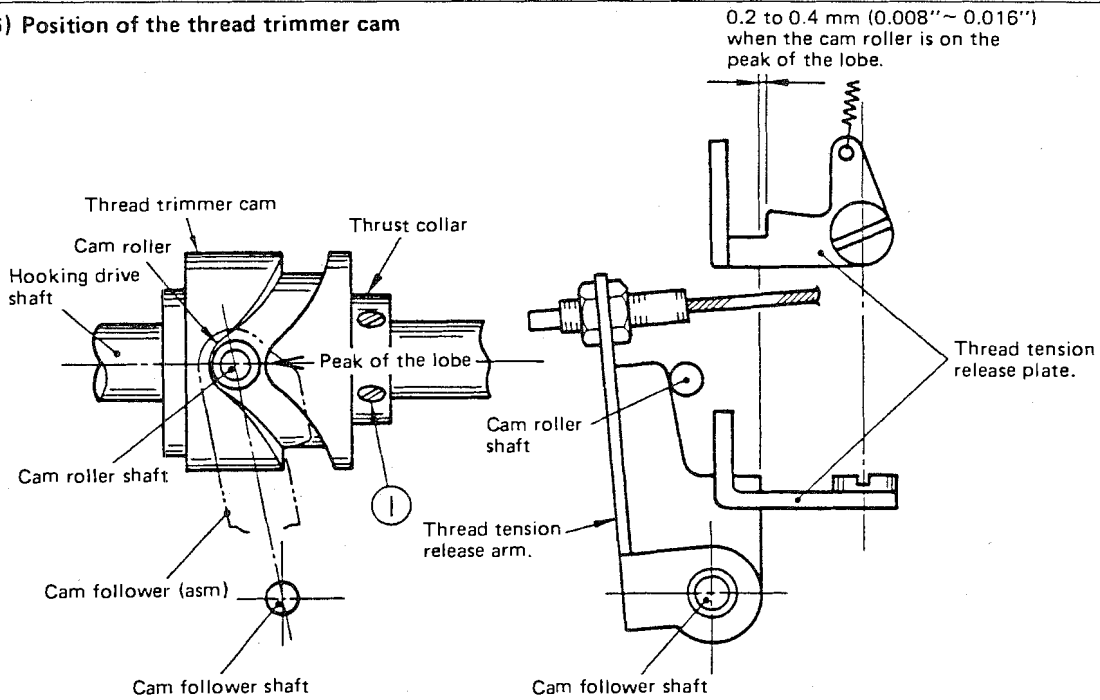


Fig. 35

Requirements;

- When the cam roller reaches the peak of the lobe of the thread trimmer cam;
- The cam roller shaft must touch the thread tension release arm and that there must be a 0.2 to 0.4 mm (0.008" to 0.016") clearance between the thread tension release arm and the thread tension release plate.

7) Position of the trimmer cam driving mechanism

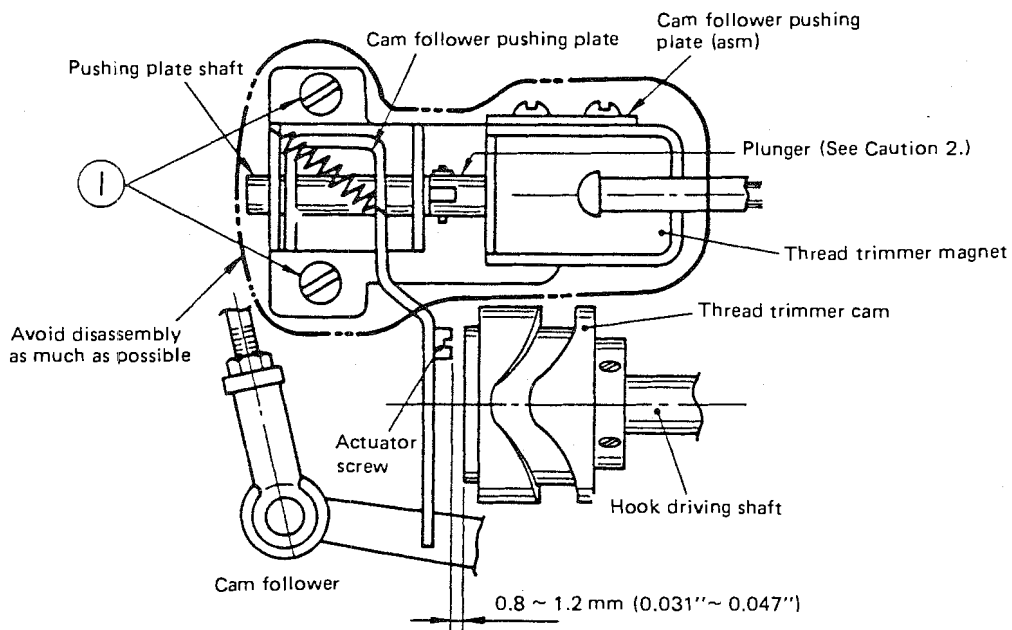


Fig. 36

Requirements;

- When the thread trimmer magnet is "off".
- There must be a 0.8 to 1.2 mm (0.031" to 0.047") clearance between the left end face of the thread trimmer cam and the top end of the actuator screw head.

How to Adjust	Results of Improper Adjustment
<ol style="list-style-type: none"> 1. Loosen two screws to release the thread trimmer cam from the hook driving shaft. 2. Loosen screws ① to release the thrust collar. 3. Put the cam roller in the guide groove on the thread trimmer cam (push the cam follower (asm) in the direction of the axis of the cam follower shaft). 4. Turn the cam until the cam roller arrives the peak of the lobe. (By so doing, the cam roller shaft moves the thread tension release arm causing the thread tension release plate to latch the arm.) 5. Move the thread trimmer cam in the axial direction of the hook driving shaft in the way that the clearance between the thread tension release arm and the thread tension release plate becomes 0.2 to 0.4 mm (0.008" to 0.016") and fix the thrust collar. 6. Make sure once again the timing of the thread trimming action and fasten the thread trimmer cam to the hook driving shaft. 	<p>If the clearance is too great;</p> <ul style="list-style-type: none"> ○ The thread may slip from the needle eye. ○ The needle-up stop position becomes unstable causing the wiper to hit the needle. <p>If the clearance is too small;</p> <ul style="list-style-type: none"> ○ The thread may slip from the needle eye.
<ol style="list-style-type: none"> 1. Loosen screws ① to release the cam follower pushing plate (asm). 2. Provide a 0.8 to 1.2 mm (0.031" to 0.047") release between the actuator screw head and the end face of the thread trimmer cam. Tighten screws ① <p>(Caution) 1. When tightening screws ① make sure that the cam follower pushing plate is parallel to the end face of the thread trimmer cam.</p> <p>2. When replacing cam follower pushing plate (asm) components, assemble them so that the pushing plate shaft and plunger smoothly move axially at any point of 360 degree.</p>	<p>If the clearance is too great;</p> <ul style="list-style-type: none"> ○ Thread trimming failure may occur. <p>If the clearance is too small;</p> <ul style="list-style-type: none"> ○ The thread trimmer may be driven accidentally causing mechanical troubles.

Adjustment Standard

8) Clearance between the tension discs for releasing the thread

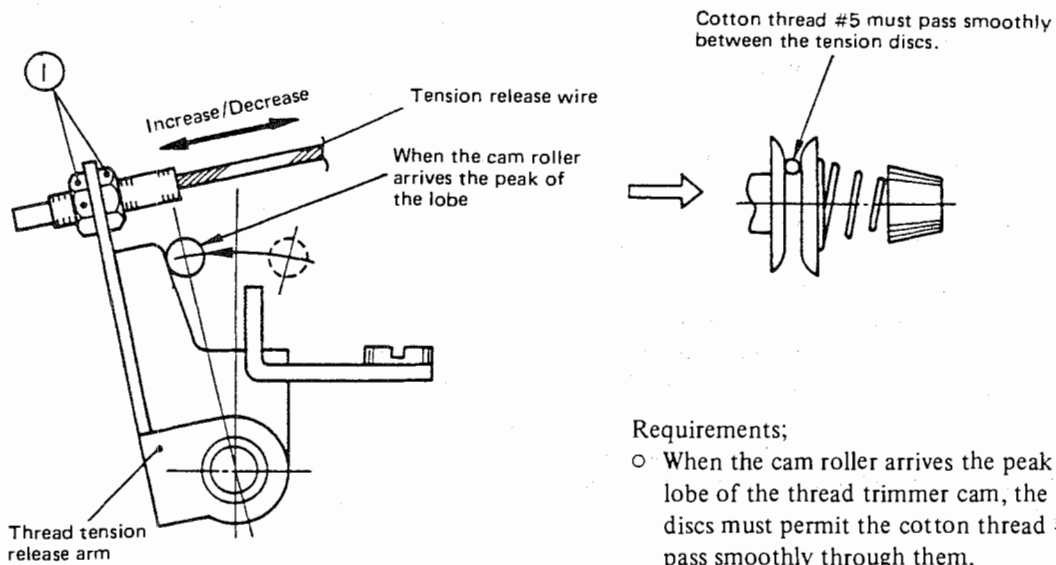


Fig. 37

Requirements;

- When the cam roller arrives the peak of the lobe of the thread trimmer cam, the tension discs must permit the cotton thread #5 to pass smoothly through them.

9) Position of the safeguard mechanism

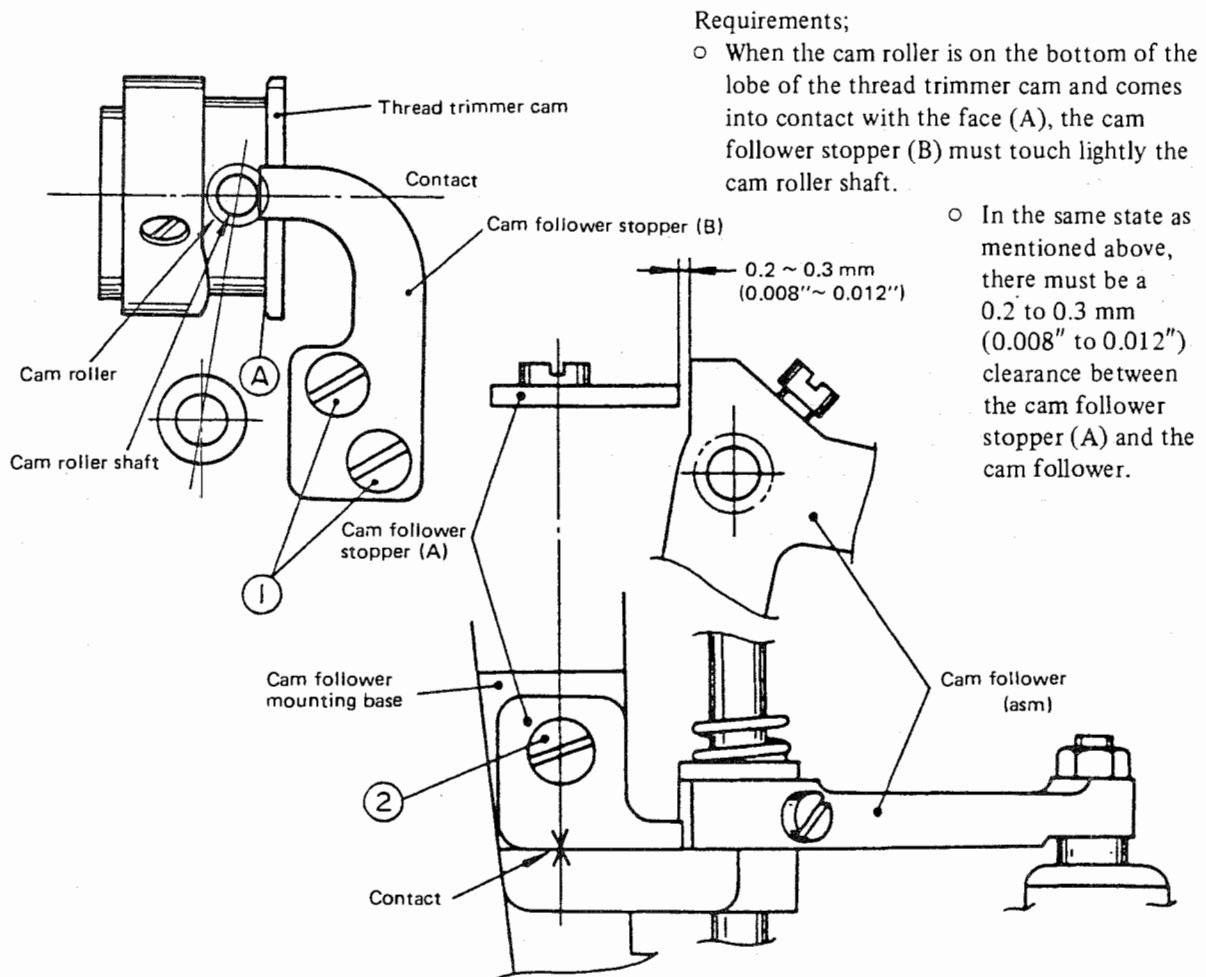
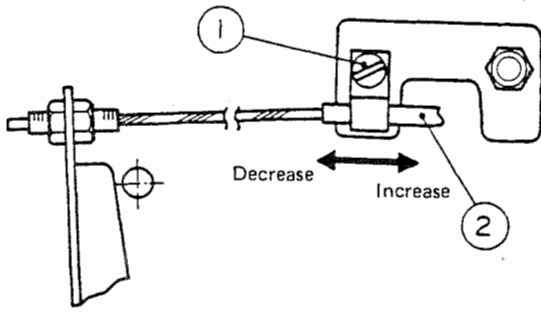


Fig. 39

Requirements;

- When the cam roller is on the bottom of the lobe of the thread trimmer cam and comes into contact with the face (A), the cam follower stopper (B) must touch lightly the cam roller shaft.
- In the same state as mentioned above, there must be a 0.2 to 0.3 mm (0.008" to 0.012") clearance between the cam follower stopper (A) and the cam follower.

How to Adjust	Results of Improper Adjustment
<p>1. Loosen nuts ① .</p> <p>2. Pull the thread tension release wire in either direction as illustrated and tighten nuts ① .</p> <p>If the above procedure fails to provide an adequate clearance between the discs, loosen screw ① shown below, and move flexible wire ② in either direction to make further adjustment of the disc clearance.</p>  <p>Fig. 38</p>	<p>If the clearance is too great;</p> <ul style="list-style-type: none"> ○ The thread trimmer cam seizes the cam follower causing mechanism troubles. <p>If the clearance is too small;</p> <ul style="list-style-type: none"> ○ The thread left on the needle after trimming becomes shorter. ○ The thread slips from the needle eye.
<p>Cam follower stopper (B)</p> <ol style="list-style-type: none"> 1. Loosen screws ① . 2. Turn the handwheel until the cam roller arrives the bottom of the lobe of the thread trimmer cam. 3. Tighten two screws ① in the way that the cam follower stopper (B) lightly touches cam roller shaft and, at the same time, the cam roller touches the face ④ of the thread trimmer cam. <p>Cam follower stopper (A)</p> <ol style="list-style-type: none"> 1. Loosen screw ② . 2. Provide a 0.2 to 0.3 mm (0.008" to 0.012") clearance between the cam follower and the cam follower stopper (A) when the cam follower (B) is in the above-mentioned state. 	<p>If the cam follower stopper (B) juts out too much;</p> <ul style="list-style-type: none"> ○ It causes a mechanical trouble. ○ The needle-up stop action becomes unstable causing the wiper to hit the needle. <p>If the cam follower stopper (B) does not touch the cam roller shaft;</p> <ul style="list-style-type: none"> ○ The bobbin thread is not clamped causing stitch failure at the start. ○ It causes a mechanical trouble. <p>If the clearance is too great;</p> <ul style="list-style-type: none"> ○ Thread trimming failure may occur. ○ It causes a mechanical trouble. <p>If the clearance is too small;</p> <ul style="list-style-type: none"> ○ The cam follower is not released from the thread trimmer cam, causing the thread trimmer to work at the start of sewing. It may break down the thread trimmer and cause other related troubles.

