



1-NEEDLE, BOTTOM FEED, LONG CYLINDER BED, LOCKSTITCH MACHINE FOR
EXTRA HEAVY-WEIGHT MATERIALS WITH A SEMI-ROTARY LARGE-CAPACITY
SHUTTLE

TSH-411

1-NEEDLE, TOP & BOTTOM FEED, LONG CYLINDER BED, LOCKSTITCH MACHINE
FOR EXTRA HEAVY-WEIGHT MATERIALS WITH A SEMI-ROTARY LARGE-CAPACITY
SHUTTLE

TSU-471

ENGINEER'S MANUAL

29338100
No.00

PREFACE

This Engineer's Manual is written for the technical personnel who are responsible for the service and maintenance of the sewing machine. This manual describes "Adjustment Procedure", "Results of Improper Adjustment", and other functions which are not covered by the Instruction Book intended for the maintenance personnel and sewing operators at a sewing factory.

All personnel engaged in repair of TSH-411 and TSU-471 are required to carefully read Section 2 "Standard Adjustment" which contains important information on the maintenance of TSH-411 and TSU-471.

The "Standard Adjustment" consists of two parts; the former part presents illustration and simplified explanation for the convenience of reconfirmation of the required adjustment values in carrying out actual adjustment after reading this manual once; and the latter part provides "Results of Improper Adjustment" in which sewing and/or mechanical failures, and the correcting procedures are explained for those persons who perform such adjustment for the first time. It is advisable to use "TSH-411 and TSU-471 Parts Book" together with this Engineer's Manual.

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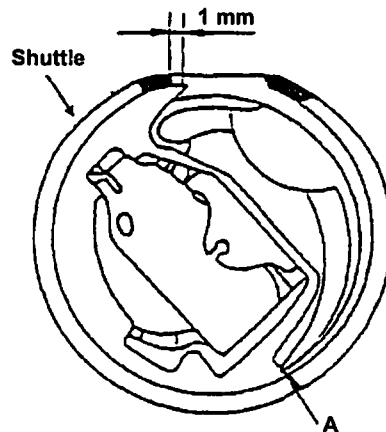
1. SPECIFICATIONS

No.	Item	Specifications	
1	Model	TSH-411	TSU-471
2	Name of machine	1-needle, bottom feed, long cylinder bed, lockstitch machine for extra heavy-weight materials with a semi-rotary large-capacity shuttle	1-needle, top and bottom feed, long cylinder bed, lockstitch machine for extra heavy-weight materials with a semi-rotary large-capacity shuttle
3	Application	Tents, bags, shoes, bag handles, safety belts, etc.	
4	Sewing speed	Max. 800 rpm	
5	Needle	SCHMETZ 794	
6	Range of needle size	Nm = 130 to Nm = 280	
7	Range of count of thread	#00 to #8	
8	Stitch length	Max. 11 mm (normal/reverse feed)	
9	Lift of presser foot	12 mm by hand lifter/ 20 mm by pedal	
10	Stitch adjusting method	Lever nut type (feed connecting link fulcrum moving method)	
11	Reverse feed stitching method	By lever	
12	Thread take-up lever	Cam type thread take-up lever	
13	Needle bar stroke	56 mm	
14	Alternate foot stroke	4 mm to 8 mm (TSU-471 only)	
15	Shuttle	Semi-rotary large-capacity shuttle	
16	Feed mechanism	Rocking method of feed connecting link by feed eccentric cam	
17	Top feed mechanism	Bottom feed interlocking method	
18	Shuttle driving shaft drive method	Driving method of oscillating rock shaft by connecting rod eccentric cam	
19	Lubrication	Manual	
20	Lubricating oil	New Defrix Oil No. 1	
21	Bobbin winder	Built-in type	
22	Free space for sewing	180 mm x 420 mm	
23	Bed size	253 mm x 656 mm	
24	Motor	4P, 400W clutch motor	
25	Belt	M type V-belt	

Standard Adjustment

2. ADJUSTMENTS

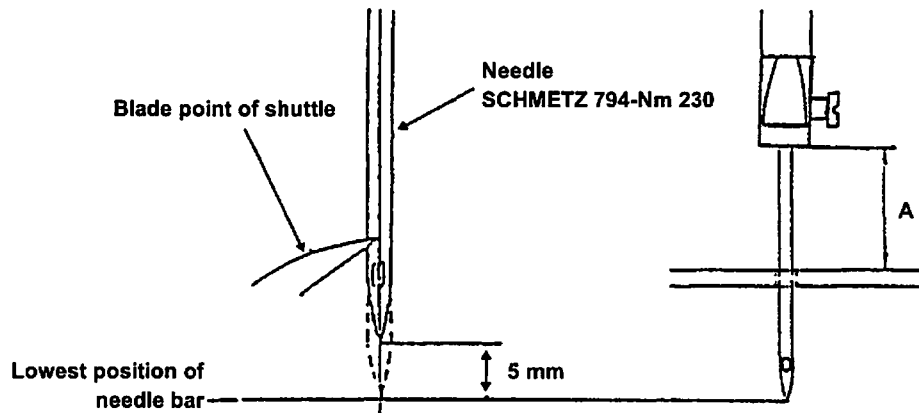
(1) The position of the shuttle when it is recessed most



Condition

- When the shuttle turns counterclockwise until it will go no further, the shuttle should come in contact with point A.

