

JUKI

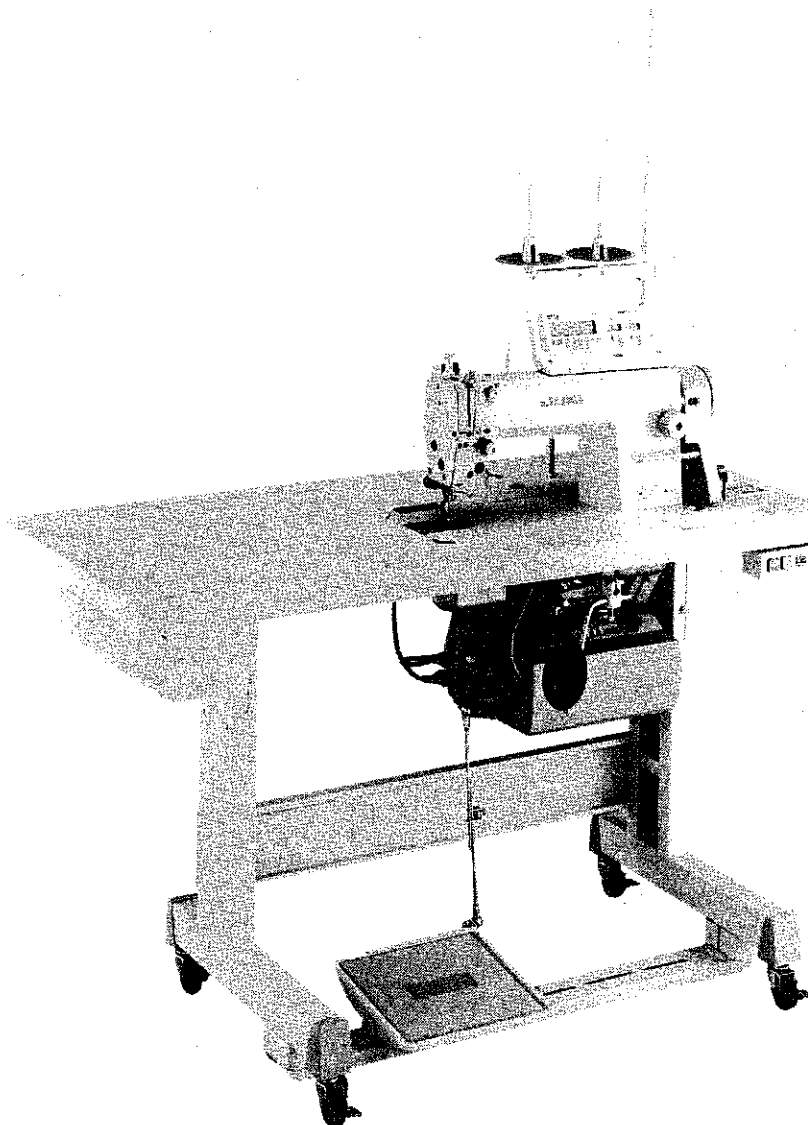
1-Needle, Needle Feed, Lockstitch Machine

DLN-5410N/ DLN-5410NH (For heavy-weight materials)
DLN-5410NL (For long pitch)

1-Needle, Needle-Feed, Lockstitch Machine with
Automatic Thread Trimmer

DLN-5410N-7/ DLN-5410NH-7
(For heavy-weight materials)

ENGINEER'S MANUAL



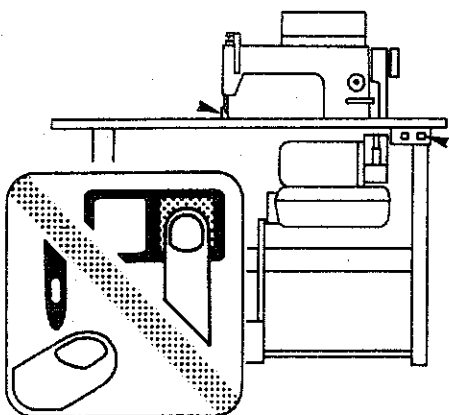
PREFACE

This Engineer's Manual is written for the technical personnel who are responsible for the service and maintenance of the sewing machines. This manual presents detailed explanation of the adjusting procedures, etc. which are not covered by the Instruction Manual intended for the maintenance personnel and operators at a garment factory.

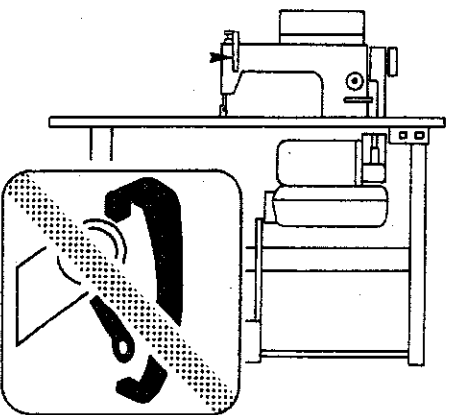
It is advisable to use the Engineer's Manual in combination with the pertinent Instruction Manual and Parts List when servicing the sewing machines of these models.

CAUTION

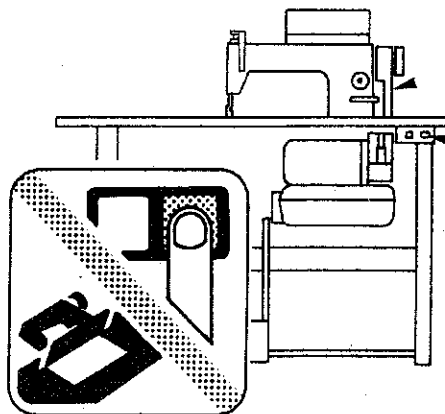
1. Keep your hands away from the needle when the power switch is turned ON or while the machine is operating.



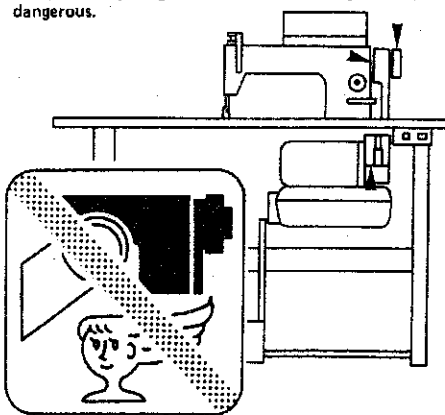
2. Do not put your fingers into the thread take-up cover while the machine is operating.



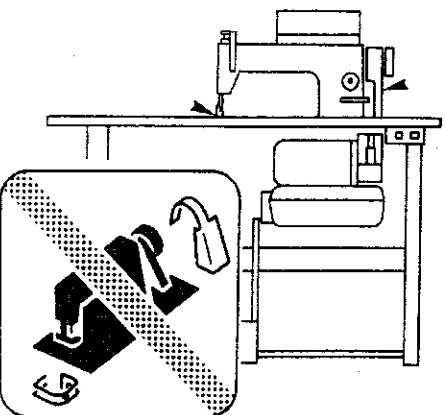
3. Be sure to turn the power switch OFF before tilting the machine head or removing the V belt.



4. During operation, be careful not to allow your or any other person's head or hands to come close to the handwheel, V belt, bobbin winder or motor. Also, do not place anything close to them. Doing so may be dangerous.



5. If your machine is provided with a belt cover, finger guard or any other protectors, do not operate your machine with any of them removed.



CONTENTS

PREFACE

1. GENERAL	1
1-1. Features	1
1-2. Specifications	2
1-3. Applications	4
2. OPERATION	5
2-1. Name of each component	5
2-2. Test run	7
3. ADJUSTMENT	9
3-1. Adjusting the timing of the cloth feed movement	9
3-2. Adjusting the stitch width	9
3-3. Adjusting the initial position of the needle bar	10
3-4. Adjusting the play or jarring of the feed and needle feed components	10
3-5. Adjusting the belt tension	12
3-6. Adjusting the needle stop position	12
3-7. Adjusting the wiper	13
3-8. Theory of thread trimming	13
3-9. Thread trimming sequence	14
3-10. How to check and adjust the timing of the thread trimming cam	15
3-11. Positioning the moving knife	16
3-12. Installing the counter knife	18
3-13. Properly installing the knife thread guide	20
3-14. Adjusting the floating amount of the tension disc No. 2	20
3-15. Sharpening the counter knife	20
3-16. Replacing the moving knife	21
3-17. Replacing the knife thread guide	21
3-18. Adjusting the thread take-up picker	22
3-19. Adjusting the clutch disc and thread trimmer solenoid	23
3-20. Installing and removing the knife mounting base	23
3-21. Positioning the one-touch type reverse feed switch lever	23
3-22. How to replace the synchronizer	24
3-23. Adjusting the auto-lifter (AK95, AK96, AK97, AK98) (Optional)	25
3-24. Adjusting the auto-lifter (AK84, AK85, AK86, AK87) to be attached to the side plate	26
4. TROUBLE AND CORRECTIVE MEASURES (Mechanical components)	31
5. TROUBLE AND CORRECTIVE MEASURES (Sewing performance)	37
6. BOBBIN CASE WITH AN IDLING PREVENTION SPRING	47
DLN-5410N-7 TABLE DIMENSIONS	48

1. GENERAL

1-1. Features

- 1) The sewing speed can be changed continuously from low to high by adjusting the level of depression of the pedal, contributing to higher efficiency.
- 2) Performs automatic reverse feed stitching at the start and end of sewing.
When the front part of the pedal is depressed, the machine carries out reverse feed stitching at constant speed, assuring consistent quality.
- 3) The pressure required for depressing the front and back parts of the pedal can be adjusted to suit each operator.
- 4) A control box mounted on the machine head enables the operator to easily check ON/OFF of the main switch and automatic reverse stitch at start/end, and stitching patterns selected. This feature virtually eliminates chances for operational mistakes.
- 5) While the machine is at rest, its pulley can be turned by hand.
A synchronizer is included in the pulley to ensure easy operation.
- 6) The max. sewing speed control variable resistor is mounted on the operation panel. This contributes to easier operation.

1-2. Specifications

Table 1

	Model	DLN-5410N-7	DLN-5410N
1	Sewing speed	Normal speed: 4,000 spm (max. 5,000 spm)	
2	Stitch length	0 to 4 mm (0" to 0.159")	
3	Needle bar stroke	30.7 mm (1.209")	
4	Needle (Example)	DB x 1 #14, (Standard)	[DB x 1 #9~#16
5	Presser foot pressure	4 to 6 kg	
6	Presser foot lift (by knee lifter) (by hand lifter)	Standard: 10 mm (0.394"), Max. 13 mm (0.511") 5.5 mm (0.216")	
7	Presser foot	Exclusive hinging presser foot	
8	Feed dog	3-row teeth (feed dog tilt adjustable)	3-row teeth
9	Height of feed dog	0.8 to 0.9 mm (0.031" to 0.035")	
10	Feed system	Swing type	
11	Thread take-up	Link-type	
12	Thread take-up stroke	Standard: 107 mm (4.212") (Max. 112 mm (4.409") to Min. 105 mm (4.133"))	
13	Lubrication	Fully automatic	
14	Oil return	By plunger pump	
15	Lubricant	New Defrix Oil No. 1	
16	Wiper	Equipped as standard device on DLN-5410N-7-W0 and DLN-5410N-7-WB	
17	Automatic reverse stitching device	Equipped as standard device on DLN-5410N-7-0B and DLN-5410N-7-WB	
18	Motor	AC servomotor	—
19	Motor output	Rated output: 400W Max. output: 550W	—
20	Power supply	3-phase or single-phase	—
21	Solenoid drive power supply	DC-31V	
22	Max. speed adjustment range	200 spm to max. speed	—
23	Needle up/down stop selector switch	The machine normally stops with its needle down. By setting this switch, the machine can be stopped with its needle up.	
24	Auto-lifter	Available as an option	

Table 2

	Model	DLN-5410NH-7	DLN-5410NH	DLN-5410NL
1	Sewing speed	Normal speed: 3,500 spm (max. 4,000 spm)		Normal speed: 2,500 spm (max. 3,000 spm)
2	Stitch length	0 to 4.5 mm (0 to 0.177")		0 to 6 mm (0 to 0.236")
3	Needle bar stroke	30.7 mm (1.209")		
4	Needle (Example)	DB x 1 #20~#23 Standard DB x 1 #22		DB x 1 #20~#23 Standard DB x 1 #22 Synthetic fiber thread DB x 1 #20, #21
5	Presser foot pressure	5~7 kg		
6	Presser foot lift (by knee lifter) (by hand lifter)	Standard: 10 mm (0.394"), Max. 13 mm (0.511") 5.5 mm (0.216")		
7	Presser foot	Exclusive hinging presser foot		
8	Feed dog	3-row teeth (feed dog tilt adjustable)	3-row teeth	
9	Height of feed dog	0.95~1.05 mm (0.037"~0.041")		
10	Feed system	Swing type		
11	Thread take-up	Link-type		
12	Thread take-up stroke	Standard: 109 mm (4.291") (Max. 114 mm~Min. 104 mm (4.488"~4.09"))		
13	Lubrication	Fully automatic		
14	Oil return	By plunger pump		
15	Lubricant	New Defrix Oil No. 1		
16	Wiper	*Equipped as standard device on DLN-5410NH-7-W0 and DLN-5410NH-7-WB		
17	Automatic reverse stitching device	Equipped as standard device on DLN-5410N-7-0B and DLN-5410N-7-WB		
18	Motor	AC servomotor*	—	—
19	Motor output	Rated output: 400W Max. output: 550W	—	—
20	Power supply	3-phase or single-phase	—	—
21	Solenoid drive power supply	DC-31V		
22	Max. speed adjustment range	200 spm to max. speed	—	—
23	Needle up/down stop selector switch	The machine normally stops with its needle down. By setting this switch, the machine can be stopped with its needle up.		
24	Auto-lifter	Available as an option		

*The wiper can be used on material as thick as 3 mm (0.118").

*Use the motor pulley with an effective diameter of $\phi 75$ mm (2.953") (MTSP00750A0, outside diameter $\phi 80$ mm (3.150")).

1-3. Applications

1) Standard models

Extensively used for light- to medium-weight general fabrics in men's suits, ladies' wear, working wear, students' uniforms, etc. Cotton or synthetic thread of #80 to #30 is generally used.

(Example)

(DLN-5410N, -5410N-7)

Table 3

Needle	Size	Thread	Material	Application
DBx1	#9	#80	Georgette, nylon, T/C broad cloth	Extremely light-weight materials
	#11	#80~#60	General broad cloth, light-weight knit	Light-weight materials
	#14	#60~#50	Wool, cotton gaberdine, drill	General fabrics
	#16	#50~#30	Overcoats	Medium- and heavy-weight materials
	#18	#30~#20	Denim	Heavy-weight materials
DBx1KN	#9	#80	Georgette, nylon, T/C broad cloth	Extremely light-weight materials
	#10	#60	General broad cloth, light-weight knit	Light-weight materials
	#12	#50	Wool, cotton gaberdine, drill	General fabrics

(DLN-5410NH, -NL, DLN-5410NH-7)

Table 4

Needle	Size	Thread	Material	Application
DBx1	#20	#30~#20	Coats, quilting	Medium-weight materials
	#21	#30~#8	Denim, overcoats, drill	Medium- and heavy-weight materials
	#22	#8	Denim	Heavy-weight materials

2. OPERATION

2-1. Name of each component

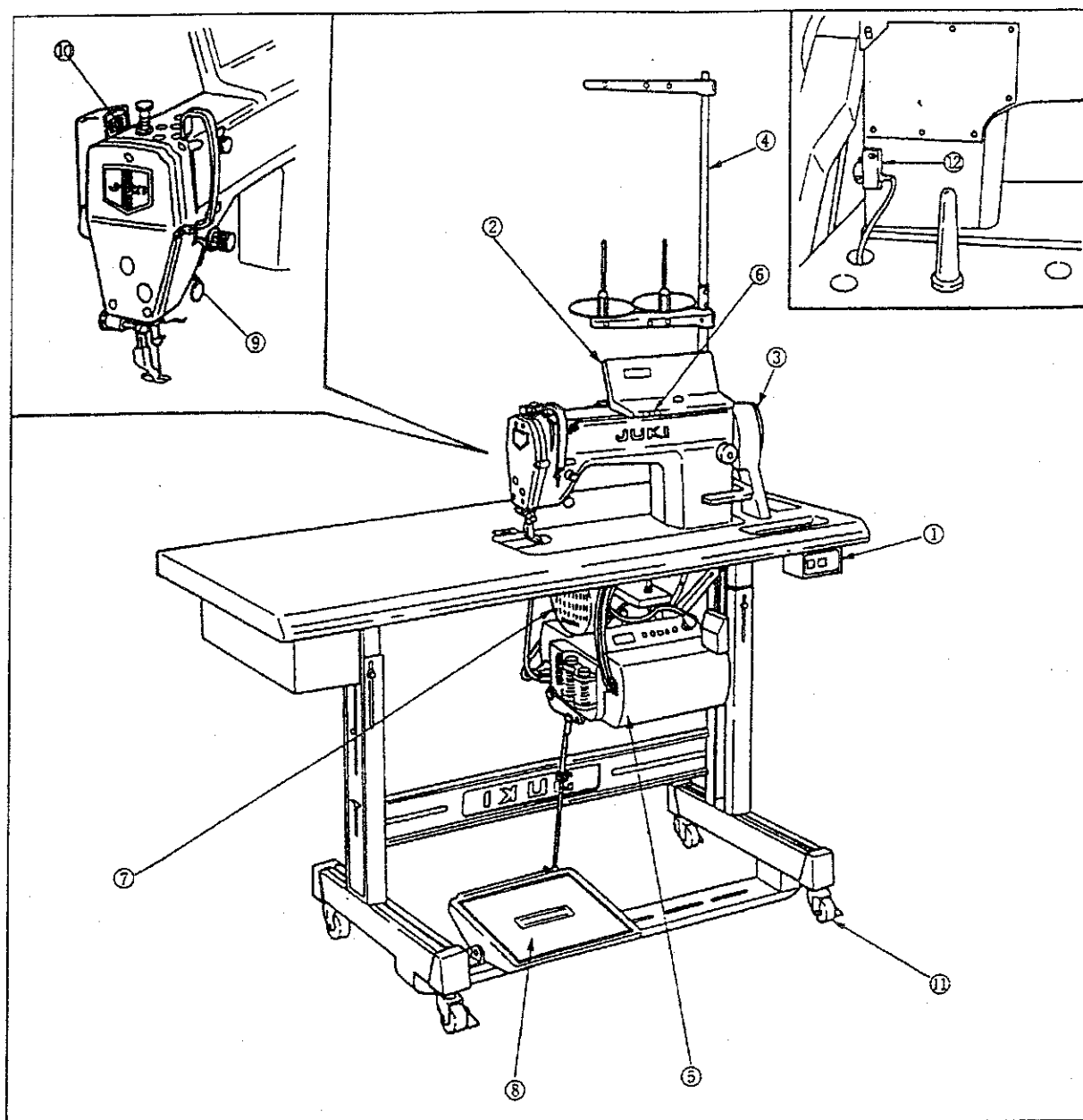


Fig. 1

- | | |
|---------------------------|-------------------------------------|
| ① Power switch | ⑧ Operation pedal |
| ② Operation panel | ⑨ Touch-back switch |
| ③ Synchronizer | ⑩ Wiper |
| ④ L-shaped thread stand | ⑪ Pedestal leveling screw or caster |
| ⑤ PSC box | ⑫ Resistor pack |
| ⑥ Max. speed control knob | |
| ⑦ Motor | |