Adjustment Standard

(2) Wiper components

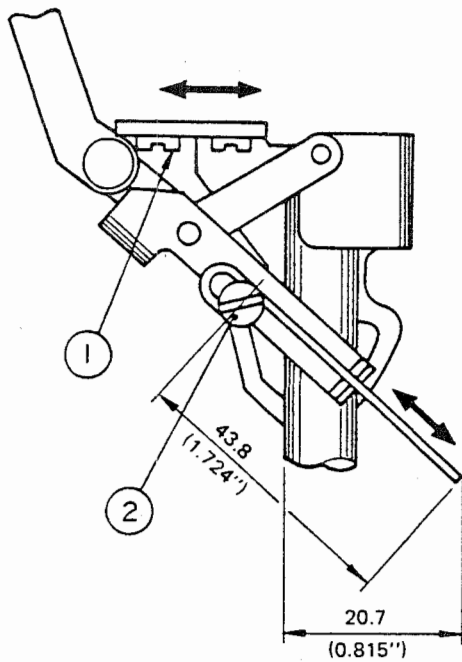


Fig. 40

Requirements;

- Position of wiper: 43.8 x 20.7 mm (1.724" x 0.815")

(3) Automatic reverse feed components

1) Stroke of the reverse feed magnet plunger

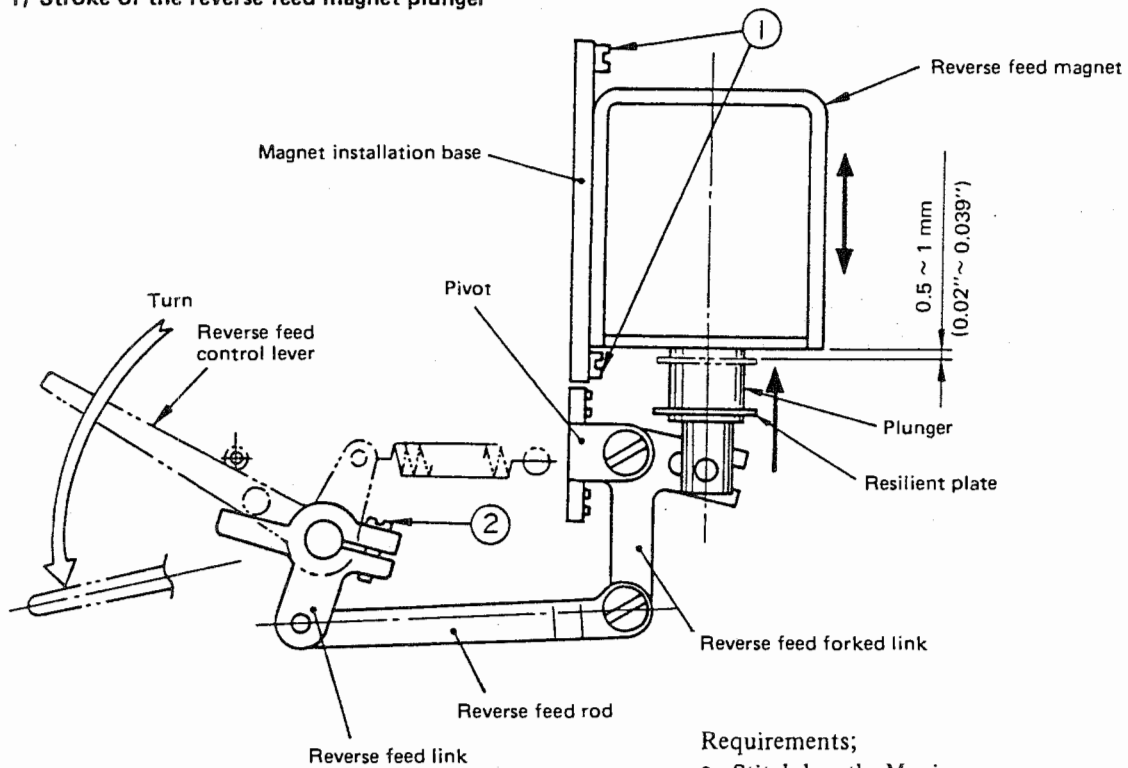


Fig. 41

Requirements;

- Stitch length: Maximum
- There must be a 0.5 to 1.0 mm (0.02" to 0.039") clearance between the bottom face of the magnet and the resilient plate attached to the plunger when the reverse control lever has been turned fully downwards.

How to Adjust	Results of Improper Adjustment
<ol style="list-style-type: none"> 1. Loosen two screws ①, and provide the specified distance 20.7 mm (0.815") as illustrated between the presser bar and the end of the wiper. Then tighten screws ①. 2. Loosen screw ②, and move the wiper in the arrowed directions to set the wiper length to 43.8 mm (1.724"). Tighten screw ②. 	<ul style="list-style-type: none"> ○ The wiper, if set longer than 43.8 mm (1.724"), strikes the needle clamp during machine operation. ○ If the distance between the presser bar and the end of the wiper is larger than 20.7 mm (0.815") the wiper strikes the needle clamp during machine operation. ○ If the distance between the presser bar and the end of the wiper is smaller than 20.7 mm (0.815"), the wiper may strike and break the needle when the wiper is actuated.
<ol style="list-style-type: none"> 1. Set the stitch length to the maximum. 2. Loosen screws ① to release the magnet installation base. 3. Turn the reverse feed control lever downwards as far as it will go and fix the reverse feed magnet installation base in the position where a 0.5 to 1.0 mm (0.02" to 0.039") clearance is provided between the bottom face of the magnet and the resilient plate attached to the plunger. 	<p>If the clearance is too great;</p> <ul style="list-style-type: none"> ○ The automatic reverse feed mechanism may fail to work due to insufficient stroke of the plunger. <p>If the clearance is too small;</p> <ul style="list-style-type: none"> ○ The stitch length in the reverse feed becomes smaller than the set stitch length.

4. DESCRIPTION OF THE THREAD TRIMMER COMPONENTS

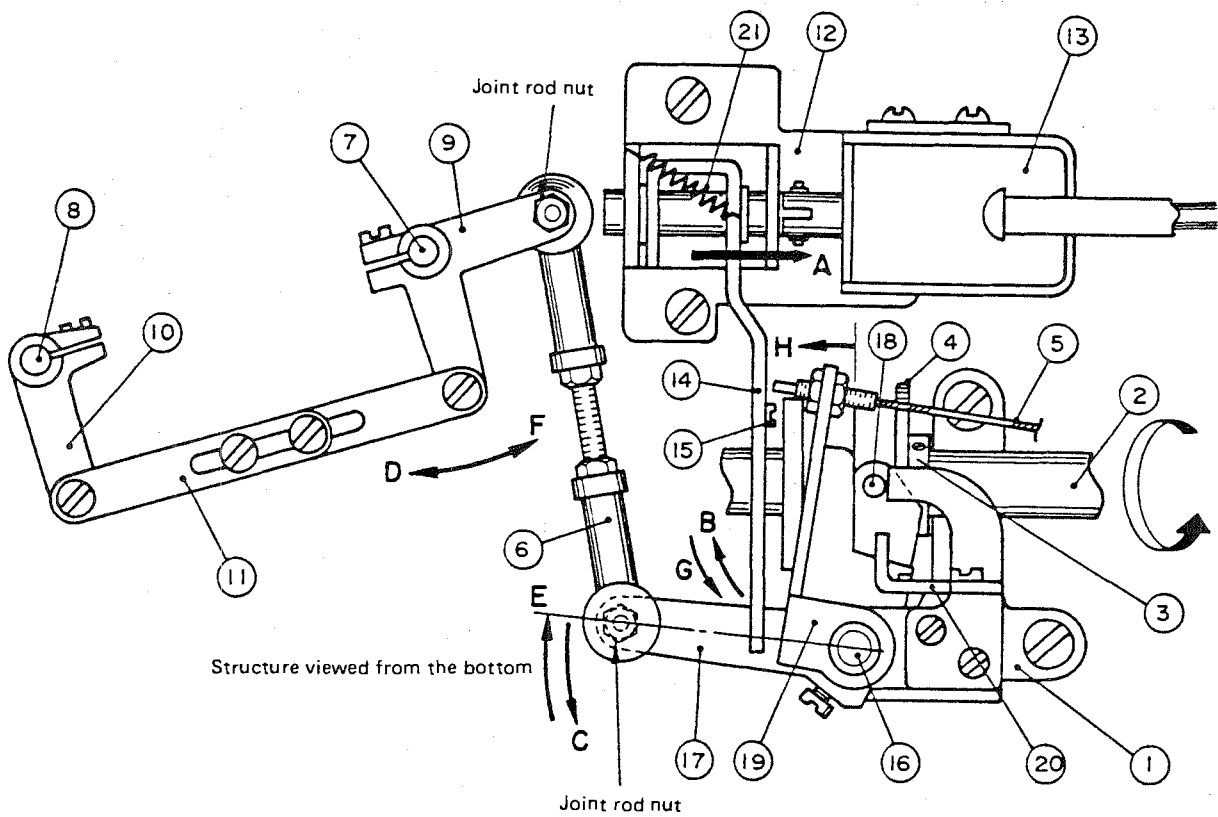


Fig. 42

Rotational angle (from the top dead center of the needle bar)	0°	90°	180°	270°	360°
Sensor signal (synchronizer)	(Needle "up")	32°	178°	(Needle "down")	
Clutch Cam follower pushing plate				55.8° (A)	
Cam roller engagement					
Moving knife	Cut at 30.5°		Failure if 44.8° or less		
Safeguard mechanism					
Clamp spring					
Thread tension release arm					
Needle "up" stop					
Timing of thread trimming (Marking dots on the arm and the handwheel meet each other)	31°				

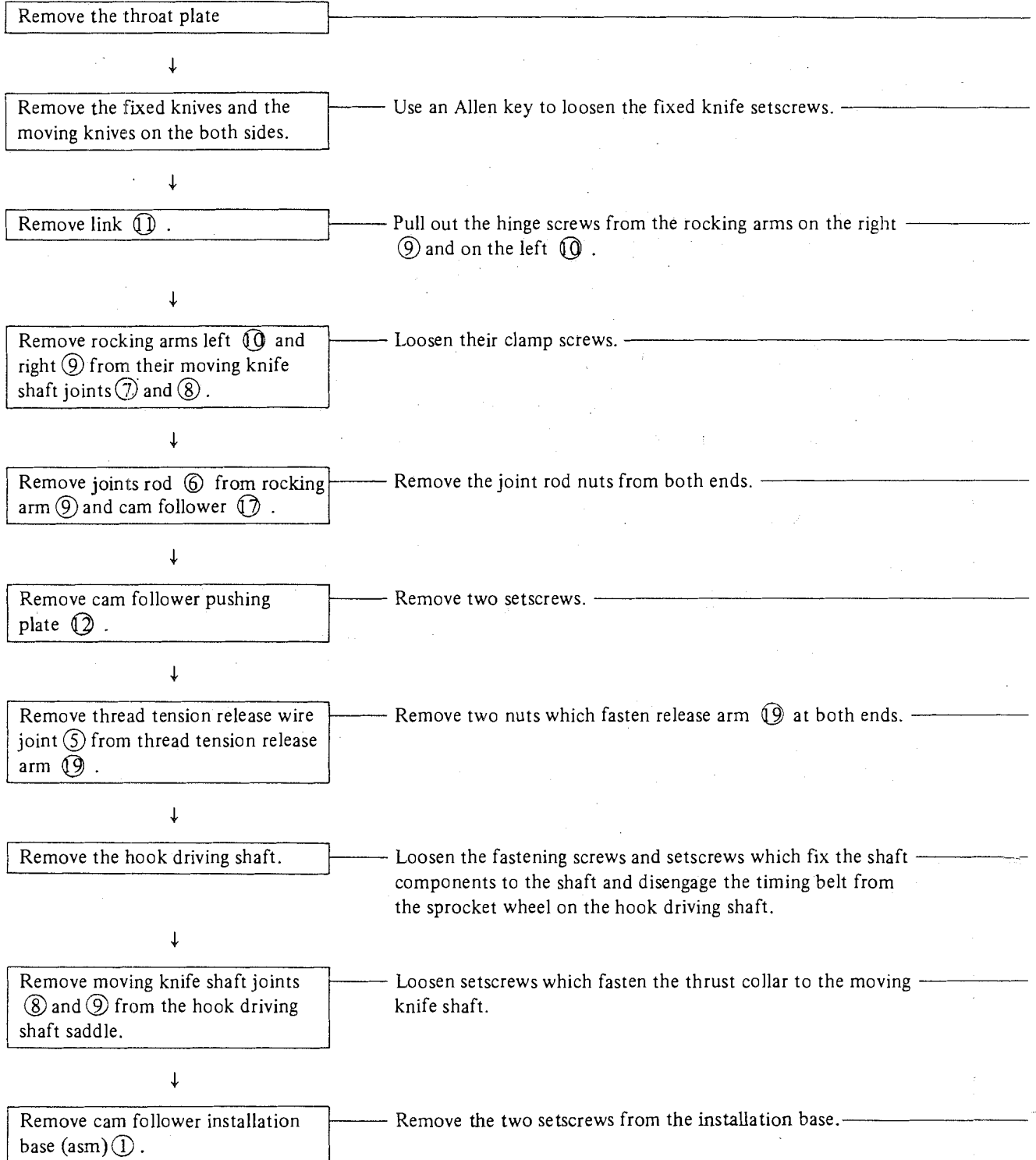
1. When current flows into thread trimmer magnet ⑬, the plunger is pulled in the direction of "A".
2. As the plunger is pulled, actuator screw ⑮ attached to cam follower pushing plate ⑭, which is fixed to the plunger, engages with the side face of thread trimmer cam ④.
3. Cam follower pushing plate ⑭ is turned in the direction "B" by the cam causing cam follower ⑰ to move in the axial direction of cam follower shaft ⑯. As a result, the cam roller of the cam follower engages with the guide groove on the thread trimmer cam.
4. Revolution of the hook driving shaft is transmitted via thread trimmer cam ④ to rock cam follower ⑰ in the direction "C".
5. Rocking motion of the cam follower is transmitted via joint rods ⑥, ⑨, ⑪ and ⑩ to drive moving knife shafts ⑦ and ⑧ in the direction "D".
6. At this moment, cam roller shaft ⑱ moves thread tension release arm ⑲ in the direction "H". As a result, tension release arm ⑲ is locked up by tension release plate ⑳ at the front end of the guide groove on the thread trimmer cam.
7. When cam roller ④ arrives at the rear end of the guide groove on the thread trimmer cam, cam follower ⑰ and moving knife shafts ⑦ and ⑧ move in the directions "E" and "F", respectively.
8. When the cam roller arrives at the rear end of thread trimmer cam ④, cam follower pushing plate ⑭ is turned in the direction "G". At the same time, the thread trimmer magnet is switched off permitting spring ㉑ to pull back cam follower pushing plate ⑭.
9. When cam follower pushing plate ⑭ goes back to its original position, cam follower ⑰ is pushed back to its original position by a force of spring in the axial direction of cam follower shaft ⑯.
10. At the same time, thread tension release plate ㉑ is pushed up and unlocks thread tension release arm ⑲ causing the tension discs to close for the next sewing cycle.