(2) Needle-to-shuttle timing



Condition

- When the blade point of the shuttle is aligned with the center of the needle on condition that the shuttle is counterclockwise pressed to the shuttle driver while the needle bar is rising from its lowest position.

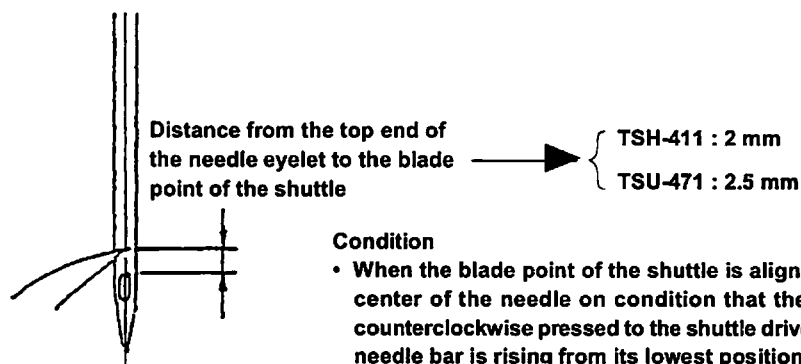
[Reference value of the lowest position of the needle bar stroke]

Distance A from the upper surface of the throat plate to the lower end of the needle bar

TSH-411 : 26.9 mm

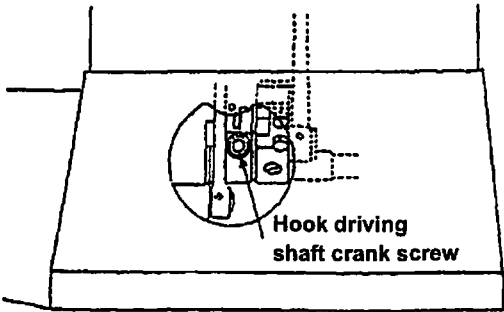
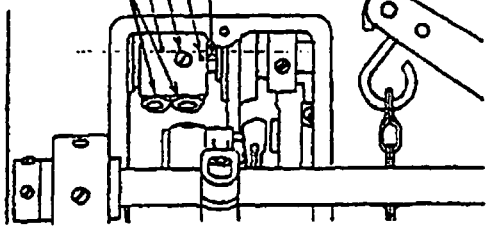
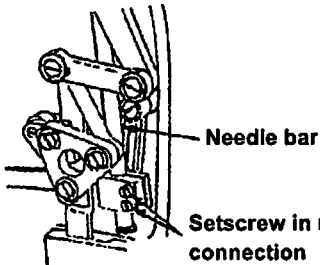
TSU-471 : 26.4 mm

(3) Height of the needle bar



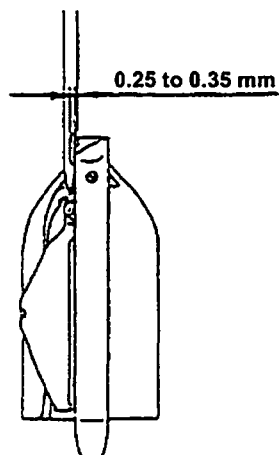
Condition

- When the blade point of the shuttle is aligned with the center of the needle on condition that the shuttle is counterclockwise pressed to the shuttle driver while the needle bar is rising from its lowest position.

Adjustment Procedures	Results of Improper Adjustment
<ol style="list-style-type: none"> 1. Turn and stop the handwheel at the position where the shuttle turns counterclockwise until it will go no further. 2. Loosen the shuttle driving shaft crank screw. 3. Turn the shuttle by hand to adjust the position of the blade point of the shuttle. Then, fix the shuttle.  <p>Hook driving shaft crank screw</p>	<p>○ Stitch skipping or thread breakage will occur.</p>
<ol style="list-style-type: none"> 1. Loosen two setscrews (B) in the connecting rod eccentric cam and setscrew (A) in the connecting rod eccentric cam. 2. Turn the connecting rod eccentric cam to adjust the lifting amount of the needle bar and tighten setscrew (A). (Reference value) Align the marker dot engraved on the connecting rod eccentric cam with the marker line engraved on the main shaft. 3. Turn the handwheel toward you, and check the lifting amount of the needle bar. Then, securely tighten two setscrews (B). <p>(Caution) Tighten the screws with the tightening torque of 180 to 200 kgfcm.</p> <p>Setscrew (A) in connecting rod eccentric cam Connecting rod eccentric cam Setscrews (B) in connecting rod eccentric cam Engraved marker dot Marker line engraved on main shaft</p> 	<p>○ Stitch skipping or thread breakage will occur.</p>
<ol style="list-style-type: none"> 1. Turn and stop the handwheel at the position where the blade point of the shuttle is aligned with the center of the needle while the needle bar is rising from its lowest position. 2. Loosen two setscrews in the needle bar connection. 3. Move the needle bar up and down to adjust the height. Then, fix it.  <p>Needle bar Setscrew in needle bar connection</p>	<p>○ Stitch skipping or thread breakage will occur.</p>