- ① Power switch
Power switch of the motor, PSC and operation panel.
- ② Operation panel
Automatic reverse feed stitching, pattern sewing ec. are set through this operation panel.
- ③ Synchronizer
The synchronizer is built in to the pulley of the sewing machine. It detects the upper and lower positions of the needle. It then transmits an input signal to the main circuit board in the PSC box.
- ④ L-shaped thread stand
- ⑤ PSC box
Comprises a circuit to control the sewing machine and motor, an output circuit to operate the elements (thread trimming solenoid, reverse feed solenoid, etc.), a pedal sensor to sense pedal operation, and a power circuit to actuate the elements.
- ⑥ (Max. speed control variable resistor)
Allows analog adjustment of the maximum sewing speed, eliminating the need for motor pulley change.
- ⑦ Motor
Operates the machine at high speed ↔ medium speed ↔ low speed in response to the signals received from the PSC box.
(An H motor is provided with a brake.)
- ⑧ Operation pedal
The front and back parts of the pedal are depressed to control the sewing speed and to actuate the thread trimmer, presser foot lifter (only for AK85 type), etc.
- ⑨ Touch-back switch
Used by hand to perform reverse feed stitching.
- ⑩ Wiper
Wipes out the needle thread after thread trimming in response to the wiper signal received from the PSC box.
- ⑪ Pedestal leveling screw or caster
Used to perform adjustment so that the table stands on the floor flatly to minimize vibration during operation.
- ⑫ Resistor pack
Automatic identification of the type of machine head.

2-2. Test run

- 1) Operation at the time of turning the power switch ON
When the power switch is turned ON, if the needle is not in its upper stop position, the machine rotates until its needle reaches the upper stop position, and then stops with its needle up.
- 2) How to operate the pedal
As shown below, the pedal is operated in four steps:

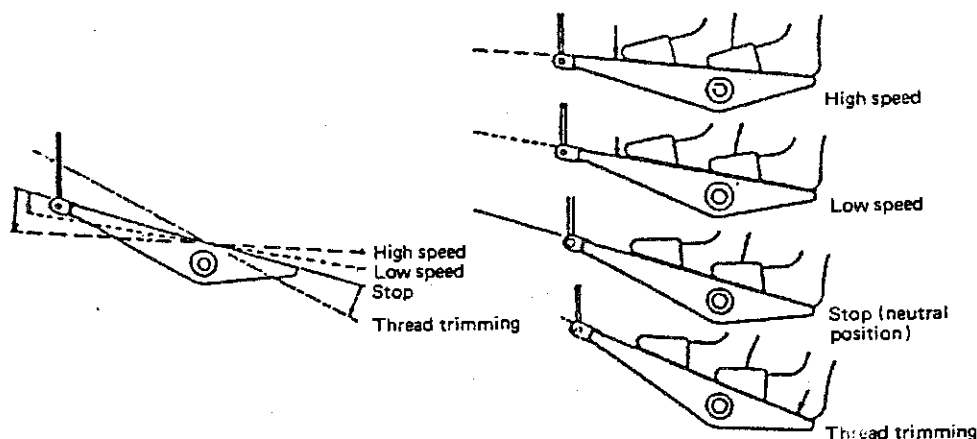


Fig. 2

- ① When the front part of the pedal is trodden lightly, the machine will start to run at low speed.
- ② When the front part of the pedal is trodden further, the machine will sew at high speed. (However, when the automatic reverse feed switch has been turned ON, the machine will not run at high speed until the reverse feed is completed.)
- ③ When the pedal is returned to the stop (neutral) position, the machine will stop with its needle up or down as set using the needle up/down selector switch.
- ④ When the back part of the pedal is trodden, the thread trimmer will be actuated, and the machine will stop with its needle up.
 - The proper thread trimming action will not be disturbed even when the pedal is returned to the neutral position immediately after the machine starts thread trimming. When the front part of the pedal is trodden immediately after the machine starts thread trimming, the proper thread trimming action will not be prevented either. In this case, however, the safety circuit will operate, so that the machine will not run even after the thread trimming has been completed. Therefore, the pedal must be returned to the neutral position once.
 - In a model provided with a wiper, the wiper will be actuated.

3) How to operate the pedal when using Auto-lifter AK85

As shown below, the pedal is operated in five steps:

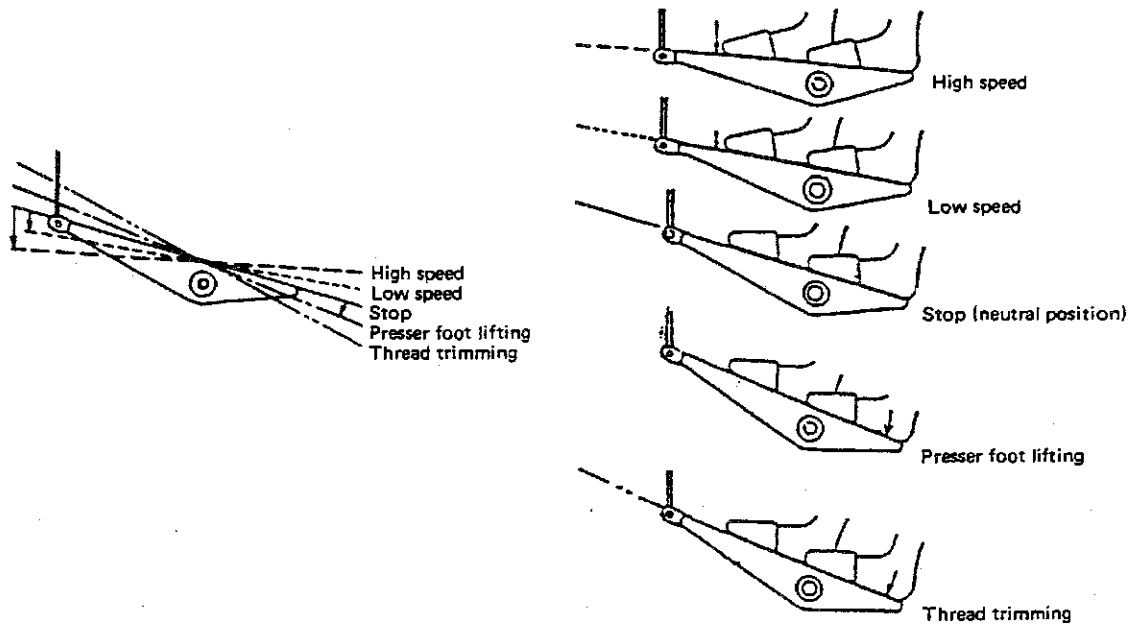
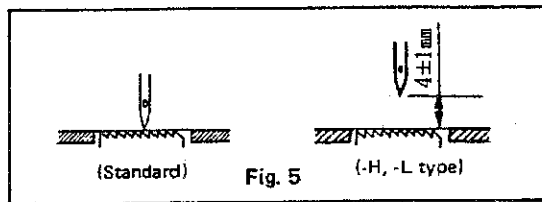
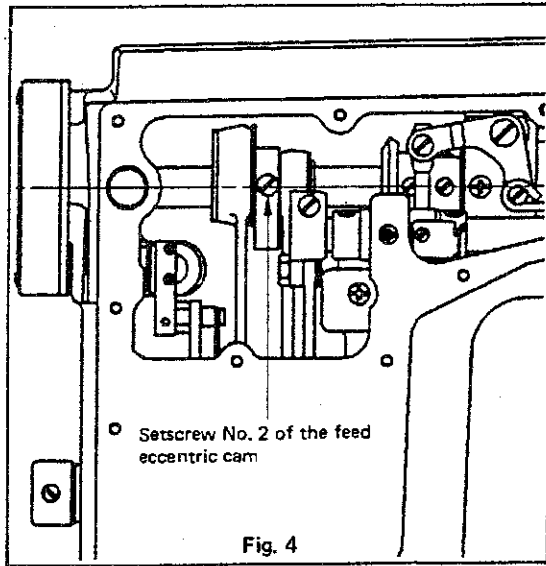


Fig. 3

- ① When the front part of the pedal is trodden lightly, the machine will start at low speed.
- ② When the front part of the pedal is trodden further, the machine will increase its speed. (However, when the automatic reverse feed switch has been turned on, the machine will run at high speed after the reverse feed is completed.)
- ③ When the pedal is returned to the stop (neutral) position, the machine will stop with its needle down.
- ④ When the back part of the pedal is trodden lightly, the presser foot will go up.
- ⑤ When the back part of the pedal is trodden further, the presser foot will go down, thread trimming will be done, the machine will stop with its needle up, and the presser foot will go up.
 - In a model provided with a wiper, the wiper will be actuated.

3. ADJUSTMENT

3-1. Adjusting the timing of the cloth feed movement



The standard adjustment of the timing of the cloth feed action is obtained when the tip of the needle is aligned with the surface of the throat plate (for the H or L type machine, the tip of the needle is $4 \pm 1 \text{ mm}$ ($0.157'' \pm 0.039''$) above the surface of the throat plate) while the handwheel is turned until the top face of the feed dog is flush with the throat plate with the feed regulating dial set to 4 (for the H or L type machine, the dial is set to 4.5) (while the needle is descending and the feed dog is ascending).

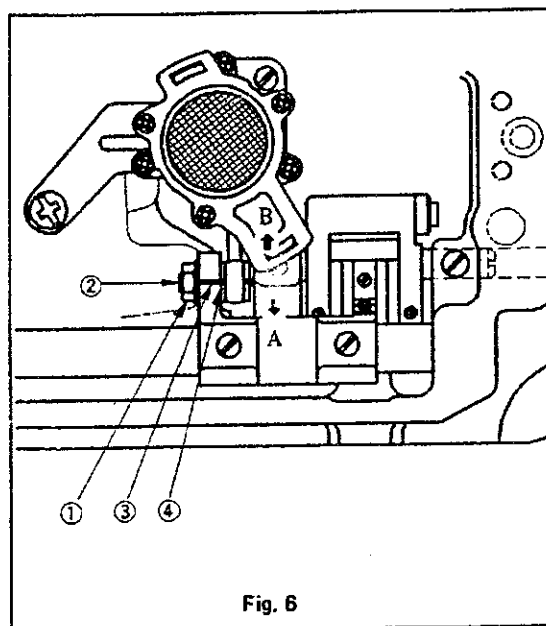
(At this time, setscrew No. 2 of the feed dog eccentric cam faces forward, as observed from the side plate.)

Loosen the setscrew in the feed eccentric cam. If the handwheel is turned in the normal direction of rotation while keeping the position of the cam unchanged, the feed timing will be slow. If the handwheel is turned in the reverse direction, the feed timing will be fast.

After making the adjustment, firmly tighten the setscrew and then turn the handwheel by hand to check that the main shaft is operating smoothly.

(Caution) If the timing of the needle to the feed dog is too early, when a heavy-weight material is sewn or an overlapped section of material is sewn, the needle may penetrate the material and then move backward before the feed dog protrudes from the surface of the throat plate. As a result, the needle may bend or break.

3-2. Adjusting the stitch width



The needle feed amount to the feed of the material can be adjusted by tilting the machine head, loosening needle feeding rod shaft nut ①, and moving rod shaft ② forward or backward.

The standard needle feed amount is obtained when marker line ③ engraved on the feed rock shaft crank is aligned with marker line ④ engraved on the needle feeding rod shaft. (Ratio between the needle feed amount and the material feed amount: 1:1)

If the needle feeding rod shaft is moved in direction A, the stitch width will be decreased, and if it is moved in direction B, it will be increased.

(Caution) If the stitch width is changed, the needle might come in contact with the needle hole in the feed. Whenever the stitch width is changed, be sure to check that the needle does not come in contact with the needle hole in the feed by feeding the needle by hand in the normal and reverse direction of rotation before starting operation.

3-3. Adjusting the initial position of the needle bar

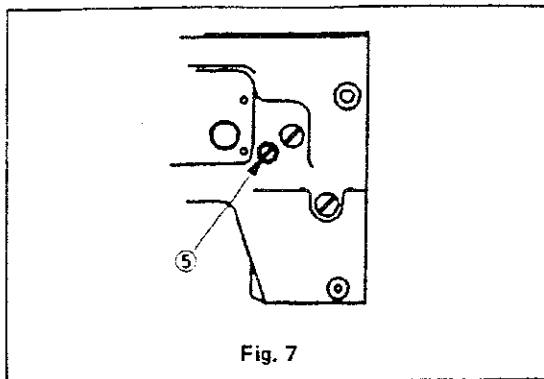


Fig. 7

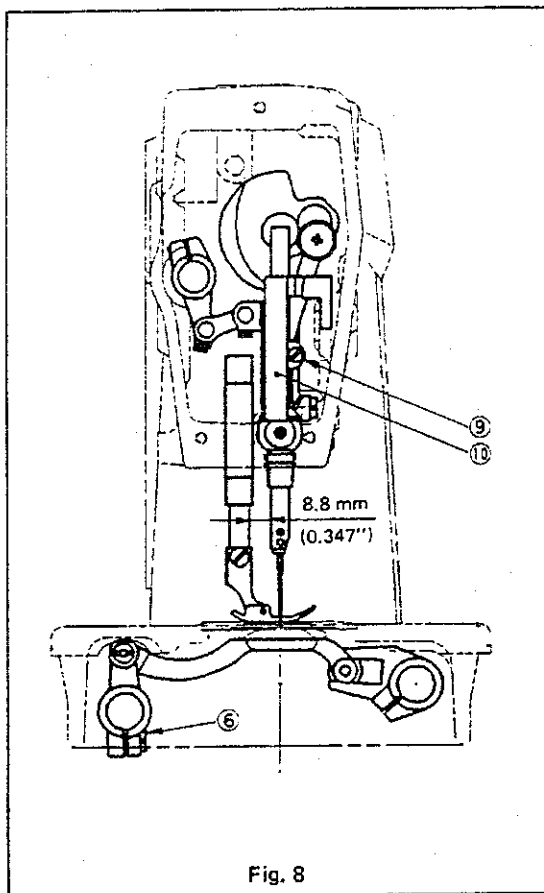


Fig. 8

To eliminate any play, or to adjust each component in the needle feed mechanism, or to change the needle entry point with regard to the needle hole, you will first have to readjust the initial position of the needle bar.

- When aligning the needle entry point with the needle hole in the feed dog:
Set the feed regulating dial to "0", loosen clamping screw ⑤ in the needle feeding shaft crank (front), and align the needle entry point with the needle hole in the feed dog by moving the needle bar forward or backward. After making the adjustment, be sure to tighten the clamping screw.

- When aligning the feed dog with the needle entry point, taking the needle entry point as standard:
Set the feed regulating dial to "0", loosen clamping screw ⑤ in the needle feeding shaft crank (front), and adjust so that an 8.8 mm (0.347") clearance is obtained between the presser bar and the needle bar, with the needle bar in its lowest position. Then tighten the clamping screw. (If you find it difficult to obtain an 8.8 mm (0.347") clearance, replace the throat plate with the throat plate of a standard lockstitch machine and adjust so that the needle enters the center of the needle hole in the throat plate.) Loosen clamping screw ⑥ in the feed bar and move the feed dog until the needle hole in the feed is aligned with the needle entry point. Then tighten the clamping screw.

(Caution) If the clearance between the presser bar and the needle bar is less than 8.8 mm (0.347"), the needle may come in contact with the presser foot with the feed amount set to the maximum.