THREAD TRIMMER COMPONENTS

Ref. No.	Part No.	Description	Ref. No.	Part No.	Description
①	10116663	Cam follower installation base (asm) (B)	⑫	10117851	Cam follower pushing plate (asm)
②	10108504	Hook driving shaft	⑬	10117604	Thread trimmer magnet
③	CS1470710SH	Thrust collar	⑭	10117802	Cam follower pushing plate
④	10117307	Thread trimmer cam	⑮	10118305	Actuator screw
⑤	10123057	Thread tension release wire joint	⑯	10116804	Cam follower shaft
⑥	10116507	Joint rod	⑰	10116754	Cam follower (asm)
⑦	10116051	Moving knife shaft joint	⑱	D2428555B00A	Cam roller shaft
⑧	10116051	Moving knife shaft joint	⑲	10117000	Thread tension release arm
⑨	10116309	Rocking arm (right)	⑳	10117208	Thread tension release plate
⑩	10116200	Rocking arm (left)	㉑	B2037372000	Spring
⑪	10116457	Link (asm)			

5. HOW TO DISASSEMBLE AND RE-ASSEMBLE THE THREAD TRIMMER UNIT

DISASSEMBLE PROCEDURES (See Fig. 42 and Parts Book.)



NOTES ON RE-ASSEMBLING

Make sure that the bobbin case stopper rests in the recess of the throat plate.

See Fig. 28 of 3-(1)-2).

The effective length of the link (asm) (center-to-center of connection holes)
(See Fig. 29.)

See 3-(1)-1). (See Fig. 27)

Set the length of joint rod ⑥ 74.5 ± 0.8 mm ($2.933'' \pm 0.031''$) between
the centers of the nuts which fix the rod at both to ⑨ and ⑰ .
(See Fig. 29)

See 3-(1)-7).

See 3-(1)-8).

See 3-(1)-5), -6), and -9).

See 3-(1)-1).

Align the center of the screws.

6. HOW TO INSTALL THE WIPER

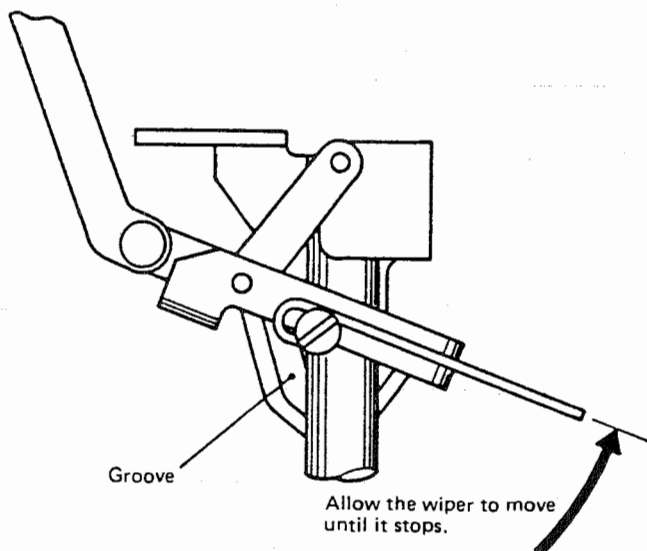
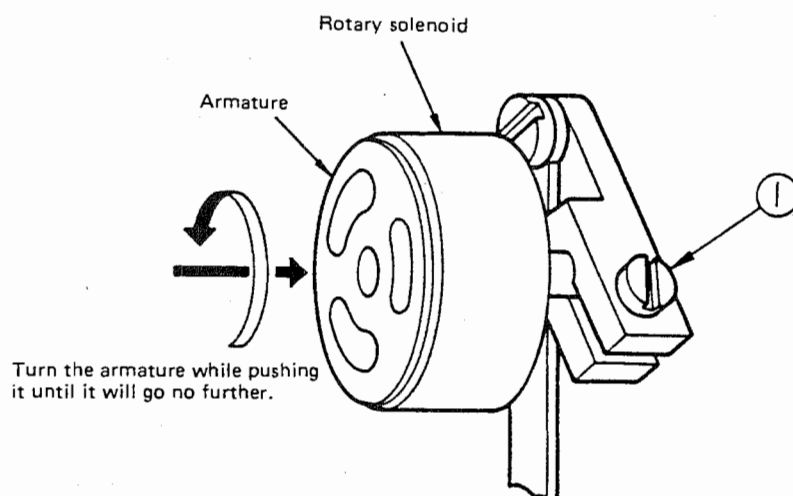


Fig. 43

HOW TO ADJUST

1. Allow the wiper to move until it stops.
2. Turn the armature of the rotary solenoid in the arrowed direction while pushing it until it will go no further, and then tighten screw ① .

NOTES ON RE-ASSEMBLING

7. HOW TO REPLACE THE TIMING BELT

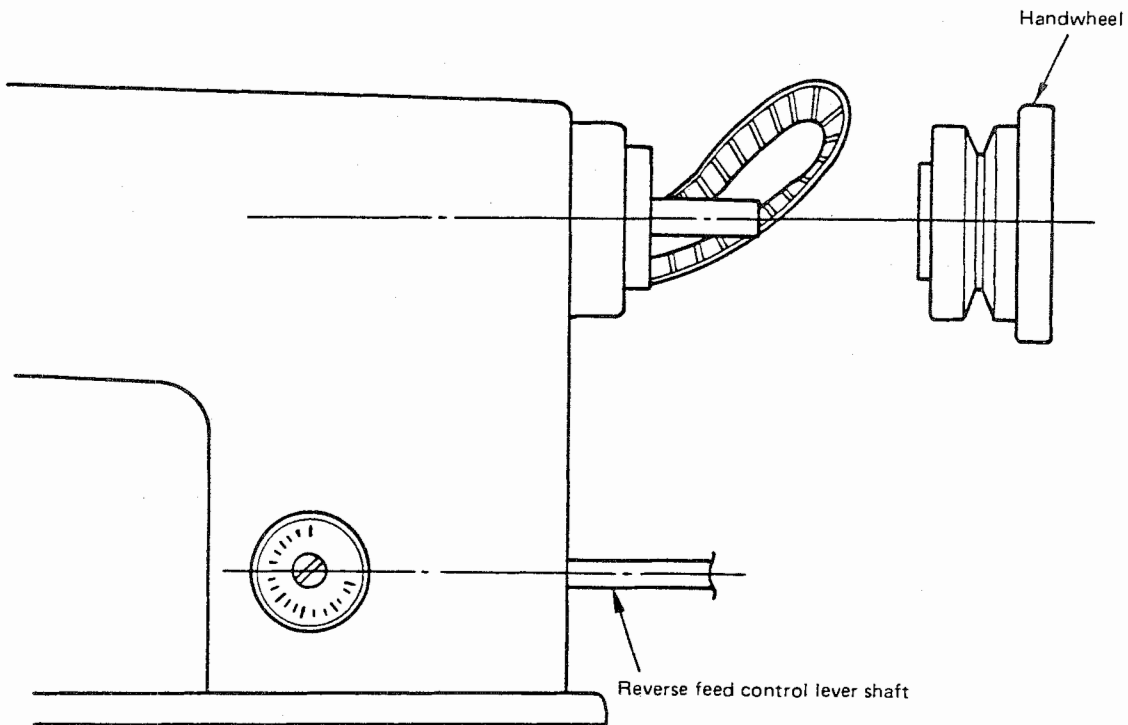


Fig. 44

8. HOW TO REMOVE THE NEEDLE BAR FRAME DRIVE BASE

- ① Remove the hand lifter and face plate.
- ② Remove cover (A) of needle stop changer base (B), and draw (B) out of the presser bar upper bushing.
- ③ Remove needle bar frame drive base guide (C).
- ④ Remove setscrews (1) to remove the needle bar frame drive shaft base.

(Note 1) The needle bar frame drive shaft base is fixed to the machine arm by two paper pins.

The needle bar frame drive base is attached to the needle bar frame drive shaft base, so use great care when removing the shaft base.

Removal of the needle bar frame drive base can be done more easily by removing the needles.

(Note 2) The needle bar frame drive base can be removed easily by driving a wedge with long blade into the clearance between the machine arm and needle bar frame drive base as shown below.

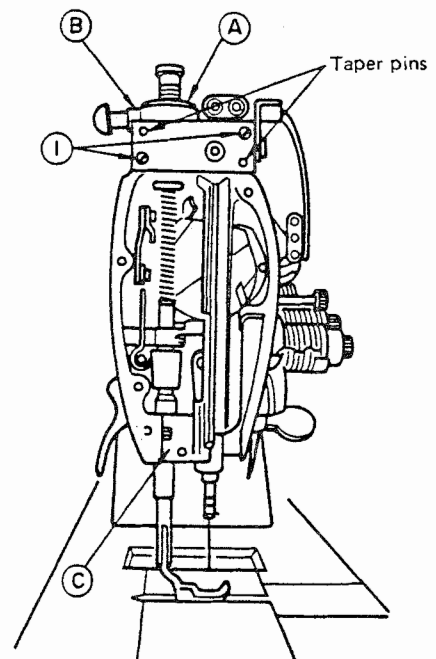
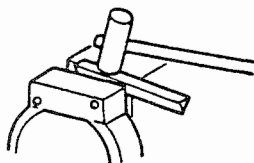


Fig. 45



HOW TO REPLACE

1. Remove the belt cover and the belt.
 2. Take the synchronizer from the handwheel.
 3. Loosen two setscrews and pull out by hand the handwheel.
- (Caution) Don't use hammer to pull out the handwheel.**
4. Set the stitch length to the maximum.
 5. Disconnect the tension spring from the feed regulating pin.
 6. Loosen the fastening screw of the feed regulating arm.
 7. Disconnect the reverse feed rod from the reverse feed forked link, and remove the reverse feed link and the reverse feed control lever.
 8. Loosen setscrews of the thrust collar on the reverse feed control lever shaft and pull out the reverse feed control lever shaft.
 9. Insert a new timing belt in the machine arm through an opening made by removing the handwheel and engage it with the sprocket wheel on the hook driving shaft.

NOTES ON RE-ASSEMBLING

- When setting the handwheel, take care not to let it bite the O-ring. Tighten the screw No. 1 (in the rotational direction) on the flat face of the shaft.
- When inserting the reverse feed control lever, take care not to break the oil seal.
- Adjust the timing of the hook driving shaft to the main shaft referring to 2-(7).

9. HOW TO REMOVE PLAYS IN THE AXIAL DIRECTION

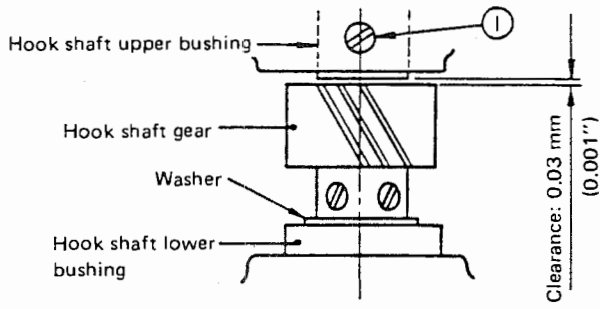


Fig. 46

Requirements;

- Clearance between the hook shaft gear and the hook shaft upper bushing must be 0.03 mm (0.001")

10. SYNCHRONIZER

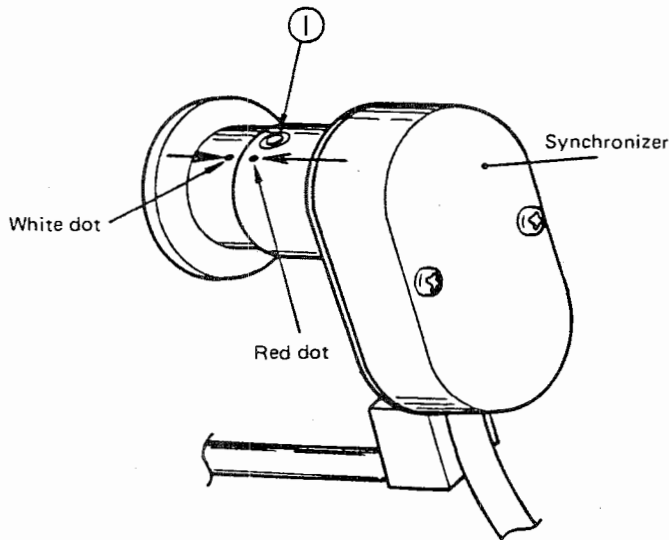
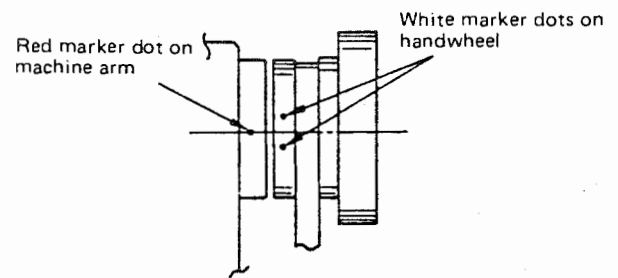


Fig. 47



Requirements;

- The red marker dot on the machine arm is between the two white marker dots (or the two green marker dots) on the handwheel when the machine stops with its needles up.

HOW TO ADJUST	EFFECTS OF ADJUSTMENT
<p>Loosen screw ① and provide specified clearance.</p>	<ul style="list-style-type: none"> ○ If the clearance is greater than 0.03 mm (0.001") it may cause stitch skipping. ○ If the clearance is smaller than 0.03 mm (0.001") it may seize the neighboring components.
<ol style="list-style-type: none"> 1. Match the red dot with the white dot and tighten screw ①. 2. Check that the red dot on the machine arm is between the two white dots on the handwheel when the machine stops with its needles up (with material and thread set on the machine). 3. If the red dot on the machine arm is not between the two white dots on the handwheel (or between the two green maker dots), loosen two screws ① on the synchronizer rotor and make fine adjustment. 	<div data-bbox="906 1137 1401 1473" data-label="Diagram"> </div> <p style="text-align: center;">Fig. 48</p> <p>If the timing of the synchronizer rotor is too early.</p> <ul style="list-style-type: none"> ○ Thread trimming failures may occur. ○ A click may be heard at the sewing start, or the moving knife may be erroneously actuated at the sewing start with consequent stitching accident in the worst case. <p>If the timing of the synchronizer rotor is too late:</p> <ul style="list-style-type: none"> ○ Thread trimming failures may occur. ○ The needles may strike the wiper.

11. TABLE OF SELECTIVE PARTS

Description	Part No.	Tolerance (mm, inch)
Hook shaft gear	10111904	-0.2 ~ -0.1 (-0.008" ~ -0.004")
	10112100	0 ~ +0.1 (0 ~ 0.004")
	10112209	+0.1 ~ +0.2 (+0.004" ~ +0.008")
Hook shaft needle bearing	SB30953010A	0 ~ -0.002
	SB30953010B	-0.002 ~ -0.004
	SB30953010C	-0.004 ~ -0.006
	SB30953010D	-0.006 ~ -0.008
Feed rock needle bearing	B1636581A00	0 ~ -0.002
	B1636581B00	-0.002 ~ -0.004
	B1636581C00	-0.004 ~ -0.006
	B1636581D00	-0.006 ~ -0.008
Hook shaft upper bushing thrust plate	10109700 Mark 0	1 (0.039")
	10110906 1	1.1 (0.043")
	10111003 2	1.2 (0.047")
	10111102 3	1.3 (0.051")
	10111201 4	1.4 (0.055")
	10109809 5	1.5 (0.059")
	10112506 6	1.6 (0.063")
	10112605 7	1.7 (0.067")
	10112704 8	1.8 (0.071")

12. PARTS TO BE FIXED BY "LOCK-TITE" PAINT

The following part is fixed by "Lock-tite" paint (601) after it has been accurately positioned. Therefore, if this part is disassembled, remove residual paint thoroughly using paint thinner and assemble it applying "Lock-tite" 601 after removing the moisture from the mating surface. If the screw which has been fixed by the paint is too hard to loosen, it is advisable to warm it using a torch lamp.