Standard Adjustment

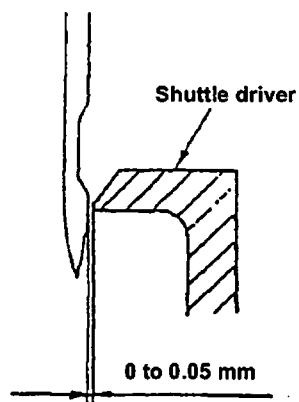
(4) Clearance between the needle and the shuttle



Condition

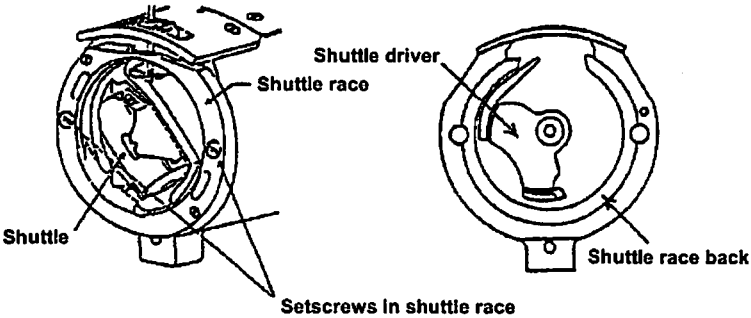
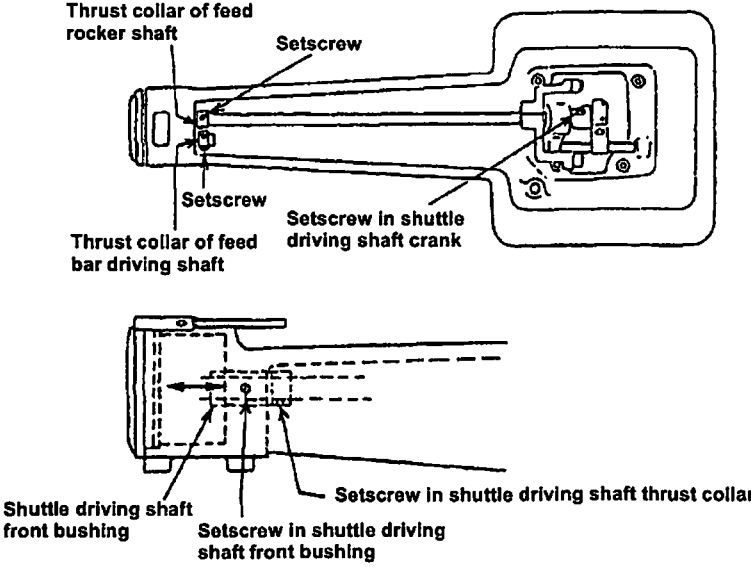
- When the blade point of the shuttle is aligned with the center of the needle while the needle bar is rising from its lowest position.
(Position as shown in the illustration of item (3) on page 2)

(5) Clearance between the needle and the shuttle driver



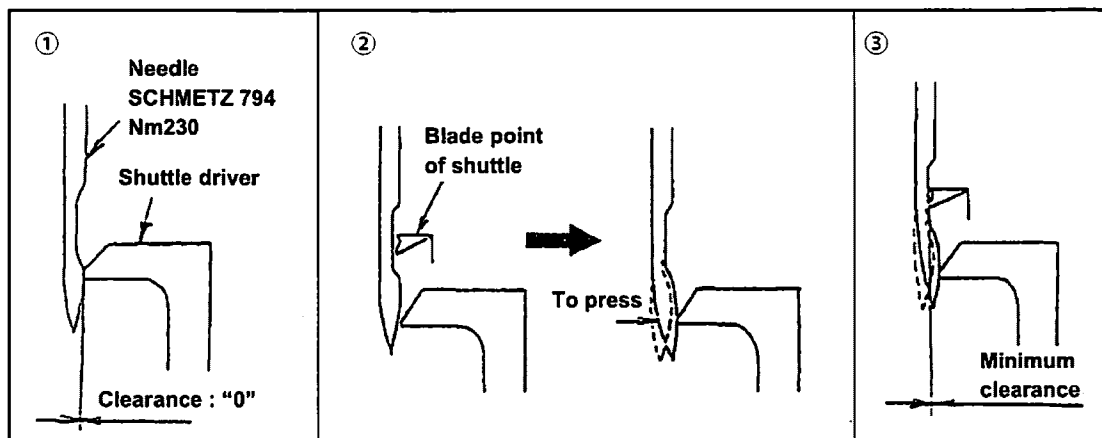
Condition

- When the convex section of the needle is aligned with the needle guard section of the shuttle driver.