3-4. Adjusting the play or jarring of the feed and needle feed components

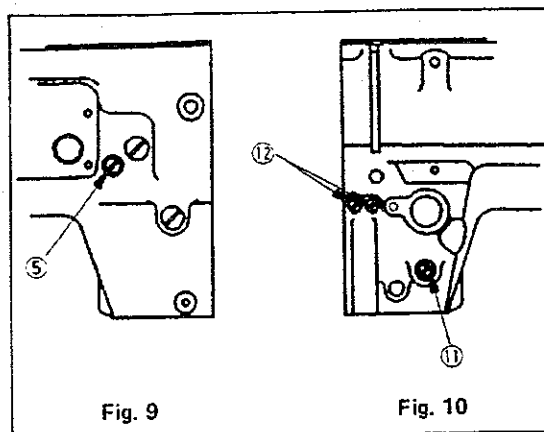


Fig. 9

Fig. 10

If there is a play or jarring in the feed or needle feed components, the following problems may result.

- ✧ Abnormal operation noise while the machine is running.
- ✧ Burrs of the feed lever
- ✧ Incorrect pitch during high-speed or low-speed operation
- ✧ Malfunctions of the electrical components due to excessive torque
- ✧ Seizure due to excessive torque

The following describes the points which need to be checked very carefully.

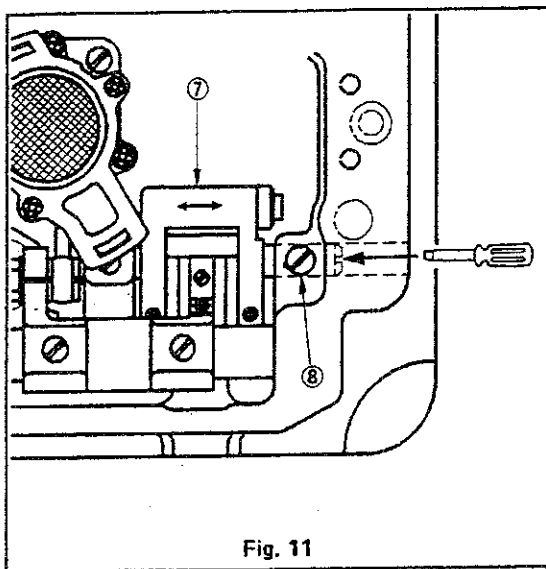


Fig. 11

- Lateral play in the feed regulating link
 - Point to be checked

There should be no lateral play in feed regulating link ⑦.
 - How to adjust

If there is any lateral play, loosen setscrew ⑧ in the fulcrum shaft and tighten the setscrew by pressing it with a screwdriver through the fulcrum shaft hole in the rear section of the bed. Press feed regulating link ⑦ to the left or right and make sure that there is no play in the feed regulating link.

Also check that the back lever moves smoothly.
- Torque in the main shaft
 - Point to be checked

There should be no axial dislocation of the feed eccentric cam and the feed rocker shaft lever or the feed driving shaft lever.
 - How to adjust

If there are incorrectly positioned, slightly loosen the screws in the feed eccentric cam, feed rocker shaft lever, and feed driving shaft lever, taking care that the phase of the screws remains unchanged. Then re-tighten the screws. By doing this, jarring in the direction of thrust will be eliminated and the movements of these components will become smoother.
- Torque in the needle bar frame components

If a smooth operation cannot be regained even if the torque in the feed components has been eliminated, it is perhaps because of the torque in the needle bar frame components.

 - Point to be checked

Remove the face plate and loosen needle bar connecting setscrew ⑨. The needle bar will now move smoothly when pushed by hand in its highest/lowest position. When the clamping screw of the needle feeding shaft lever (front) is loosened, needle bar frame ⑩ can be moved laterally by hand without hindrance.
 - How to adjust

If the needle bar frame is unable to move smoothly, loosen clamping screw ⑪ of the roller guide base and re-tighten the clamping screw so that the needle bar frame smoothly moves in a lateral direction and so that the needle also moves without being hindered while thrusting the screw toward the needle bar frame.

If the smooth movement of the feed bar frame cannot be obtained, loosen setscrews ⑫ in the needle bar frame and adjust the position of the needle bar frame guide.

3-5. Adjusting the belt tension

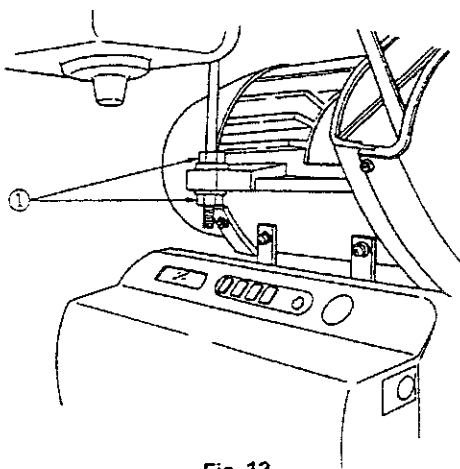


Fig. 12

An excessive belt tension may damage the main shaft bushing of the machine or the motor bearing, while an insufficient belt tension may cause the belt to slip with consequent shortened life of the belt, and also cause other failures such as overrun after thread trimming and machine stops with uneven needle stop height.

To avoid such problems, use a belt of an appropriate length as specified in the INSTRUCTION MANUAL. Adjust the belt tension using nut ① so that the middle of the belt slacks about 15 mm (0.591") when a 1 kg pressure is applied.

3-6. Adjusting the needle stop position

1) How to adjust the upper stop position (after thread trimming)

The standard upper needle stop position is such that the red marker dot on the arm aligns with the white marker dot on the handwheel when the needle stops after thread trimming. For the 5410NH-7, the correct upper stop position is such that the red marker dot on the arm is aligned with the white marker dot on the handwheel when the needle stops after the thread trimmer has trimmed the thread.

With the needle in its upper stop position, loosen screw (A) shown in the figure at right to perform adjustment within the slit.

- Move (A) toward ① to advance stop timing.
- Move (A) toward ② to retard stop timing.

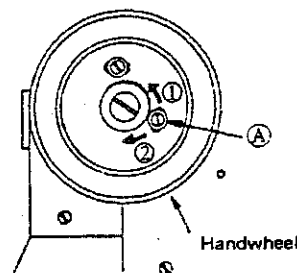


Fig. 13

2) How to adjust the lower stop position

To adjust the lower stop position of the needle at the time when the pedal is set to the neutral position after the front part of the pedal is depressed, set the needle in its lower stop position, and loosen screw (B) (see figure at right) to make adjustment within the slit.

- Move (B) toward ① to advance stop timing.
- Move (B) toward ② to retard stop timing.

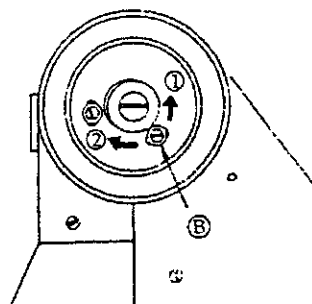


Fig. 14

Note: Do not run the machine with (A) and (B) loosened while making the above adjustment. Screws (A) and (B) should be loosened only, and should not be removed. If the needle-up stop position has been changed, be sure to check whether the needle comes into contact with the wiper when the machine is running.

3-7. Adjusting the wiper

1. Adjusting the position of the wiper

Adjust the position of the wiper according to the thickness of materials to be sewn as follows:

- (1) Turn the handwheel in the normal rotational direction to align white dot ① on the handwheel with red dot ② on the machine arm.
- (2) Insert wiper ③ into wiper driving shaft ④ until the vertical clearance between the wiper edge and the needle point is 2 mm (0.079"), and until the parallel clearance between the needle center and the straight inside face of the wiper is 1 mm (0.039"). Press wiper collar ⑤ against wiper ③, and securely tighten wiper adjustment screw ⑥.

Note: Do not loosen the wiper solenoid setscrew.

When the wiper is not used, turn the wiper seesaw switch OFF.

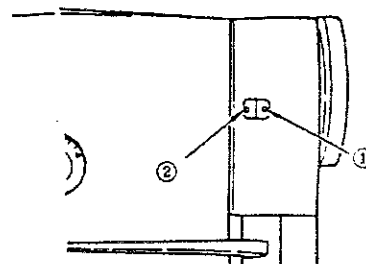


Fig. 15

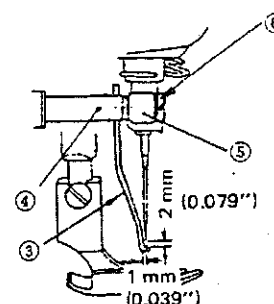


Fig. 16

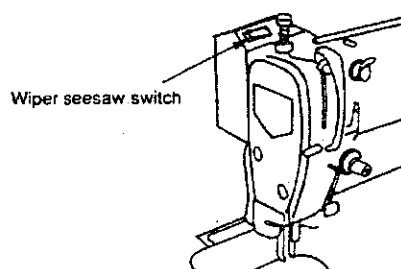
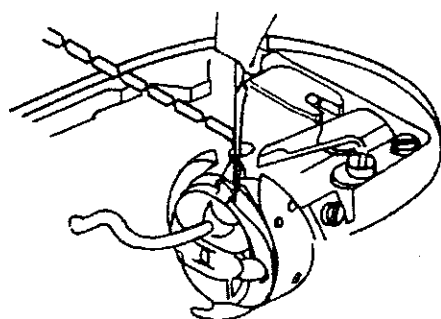
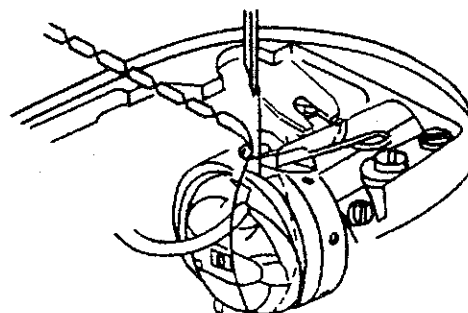


Fig. 17

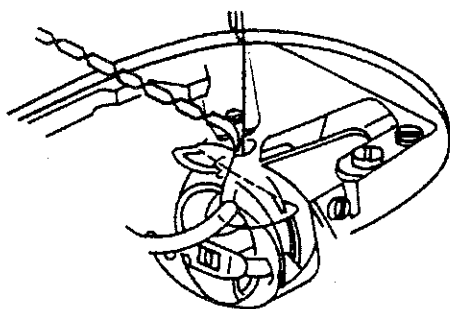
3-8. Theory of thread trimming



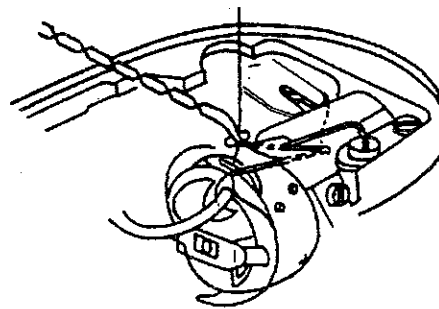
1. The blade point of the sewing hook catches the needle thread.



2. The moving knife spreads the threads.
(goes back)



3. The moving knife hooks the needle threads and bobbin threads (advances).



4. The threads are trimmed.

Fig. 18

3-9. Thread trimming sequence

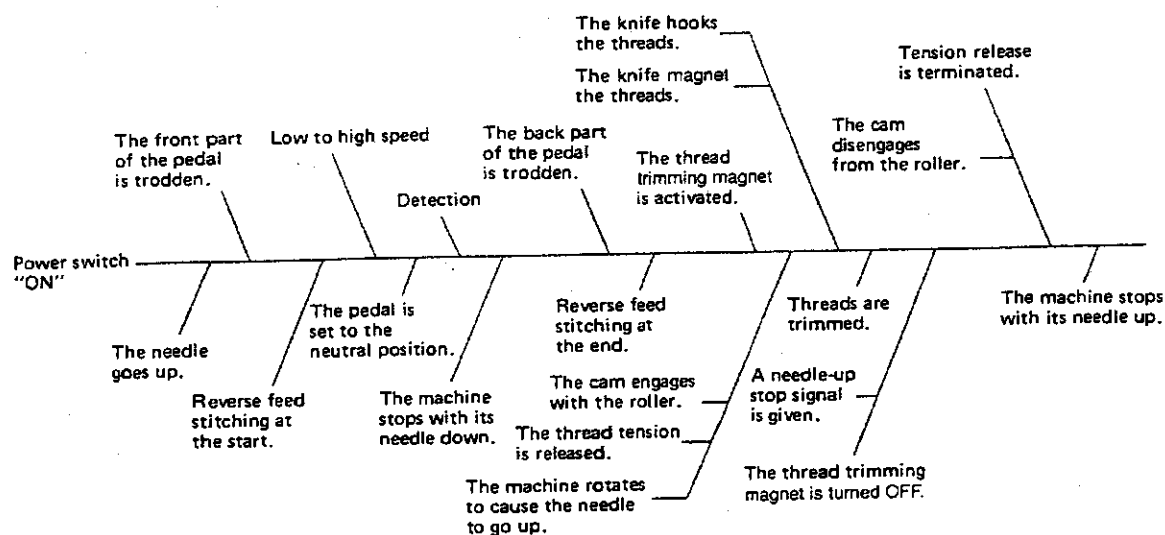


Fig. 19

Note: The above chart assumes that the switches for automatic reverse feed stitching at the start and end have been set to "ON".

3-10. How to check and adjust the timing of the thread trimming cam

1) Correct way to check the timing of the thread trimming cam

The timing of the thread trimmer cam for cotton and synthetic threads can be obtained simply by aligning the marker dot on the machine arm and the marker dot on the handwheel.

Tilt the machine head, manually turn the handwheel until the thread take-up lever almost reaches its highest position, and press thread take-up picker ① in Fig. 20 to the right by finger. This causes the cam roller to fit in the groove of the thread trimmer cam. With this condition maintained, turn the handwheel in the direction opposite to the normal rotational direction, and you will find a position in which the handwheel no longer turns. Then, adjust the cam timing so that marker dot ① (Fig. 21) on the machine arm is aligned with marker dot ② (Fig. 21) on handwheel as shown in Fig. 21. This provides the proper cam timing for cotton and synthetic threads.

*For the DLN-5410NH-7 in particular, the marker dot on the arm should be aligned with the marker dot on the handwheel.

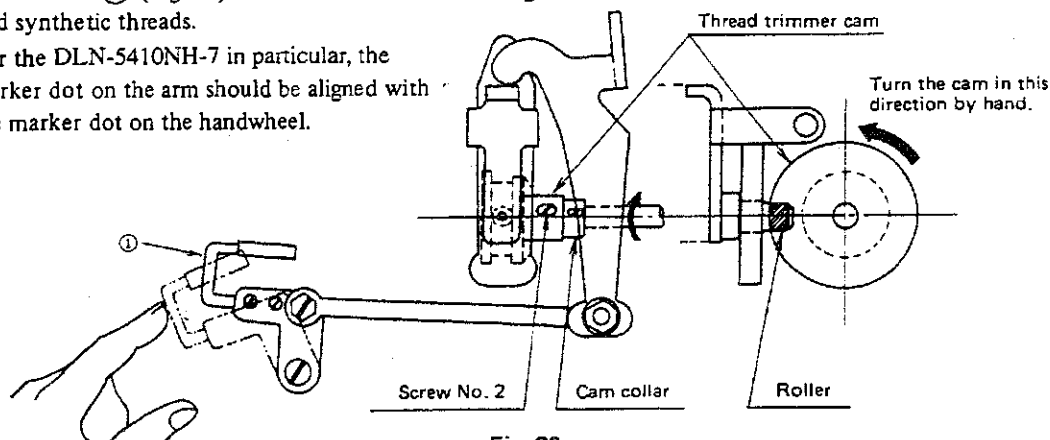


Fig. 20

2) How to adjust the timing of the thread trimmer cam

Loosen screw No. 1 first, and then screw No. 2 (Fig. 20), and align red marker dot ② on the handwheel with red marker dot ① on the machine arm (Fig. 21).

Fit the cam roller in the groove of the cam while pressing thread take-up picker ① (Fig. 20) to the right. Manually turn only the cam (do not turn the hook driving shaft) in the direction opposite from the normal rotation of the hook driving shaft (see the arrow in Fig. 20) until a position in which the cam goes no further is reached. In

this position, press the cam against the thrust collar of the thread trimmer cam (Fig. 20), and retighten the screw No. 2 first and then the screw No. 1. If the cam collar has not been moved, press the thread trimmer cam against the cam collar, and retighten the screw No. 2 first and then the screw No. 1.

(Caution) DLN-5410NH-7 in particular, if the cam position is determined with red marker dot ② above red marker dot ①, the needle thread may not be completely separated and may come off the needle after thread trimming. So be careful.

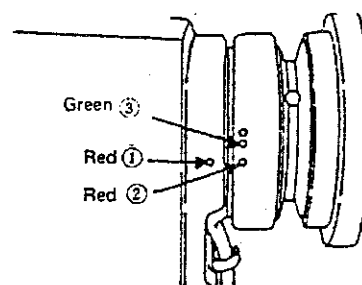


Fig. 21

- (Ref.) 1. The dots engraved on the handwheel provide the standard cam timings. It is possible to obtain a timing which is approx. 2° earlier than that for cotton or synthetic thread, or a timing which is approx. 5° later than that for cotton or synthetic thread. In this case, however, confirm that the moving knife securely separates the two threads below the throat plate bottom surface. If a cam timing is too early or too late, the thread remaining on the needle may become too short, causing the needle thread to slip off the needle immediately after thread trimming. Also, the cam roller may fail to fit in the groove of the thread trimmer cam.
2. The thread trimmer cam timings for cotton and synthetic threads are basically the same. However, if the following problems are presented when using a thinner synthetic thread:
- ① A few beginning stitches are skipped.
 - ② Thread slips off the needle at the start of sewing.
- Perform the following adjustment for special synthetic threads:
- ① Align marker dot ① (Fig. 21) on the machine arm with green marker dot ③ (Fig. 21) on the handwheel.
 - ② Use the soft start function for the first starting stitch.
3. For the DLN-5410NH-7, use the soft-start function for the first stitch at the sewing start. If stitch skipping still occurs, use the soft-start function for the first and second stitches at the sewing start. The thread trimmer rotational speed should be set to 200 ± 20 s.p.m. or less.