(Caution) It is not recommended to disassemble the part.

- Feed regulating arm plate (setscrew) Part No. 10106706
- * If the feed regulating arm plate (setscrew) is disassembled, the actual stitch length may substantially differ from the stitch dial indication

13. PARTS FIXED BY BOND OR SEALING MATERIALS

The following parts are fixed on sealed against oil leakage:

Parts	Sealing/Bonding materials
1. Hand lifter shaft O-ring	THREE-BOND 1101
2. Thread take-up cover bottom	THREE-BOND 1101
3. Feeding lever shaft oil seal	Gum-type adhesive agent (for outside sealing)
4. Feed adjusting screw O-ring	THREE-BOND 1101
5. Oil sight window setscrew	THREE-BOND 1101
6. Thread tension release wire mounting base setscrew	THREE-BOND 1101

14. MAINTENANCE PARTS

Basic maintenance parts

Part No.	Description	Remarks on installation
	Needle (DP x 5)	○ Direction of the long groove on the needle
10353159	Hook (asm) (for model with thread trimmer) left	○ See "Needle-to-hook relation" and "Working position of the bobbin case opening lever". ○ See "Needle entry in the needle feed slot" and "Lubrication".
10353050	right	
10353852	Hook (asm) left (for model without thread trimmer)	
10353753	Hook (asm) right (for model without thread trimmer)	
10353605	Bobbin (for model with thread trimmer)	
10354009	Bobbin (for model without thread trimmer)	
10211100	Moving knife	○ See "Height of the moving knife" and "Position of the moving and fixed knives".
10232403	Fixed knife	○ See "Position of the thread presser".

Recommendable maintenance parts

Part No.	Description	Remarks on installation
10112001	Hook shaft gear	○ Tighten three setscrews evenly.
10354405	Bobbin case opening lever	○ See 2-(3).
10116754	Cam follower (asm)	○ See 3-(1)-9).
10117802	Cam follower pushing plate	○ See 3-(1)-7).
10118305	Pushing plate actuator screw	○ See 3-(1)-7).
B3128051000	Thread take-up spring (A)	
B3128527000	Thread take-up spring (B)	
B35105120A0	Oil felt (asm)	

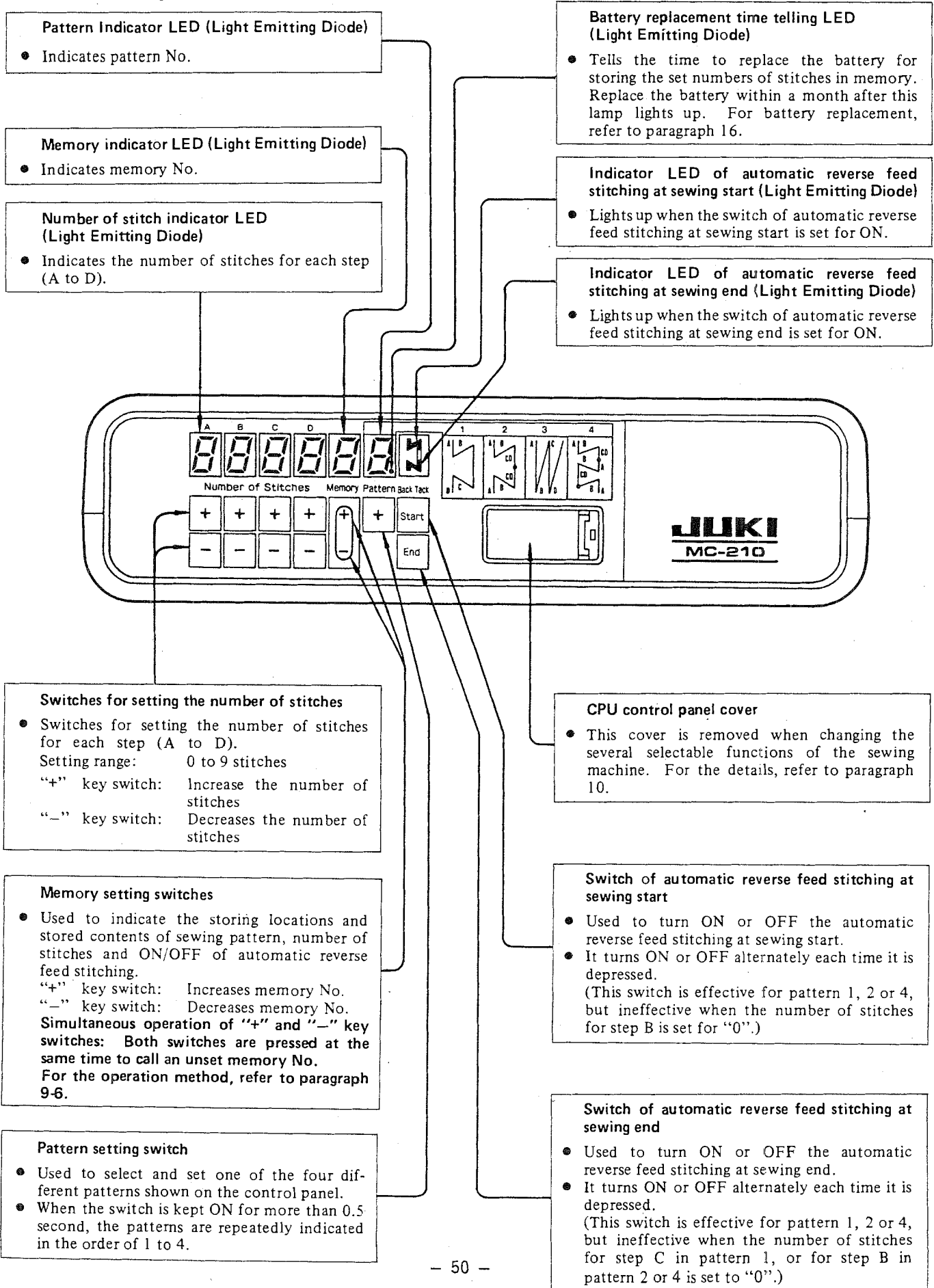
15. IMPORTANT CAUTIONS IN ADJUSTMENT

1. When you confirm the correct direction of revolutions at the time of installation, don't operate the thread trimmer, with the motor running in the reverse direction.
If the motor runs in the wrong direction, it will break the thread trimmer. (Correct direction: the handwheel revolves towards you.)
2. In the special adjustment for the Needle Entry Point (see 2-(1)-1), if you set the needle bar closer to the presser bar than the standard, the needle will hit the presser foot, the feed dog will touch the throat plate, and the needle clamp will hit the wiper holder connection, respectively.
3. Never remove the feed regulator arm plate (10106706) from the feed regulator base.
4. Screw tightening torque
 - 1) Fastening screw of the feed regulator base (10107100): 45 ~ 50 kg-cm
 - 2) Fastening screw of the reverse feed link (Screw ②, Fig. 41) 45 ~ 50 kg-cm
A torque of 45 to 50 kg-cm is obtained by tightening the screw 1/4 to 1/2 turns after reaching the end of its thread using an accessory screwdriver (large).
 - 3) Oil sight window: 5 ~ 10 kg-cm
 - 4) Hook driving shaft saddle setscrew (A): 80 ~ 100 kg-cm
 - 5) Hook driving shaft upper bushing setscrew: 10 ~ 12 kg-cm
 - 6) Changer rocking block setscrew: 20 ~ 25 kg-cm
5. Do not move the magnet plate in the synchronizer.

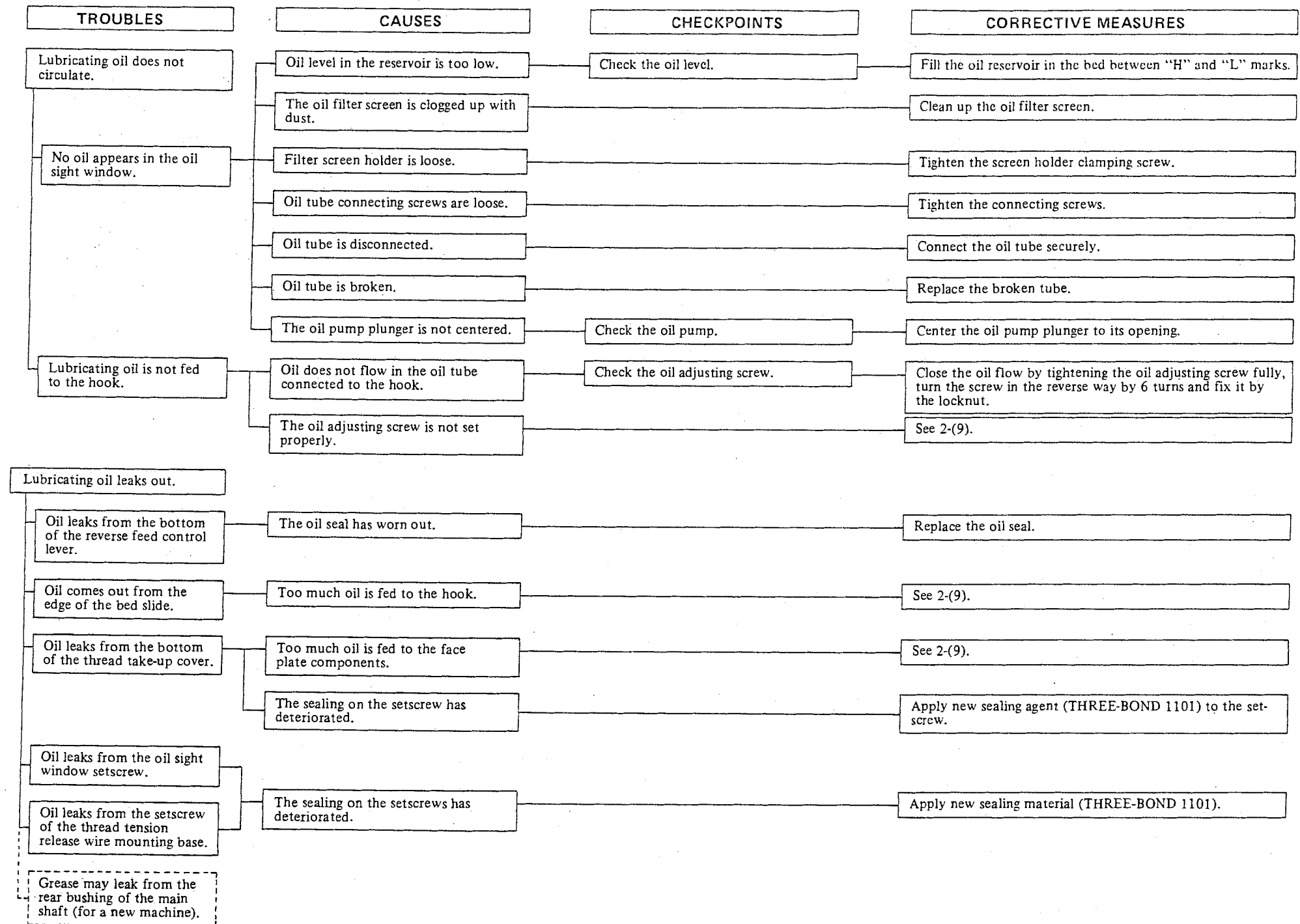
19. ELECTRIC COMPONENTS

(1) Function of each switch on the CPU panel

CPU box panel



16. MECHANICAL TROUBLES AND CORRECTIVE MEASURES



TEST REPORT

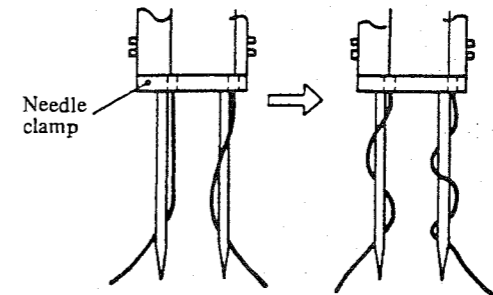
* This trouble may be caused by misalignment of the plunger at the time of repair or maintenance work.

17. STITCH FAILURES AND CORRECTIVE MEASURES

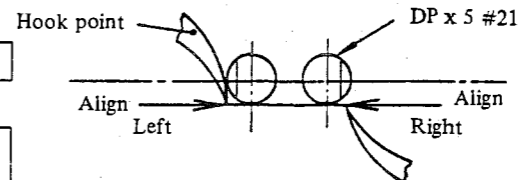
FAILURE	CAUSES	CHECK POINTS	CORRECTIVE MEASURES	
1. Thread breaking	Surface of thread path, needle point, hook point, throat plate or bobbin case is not smooth.	Check for the scratched parts.	Remove scratches from the hook point using a fine sandpaper. Make the throat plate slot surface smooth using a buffing wheel.	
	Thread is untwisted or torn.	Needle thread tension is too high.	Adjust the needle thread tension.	
		Clearance between the bobbin case opening lever and the bobbin case is too great.	Check the clearance.	Reduce the clearance (see 2-(3)).
		The hook point hits the needle.	Check the clearance.	See 2-(2)-2).
		Lubricating oil fed to the hook is not enough.	Check the amount of lubricating oil.	See 2-(9).
Thread is broken leaving 20 to 30 mm (0.787" ~ 1.181") of needle thread on the wrong side of fabric.	Needle thread tension is too low.		Adjust the needle thread tension (this occurs rather in synthetic fiber thread).	
	Thread take-up spring is too tight or its stroke is too small.		Reduce the tension of the thread take-up spring or increase its stroke.	
	Needle-to-hook timing is wrong.	Check the marker lines on the needle bar.	See 2-(2).	
2. Stitch skipping	Clearance between the needle and the hook point is too great.	Check the clearance.	See 2-(2)-2).	
	Needle-to-hook timing is wrong.	Check the marker lines on the needle bar.	See 2-(1)-1), -2), -3), and 2-(2).	
	Presser foot does not press the materials (insufficient presser foot pressure).	Check the pressure of the presser foot.	Tighten the presser spring regulator screw.	
	Height of the needle bar is wrong.	Check the needle bar height at its lowest point.	See 2-(1)-2).	
	Hook point is blunt.	Check the hook point.	Make the hook blade straight and sharp or replace the hook.	
	Needle guard on the hook is insufficient.	Check the clearance between the needle and the hook needle guard.	See 2-(2)-2).	
	Needle size is not suitable.		Replace the needles by thicker ones.	

TEST REPORT

* If thread breaking or stitch skipping occurs frequently with synthetic fiber thread (Tetoron #80 ~ #50);
1) Wind the threads once on to the needles.



* If stitch skipping occurs frequently with cotton thread; Find which needle causes stitch skipping, and delay its needle-to-hook timing by a needle's thickness from that of the other needle.



(Example)
Suppose that the right-hand needle causes stitch skipping;
1) Loosen screws which fix the hook shaft gear of the right-hand hook.
2) Needle DP x 5 #21 is used and stitch length is "4".
3) Align the hook points with the end face of the needle #21 as illustrated, so that the right-hand needle-to-hook timing is delayed by a needle's thickness.