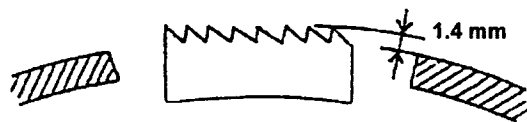
Adjustment Procedures	Results of Improper Adjustment
<p>Adjust the clearance between the needle and the shuttle by replacing the shuttle race back. The shuttle race back comes in six different thickness in addition to the standard thickness.</p> <p>To replace the shuttle race back :</p> <ol style="list-style-type: none"> 1. Remove two setscrews in the shuttle race, remove the shuttle race, and remove the shuttle. 2. Turn the handwheel until the shuttle driver is brought to the position where the shuttle race back comes off as shown in the illustration. Then, replace the shuttle race back. 	<ul style="list-style-type: none"> ○ If the clearance is excessively small, needle and hook will interfere with each other. As a result, damage of the both will result. ○ If the clearance is excessively large, stitch skipping or thread breakage will result.
<ol style="list-style-type: none"> 1. Loosen two setscrews, and remove the thrust collar of the feed bar driving shaft. 2. Loosen two setscrews, and move the thrust collar of the feed rocker shaft. 3. Loosen two setscrews in the shuttle driving shaft thrust collar, setscrew in the shuttle driving shaft front bushing and screw in the shuttle driving shaft crank. 4. Adjust the clearance by moving the shuttle driving shaft front bushing to the left and right. 5. After the adjustment has been completed, fix the shuttle driving shaft thrust collar, making sure that there is no axial play of the shuttle driving shaft. Then, fix the shuttle driving shaft crank. 6. Finally, secure the respective thrust collars, making sure that there is no play in the feed rocker shaft and the feed bar driving shaft. 	<ul style="list-style-type: none"> ○ If the clearance is excessively small and shuttle driver presses needle, stitch skipping or thread breakage will result. ○ If the clearance is excessively large, needle and hook will interfere with each other. As a result, damage of the both will result.

Standard Adjustment

[The standard for adjusting the clearance between the needle and the blade point of the shuttle]