3-11. Positioning the moving knife

1) Proper position of the moving knife

The moving knife should be positioned so that the front end of the moving knife is 3 mm (0.118") to 3.5 mm (0.138") behind the center of the needle as illustrated in Fig. 22 (for the H type machine, see Fig. 22-1) when the moving knife travels to its stroke end with the pitch set to 0 (zero). If the retreat of the moving knife is not enough, the knife may fail to catch the needle or bobbin thread at the time of thread trimming. On the contrary, if the moving knife retreats excessively, the moving knife may hit the feed dog. To avoid these problems, be sure to accurately position the moving knife.

The standard moving knife home position is obtained by bringing the periphery of the moving knife in contact with the V-shaped groove of the knife mounting base.

DLN-5410N-7

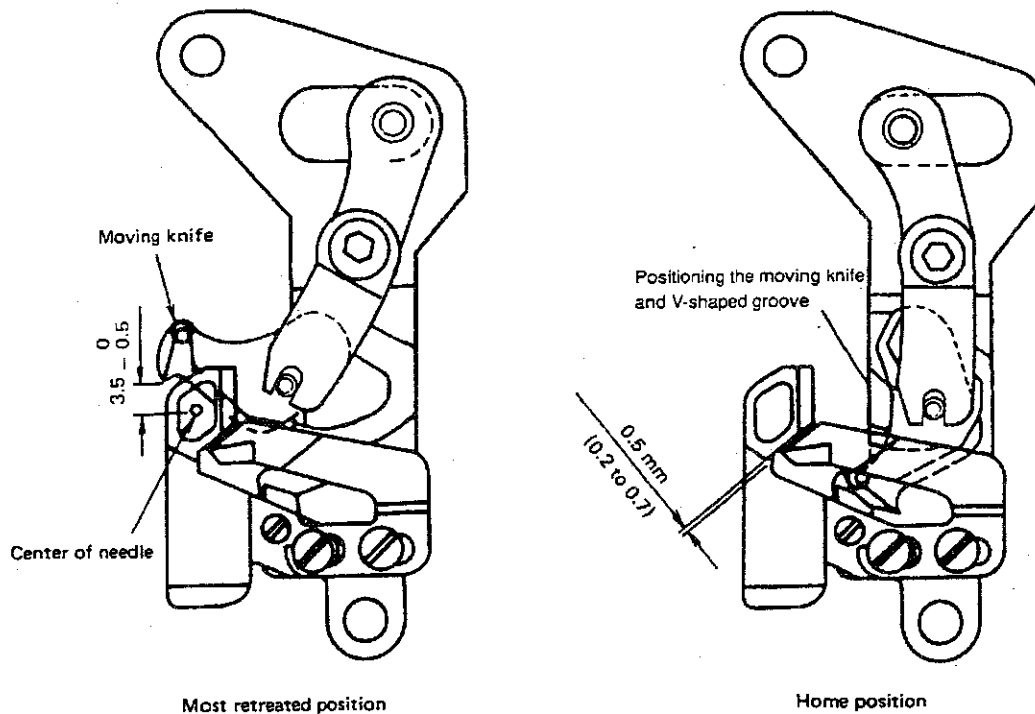


Fig. 22

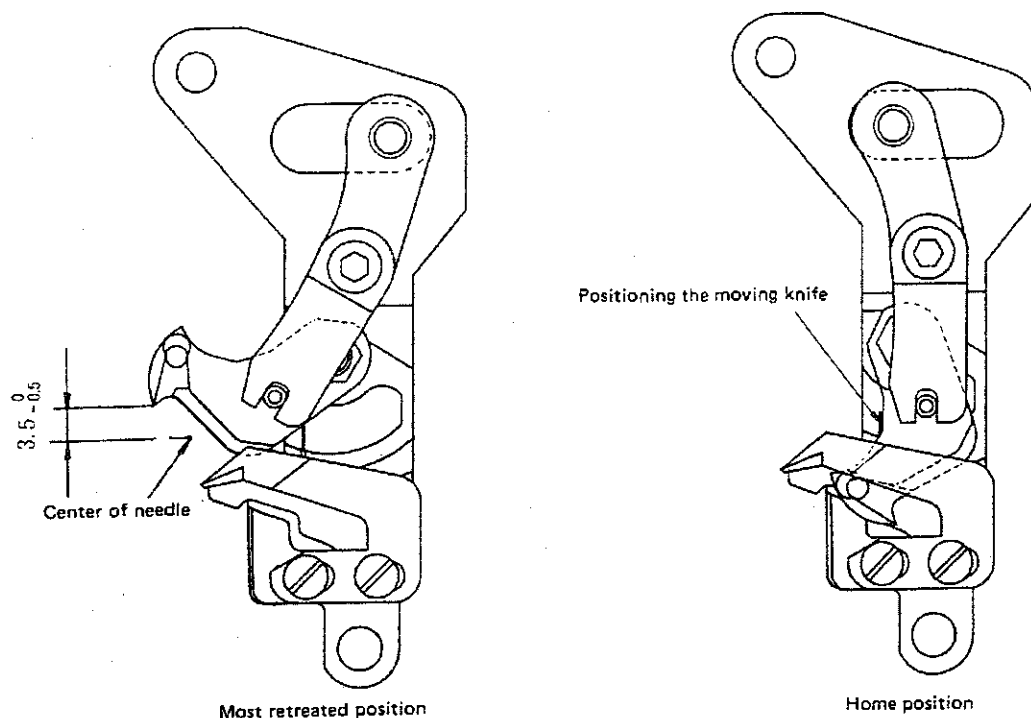


Fig. 22-1

2) How to position the moving knife

The position of the moving knife is adjusted by changing the lateral position of link driving magnet pin ① (Fig. 23) while the machine is at rest.

- ① Loosen the lock nut of link driving magnet pin ① (Fig. 23)
- ② Move the link driving magnet pin to the right or left to make the V-shaped groove (Fig. 22) meet the periphery of the moving knife, referring to the home position shown in Fig. 22.
- ③ Retighten the lock nut of the link driving magnet pin when the proper position of the moving knife has been obtained. As the link driving magnet pin is moved to the right, the retreat of the moving knife increases. As it is moved to the left, the retreat of the moving knife decreases.

3) When the moving knife can not be properly positioned merely by adjusting the position of the link driving magnet pin.

- ① Loosen adjusting nut of link driving magnet pin ① (Fig. 23)
- ② Adjust so that the center of the link driving magnet pin aligns with V-shaped groove ③ (Fig. 23) of the knife driving shaft ②, (Fig. 23) and fix link driving magnet pin by tightening the lock nut.
- ③ Loosen two screws ⑤ (Fig. 23) of the knife driving shaft stopper ④ (Fig. 23).
- ④ Move the knife driving shaft ② (Fig. 23) to make the periphery of the moving knife meet the V-shaped groove of the mounting base (Fig. 22), and fix knife driving shaft stopper ④ (Fig. 23) by tightening two screws ⑤ (Fig. 23).

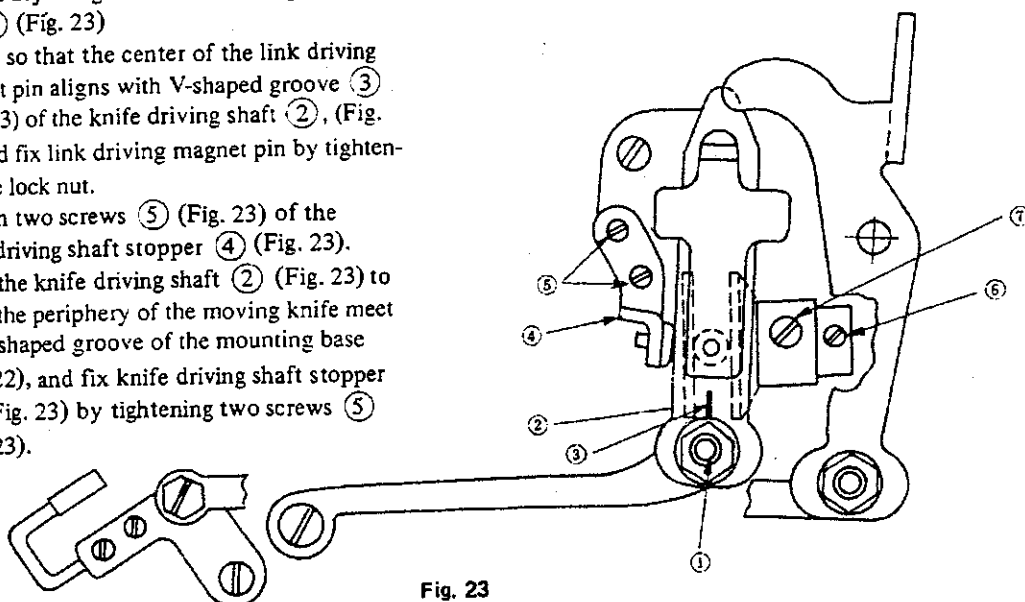


Fig. 23

- ⑤ Loosen the two screws of thread trimmer cam ⑦ (Fig. 23) and cam collar ⑥ (Fig. 23).
- ⑥ Align red dot ② (Fig. 21) on the handwheel with red dot ① (Fig. 21) on the machine arm.
- ⑦ Manually turn the cam until screw No. 2 ⑦ (Fig. 23) faces toward you. Then press the thread take-up picker to the right.
- ⑧ Move the cam to the right or left to engage the cam with the cam roller.
- ⑨ With the cam engaged with the cam roller, turn the cam in the direction of the arrow (toward you) until it stops, while lightly pulling the cam to the right.
- ⑩ Tighten screw No. 2 ⑦ (Fig. 23) of the cam for preliminary installation.
- ⑪ Then confirm:
 - a) that the specified marker dots on the machine arm and handwheel are in alignment,
 - b) the roller smoothly fits in the cam groove, and
 - c) the retreat of the knife has been set to 3 to 3.5 mm (0.118" to 0.138").
- ⑫ Securely tighten the two screws of the cam.
- ⑬ Press the thrust collar against the cam and fix it by tightening the screw.

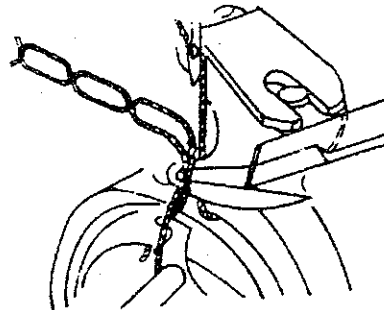


Fig. 24

- Note:
- Note that a minute change in the lateral position of the knife driving shaft will greatly affect the retreat of the knife.
 - Confirm that the moving knife spreads the threads as shown in Fig. 24

3-12. Installing the counter knife

Refer to Fig. 25-1, and 26 for proper installation of the counter knife. The standard distance from the blade point of the counter knife to the knife thread guide, which is positioned so that the needle enters the center of its opening, is 0.5 mm (0.019"). At this time, the blade point of the counter knife is about 4 mm (0.157") away from the center of the needle. * **For the H type machine, the blade point of the counter knife should be approximately 11.3 mm (0.445") away from the screw hole. (Fig. 25-2)** The blade point of the counter knife is located 0.6 mm (0.0236") above the installing surface as shown in Fig. 26.

The sharpness of the counter knife depends upon the installing angle of the blade tip of the counter knife. The proper overlap of the counter knife blade with that of the moving knife will provide the best sharpness.

Whenever the counter knife has been readjusted or replaced, be sure to check the sharpness of the counter knife, and adjust the installing angle (Fig. 27) of the counter knife. The installing position of the counter knife can be moved to the right from the standard position.

When the counter knife has been installed in such a position, the needle and bobbin threads to be pulled out become correspondingly longer, and also the timing of thread trimming is delayed, resulting in an increased length of the thread remaining on the needle after thread trimming (Fig. 28).

When using synthetic thread, the timing of thread trimming can be delayed by moving the counter knife to the right. In this case, the timing of the thread trimmer cam must also be adjusted.

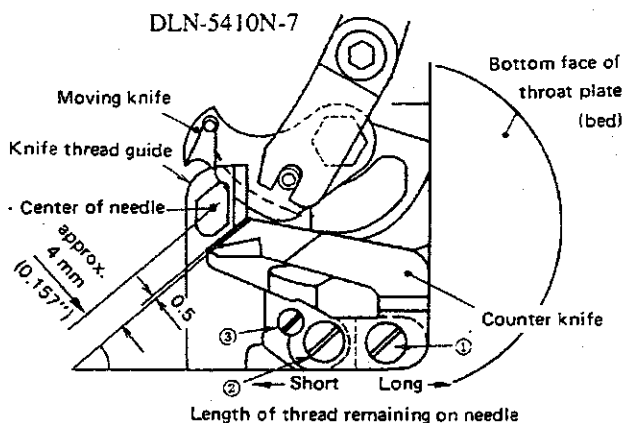


Fig. 25-1

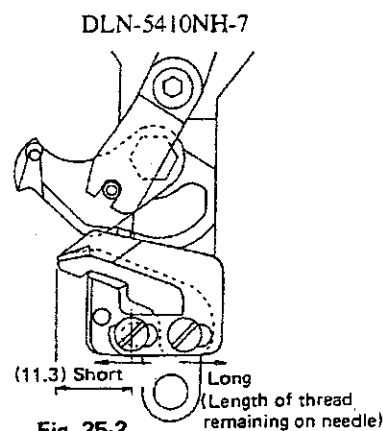


Fig. 25-2

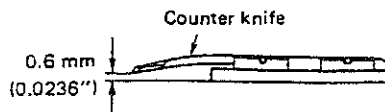


Fig. 26

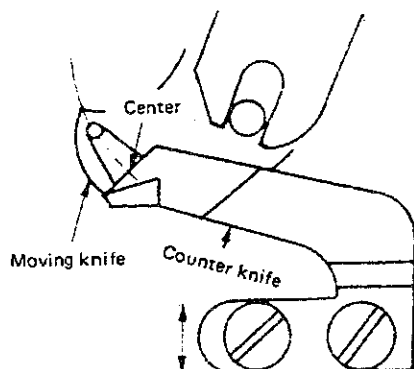


Fig. 27

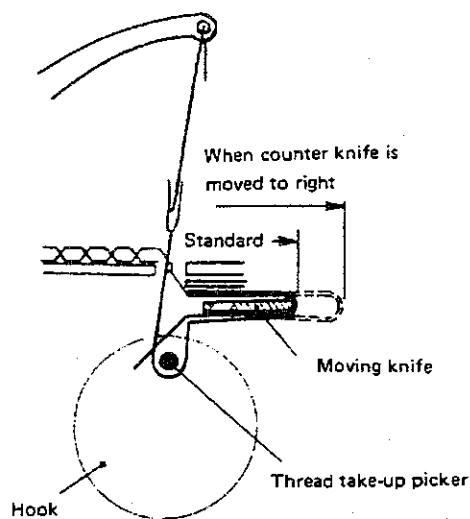


Fig. 28

3-12-1. Adjusting the bobbin thread retaining plate (DLN-5410NH-7)

One or several stitches are likely to skip at the sewing start, if the bobbin thread retaining plate fails to retain the bobbin thread. In this case, loosen screw ①, and move the bobbin thread retaining plate in direction ③ so that the retaining force of the bobbin thread retaining plate is increased.

When using a thicker thread and the retaining force of the bobbin thread retaining plate is excessive, the moving knife may fail to completely return to its home position due to the resistance of the counter knife and the bobbin thread retaining plate. In this case, move the bobbin thread retaining plate in direction ④ to decrease the retaining force of the bobbin thread retaining plate.

(Caution) If the bobbin thread retaining plate is moved too far direction ③, the needle thread may be caught in the bobbin thread retaining plate. So be careful.

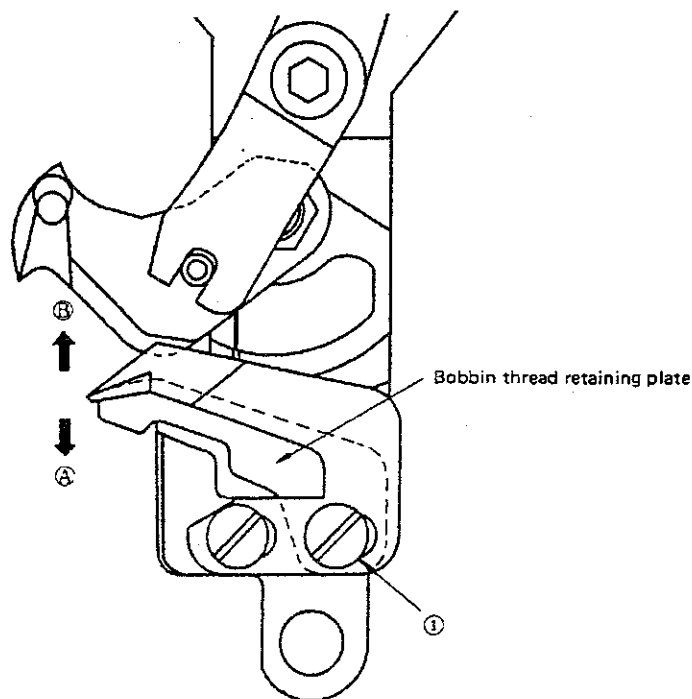


Fig. 28-1

3-13. Properly installing the knife thread guide

Install the knife thread guide so that the needle enters exactly the center of its opening.