TROUBLES	CAUSES	CHECK POINTS	CORRECTIVE MEASURES
3. Loose stitch (balloon or looped stitch)	Bobbin case is threaded faultily.	Check that the thread passes through the forked tension spring on the bobbin case.	Thread the bobbin case correctly.
	Thread path is not smooth or has burrs.	Check each thread path.	Sand the rough surface with a fine sandpaper or a buffing wheel.
	Bobbin does not spin smoothly in the bobbin case.	Draw the bobbin thread by hand and check if the thread comes out smoothly from the bobbin case.	Replace the bobbin or hook.
	Clearance between the bobbin case opening lever and the bobbin case is too great.	Check the clearance.	See 2-(3).
	Clearance between the bobbin case stopper and the throat plate is too small.	Check the clearance.	See 2-(4).
	The bobbin case has been fitted improperly.	Check if the bobbin case has been fitted snugly or not.	Replace the bobbin case or the hook.
	The feed dog is too high.	Check it against the standard height.	Refer to "Height of the feed dog".
	The needle feed slot is not suited to the stitch length.	The needle feed slot should be 2 x 3 (0.079" x 0.118") for a stitch length exceeding 4 mm (0.157"), and $\phi 2$ (0.079") for a stitch length of 4 mm (0.157") or less.	If the same trouble still occurs, make it about 0.2 mm (0.008") lower than the standard value. Replace the feed dog.
4. Irregular stitch	Bobbin case is threaded wrongly.	Check if the thread passes through the tension spring (at the forked end) on the bobbin case.	Thread the bobbin case correctly.
	Thread path is not smooth.	Check the thread path.	Smooth the thread path using a fine sandpaper or buffing wheel.
	Bobbin does not spin smoothly in the bobbin case.	Draw the bobbin thread by hand and check if it comes out smoothly from the bobbin case.	Replace the bobbin or the hook.
	Clearance between the bobbin case opening lever and the bobbin case is too great.	Check the clearance.	See 2-(3).
	Bobbin thread tension is too low.		Adjust the tension spring on the bobbin case.
	Bobbin is wound up too tight (especially synthetic fiber thread).	Check the tightness of the thread in the bobbin.	Wind the bobbin with an adequate tension.
	Thread take-up spring does not work synchronously with the hook.	Check how far the take-up spring moves away from its initial position when the hook has drawn out the thread most.	Adjust the thread take-up spring to make it move about 1 mm (0.039") from its initial when the hook has drawn out the thread most.
	Clearance between the bobbin case stopper and the throat plate is too small.	Check the clearance.	See 2-(4).
	In machine with thread trimmer, the racing-proof spring has been installed when the racing-proof cloth should be installed.	Use the racing-proof spring for synthetic fiber thread, and the racing-proof cloth for other threads.	Replace with the racing-proof spring (10111508) or racing-proof cloth (10232106) as required.
	The hook timing is too early.	Check the hook timing.	Delay the hook timing to 2.8 ~ 3.2 mm (0.110" ~ 0.126") (If the machine is provided with a thread trimmer, also delay the thread trimming timing)

TEST REPORT

* If this trouble frequently happens;
 1) Smooth the thread path.
 2) Reduce the clearance between the bobbin case opening lever and the bobbin case to 0.15 or 0.2 mm (0.005" ~ 0.008").
 But, don't reduce the clearance too much, or it may break the bobbin case.

* Generally, when the needle thread "leaps", it forms unfavorable stitches.
 This phenomenon can be reduced or avoided by:
 1) Reducing the clearance between the bobbin case opening lever and the bobbin case
 2) Let the bobbin spin freely in the bobbin case.

* To reduce irregular stitches, the thread take-up spring is desirably adjusted to have a lower tension and smaller stroke. This will allow the tension of the needle thread tension spring to be increased, thus providing stable thread feed.

* Take care not to set the hook timing too late, or else needle thread breakage or loose stitches may result.

18. MECHANICAL TROUBLES OF ATTACHMENTS AND CORRECTIVE MEASURES

TROUBLES	CAUSES	CHECK POINTS	CORRECTIVE MEASURES
AUTOMATIC THREAD TRIMMER			
1. Thread slips from the needle eye at the end of thread trimming action.	Tension post No. 1 is too tight.	Check the thread tension.	Reduce the thread tension applied by the tension post No. 1.
	Thread trimmer works too early.	Check the marker dots on the handwheel and the position of the thread trimmer cam.	See 3-(1)-5).
	Thread tension disc does not "float" sufficiently.	Check the clearance between the tension discs when releasing the thread.	See 3-(1)-8).
	The needle thread gets into the bobbin thread catching groove of the moving knife.	Check the initial position of the moving knife.	See 3-(1)-2).
	The thread guide thread presser (felt) has worn out due to thread rubbing.		Replace the thread guide thread presser (B1131-528-000) with a new one.
2. Thread slips from the needle eye at the start of sewing.	Thread left in the needle eye is too short to start.		
	The thread tension post No. 1 is too tight.	Check the thread tension.	Reduce the tension.
	Tension discs do not "float" sufficiently to release the thread.	Check the clearance between the tension discs when releasing the thread.	See 3-(1)-8).
	Bobbin thread clamp spring is too weak.		See 3-(1)-4).
	Clamp spring is set in a wrong position.		See 3-(1)-3).
3. The first several stitches are not made.	Bobbin thread is not held positively.	Check if the bobbin thread is held or not.	See 3-(1)-2), 3-(1)-3) and 3-(1)-9).
	Bobbin thread tension is too low.		Increase the bobbin thread tension.
	Timing of the needle-up stop is too early.	Check if the amount of the take-up lever between the needle-stop point and the upper dead point of the take-up lever is too great or not.	See 10. "Synchronizer"
	The moving knife has edges at A and B.		Using a fine sandpaper or diamond file, remove the edges at A and B with care taken to the moving knife blade.

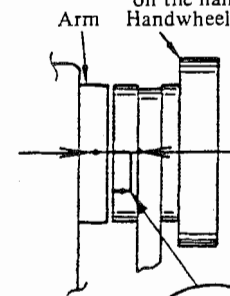
TEST REPORT

* Such troubles as "thread escapes from the needle eye" and "the first several stitches are not made" are mainly caused by shortness of the thread left in the needle eye at the start. These troubles are frequently caused when a short stitch is made with thin synthetic fiber thread. In order to minimize such troubles, change the timing of the following components;

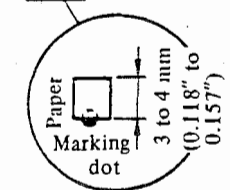
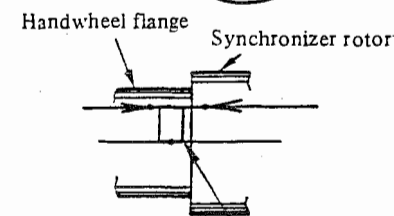
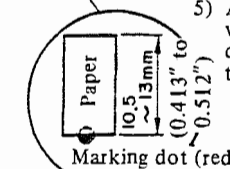
- 1) Start of the moving knife:
294° → 310° ~ 315°
- 2) Needle-up stop:
50° ~ 58° → 60° ~ 65°

How to change the timing:

1) Stick a piece of paper (10.5 ~ 13 mm [0.413" of 0.512"] long) using adhesive tape to the handwheel aligning its one end with the center of the marking dot on the handwheel as illustrated.

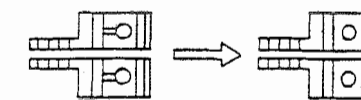


- 2) Turn the handwheel until the other end of the paper arrives at a point shown by the marking dot engraved on the arm.
- 3) Adjust the thread trimmer cam according to 3-(1)-5).
- 4) Next, set the marking dot on the synchronizer to that on the handwheel flange in the way to delay the timing as illustrated.
- 5) Adjust the height of the wiper so that the wiper does not interfere with the needles.



* "The first several stitches are not completed":

- This trouble may be also caused by a bobbin which is wound a less amount of thin thread. In such a case, fill up the bobbin.
- The pressure of the clamping spring is too high.
- This trouble often occurs if feed dogs with large needle feed slots are used for thin needles. (Replace the feed dogs with A-type feed dogs.)

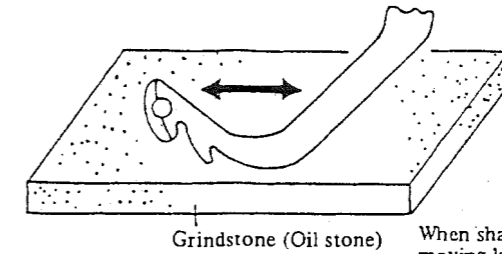


φ2 (0.079") φ1.6 (0.063") (Use feed dogs having needle feed slots without thread relief slits.)

TROUBLES	CAUSES	CHECK POINTS	CORRECTIVE MEASURES
4. Thread trimmer does not cut the thread sharply (whiskered end).	Moving knife blade does not fit the fixed knife blade.	Position of the moving knife.	See 3-(1)-1), 3-(1)-2), and 3-(1)-3). Adjust or replace the moving knife or fixed knife.
	Knife blade is blunt.	Blades of the moving knife and fixed knife.	
	Moving knife slants.	Motion of the moving knife blade (up and down).	See 3-(1)-1).
	The clearance between the feed dog and the moving knife is not enough.	Clearance between the needle and the hook point.	See 2-(2)-2).
5. Thread trimmer does not cut the thread (fails to catch the thread).	Initial position of the moving knife is wrong.	Distance from the top end of the moving knife to that of the fixed knife.	See 3-(1)-2).
	Needle entry point is wrong.	Distance from the needle bar to the presser bar.	See 2-(1)-1) and 2-(1)-3).
	Moving knife does not come back to the fixed knife.	Thread trimming timing.	See 3-(1)-5).
	Moving knife moves too much after trimming.	Position of the safeguard stopper.	See 3-(1)-9).
	Timing of thread trimming is wrong.	Marking dot on the handwheel and thread trimmer cam position.	See 3-(1)-5).
	Moving knife does not work.	Thread trimmer cam driving mechanism.	See 3-(1)-7).
	Clutch fails to work.		
	The synchronizer timing is bad.	Alignment of the marker dots.	See 10. "Synchronizer"
	The bobbin thread tension is extremely low.		Apply more tension to the bobbin thread through the tension spring.

TEST REPORT

* How to sharpen the moving knife blade.



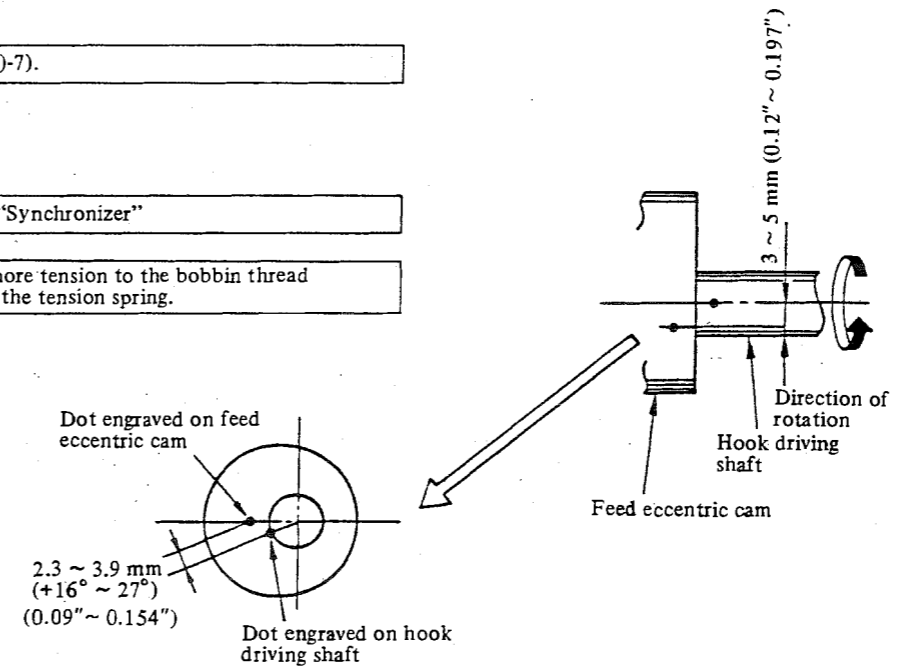
Grindstone (Oil stone)

When sharpening the blade of the moving knife, be sure to bring the blade surfaces into close contact with the surface of the grindstone. (A rougher grindstone is better for sharper finish of the blade).

* "Fails to catch the thread".
If this trouble frequently happens, set the feed eccentric cam slightly earlier than the standard in relation to the hook driving shaft.

HOW TO ADJUST

1. Adjust the timing of the cloth feed action referring to 2-(5).
2. Set the marker dot engraved on the feed eccentric cam to 2.3 through 3.9 mm (0.09" ~ 0.154") from the marker dot on the hook driving shaft as illustrated. (After this adjustment, check the stitch length once again.)



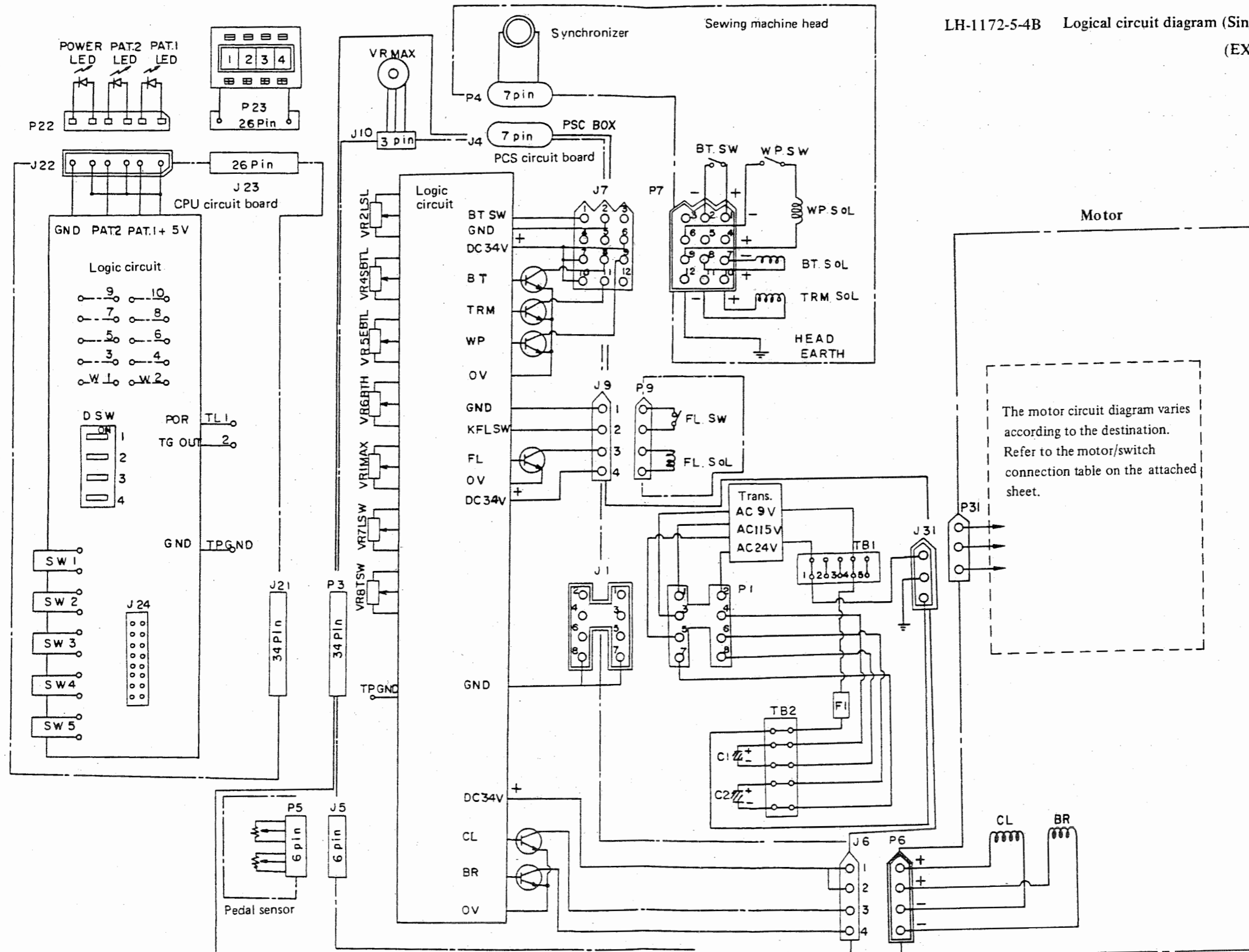
TROUBLES	CAUSES	CHECK POINTS	CORRECTIVE MEASURES
WIPER COMPONENTS			
1. Wiper fails to wipe the thread.	The top end of the wiper faces in a wrong way.		Correct the orientation of the wiper.
	Thread is not cut completely.		See Troubles 18-4 and 18-5
	Bobbin thread clamping pressure is too high.		See 3-(1)-4).
2. Wiper hits the needle.	Thread trimming action is too late.	Check the marking dot on the hand-wheel.	See 3-(1)-5).
	Clearance between the tension release arm and the tension release plate is too great.	Check the clearance.	See 3-(1)-6).
	Cam follower stopper (B) presses too much the cam roller shaft.	Relation of cam follower stopper (B) to the cam roller shaft.	See 3-(1)-9).
	Timing of the synchronizer is too late.	Check the marking dot on the synchronizer rotor.	See 10.
	Working level of the wiper is too high.	Clearance between the wiper and the needle.	See 3-(2).
AUTOMATIC AND ONE-TOUCH TYPE REVERSE FEED MECHANISM			
1. Number of stitches preset by the stitch counter differs from the actual number of stitches.	Some of the components are interfered.	Connection between the plunger and the feed regulator.	Remove the cause of interference.
	Spring to pull the feed regulator base is too tight.	Check if the reverse feed control lever can be depressed fully downwards with a pressure of 1.2 kg or less when the machine is at rest.	Reduce the tension of the spring.
	Stroke of the reverse feed magnet plunger is too great.	Clearance between the bottom face of the magnet and the resilient plate attached to the plunger (standard; 0.5 to 1.0 mm) (0.020" ~ 0.039").	See 3-(3)-1).
2. Stitch length in the reverse feed differs from that in the forward feed (up to 4 mm (0.157") stitch).	Inclination of the feed regulator base is inadequate.	Relation of the stitch length to the feed regulator rod pin when the machine is at rest.	See 2-(11).