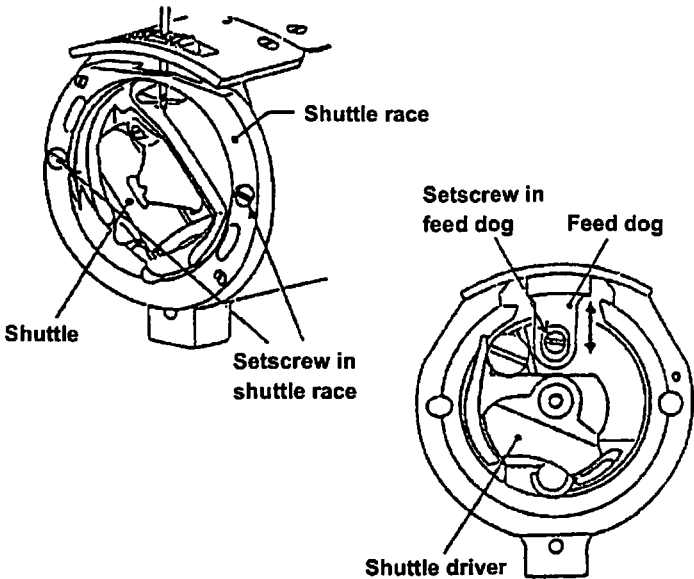


(6) Height of the feed dog



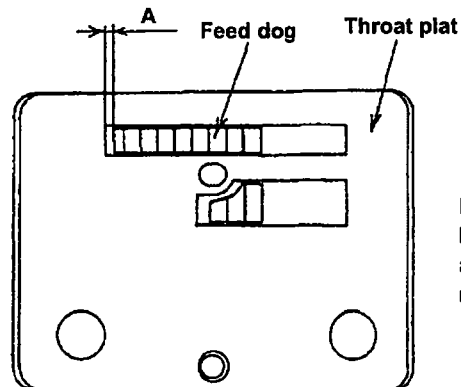
Conditions

- Maximum stitch length feed (11 mm)
- Needle bar at its upper dead point

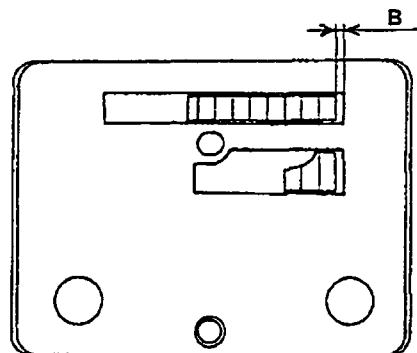
Adjustment Procedures	Results of Improper Adjustment
<p>Use a standard SCHMETZ 794-Nm230 needle.</p> <ol style="list-style-type: none"> ① Turn and stop the handwheel at the position where the convex section of needle is aligned with the needle guard section of shuttle driver, and adjust the clearance between them to "0". ② Turn and stop the handwheel at the position where the blade point of shuttle is aligned with the center of needle while the needle bar is going up from its lowest position, and press the needle against the needle guard section of shuttle driver. ③ In the state of ②, adjust the clearance to a minimum, making sure that the needle does not come in contact with the blade point of shuttle. <p>* By this adjustment, the clearance between the needle and the blade point of the shuttle will be 0.25 to 0.35 mm.</p>	
<ol style="list-style-type: none"> 1. Remove two setscrews in the shuttle race to remove the shuttle race, and remove the shuttle. 2. Turn the handwheel to move the shuttle driver to the position where the setscrew in the feed dog can be observed. 3. Loosen the setscrew in the feed dog, and adjust the height of the feed dog by moving the feed dog up or down. 4. After the adjustment, firmly tighten the setscrew in the feed dog. <div style="text-align: center;">  </div>	<ul style="list-style-type: none"> ○ When the height is high, the feed dog comes in contact with the throat plate. In addition, damage of the sewing product will result. ○ When the height is low, the feed dog comes in contact with the shuttle race and the shuttle race back. In addition, the feed force will be deteriorated.

Standard Adjustment

(7) Longitudinal position of the feed dog



Front and rear clearances A and B between throat plate and feed dog are equal (in both normal and reverse feed stitchings).

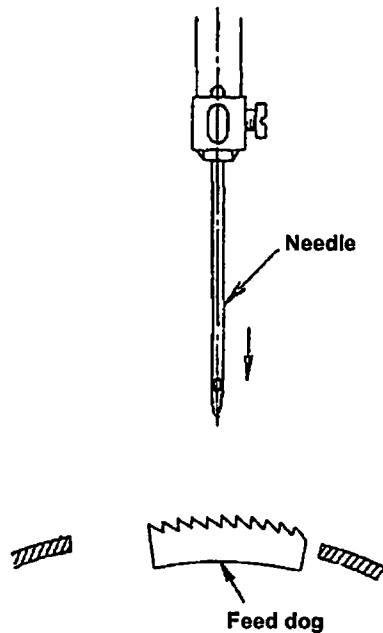


Condition

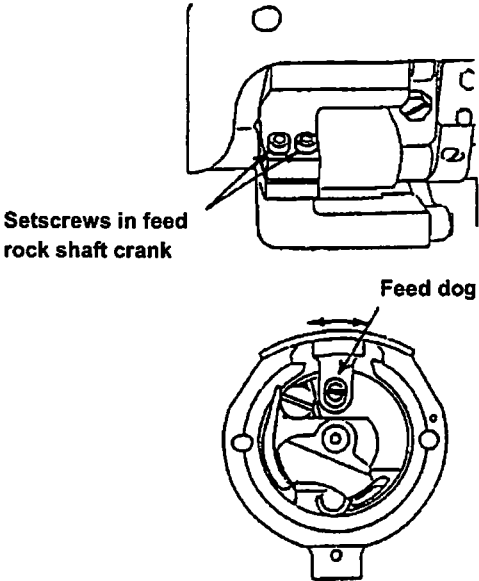
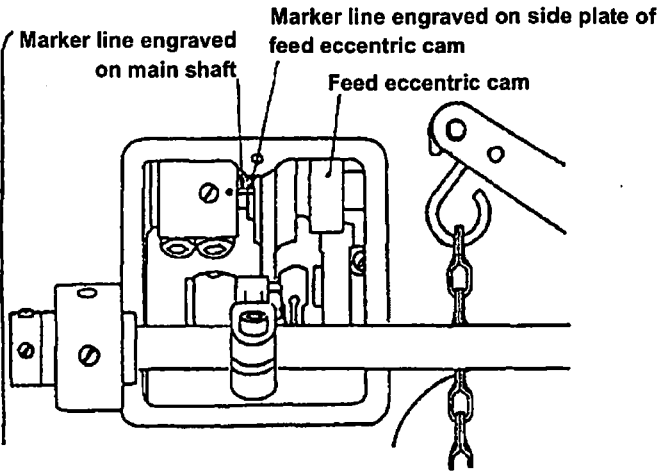
- Maximum stitch length (11 mm)

(8) Feed timing

Feed eccentric cam



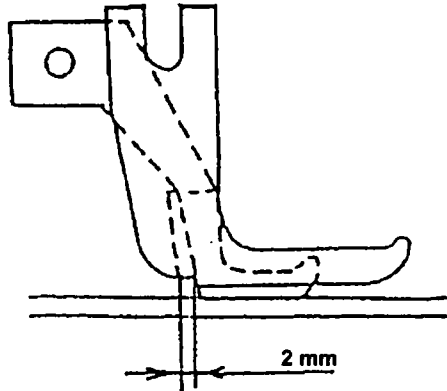
Feeding motion starts at the same time when the needle bar starts descending from its highest dead point.