3-14. Adjusting the floating amount of the tension disc No.2

1) How to check the floating amount

Check whether the tension disc No. 2 floats 0.5 to 1 mm (0.019" to 0.039") when thread take-up picker ① (Fig. 20) is pressed to the right with the thread take-up lever located slightly below its highest position and the presser foot lifted.

2) How to adjust the floating amount

- ① To increase the floating amount, loosen screw ① (Fig. 29), and move tension release wire ② to the right.
- ② To decrease the floating amount, loosen screw ①, and move tension release wire ② to the left. After adjustment, securely tighten screw ①.

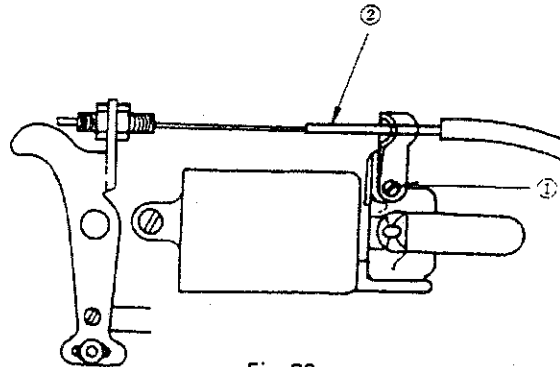


Fig. 29

3-15. Sharpening the counter knife

The most important factor of the sharpness of the thread trimmer is the shape of the blade tip of the counter knife. In most cases, the sharpness of the thread trimmer can be improved by merely sharpening the blade of the counter knife.

For proper thread trimming, the blade of the counter knife must be brought into contact with the blade of the moving knife.

- The sharpness of the thread trimmer is improved simply by sharpening "A" shown in Fig. 30 (Pay attention to the angle shown in Fig. 30).

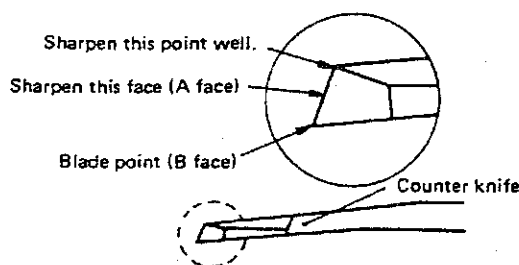


Fig. 30

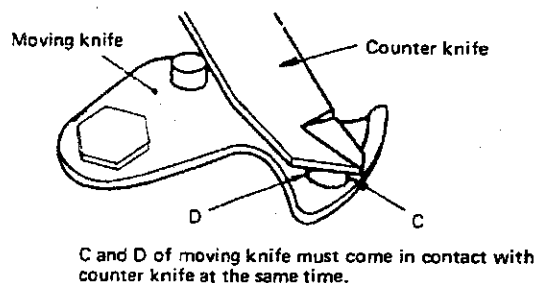


Fig. 31

- The thread trimmer also becomes dull when "B" is worn and rounded. Take care not to change the angle when sharpening the blade edge.
- If the thread trimmer is still dull even after the blade of the counter knife has been sufficiently sharpened, it is because the two points of the moving knife fail to contact with the blade of the counter knife at the same time. In this case, correct the tilt of the counter knife.

Note: The contact of the moving knife with the counter knife can also be improved by changing the angle shown by the arrow in Fig. 32. When "D" side shown in Fig. 31 is dull, decrease this angle. When "C" side is dull, increase the angle.

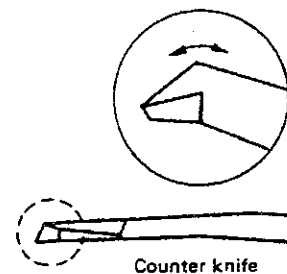


Fig. 32

3-16. Replacing the moving knife

Remove the moving knife in the following order:

- 1) Loosen hinge screw ① (Fig. 33)
- 2) Loosen hinge screw ① (Fig. 34) in the forked base for the knife, and move the forked base for the knife to the position illustrated in Fig. 34-1. Now loosen hinge screw ① (Fig. 34-1), and remove it.

(When removing the hinge screw in the knife, it is recommended to use the exclusive screwdriver (part No. J1063000000, separately available). It will help you remove the screw easier.)

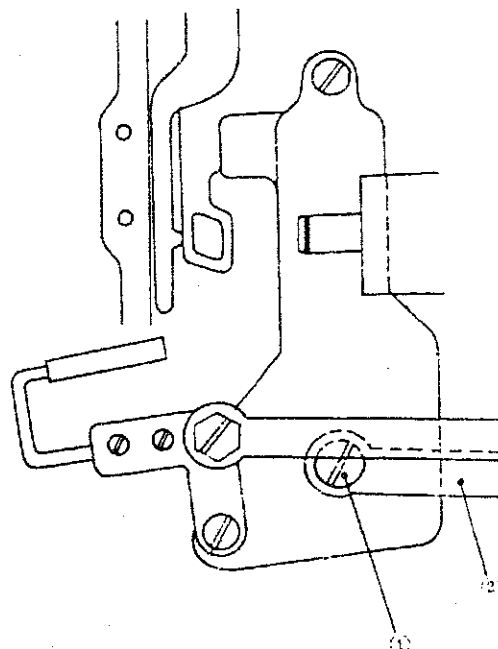


Fig. 33

<How to install>

Assemble the moving knife unit by reversing the above order.

After tightening the hinge screw of the moving knife, move the moving knife by hand to confirm that it moves smoothly without play. Securely insert the pin for knife forked base into the forked base for knife, and tighten the hinge screw for knife forked base. Confirm that the knife is actuated when moving knife link (Fig. 34) is moved to the right and left.

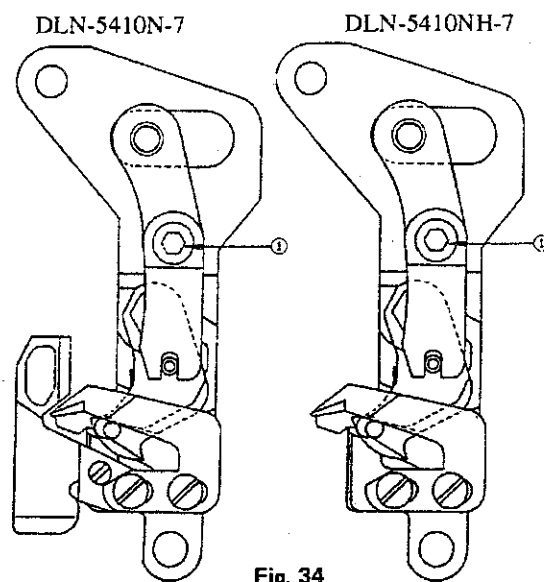


Fig. 34

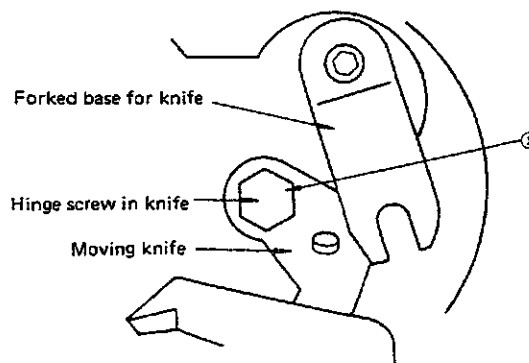


Fig. 34 - 1

3-17. Replacing the knife thread guide

Change the knife thread guide by loosening screws ② and ③, with screw ① (Fig. 25) left tightened. If the installing angle of the counter knife has been disturbed, readjust it in accordance with 3-12. "Installing the counter knife".

3-18. Adjusting the thread take-up picker

If thread take-up picker ③ (Fig. 35) enters the bobbin case too deeply at the time of thread trimming, the bobbin does not turn, and the bobbin thread is cut too short, causing stitch skipping at the start of sewing. On the contrary, if the entrance of the thread take-up picker into the bobbin case is not enough, the needle thread slips off the tip of the thread take-up picker at the time of thread trimming. As a result, the thread remaining on the needle after trimming becomes too short, causing the thread to slip off the needle.

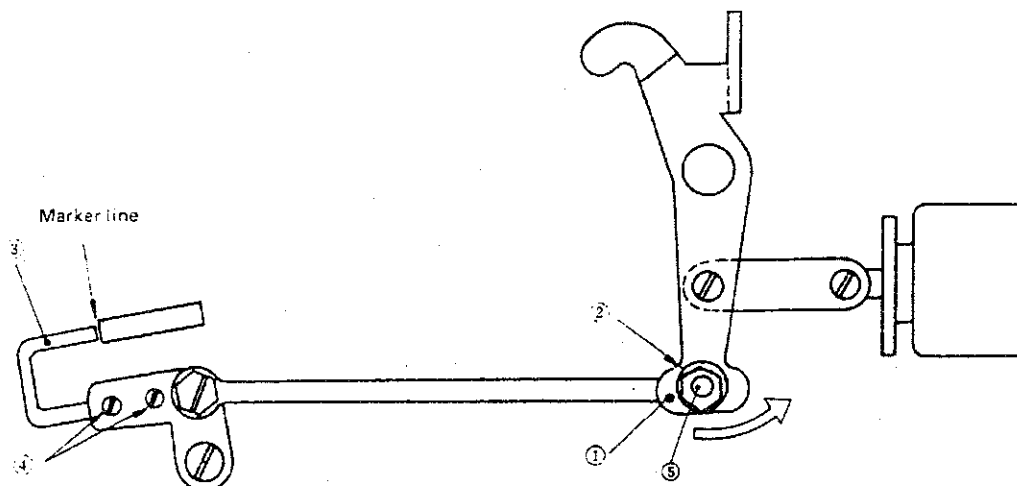


Fig. 35

1) Positioning the thread take-up picker

With clutch disc ① (Fig. 35) pushed in the direction of arrow (to the right), make adjustment so that the bobbin thread can be pulled out smoothly.

At this time, perform the adjustment so that a clearance of 1.0 to 1.5 mm (0.04" to 0.059") is provided between the tip of the thread take-up picker (bobbin winder trip latch) and the middle of the top recess of the bobbin case, and also the rear end of the bobbin winder trip latch is aligned with the marker line of the thread take-up picker. (Fig. 36)

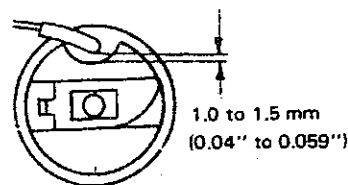


Fig. 36

2) How to adjust the position of the thread take-up picker

After loosening screws ④ (Fig. 35), adjust so that the tip of the thread take-up picker (bobbin winder trip latch) is positioned as shown in Fig. 36. To adjust the entrance of the thread take-up picker into the bobbin case, move stopper ② (Fig. 35). After completion of the above adjustment, retighten the nut of the stopper ⑤.

The standard position of the stopper is such that, with the clutch disc pushed to the right, the end of the picker is in parallel to the hook driving shaft.

3-19. Adjusting the clutch disc and thread trimmer solenoid

The thread trimmer solenoid stroke is 6 mm (0.236"). Position the clutch disc and solenoid so that, when the thread trimmer solenoid is actuated, clearance A becomes 0.1 mm (0.004") to 0.5 mm (0.019"). Then tighten setscrews ⑩ (Fig. 38).

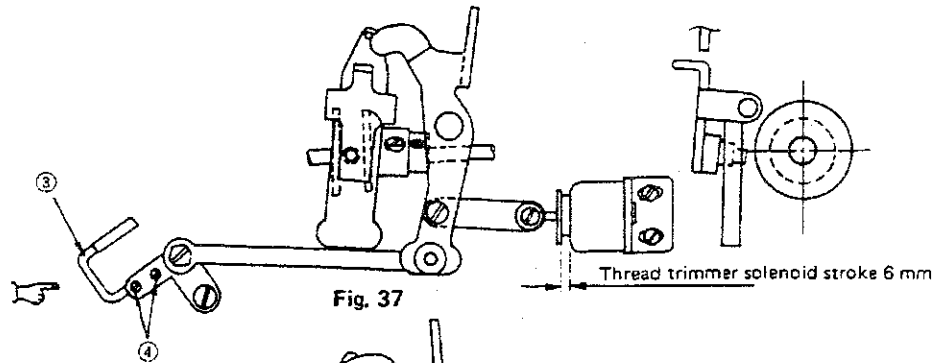


Fig. 37

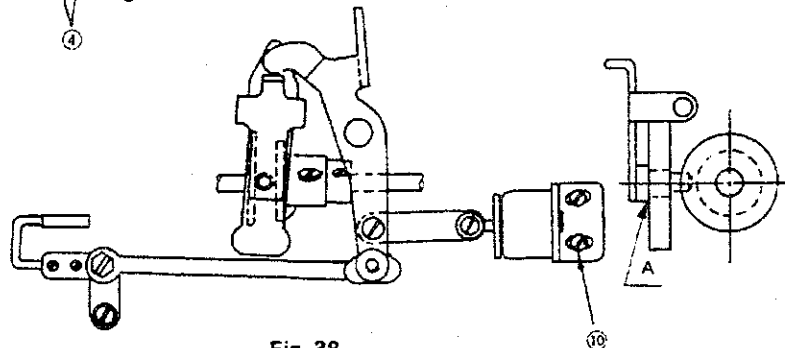


Fig. 38

3-20. Installing and removing the knife mounting base

Remove knife mounting base ① (Fig. 39) in the following sequence:

- 1) Remove the hook.
- 2) Loosen hinge screw ② (Fig. 39), and remove hinge screw ③ (Fig. 39).
- 3) Remove hinge screws ④ (Fig. 39) and ⑤ (Fig. 39), then, the knife mounting base can be removed.

Note: To install the knife mounting base, reverse the above sequence.

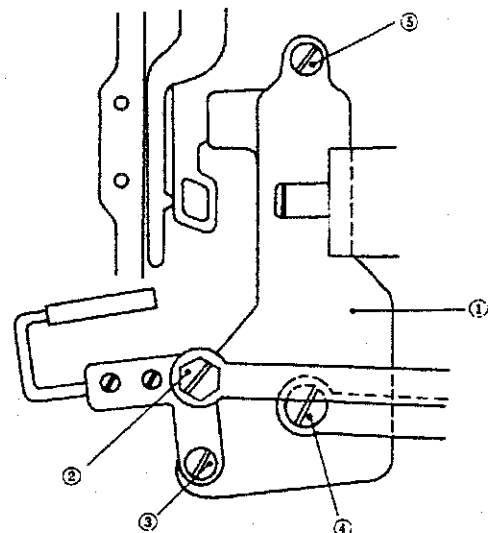


Fig. 39

3-21. Positioning the one-touch type reverse feed switch lever

There is no specified height for one touch reverse feed switch lever ①, and therefore the one-touch type reverse feed switch lever may be positioned at any height suited for each operator.

Loosen screw ② and move the switch lever up and down to obtain a suitable height. Retighten the screw after adjustment.

Note: This switch is sometimes abbreviated to "B. T. SW" (Back tack switch).

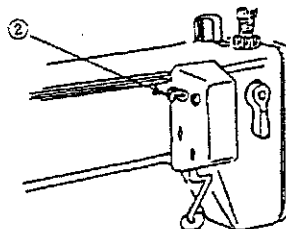


Fig. 41

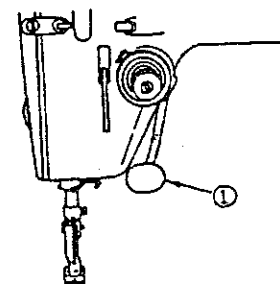


Fig. 40

3-22. How to replace the synchronizer

If the synchronizer fails, the needle will not stop in the upper or lower position when the machine stops, causing the safety circuit to be put into operation, or the machine will keep on running at high speed when it should stop. Replace a faulty synchronizer in the following sequence. Note that the synchronizer is always changed together with the pulley.

- 1) Remove the belt cover, and loosen two setscrew ① of the pulley, to remove the pulley.