TEST REPORT

* If the wiper does not return when thick thread is used:

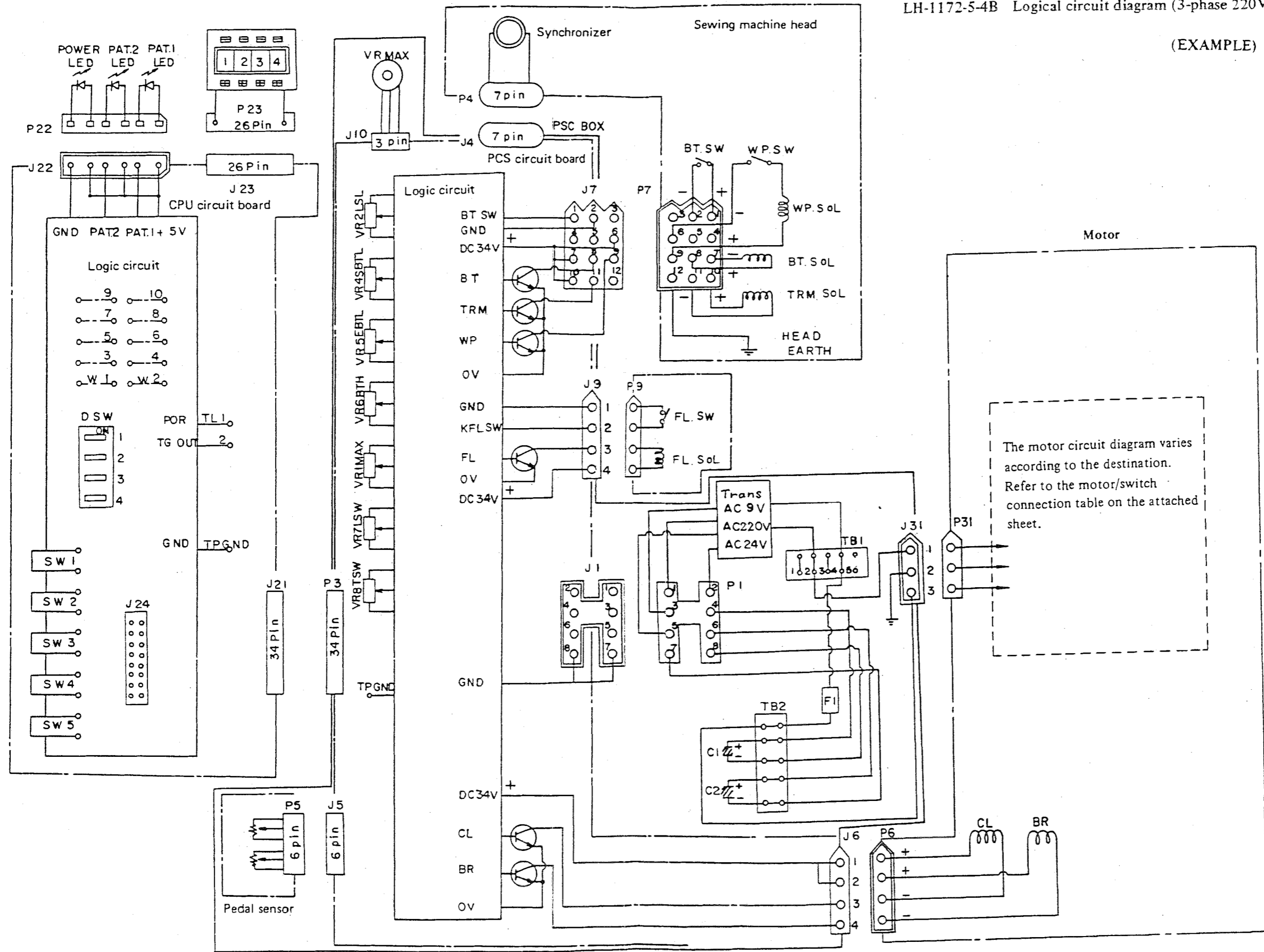
- Check if the thread gets entangled with the wiper causing the presser foot to float. In this state, if the thread is broken, the wiper will return.
- This phenomenon is prevented by reducing the projection of the moving knife. (0.4 ~ 1.2 mm) (0.016" ~ 0.047")

LH-1172-5-4B Logical circuit diagram (Single-phase 115V)
(EXAMPLE)



The motor circuit diagram varies according to the destination. Refer to the motor/switch connection table on the attached sheet.

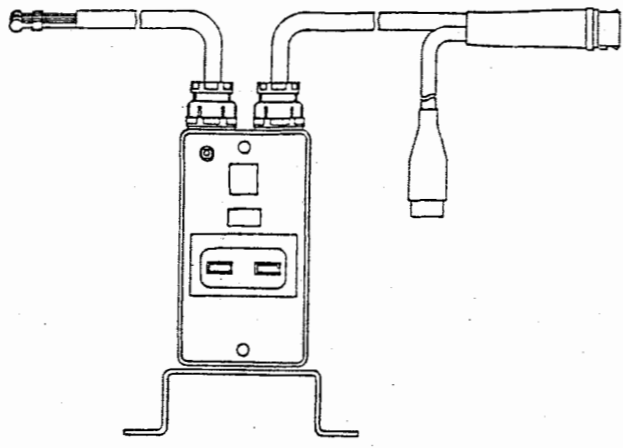
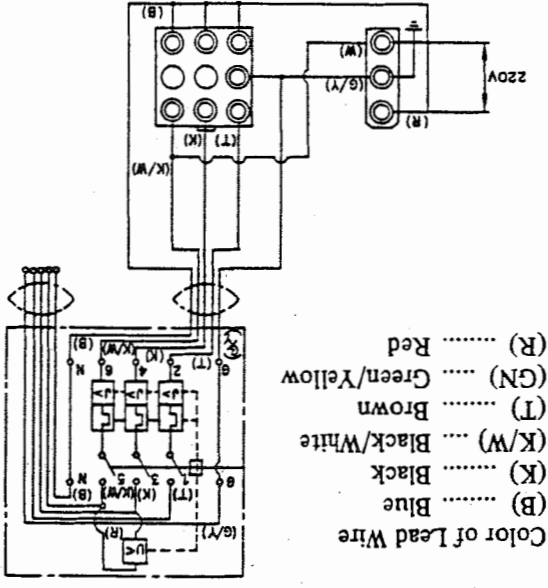
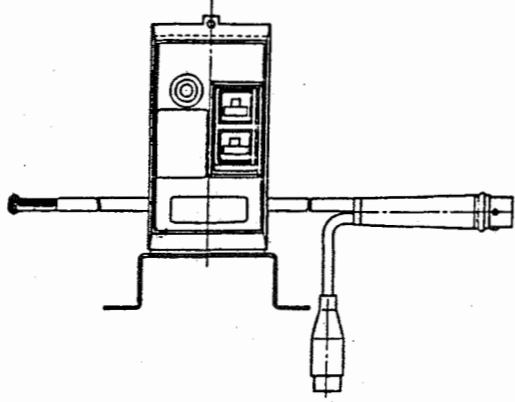
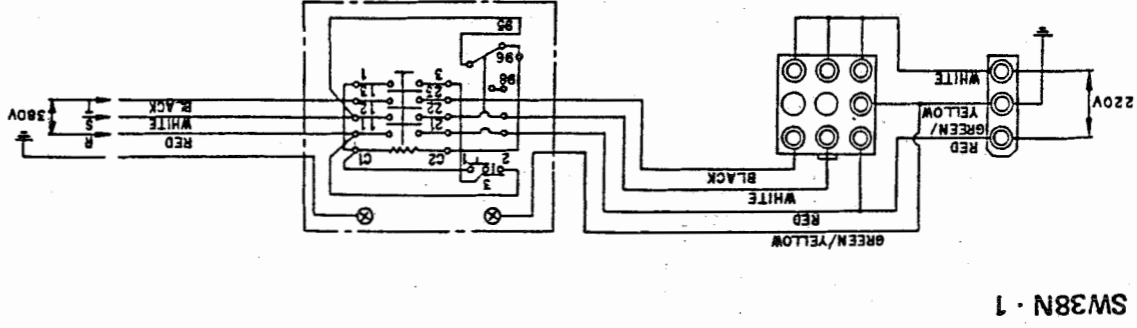
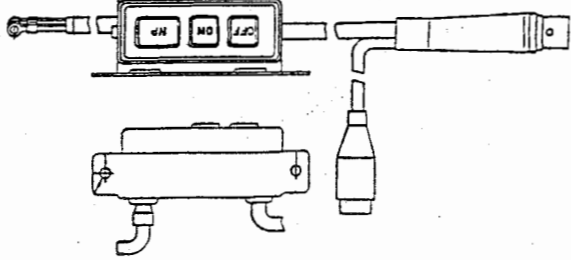
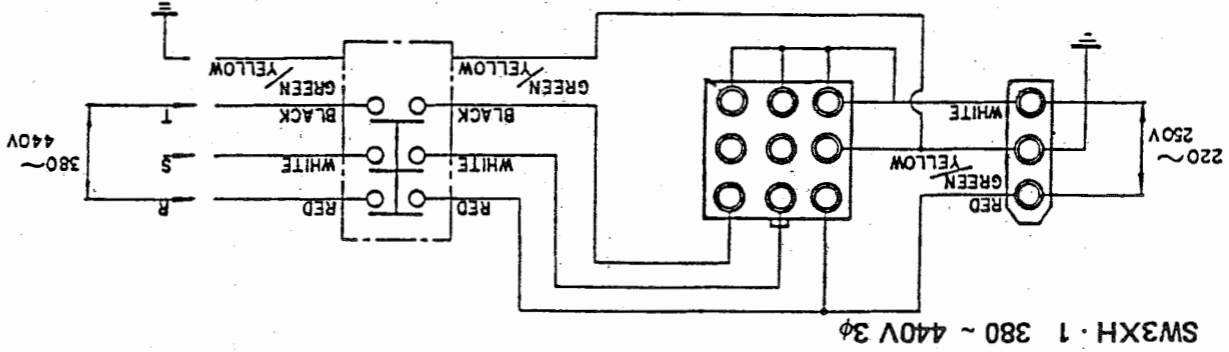
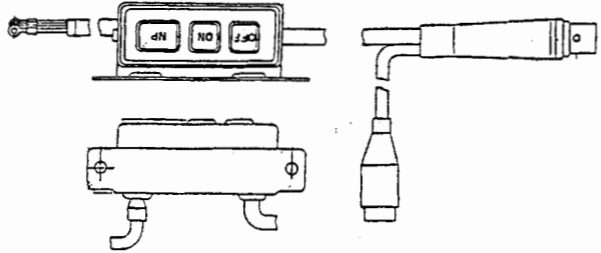
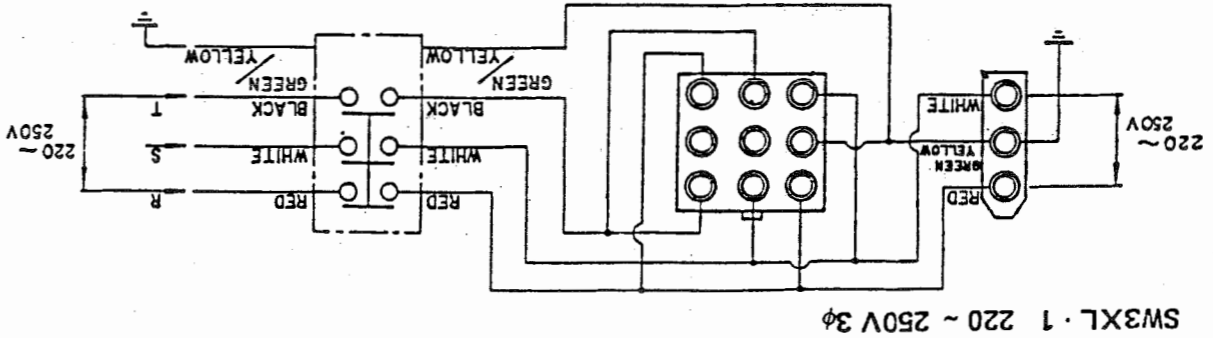
(EXAMPLE)



For 380 ~ 440V power supply voltage

For 220 ~ 250V power supply voltage

When 3-phase motor is used:



Color of Lead Wire
 (B) Blue
 (K) Black
 (K/W) Black/White
 (T) Brown
 (GN) Green/Yellow
 (R) Red

SW38K · 1

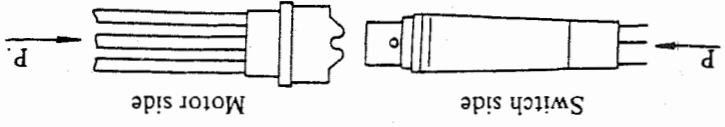
SW38N · 1

SW3XH · 1 380 ~ 440V 3φ

SW3XL · 1 220 ~ 250V 3φ

Motor side

Remarks

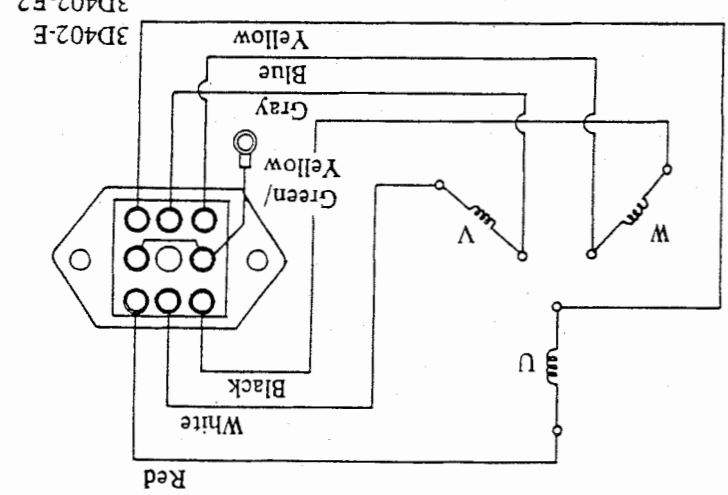


The pin layout of the 9P connector is to be observed from P.