Adjustment Procedures	Results of Improper Adjustment
<ol style="list-style-type: none"> 1. Maximize the stitch length (11 mm). 2. Loosen two setscrews in the feed rock shaft crank. 3. Move the feed dog to the right and left to adjust so that the longitudinal clearance between the window hole of the throat plate and the feed dog is equal when the feed dog moves, and fix the feed dog.  <p>Setscrews in feed rock shaft crank</p> <p>Feed dog</p>	<ul style="list-style-type: none"> ○ The feed dog comes in contact with the throat plate and contact noise will occur.
<ol style="list-style-type: none"> 1. Loosen two setscrews in the feed eccentric cam. 2. Turn the feed eccentric cam to adjust the timing and fix the cam. <p>(Standard)</p> <p>Align the marker line engraved on the side plate of the feed eccentric cam with the marker line engraved on the main shaft to obtain the standard timing.</p>  <p>Marker line engraved on main shaft</p> <p>Marker line engraved on side plate of feed eccentric cam</p> <p>Feed eccentric cam</p>	<ul style="list-style-type: none"> ○ Stitch length in terms of the graduations on the feed lever will change. In addition, stitch length of normal and reverse feed stitches will change. ○ Irregular stitches will occur.

Standard Adjustment

(9) Movement of the walking foot (This item is applied only to the TSU-471.)

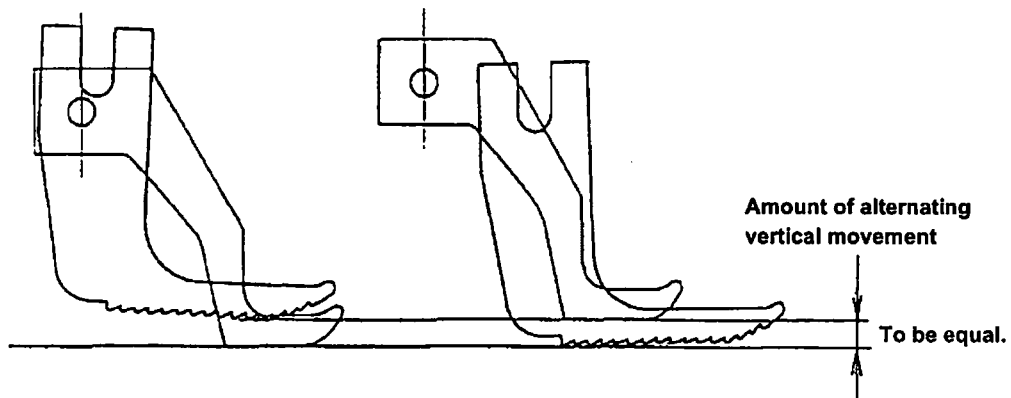
1) Longitudinal position of the walking foot

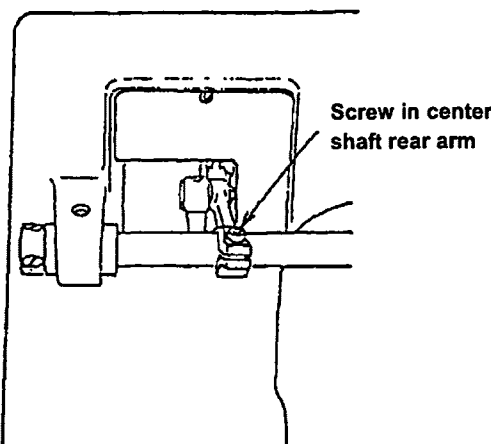
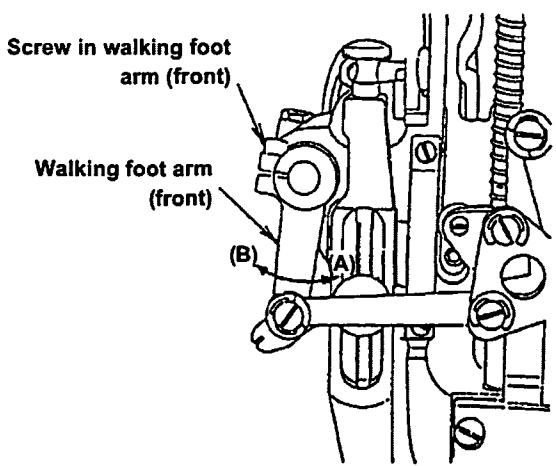


Conditions

- Maximum stitch length (11 mm)
- When walking foot is most close to presser foot.