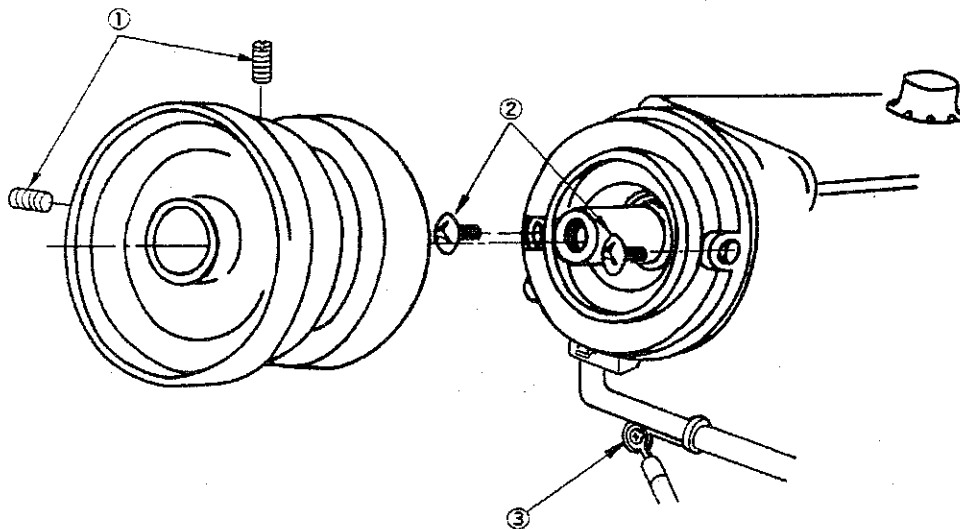


Fig. 42

- 2) Remove the cord setscrew ③ and two setscrews ② of the stator mounting base to remove the stator.
- 3) Fix a new stator by the setscrews.
- 4) The stator mounting base is made of plastics. Tighten the setscrews with approx. 15 kg.cm torque.
- 5) Retighten the cord setscrew.
- 6) Install the pulley so that the screw No. 1 contacts the flat part of the main shaft, and a $1 \text{ mm} \pm 0.2 \text{ mm}$ ($0.039'' \pm 0.008''$) clearance is provided between the stator mounting base and the end face of the pulley as shown in the figure.
- 7) Turn the pulley by hand to check it for smooth rotation.
- 8) Install the cord, and attach the V belt to the pulley. Then confirm that there is no contact between the V belt and the cord.
- 9) With the needle set in the lower position, turn on the power switch. The machine will then operate until the needle has gone up fully. If the needle stop position at that time is considerably deviated from the standard, check the position of the pulley setscrew.
- 10) Run the machine at low speed to check for any frictional noise. After reinstalling the belt cover, check for frictional noise again.
- 11) Adjust the upper and lower needle stop positions by the setscrew of the magnet mounting base of the pulley.

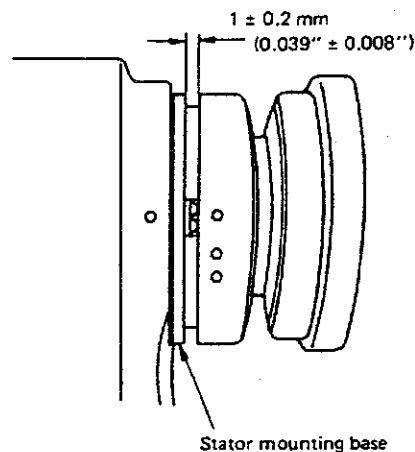


Fig. 43

3-23. Adjusting the Auto-lifter (AK95, AK96, AK97, AK98) (Optional)

1) How to use the AK95 and AK97

- ① When it is necessary to raise the presser foot during a sewing cycle, stop sewing, and then depress the knee switch.
- ② The moment you release the knee switch, the presser foot comes down.

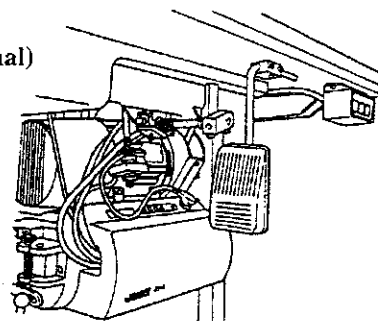


Fig. 44

2) How to use the AK96 and AK98

- ① Refer to 2-2-3). See page 8.

3) Adjusting the Auto-lifter stroke

- ① Loosen locknut ①.
- ② Loosen the locknut of stopper (A) ②, and lower the stopper (A) ② fully downward.
- ③ Under the condition described in step ② above, actuate the solenoid, and check whether the presser foot lift is about 10 mm (0.394") or not. If the presser foot lift exceeds 10 mm (0.394"), turn the plunger counterclockwise. If the lift is lower than 10 mm (0.394"), turn the plunger clockwise to adjust it to 10 mm (0.394").
- ④ Actuate the solenoid to raise stopper (A) ② until it comes in contact with the oil reservoir.
- ⑤ Turn the knee switch OFF, and raise stopper (A) ② an additional turn.
- ⑥ Tighten the locknut of stopper (A) ② and locknut ①.
- ⑦ Raise stopper (B) ⑥ until it comes in contact with the oil reservoir. Adjust the clearance between rod ③ coming out of the oil reservoir and the indented part of lifter lever ④ to about 1 mm (0.039").
- ⑧ Tighten the locknut of stopper (B) ⑥.

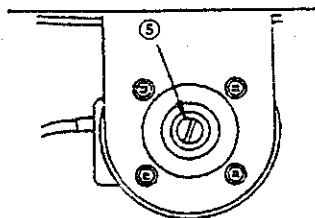
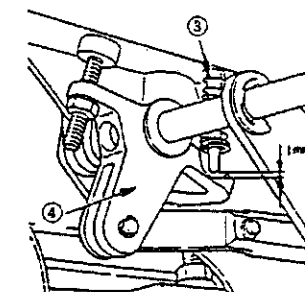
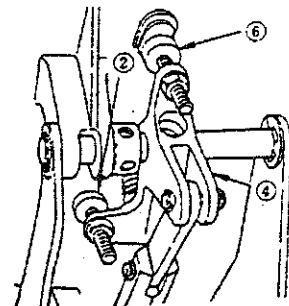
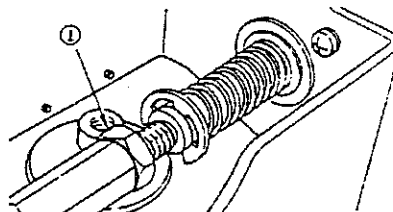
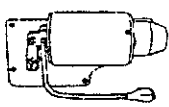




Fig. 45

(Precaution) The presser foot lift can be changed simply by moving stopper (A) ② up or down. However, if the presser foot pressure is too high, the presser foot may fail to go up. So, whenever changing the presser foot lift, repeat steps from ① to ⑧.

3-24. Adjusting the auto-lifter (AK84, AK85, AK86, AK87) to be attached to the side plate

	AK device asm.	Flyback resistor (asm.)	Knee switch asm.	Machine head used	Motor used
					
AK84	○		○	-7 type	KFL type SC-1 motors, motors A from other companies
AK85	○			-7 type	PFL type SC-1 motors, motors A from other companies
AK86	○	○	○	-7 type	KFL type EC-23 to -233 motors, motors B from other companies
AK87	○	○		-7 type	PFL type EC-23 to -233 motors, motors B from other companies

[Caution] * Motors A from other companies mean motors which do not require a flyback circuit in the auto-lifter solenoid.

* Motors B from other companies mean motors which require a flyback circuit in the auto-lifter solenoid.

Fig. 46

1) Assembling procedure (when the auto-lifter is separately purchased)

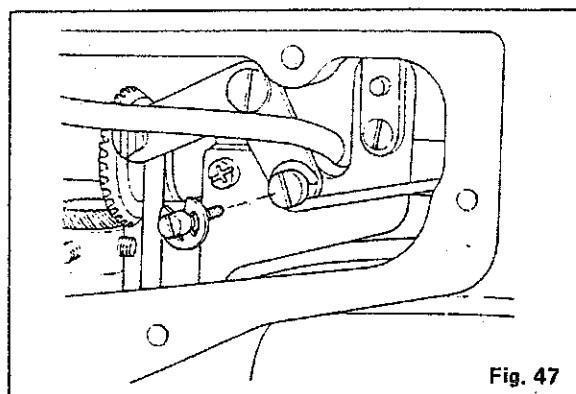


Fig. 47

Remove the side plate and replace the hinge screw of the knee-lifter crossbar with the knee-lifter crossbar pin supplied with the device.

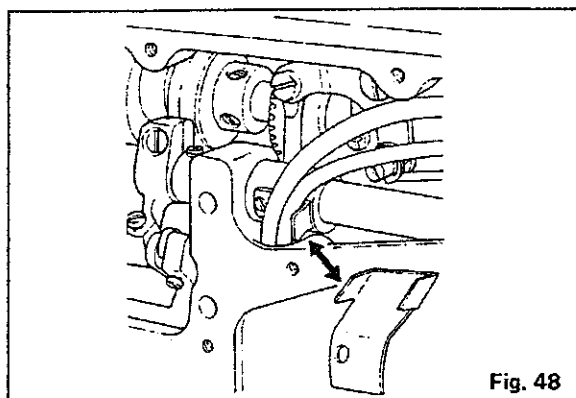
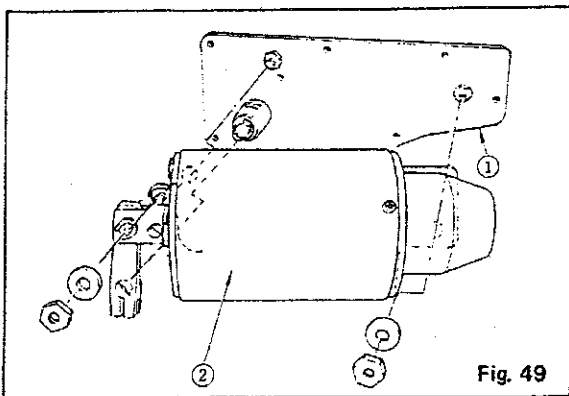
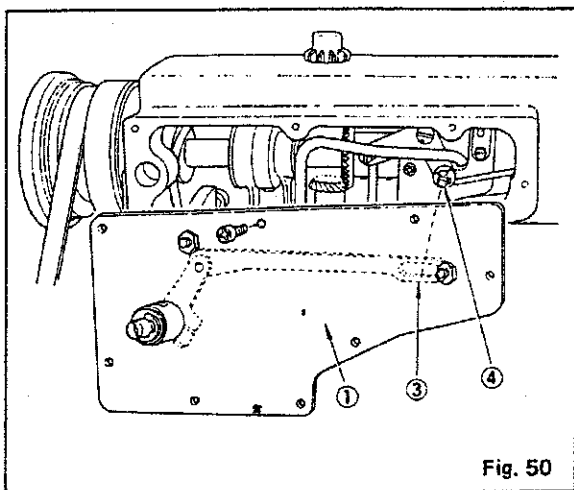


Fig. 48

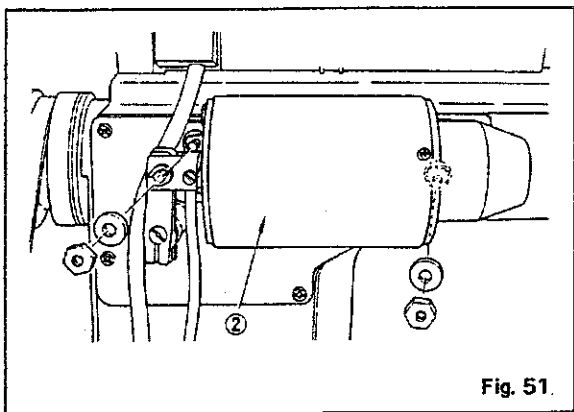
If you are using a sewing machine with a boss on the side plate, replace the pipe support supplied with the unit.



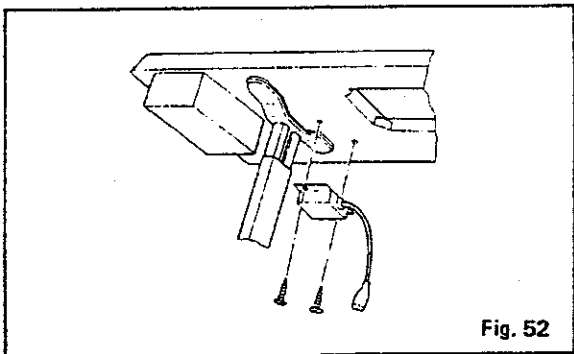
Remove side plate (asm.) ① and solenoid (asm.) ② of the sewing machine.



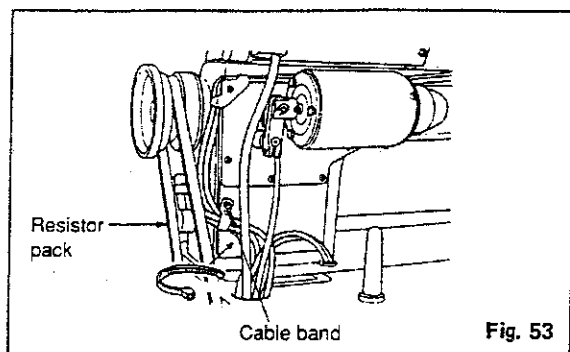
Install side plate (asm.) ① on the sewing machine.
Take care that the slot in solenoid link ③ is set to knee lifter crossbar pin ④ .



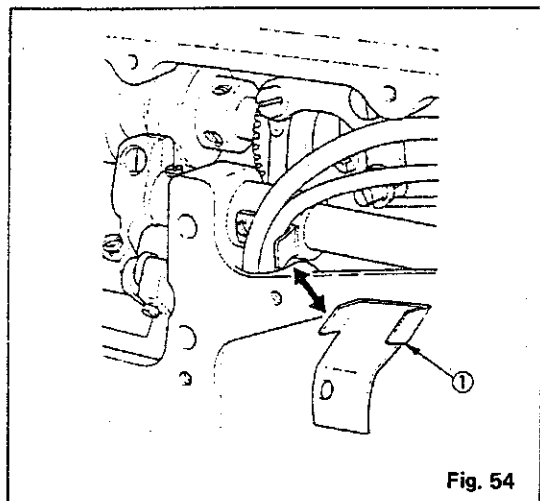
Install solenoid (asm.) ② .



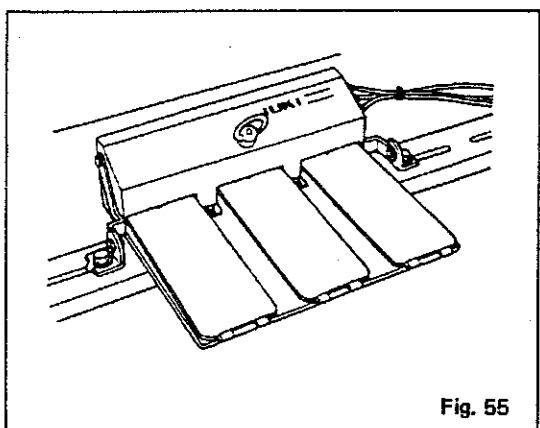
Attach the flyback resistor (asm.) onto the bottom face of the table, as illustrated.
(AK86 and AK87 only)



Use the cable band supplied with the unit and bind the control panel cables so that they do not come in contact with the moving parts.



- 2) For the case where the auto-lifter is delivered separately Pipe support ① is supplied with the device as standard. This type of device can be used with the thread trimmer for the DLU-5490N model or similar models.



- 3) When used with the PK70 (3-pedal)
If the PK70 is to be used with the auto-lifter, be sure to specify AK85 and AK87.

4) Adaptability to the PSC box

To change the standard type with the PFL type, the following components will be required and the adjustment described below will be necessary.

① Components required for change

Name of part	Part No.	Q'ty
M4009351000A	Spring shaft B	1
M4011351000	Rear part depressing spring B	2
M4012351000	Rear part depressing pressure adjusting screw	1
M2010110000	Rear part depressing pressure adjusting nut	1

② Attaching the parts

- Loosen rear part depressing pressure adjusting nut ⑥ of the pedal sensor A asm. (Fig. 56), and remove rear part depressing pressure adjusting screw ⑤. Then remove rear part depressing spring A ③ and replace it with rear part depressing spring B. Then attach screw ⑤ and nut ⑥ in position.
- Attach the spring shaft B, rear part depressing spring B, rear part depressing pressure adjusting screw and rear part depressing pressure adjusting nut to side ②, shown in Fig. 57, same as in the case of side ①.

(Caution) Apply grease to portions ③ and ④ of the shafts when assembling the parts.

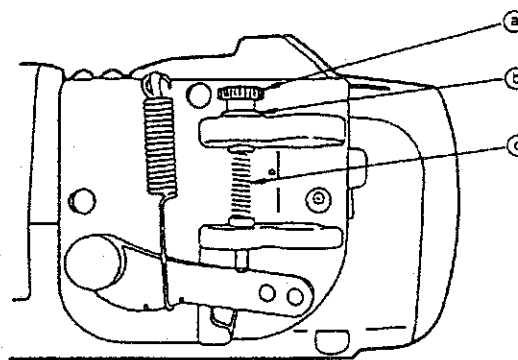


Fig. 56 Pedal sensor A asm.

③ Adjusting the pressure required to depress the back part of the pedal

Adjust the height of the spring which has been changed for the knee-operated auto-lifter (PFL) type. Adjust the height of the spring on side ①, in Fig. 57, to 27 mm and that of the spring on side ②, in Fig. 57, to 28 mm using heel-depress pressure adjusting screws ①. After the spring height has been adjusted, tighten heel-depress pressure adjusting nuts ② to prevent adjusting screws ① from loosening.

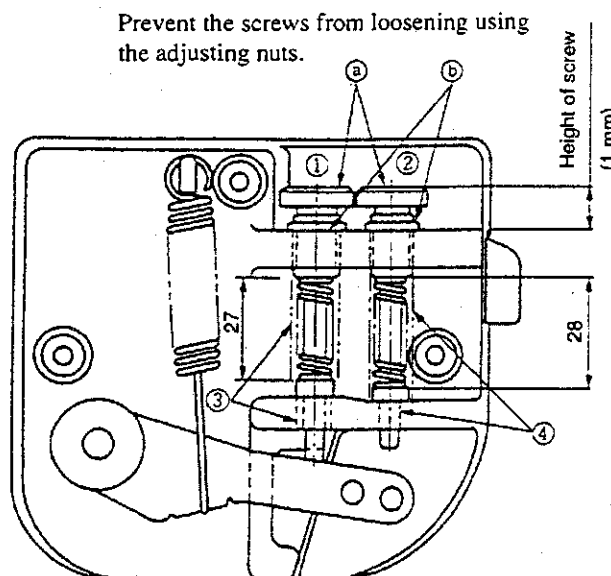


Fig. 57 Pedal sensor B asm.