(Note) Fit in the above connectors as shown on the right.

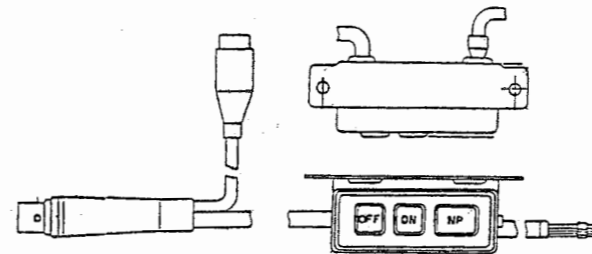
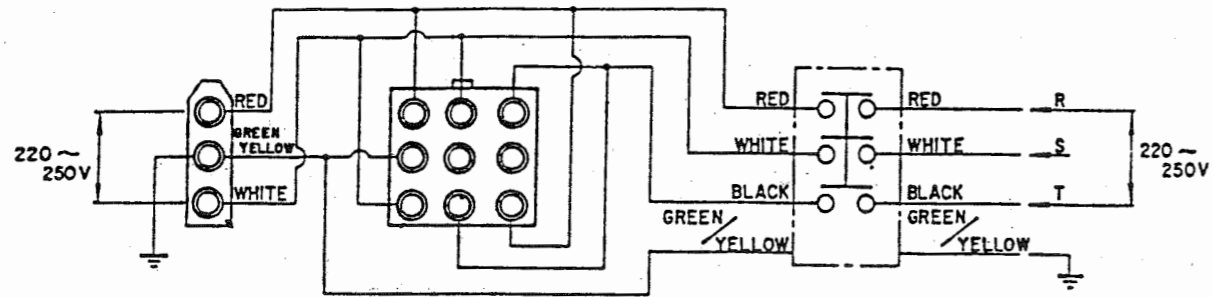
Motor side Switch side

(Note) The same motor connection is used for the switch types, SW3XL · 1, SW3XH · 1, SW38N · 1 and SW38K · 1.



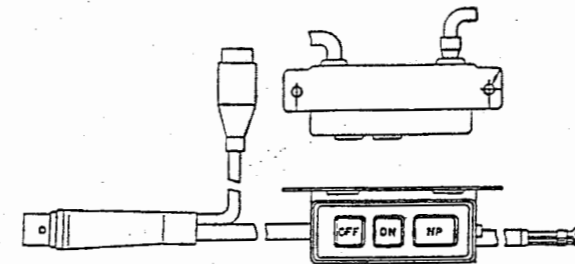
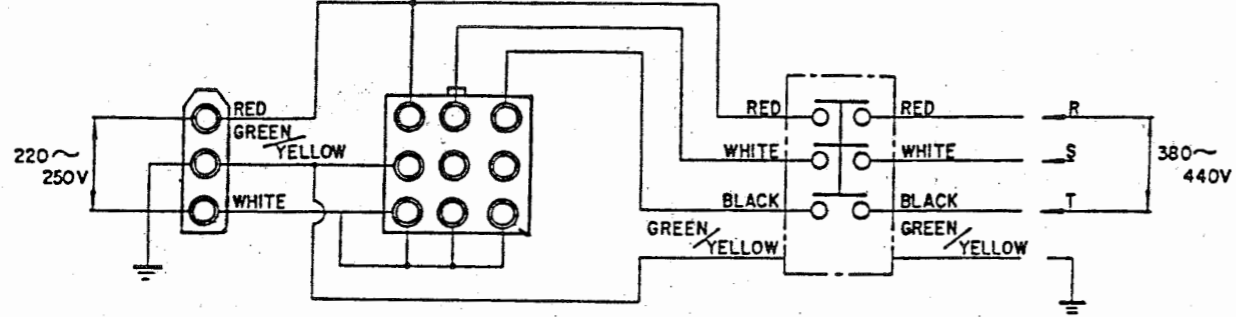
For 220 ~ 250V power supply voltage

SW3XL · 1 220 ~ 250V 3φ



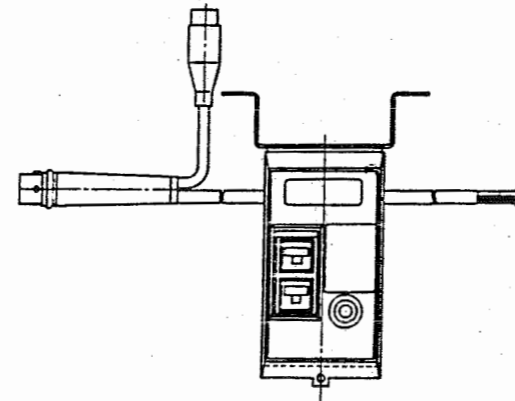
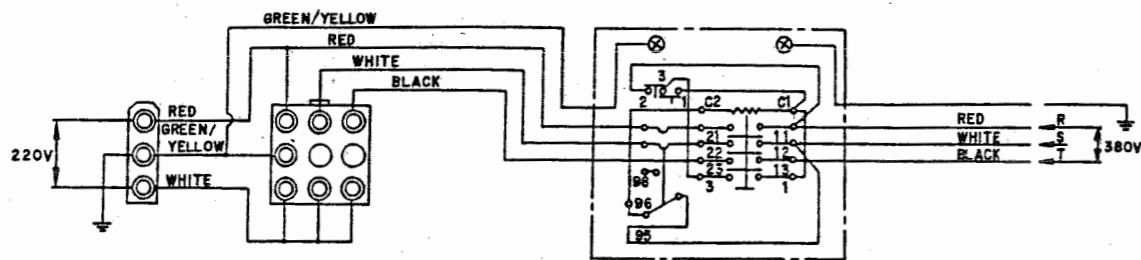
Motor side

SW3XH · 1 380 ~ 440V 3φ



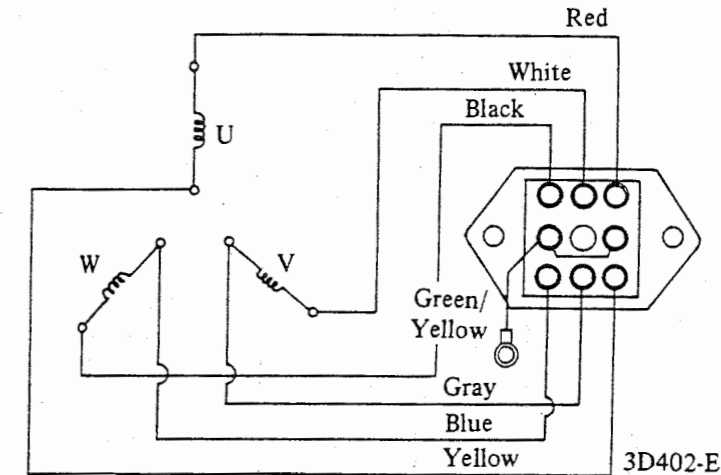
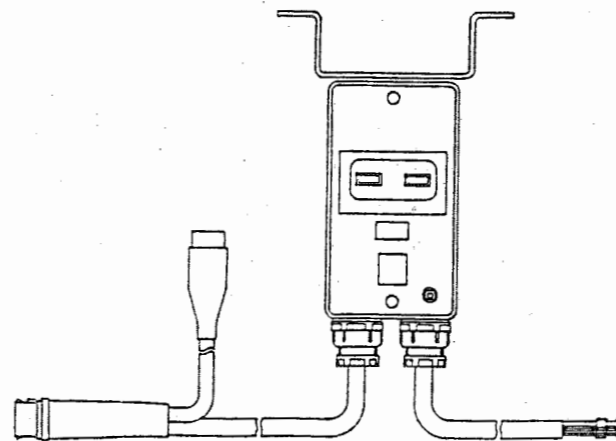
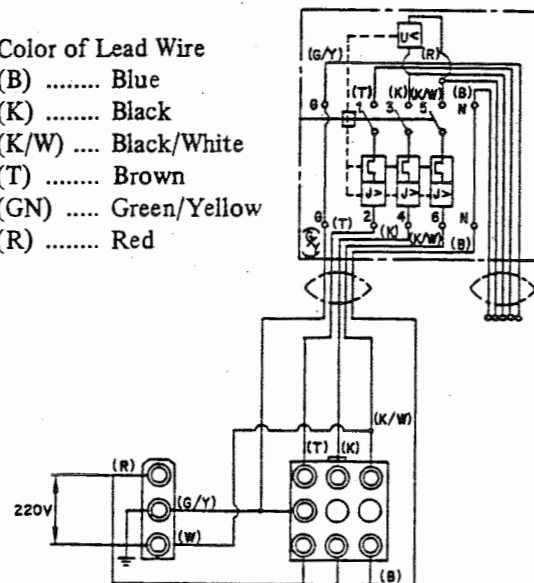
For 380 ~ 440V power supply voltage

SW38N · 1



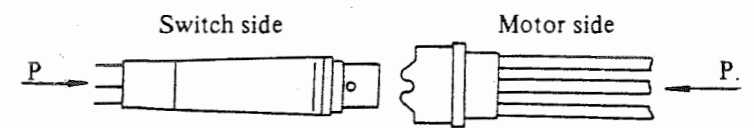
SW38K · 1

- Color of Lead Wire
- (B) Blue
 - (K) Black
 - (K/W) Black/White
 - (T) Brown
 - (GN) Green/Yellow
 - (R) Red



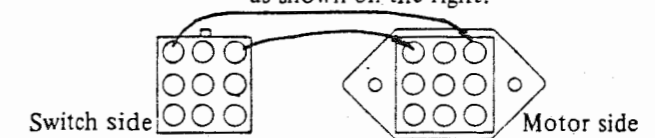
(Note) The same motor connection is used for the switch types, SW3XL · 1, SW3XH · 1, SW38N · 1 and SW38K · 1.

Remarks



The pin layout of the 9P connector is to be observed from P.

(Note) Fit in the above connectors as shown on the right.



Sewing patterns

Memory Nos. 1 to 9 are provided as locations for storing sewing patterns. The memory contents include the type of pattern, the numbers of stitches for steps A to D, and ON/OFF of reverse feed stitching. By specifying the memory No. of the desired sewing pattern stored, sewing operation can be done according to the setting shown on the CPU control panel.
(Several sewing patterns are set at the factory to check for proper operation before delivery.)


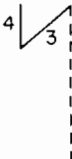

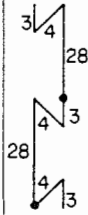

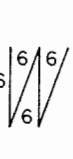




Memory No.		0	1	2	3	4	5	6	7	8	9
Sewing patterns produced according to memory contents											
Memory contents	Pattern No.	—	1	1	4	1	3	1	1	1	1
	Number of stitches A	—	4	4	3	0	6	0	0	0	0
	Number of stitches B	—	3	5	4	0	6	0	0	0	0
	Number of stitches C	—	5	4	2	0	6	0	0	0	0
	Number of stitches D	—	0	3	8	0	6	0	0	0	0
	Automatic reverse feed stitching at start	—	ON	ON	ON	OFF	—	OFF	OFF	OFF	OFF
	Automatic reverse feed stitching at end	—	ON	ON	ON	OFF	—	OFF	OFF	OFF	OFF

Table 1.

- Table 1 * Memory No. 0 is exclusively used for sewing without automatic reverse feed stitching and inching.
 * Memory Nos. 4, 6, 7, 8 and 9 have no set sewing patterns.
 * The memory contents enclosed with the bold line can be freely set.
 * When the numbers of stitches for all the steps, A to D are set for "0", the pattern No. will be "1".
 * It is advisable to set sewing patterns in the order of memory Nos. (1, 2, -- 9) according to the sewing operation.

1. How to call set sewing patterns

A set sewing pattern can be called by operating the memory "+" key switch and the memory "-" key switch. When the setting is as shown in Table 1, the memory No. changes like 1 → 2 → 3 → 5 → 0 → 1 as illustrated when the memory "+" key switch is depressed. At this time, the memory contents of each memory No. will be shown. When the memory "-" key switch is depressed, the change goes like 1 → 0 → 5 → 3 → 2 → 1. (A memory No. with no set sewing pattern is automatically skipped.) Keep on depressing either memory switch until the desired sewing pattern is reached.

A	B	C	D	Memory	Pattern	Back Tack
-	-	-	-	0	-	□
4	3	5	0	1	1	↔
4	5	4	3	2	1	↔
3	4	2	0	3	4	↔
6	6	6	6	5	3	□

Memory "-" key switch
Memory "+" key switch

2. How to change the number of stitches for a set sewing pattern

The number of stitches for a set sewing pattern can be changed by depressing the "+" or "-" number of stitches setting key switch for the step (A to D) whose number of stitches is to be changed. (The "+" key switch decreases the number of stitches, while the "-" key switch decreases it. When either of these switches is continuously depressed, the number of stitches will also change continuously.)

3. How to change ON/OFF of automatic reverse feed stitching of a set sewing pattern

The switches of automatic reverse feed stitching at sewing start and end turn ON or OFF alternately each time they are depressed.

- (Caution)
- * If the number of stitches for step B is set for "0", the automatic reverse feed stitching at sewing start cannot be engaged.
 - * If the number of stitches for step C is set for "0", the automatic reverse feed stitching at sewing end cannot be engaged.
 - * In the case of pattern 3, the automatic reverse feed stitching at sewing start or end cannot be engaged.

4. How to change the pattern shape of a set sewing pattern

When the pattern switch is kept depressed for more than 0.5 second, the pattern indication changes. Keep on depressing the pattern switch until the pattern No. having the desired pattern shape is reached. (The pattern Nos. 1 to 4 are repeatedly indicated.) When the pattern No. has been changed, all the numbers of stitches which have previously been set will be cleared to "0". Therefore, it is necessary to set the numbers of stitches again.

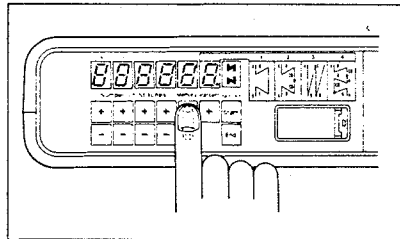
5. How to erase set sewing patterns

Call the memory No. (3, for instance) to be erased using the memory switch. Next, keep on depressing the pattern switch for more than 0.5 second. The pattern No. indication will change and at the same time the numbers of stitches will be all reset to "0". This erases the contents of the specified memory No. (3 in this case). Now, you can change it to the desired memory No.

6. How to set a new sewing pattern

1. When the memory "+" and "-" key switches are depressed at the same time, memory Nos. (1, 2, - 9) which have not been set will be automatically indicated in sequence. When the setting is as shown in Table 1, memory Nos. will be indicated in the order illustrated when you keep on depressing the memory switches. Release the switches at the moment the desired memory No. appears.
2. Next, if the desired pattern shape belongs to a pattern No. other than "1", depress the pattern switch for more than 0.5 second to change the indication to the desired pattern No.
3. Using the number of stitch setting switches, set the number of stitches for each step (A to D).