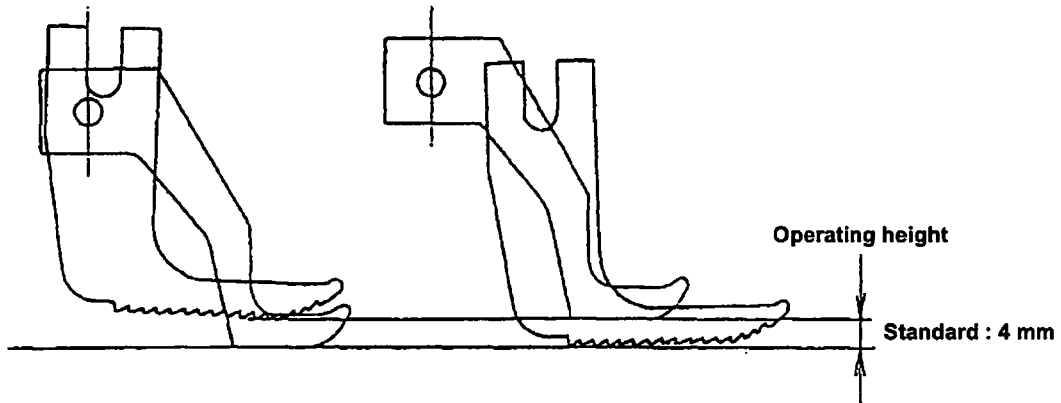
2) The amount of alternating vertical movement of the walking foot and the presser foot



Adjustment Procedures	Results of Improper Adjustment
<ol style="list-style-type: none"> 1. Maximize the stitch length (11 mm). 2. Lower the presser foot on the throat plate, turn and stop the handwheel at the position where the walking foot is most close to the presser foot. 3. Loosen the screw in the center shaft rear arm. 4. Move the walking foot to adjust the clearance and fix it. 	<ul style="list-style-type: none"> ○ If the clearance is smaller than the specified value, the walking foot comes in contact with the presser foot and contact noise will occur. ○ If the clearance is larger than the specified value, stitch length in terms of the graduations on the feed lever will change.
<ol style="list-style-type: none"> 1. Bring the needle bar to the lowest position of its stroke. Then, lower the presser foot. 2. Loosen the screw in the walking foot arm (front). 3. Move the walking foot arm (front) : <ul style="list-style-type: none"> • In the direction of (A) and fix it → amount of movement of the presser foot is decreased. • In the direction of (B) and fix it → amount of movement of the presser foot is increased. 	<ul style="list-style-type: none"> ○ It is effective when the amount of movement of the walking foot is slightly increased according to the sewing product. (Sponge, excessive height difference at stepped section, etc.) ○ When the amount of alternating vertical movement of the walking foot and that of the presser foot are excessively different from each other, stitch length in terms of the graduations on the feed lever will change.

Standard Adjustment

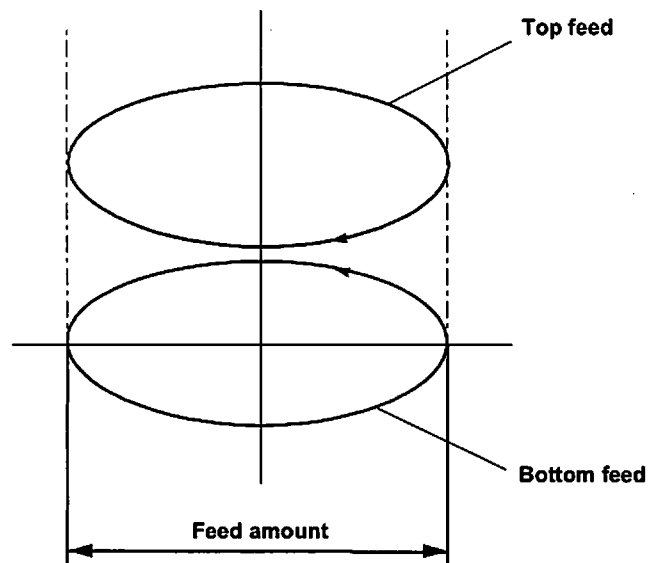
3) Operating height of the walking foot and the presser foot