④ Setting the PSC box

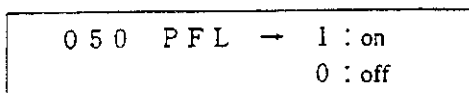
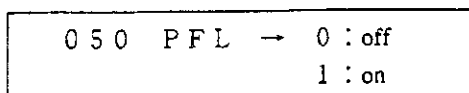
To change the standard type to the PFL type, the following two functions should be set differently. Set the functions appropriately using the liquid crystal display and switches 1 through 4 mounted on the upper front face of the PSC box.

(Refer to the Instruction Manual for the PSC box for how to set the functions.)

a. Selection of pedal lifter function (PFL type) (Function setting No. 050)

The presser foot can be raised by depressing the back part of the pedal. This function is effective when the unit is used with the AK device.

(For the PFL type Set to "1 : on")



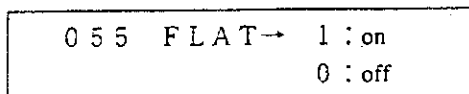
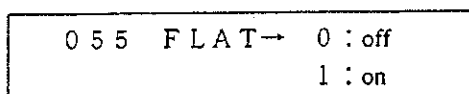
0 : off The pedal lifter function is ineffective.
1 : on The pedal lifter function is effective.

* Set the function to "1 : on."

b. Presser foot lifting function after thread trimming (KFL or PFL type) (Function setting No. 055)

This is the function to automatically lift the presser foot after thread trimming. This function is effective when the unit is used with the AK device.

(For the KFL or PFL type Set to "1 : on")

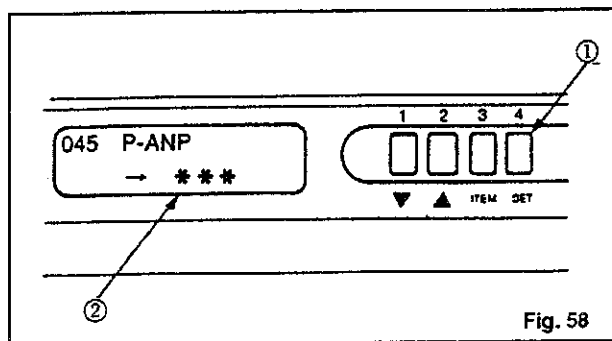


0 : off Auto lifting function is ineffective.
1 : on Auto lifting function is effective.

* Set the function to "1 : on."

⑤ Automatic correction of the neutral position of the pedal sensor

When the pedal is in the neutral position, error occurring during assembling is corrected.



Pressing 4 [SET] switch ①, turn ON the power switch. Now, the amount of correction is shown at the "***" portion on LCD panel ② located on the left of the switch. If the amount indicated is proper, it is added to the LCD panel as a correction value.

(Caution) The function fails to work normally if you depress the pedal. Be sure not to place your foot or anything on the pedal.

5) Miscellaneous

① 2P connector to be connected to the PSC box.

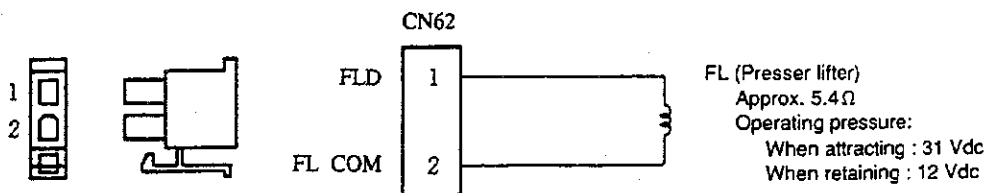


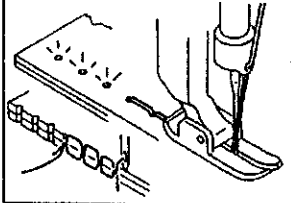
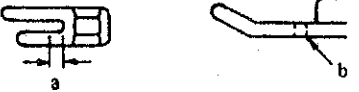
Fig. 59

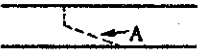
② Sealant

The screws and bushes of the side plate are firmly fixed in place using adhesive sealant Locktite 262.

Never disassemble these screws and bushes.

4. TROUBLES AND CORRECTIVE MEASURES (Mechanical components)

Trouble	Cause (1)	Cause (2)	Corrective measures
<p>1. One or a few stitches are skipped at the start of sewing.</p> 	<p>1-1). The thread remaining on the needle after thread trimming is too short.</p>	1)-A. The needle thread tension becomes too high at the time of thread trimming due to some trouble in the needle thread path.	Check the needle thread path. Remove thread entangled with thread guide pin, or correct the position of the thread guide on the thread stand or other troubles.
		1)-B. The tension of the tension disc No. 1 is too high.	Reduce the tension by turning counterclockwise the tension nut of the tension disc No. 1.
		1)-C. The floating amount of the tension disc No. 2 at the time of thread trimming is insufficient.	Check whether a tension disc floats 0.5 mm (0.019") to 1 mm (0.039") when the thread take-up picker is pressed in to the right, and if not, correct it by the adjusting nuts Fig. 29 ① and ② on the bottom surface of the bed. Also check whether the discs are released in parallel, and if not, turn the tension nut 180° or correct the tilt of the spring.
		1)-D. The cam timing is too early.	Check and correct the cam timing in accordance with 3-6.
		1)-E. The thread slips off the needle at the time of thread trimming due to improper position of the thread take-up picker.	Check for loosened setscrew of the thread take-up picker.
		1)-F. The counter knife is located too close to the needle, or the blade point is too sharp.	Removing the throat plate, check and correct the position of the counter knife, or check for any scratch on the moving knife (Refer to 3-8).
		1)-G. There are scratches on the knife thread guide, moving knife, or hook.	Check the hole of the knife thread guide and hook for scratches or burrs, and if a scratch or burr has been found, buff it. If buffing does not correct the trouble, replace the components.
		1)-H. The standard cam timing is too early.	Correct the timing for a synthetic thread (special)
		2)-A. Distance "a" is too large. Or run-off length "b" is too large. As a result, the needle thread sewing is not be caught.	<p>Check "a" and "b" of the presser foot, and "A" of the throat plate.</p> <ul style="list-style-type: none"> When synthetic thread is used for tricot "a" < 0.8 mm (0.031"), and radius of "A" and "b" < 0.3 mm (0.012"). When synthetic thread is used, "a" shall be smaller than 1.2 mm (0.047"), and there shall be no relief at "b" and "A". For cotton thread, the relief at "a", "b" and "A" should be minimized as long as good tightness of stitches is obtained. The smaller the relief at "a", "b", and "A", the better for lighter-weight or coarser fabrics, more slippery thread, or smaller stitch length. If stitch length is 3 mm or less, it is advisable to use B1524041AA0 presser foot. (L type: If stitch length is 4 mm or less, it is advisable to use B1524041BA0 presser foot)
	1-2). The needle, throat plate, or presser foot used is not correct, or the presser foot pressure is too low.		

Trouble	Cause (1)	Cause (2)	Corrective measures
		2)-B. The relief at "A" of the throat plate needle hole is too large. 	
		2)-C. The needle is too thick.	A thinner needle is better as long as sufficient tightness of stitches is obtained.
		2)-D. The needle hole in the throat plate is too large.	Replace the throat plate by one with a smaller needle hole.
		2)-E. The presser foot pressure is insufficient.	Increase the pressure of the presser foot, with care taken not to cause the feed power to decrease or stitches to jam.
	1-3). The blade point of the hook fails catch the needle thread (stitch skipping).	3)-A. The timing between the needle and the hook is bad.	Check whether the height of the needle bar is correct, and if not, readjust it to the marker line on the needle bar (2.0 mm) (0.079"). For knit and similar materials, delay the timing by slightly lowering the needle bar.
		3)-B. The tension and stroke of the take-up spring and too high and too large.	Reduce the tension and the stroke (standard stroke: 5 to 7 mm (0.197" to 0.276")).
		3)-C. The blade point of the hook has worn out.	Correct the blade point, or replace the hook.
		3)-D. The needle is improperly installed.	Properly install the needle. If the needle has been bent, replace it.
	1-4). The bobbin thread at the start of a seam line is too short.	4)-A. The free end of the bobbin thread is pulled into the bobbin due to racing of the bobbin.	Increase the pressure of the bobbin case holder positioning finger. Increase the bobbin thread tension.
		4)-B. The pressure of the bobbin case holder positioning finger is too high.	Decrease the pressure of the bobbin case holder positioning finger, and check for racing of the bobbin.
		4)-C. A scratch or burr on the hook cuts the bobbin thread short.	Eliminate the scratch or burr, or replace the hook.

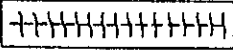
Trouble	Cause (1)	Cause (2)	Corrective measures
2. The end of the needle thread of a starting stitch is exposed on a material.	1-5). The needle and bobbin threads sometimes fail to interlace each other at the start of sewing.	5)-A. The starting sewing speed is too high.	Use the soft start function for the first one stitch.
		5)-B. The bobbin thread retaining plate fails to retain the bobbin thread.	Adjust the bobbin thread retaining plate according to 3-12-1.
	2-1). The thread remaining on the needle after thread trimming is too long.	1)-A. The thread tension No. 1 is not high enough.	Increase the thread tension No. 1.
		1)-B. The timing of the thread trimmer cam is too late.	Check and correct the cam timing in accordance with 3-6.
		1)-C. The counter knife is improperly positioned.	Correct the position of the counter knife in accordance with 3-8.
3. The seam on the wrong side of the material cannot be finished beautifully at the sewing start. (The needle thread remains too long on the wrong side of the material.)	3-1). The thread remaining on the needle after thread trimming is too long.	1)-A. Refer to the above 2-1).	Refer to the above 2-1).
	3-2). The needle thread remaining on the needle after thread trimming can not shortened because the needle, throat plate, or presser foot used is unsuitable.	2)-A. Refer to the above 1-2).	Refer to the above 1-2).
4. The thread slips off the needle at the start of a seam line.	4-1). There is variation in the length of the thread remaining on the needle after thread trimming.	1)-A. A delayed cam timing causes the thread tension No. 1 to become too high, and thread is trimmed before the moving knife and counter knife overlap each other.	Stopping the motor, push the thread take-up picker into the bobbin case by hand with the needle down, slowly turn the handwheel by hand toward you to perform thread trimming, and then stop the handwheel when the thread take-up lever has reached its highest position. At this time, if the thread remaining on the needle is 10 mm (0.394") or more shorter than that for thread trimming performed through pedal action, it means that the length of the remaining needle thread is not enough. Set the timing of the thread trimmer cam earlier, and decrease the thread tension No. 1.
		1)-B. The thread take-up picker does not enter the bobbin case sufficiently, causing the needle thread to come off the thread take-up picker from time to time.	Correct the position of the thread take-up picker according to 3-13.
		1)-C. The blade of the counter knife has been sharpened excessively, and thread is trimmed only by the counter knife.	Re-sharpen the blade of the knife according to 3-10, or replace the knife.

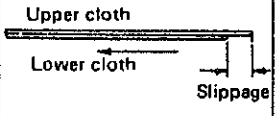
Trouble	Cause (1)	Cause (2)	Corrective measures
	4-2). The thread slips off the needle immediately after thread trimming.	1)-D. The knife thread guide, moving knife, or hook has scratches or burrs.	Remove the scratches or burrs, or replace the defective component.
		1)-E. The needle is too thick.	Change the needle.
		2)-A. The cam timing is too early, and the thread to be left on the needle is also trimmed.	The thread slips off the needle immediately after thread trimming because the moving knife spreads the threads improperly, and the thread to be left on the needle is also cut (Remove the throat plate, and you will find a remaining needle thread trimmed to about 20 mm (0.787")). In this case delay the timing of the thread trimmer cam.
		3)-A. The starting sewing speed is too high.	Use the soft start function for the first one stitch.
		3)-B. The material surface resistance is too low.	Use the feed dog (11322104) made to order.
5. The beginning stitch is loose.	5-1). The needle thread tension at the start of a seam line is not high enough.	1)-A. The thread take-up picker is positioned improperly.	Correct the position of the thread take-up picker in accordance with 3-13.
		1)-B. The bobbin thread tension is reduced at the start of a seam line because of racing of the bobbin.	Readjust the thread take-up picker in accordance with 3-13 to prevent the bobbin from racing. Use a spring loaded bobbin case.
		1)-C. Both needle and bobbin thread tensions are insufficient.	Increase both needle and bobbin thread tensions.
		1)-D. The presser foot or throat plate used is incorrect.	Refer to Cause (1) of 1-2).
6. The needle thread cannot be trimmed, while the bobbin thread is trimmed.	6-1). The final stitch is skipped.	1)-A. The needle has been attached to the needle bar improperly.	Correct the installation of the needle, and check the needle for bend.
		1)-B. The stroke of the take-up spring is too large.	Reduce the stroke of the take-up spring to 5 – 7 mm (0.197" – 0.276 ").
		1)-C. The hook timing is not correct.	Check for stitch skipping at low sewing speed, and readjust the hook timing (Adjust the hook timing 2.0 mm (0.079") which is earlier than that for the standard lockstitchers).

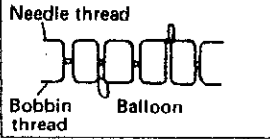
Trouble	Cause (1)	Cause (2)	Corrective measures
	6-2). Some part of the thread trimmer blades is dull.	2)-A. The blade of the moving knife does not closely meet that of the counter knife at the time of thread trimming (The installing angle, position, and the tilt of the blade tip of the counter knife are not correct with respect to the blade of the moving knife).	Remove the throat plate, and manually operate the thread trimmer to cut about three cotton thread #50. When all the three threads are cut evenly, no further corrective action is required. If not; <ul style="list-style-type: none"> Sharpen the counter knife. Correct the tilt of the blade tip of the counter knife. Correct the position of the counter knife.
7. The bobbin thread cannot be trimmed, while the needle thread is trimmed.	7-1). The moving knife fails to go back far enough.	1)-A. The retreating amount of the moving knife is not correct (the lateral positioning of the knife driving shaft or the thread trimmer cam is not correct).	Check the treating amount of the moving knife, and readjust the lateral position of the thread trimmer cam so that the retreating amount of the moving knife becomes 3 to 3.5 mm. (0.118" to 0.138")
	7-2). The position of the bobbin thread at the time of thread trimming varies.	2)-A. A hook other than specified is used.	Check whether the hook has a guide groove for bobbin thread, and if not, replace the hook.
8. The wiper comes in contact with the needle.	8-1). The height of the wiper is incorrect.		Correct the height of the wiper.
9. Neither the needle thread nor the bobbin thread are trimmed.	9)-1. The rotational speed of the thread trimmer is too low.		Increase the rotational speed of the thread trimmer.
	9)-2. The bobbin thread retaining plate functions excessively.		Decrease the retaining force of the bobbin thread retaining plate. (See 3-12-1.)

Trouble	Cause (1)	Cause (2)	Corrective measures
10. Needle breaks	10-1). Needle feed amount is not proper.	1)-A. Faulty position of the needle feed rod shaft.	Check whether the moving amount of the needle is too large with regard to the needle hole in the feed or not. If it is, re-adjust the position of the needle feed rod shaft.
	10-2). Needle entry point is not correct.	2)-A. Starting position of the needle bar frame is not correct.	Check whether the needle enters the center of the needle hole in the feed or not. If it fails to enter the center of the hole, loosen the clamping screw of the needle feed shaft front arm and adjust the starting position of the needle bar frame.
11. Abnormal operating noise · Lever burrs	11-1). Excessive contact of each component	1)-A. Inadequate separation of the feed and needle swing mechanism.	Check the contact between the throat plate and feed dog, the needle bar frame and needle bar frame guide, and the needle and feed dog. Then make re-adjustment of starting position of each component.
	11-2). Play in each component	2)-A. Excessive play of the feed regulating link in the thrust direction.	Tilt the sewing machine head, move the feed regulating link to the right or left, and check for the play of the feed regulating link. If there is an excessive play, adjust to eliminate the play in the feed regulating link fulcrum shaft.
	11-3). Screws are loosened.	3)-A. Screws in the feed regulating link components are inadequately tightened.	Check whether the four machine screws of the feed regulating link components are securely tightened or not. If not, be sure to re-tighten it/them securely.