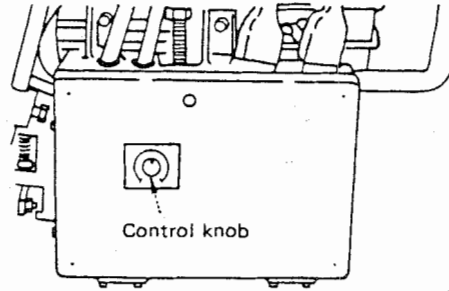
(Note) Depress the memory "+" and "-" key switches at the same time as illustrated.



A	B	C	D	Memory	Pattern	Back Tack
00	00	00	00	4	1	□
00	00	00	00	6	1	□
00	00	00	00	7	1	□
00	00	00	00	8	1	□
00	00	00	00	9	1	□

(3) Adjusting the maximum sewing speed

In the LH-1172-5, the sewing speed can be easily adjusted from a low speed of about 500 s.p.m. up to the maximum speed through the control knob on the PSC box cover. As the control knob is turned counterclockwise, the maximum sewing speed reduces.

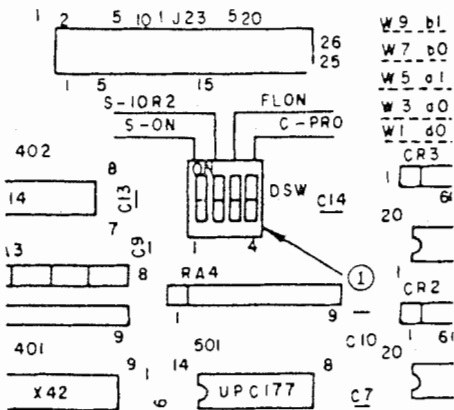


(4) Setting for the soft starting

The LH-1172-5 machine is provided with a "soft" starting feature to ensure stitch formation at the start of a seam line for sewing heavy-weight materials.

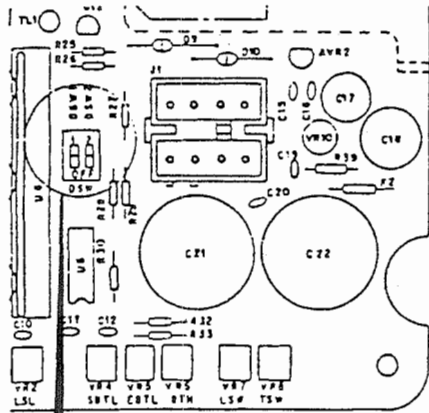
The "soft" starting is a feature to run the machine at a low speed for the beginning one stitch (1 to 2 stitches for 210 type). This soft starting feature works whether the switch for reverse feed stitching at the start of a seam line is set to "ON" or "OFF".

The soft starting is set by turning on the dip switches (DSW) 1 and 2 on the CPU printed circuit board.



DSW1 (S-ON)	DSW2 (S-1OR2)	Number of stitches
OFF	—	— — — — — (No soft starting)
ON	OFF	— — — — — (One-stitch soft starting)
ON	ON	— — — — — (Two-stitch soft starting)

(5) Setting the dip switches on PSC printed circuit board

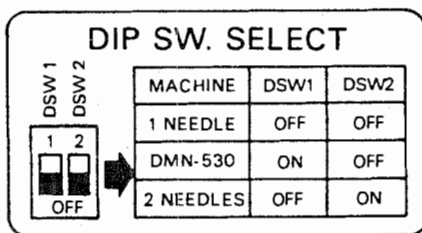


Properly set the dip switches (DSW1 and DSW2) in the PSC box to provide the control best suited for each machine head. For most operations, both DSW1 and DSW2 are set to OFF.

DSW1; Set this dip switch to ON for DMN530-5 or DMN531-5.

DSW2; Set this dip switch to ON when sewing medium-weight material by LH-1172-5, or if the clutch/brake disks produce clatter at a low speed.

(Note that low sewing speed may be reduced when DSW2 is set to ON.)



(6) Setting for a machine with Auto-lifter

A machine equipped with Auto-lifter (AK-11) requires an exclusive PSC box but it uses the same CPU box as that for a machine without Auto-lifter. Set the dip switch (DSW) FL ON (see "Setting for the soft starting") to ON for a machine with Auto-lifter.

(7) Stand-by circuitry

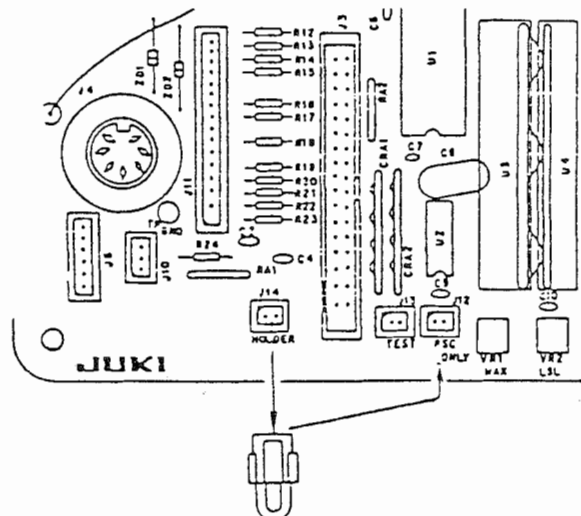
The PSC board is provided with a stand-by circuitry which is capable of controlling the sewing speed (through the pedal action) or stop of the machine in the absence of the CPU board.

In case of a CPU board failure, this stand-by circuitry functions to cause the machine to operate, without the CPU board, as a machine with needle-up/down stop feature, by changing the connection of the connectors.

<Function of the stand-by circuitry>

The stand-by circuitry controls the start, sewing speed, and stop of the machine through the pedal action. (The needle-up/down stop function works, but thread trimming, automatic or one touch reverse feed stitch features are inoperative.)

The control knob for maximum sewing speed is operative.



<How to switch to the stand-by circuitry>

- ① Turn off the power switch, open the cover of the PSC box, and remove the J3 plug.
- ② Attach the connector at J14 (HOLDER) to H12 (PSC ONLY).
- ③ Close the cover of the PSC box with the J3 plug left disconnected.

This completes the switching to the stand-by circuitry.

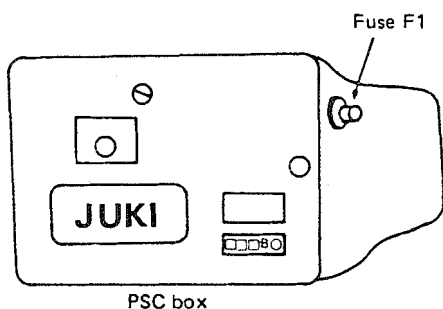
When the power switch is turned on, the power indication lamp on the CPU box will not light. However, this does not mean any failure.

When the pedal is depressed forward (toe down), the machine will start, and the speed can be controlled.

When the pedal is returned to the neutral position, the machine will stop with the needles down. The machine will stop with the needles up, but thread trimming can not be performed even when the pedal is trodden on backward (heel down).

Further, the automatic and one touch reverse feed stitch functions do not work.

(8) How to replace the fuse



Fuse F1 (glass-tub fuse)
 In case of A 220V spec. Fuse: 5A
 In case of B 110V spec. Fuse: 8A

The fuse is located on the right side of the PSC box as shown above. Make sure to turn off the power switch before replacing the fuse. If the new fuse immediately blows, identify the cause. Do not replace a blown fuse with one having a larger capacity.

To take out the fuse, turn the fuse holder cap in the arrowed direction to remove it using a Phillips screw-driver.

There are two types of PSC box in the power supply voltage; one type of PSC box operates on 100 volt, and the other operates on 200 volt. Use a 100 V PSC box for a single-phase 110 V ~ 125 V, and a 200 V PSC box for other power supply voltage (single-phase 220 V ~ 250 V, 3-phase 220 V ~ 250 V, or 3-phase 380 V ~ 440 V). The 100 V PSC box has transformer taps for 100 V, 105 V, 110 V, 115 V, 120 V, and 130 V. The 200 V PSC box has 190 V, 200 V, 230 V, 240 V, and 250 V transformer taps. Use the most suitable tap in accordance with the power supply voltage. For a 3-phase 380 V ~ 440 V power supply voltage, calculate the tap voltage from the following formula to select a tap having the most approximate voltage:

$$\text{The voltage of a tap to be selected} = \frac{\text{Power supply voltage}}{\sqrt{3}}$$

Example: For a 400 V power supply voltage

$$\text{Tap voltage} = \frac{400}{1.732} = 230.9 = 230 \text{ [V]}$$

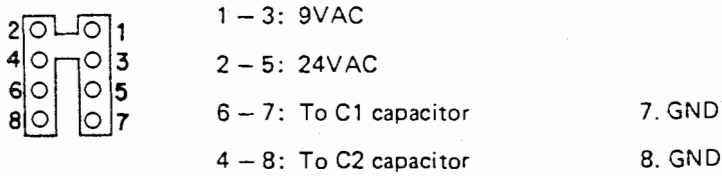
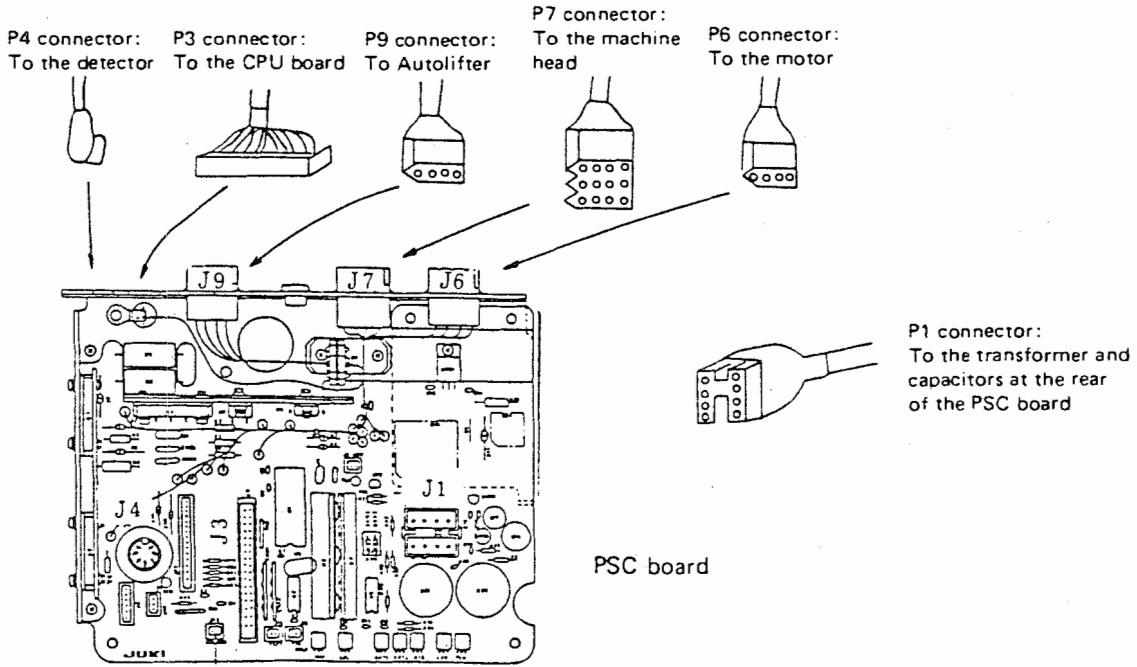
To make connection to a necessary tap, turn off the power, and remove the PSC board. Then you will find a terminal base. Perform connection in accordance with the label indicating the voltages for voltage switching.

NO.	INPUT VOLTAGE	WIRE TERMINAL
1	100V	2 - 3
2	105V	2 - 4
3	110V	1 - 3
4	115V	1 - 4
5	120V	2 - 5
6	130V	1 - 5
INPUT VOLTAGE WIRE TABLE		

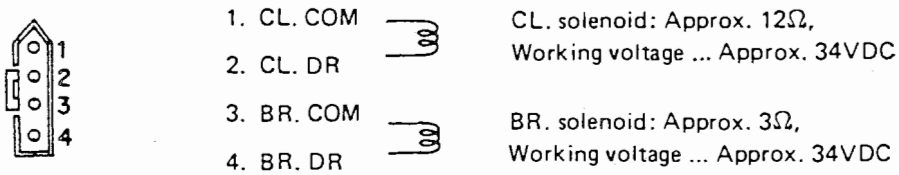
NO.	INPUT VOLTAGE	WIRE TERMINAL
1	190V	2 - 3
2	200V	1 - 3
3	220V	2 - 4
4	230V	1 - 4
5	240V	2 - 5
6	250V	1 - 5
INPUT VOLTAGE WIRE TABLE		

Caution: When operating the PSC box on a 380 V ~ 440 V power supply voltage, confirm that the specified switch and motor are used without fail, or else the PSC box will be damaged.

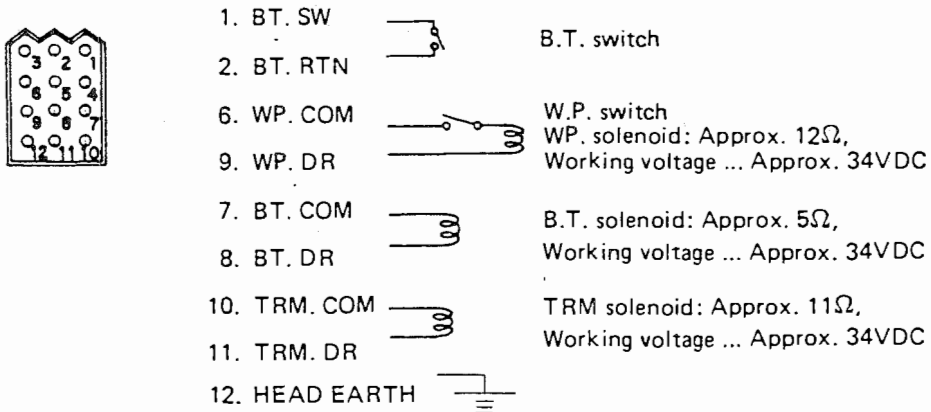
Connection Diagram of the Connectors (LH-1172-5-4B AK-11)



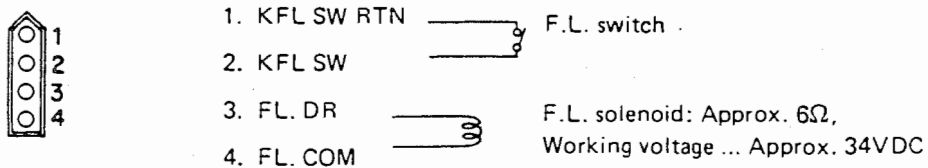
(P6 connector)



(P7 connector)



(P9 connector)



MOTOR/SWITCH CONNECTION TABLE

When single phase motor is used:

<p style="writing-mode: vertical-rl; transform: rotate(180deg);">Switch side</p>	<p style="writing-mode: vertical-rl; transform: rotate(180deg);">Connection diagram</p>	<p>SW1XL · 1 110 ~ 125V 1ϕ</p> <p>For 110 ~ 125V power supply voltage</p>
<p style="writing-mode: vertical-rl; transform: rotate(180deg);">Switch side</p>	<p style="writing-mode: vertical-rl; transform: rotate(180deg);">Connection diagram</p>	<p>SW1XH · 1 220 ~ 250V 1ϕ</p> <p>For 220 ~ 250V power supply voltage</p>
<p style="writing-mode: vertical-rl; transform: rotate(180deg);">Motor side</p>	<p style="text-align: right;">1D402-E 1D402-E2 (1ϕXL/XH)</p> <p>(Note) The same motor connection is used for the both switch types, SW1XL · 1 and SW1XH · 1.</p>	
<p style="writing-mode: vertical-rl; transform: rotate(180deg);">Remarks</p>	<p>The pin layout of the 9P connector is to be observed from P.</p> <p>(Note) Fit in the above connectors as shown on the right.</p>	



4
1
2

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