5. TROUBLES AND CORRECTIVE MEASURES (Sewing performance)

Trouble	Description	Cause (1)	Cause (2)	Corrective measures
1. Puckering	<p>Wrinkles developed around stitches due to stitch shrinkage or uneven material feed.</p> 	<p>The needle is too thick.</p> <p>The needle and bobbin thread tensions are too high.</p> <p>Problem with the presser foot</p> <p>Material flaps.</p>	<p>The thread path is unsmooth.</p> <p>The hook timing is too late.</p> <p>The feed timing is too early.</p> <p>The thread take-up lever stroke is too large.</p> <p>The thread take-up spring stroke is too small.</p> <p>The thread used is frictional.</p> <p>The presser foot pressure is too high.</p> <p>The bottom of the presser foot sole is unsmooth.</p> <p>The material is difficult to feed.</p> <p>The relief of the presser foot sole is too large.</p> <p>The presser foot is not parallel to the throat plate.</p> <p>The needle point is dull.</p>	<p>Use a thin needle as much as possible. Use a KN needle (standard needle). (Example DB x 1 #11 - DB x 1KN #9)</p> <p>Smooth the thread path.</p> <p>Advance the hook timing as long as no stitch skipping occurs.</p> <p>Delay the feed timing with respect to the needle motion.</p> <p>Move the arm thread guide to the right to decrease the length of thread pulled out by the thread take-up lever.</p> <p>Increase the stroke</p> <p>Use the silicone oil lubricant device.</p> <p>Set the pressure as light as possible (while the material is securely fed). If the presser foot is set with slightly raised, the pressure is effectively decreased.</p> <p>Buff the presser foot sole.</p> <p>Use a Teflon presser foot or nidax presser foot.</p> <p>Use a presser foot with a smaller or no relief.</p> <p>Replace the presser foot or presser bar.</p> <p>Replace the needle.</p>

Trouble	Description	Cause (1)	Cause (2)	Corrective measures
		Problem with the feed dog	The feed dog is too high.	Lower the feed dog as long as sufficient feed power is maintained.
			The top edges of the feed dog teeth are worn.	Sharpen the top edges.
			The feed dog tooth pitch is too large.	Use one with a smaller pitch.
			The feed dog tilt is not correct.	Adjust the tilt so that the front end of the feed dog is higher than the rear end.
			The feed dog has poor parallelism.	Replace the feed dog.
		The sewing speed is too high.		Reduce the speed.
		Miscellaneous		Use the cloth puller.
				Pull the material back by hand.
				Use an aluminum bobbin (part No. B9117552A00)
2. Uneven material feed	<p>The upper and lower cloths are not evenly fed.</p>  <p>Upper cloth Lower cloth Slippage</p>	Problem with the feed dog	The feed dog is too high.	Lower the feed dog as long as sufficient feed power is ensured.
			The top edges of the feed dog teeth are worn.	Sharpen the top edges.
			The feed dog pitch is too large.	Use one with a smaller pitch.
			The tilt of the feed dog is not correct.	Set the feed dog with its front down.
			The feed timing is too late.	Adjust the feed timing to the standard timing.
		Problem with the presser foot	The presser foot pressure is too high.	Minimize the pressure as long as material is properly fed.
			The presser foot sole is unsmooth.	Buff the sole.
			The material is difficult to feed.	Use a Teflon presser foot or a nidax presser foot.
		The sewing speed is too high.		Reduce the speed.

Trouble	Description	Cause (1)	Cause (2)	Corrective measures
3. "Balloon" stitches (loose stitches and looping)	<p>Thread knots are formed on either side of material as a random thread loop.</p>  <p>Needle thread Bobbin thread Balloon thread</p>	The thread tensions are not high enough.		Increase the tensions. (Increase the bobbin thread tension in particular.)
		The thread take-up spring has been misadjusted.	The stroke is too small.	Increase the stroke.
			The tension is weak.	Increase the tension.
			The spring comes in contact with the machine arm.	Readjust so that the spring does not touch the arm.
		The thread take-up lever stroke is too large.		Move the arm thread guide to the right to decrease the length of thread pulled out by the thread take-up lever.
		Problem with the hook	The hook timing is too early.	For a cotton or spun thread, adjust it to the standard timing or to a slightly later timing.
			The hook timing is too late.	For a synthetic thread, adjust it to the standard timing or to a slightly earlier timing.
			The clearance between the hook and bobbin case opening lever is too small.	Increase the clearance.
			The hook lubrication is inadequate.	Adequately lubricate the hook.
			The hook motion is unsmooth.	Replace the hook.
		Problem with the thread path	The thread path is unsmooth.	Smooth the thread path.
			The thread path has scratches.	Smooth the thread path.
			Thread is caught somewhere in the thread path.	Correct the threading.
		Problem with the bobbin or bobbin case	The bobbin thread is caught due to poor fit between the bobbin and bobbin case.	Replace the bobbin or bobbin case
			Thread has not properly been wound around the bobbin.	The winding tension was too high or low.

Trouble	Description	Cause (1)	Cause (2)	Corrective measures
			The tension spring of the bobbin case is faulty.	Replace the bobbin case.
			The thread in the bobbin case races.	To prevent bobbin racing, use a bobbin with spring for prevention of racing or put a thin cloth in the bobbin case.
		Problem with feed	The feed timing is bad, or the feed dog is too low.	For cotton or spun thread, adjust the feed timing slightly later than the standard timing, and adjust it slightly earlier than the standard for synthetic thread. Increase the feed dog height (up to 1 mm (0.039")).
		Problem with the presser foot	The presser foot is too high.	Correct the height.
			The presser foot sole has little or no relief (for thicker thread or larger stitch length).	Use one with a larger relief.
		Problem with the thread tension controller	The thread tension discs are loose.	Properly adjust the tension release timing.
		The needle is too thin for the thread used.		Change the needle or thread.
		Problem with the needle	The needle point has a burr.	Replace the needle. (It is advisable to use a ball-point needle for synthetic thread.)
		The needle and bobbin thread tensions are too high.		Use the feed dog (part No. 11322104) made to order.
			The thread tension of the bobbin winder is excessive.	Loosen the tension adjusting nut of the bobbin winder.
	The shape of the spring on the bobbin case is defective.	Replace the bobbin case.		

When using tetron thread, thread knots continuously appear on the wrong side of the material.

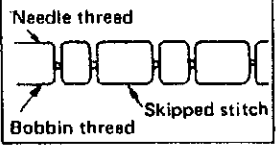
Needle thread

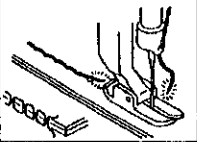
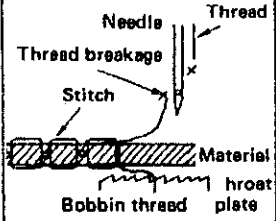
Bobbin thread





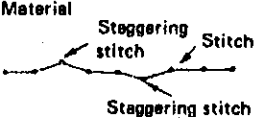
Loose stitches

Outlet of the bobbin thread

The spring should not contact with the bobbin case near the outlet of the bobbin thread.

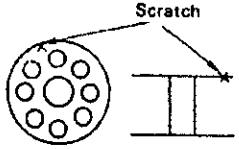
Trouble	Description	Cause (1)	Cause (2)	Corrective measures
4. Stitch skipping	<p>The machine fails to form a complete stitch.</p>  <p>Needle thread</p> <p>Bobbin thread</p> <p>Skipped stitch</p>	Problem with the needle	<p>The needle is bent.</p> <p>The needle orientation is wrong.</p> <p>The needle point is blunt.</p> <p>The needle is too thick or thin for the thread used.</p>	<p>Replace the needle.</p> <p>Properly attach the needle.</p> <p>Replace the needle.</p> <p>Replace the needle.</p>
		Problem with the hook	<p>The hook point is blunt or worn.</p> <p>The hook timing is bad.</p> <p>The needle bar height is wrong.</p> <p>The clearance between the hook point and needle is wrong.</p> <p>Uneven loops are formed.</p>	<p>Correct the hook point or replace the hook.</p> <p>Correct the timing. (The proper timing depends on the type of material and thread. In general, the timing should be set earlier for synthetic thread or heavy-weight material, and it should be set later for light-weight material.)</p> <p>Properly adjust it with respect to the hook point. (In general, the needle bar should be set higher for synthetic thread, and it should be set lower for light-weight material.)</p> <p>Minimize the clearance.</p> <p>Wrap the thread around the needle.</p>
		The needle thread tension is too high.		Decrease the tension. Use the silicone oil lubricating device.
		The sewing speed is too high.		Reduce the sewing speed.
		The feed timing is bad. (The needle bends.)		Correct the feed timing.
		The thread take-up spring has been misadjusted.	The stroke is too large.	Decrease the stroke.
			The tension is too high.	Decrease the tension.
		The material flaps.	The presser foot is not in close contact with the material.	Correct the presser foot height.
			The relief of the presser foot sole is too large.	Use one with a smaller relief or with no relief.
			The presser foot is not parallel to the throat plate.	Replace the presser foot or presser bar.

Trouble	Description	Cause (1)	Cause (2)	Corrective measures
5. The needle thread breaks. 	The needle thread splits finely or breaks during sewing. 	Problem with the thread path (including the throat plate, feed dog and presser foot)	The thread path is unsmooth.	Smooth the thread path.
			The thread path has scratches.	Smooth the thread path.
			Thread is caught somewhere in the thread path.	Correct threading.
		The needle thread tension is wrong.	The tension is too high or low.	Properly adjust the tension.
			Thread tension No. 1 is too low.	Increase the tension so that the thread does not "Jump".
		The thread take-up spring has been misadjusted.	The stroke is too large or small.	Properly adjust the stroke.
			The tension is too high or low.	Properly adjust the tension.
		Problem with the needle	The needle is bent.	Replace the needle.
			The needle has scratches.	Replace the needle.
			The needle point is blunt.	Replace the needle.
			The needle orientation is wrong.	Properly attach the needle.
			The needle is too thin or thick for the thread used.	Replace the needle.
			The needle point is too sharp.	Use a ball-point needle (KN, S, J, B, U, Y, etc.).
		Problem with the hook	The hook thread path has scratches.	Smooth the thread path.
			The hook point is blunt or worn.	Correct the hook point or replace the hook.
			The clearance between the hook and the bobbin case opening lever is too small.	Increase the clearance.
			The hook is inadequately lubricated.	Adequately lubricate it.

Trouble	Description	Cause (1)	Cause (2)	Corrective measures
	Thread breaks during reverse feed stitching.	The needle has improperly been attached.	The orientation of the needle is wrong. Long groove side  Indented side	Attach the needle so that the long groove of the needle faces exactly to the left or slightly toward the operator as illustrated. About 10° 
				Wrap thread around the needle.
	Thread breaks when the machine produces idle stitches.	The needle has improperly been installed.	The orientation of the needle is wrong. Long groove side  Indented side	Attach the needle so that the long groove of the needle faces exactly to the left or slightly away from the operator as illustrated. About 10° 
		The knife thread guide has improperly been positioned.		Accurately position it so that the needle enters the center of the opening.
		The needle bar is too low.		Raise the needle bar.
6. Staggering stitches	Some stitches stagger, whereas they should be aligned. Material 			Wrap the thread around the needle.
				Decrease the tension.
		The needle thread tension is too high.		
		Problem with the needle	The needle is bent.	Replace the needle.
			The needle point is blunt.	Replace the needle.
			The needle is too thin.	Use a thicker needle. If it is a KN needle (1-step needle), replace it with a 2-step needle.
			The needle is too long.	Use a shorter one or one with a longer shank (DAX1).
		The sewing speed is too high.		Reduce the speed.

Trouble	Description	Cause (1)	Cause (2)	Corrective measures
7. Material fiber breaks.	Material fibers are broken by the needle during sewing. 	Problem with the feed dog	The feed dog has poor parallelism. The feed dog has improperly been installed. The feed dog mounting base has a lateral play.	Replace the feed dog. Properly install it. Remove the play.
		Problem with the presser foot	The presser foot is too high. The presser foot has poor parallelism. The presser foot pressure is too low.	Correct the presser foot height. Replace the presser foot or presser bar. Increase the presser foot pressure.
		Problem with threading	The machine head has erroneously been threaded.	Correct the threading.
		Problem with the needle	The needle generates much heat. The needle is too thick. The needle point is blunt. The needle point shape is unsuitable. (The type of needle is incorrect.)	Use the silicone lubricating device. Use as thin a needle as possible. Replace the needle. Use a ball-point needle. (KN, S, J, B, U, Y, etc.)
		The sewing speed is too high.		Reduce the speed. (to prevent the needle from generating heat)
		Too much tension is applied to the material.	The presser foot pressure is too high. The feed dog is too high.	Minimize the presser foot pressure. Minimize the height.
		The room humidity is too low.		Keep the humidity at about 65% to prevent the needle from getting hot and to prevent static buildup from friction.
		The feed pitch is too small.		Maximize the pitch as much as possible.

Trouble	Description	Cause (1)	Cause (2)	Corrective measures
8. Irregular stitches	<p>Thread knots appear on either side of material at random.</p> <p>Needle thread</p> <p>Bobbin thread</p> <p>Stitch</p> <p>Knot exposed on the right side</p> <p>Knot exposed on the wrong side</p>	Problem with the hook	The hook has been excessively or inadequately lubricated.	Adequately lubricate the hook.
			The hook thread path is unsmooth.	Replace the hook, or correct the thread path.
		Problem with the bobbin or bobbin case	The bobbin thread cannot be pulled out smoothly due to poor fit between the bobbin and bobbin case.	Replace the bobbin or bobbin case.
			The bobbin has improperly been wound, and the bobbin thread cannot be pulled out smoothly.	Correct the bobbin thread winding tension or the position of the bobbin winding tensioner.
			The bobbin in the bobbin case races.	To prevent the bobbin from racing, use a bobbin with spring, or put a thin cloth in the bobbin case.
			The tension control spring of the bobbin case is faulty.	Replace the bobbin case.
			The bobbin has improperly been put in the bobbin case.	Refer to "6. BOBBIN CASE WITH AN IDLING PREVENTION SPRING".
		The needle and bobbin thread tensions are too low.		Increase the tensions.
		The thread take-up spring has been misadjusted.	The stroke is too large or small.	Correct the stroke.
			The tension is too high or low.	Correct the tension.
		Problem with the thread path	The thread path is unsmooth.	Smooth the thread path.
			The thread path has scratches.	Smooth the thread path.
			Thread is caught somewhere in the thread path.	Correct the threading.
		Material flaps.	The relief of the presser foot sole is too large.	Use one with a smaller or no relief.
			The presser foot has poor parallelism.	Replace the presser foot or presser bar.

Trouble	Description	Cause (1)	Cause (2)	Corrective measures
9. The bobbin has a scratch.	 <p>The bobbin is scratched as illustrated, and a burr is left.</p>	<p>The thread take-up lever stroke is too large.</p> <p>When a DAB-type hook (11038650) is used, the needle may come into contact with the bobbin.</p>	<p>The feed dog has poor parallelism.</p> <p>The presser foot is too high.</p>	<p>Replace the feed dog.</p> <p>Correct the presser foot height.</p>
				<p>Move the arm thread guide to the right to decrease the length of thread pulled out by the thread take-up lever.</p>
				<p>Use the D1113-126-WA0 for the thread guide bar.</p>
				<p>Use the 11141355 (old DAC-type hook) which has needle guard effect for a #11 needle.</p> <p>When using a thicker needle, correct the needle guard.</p>

6. BOBBIN CASE WITH AN IDLING PREVENTION SPRING

The DLN-5410N, 5410N-7 use bobbin cases with an idling prevention spring. Adjust the tension of the idling prevention spring as follows.

If the bobbin races	Increase the spring tension.
If loose stitches result	Decrease the spring tension.

○ How to adjust the tension of the idling prevention

- 1) Remove the spring as illustrated below, using an old sewing machine needle. (At this time, hold the spring with your thumb to prevent it from jumping out.)
- 2) Adjust the spring pressure by changing the height of the arch of the spring. (Take care not to allow the free end of the spring to float above the bobbin case.)
- 3) Set ear ① first, and insert the sewing machine needle to push the central part of the spring, then set ear ②.

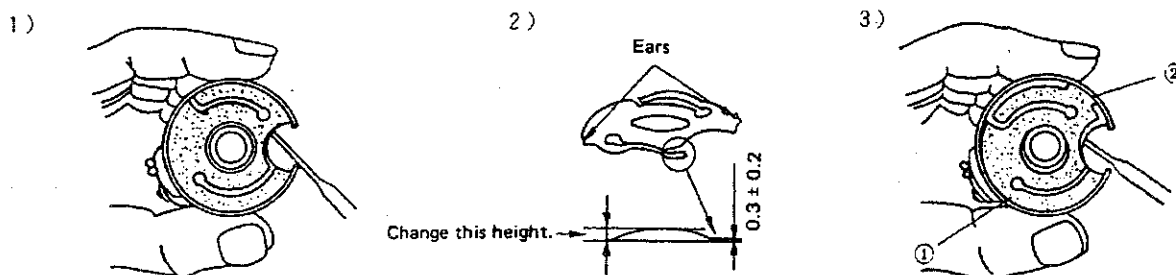


Fig. 63

How to correct irregular stitches produced at high/low speed

If excessively tight stitches are produced at low sewing speed:	Increase the bobbin thread tension and the idling prevention
If loose stitches are produced at low sewing speed:	Decrease the bobbin thread tension and the idling prevention spring tension.

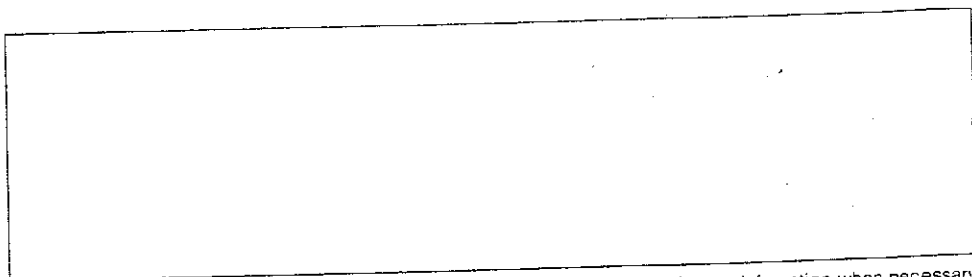
Note: If the bobbin races or if irregular stitches are produced at high/low sewing speed, it is advisable to use a bobbin case with an idling prevention spring.

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