Standard

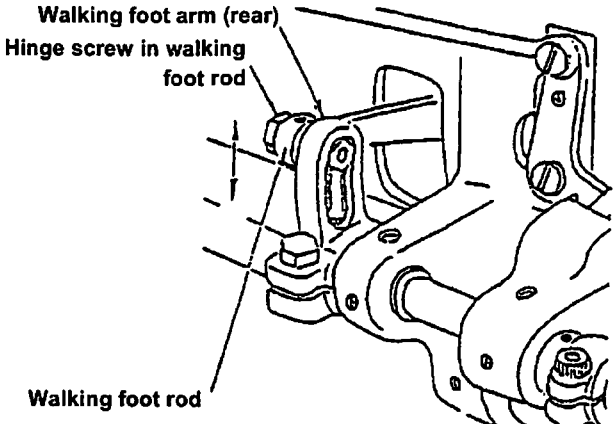
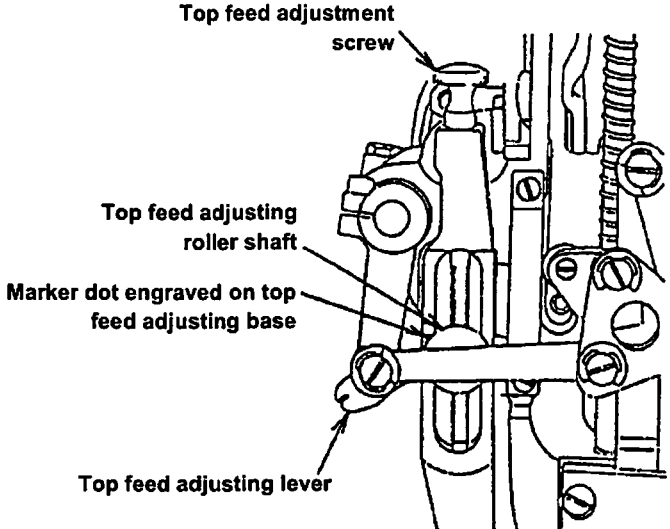
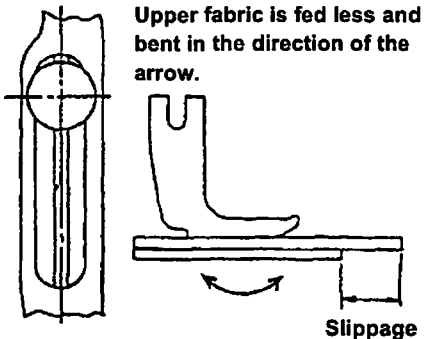
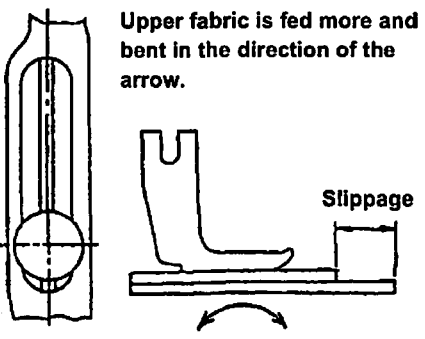
- Fix the walking foot rod to the top of the slot in the walking foot arm (rear).

4) Feed amount of the walking foot



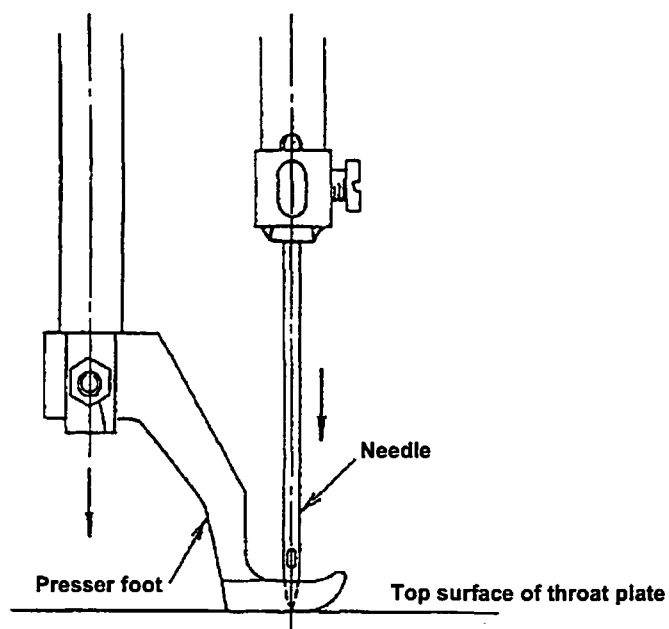
Standard

- Bottom feed amount versus top feed amount is 1 : 1.

Adjustment Procedures	Results of Improper Adjustment
<ol style="list-style-type: none"> 1. Loosen the hinge screw in the walking foot rod. 2. Fix the walking foot rod : <ul style="list-style-type: none"> • to the bottom (A) of the slot in the walking foot arm (rear) → operating height is maximized (8 mm). • to the top (B) of the slot in the walking foot arm (rear) → operating height is minimized (4 mm). 	<ul style="list-style-type: none"> ○ It is effective when the operating height is increased according to the sewing product. (Sponge, excessive height difference at stepped section, etc.) ○ When the operating height is excessively high, stitch length in terms of the graduations on the feed lever will change.
<ol style="list-style-type: none"> 1. Raise the hand lifter lever. 2. Loosen the top feed adjusting lever. 3. Turn the top feed adjustment screw : <ul style="list-style-type: none"> -1. Turn clockwise → top feed amount is decreased. -2. Turn counterclockwise → top feed amount is increased. ◎ Align the outer diameter of the top feed adjusting roller shaft with the marker dot engraved on the top feed adjusting base → bottom feed amount versus top feed amount is 1 : 1. 4. After the adjustment, tighten the top feed adjusting lever to fix. 	<p>3-1 When the top feed adjusting roller shaft is at the top position :</p>  <p>3-2 When the top feed adjusting roller shaft is at the bottom position :</p> 

Standard Adjustment

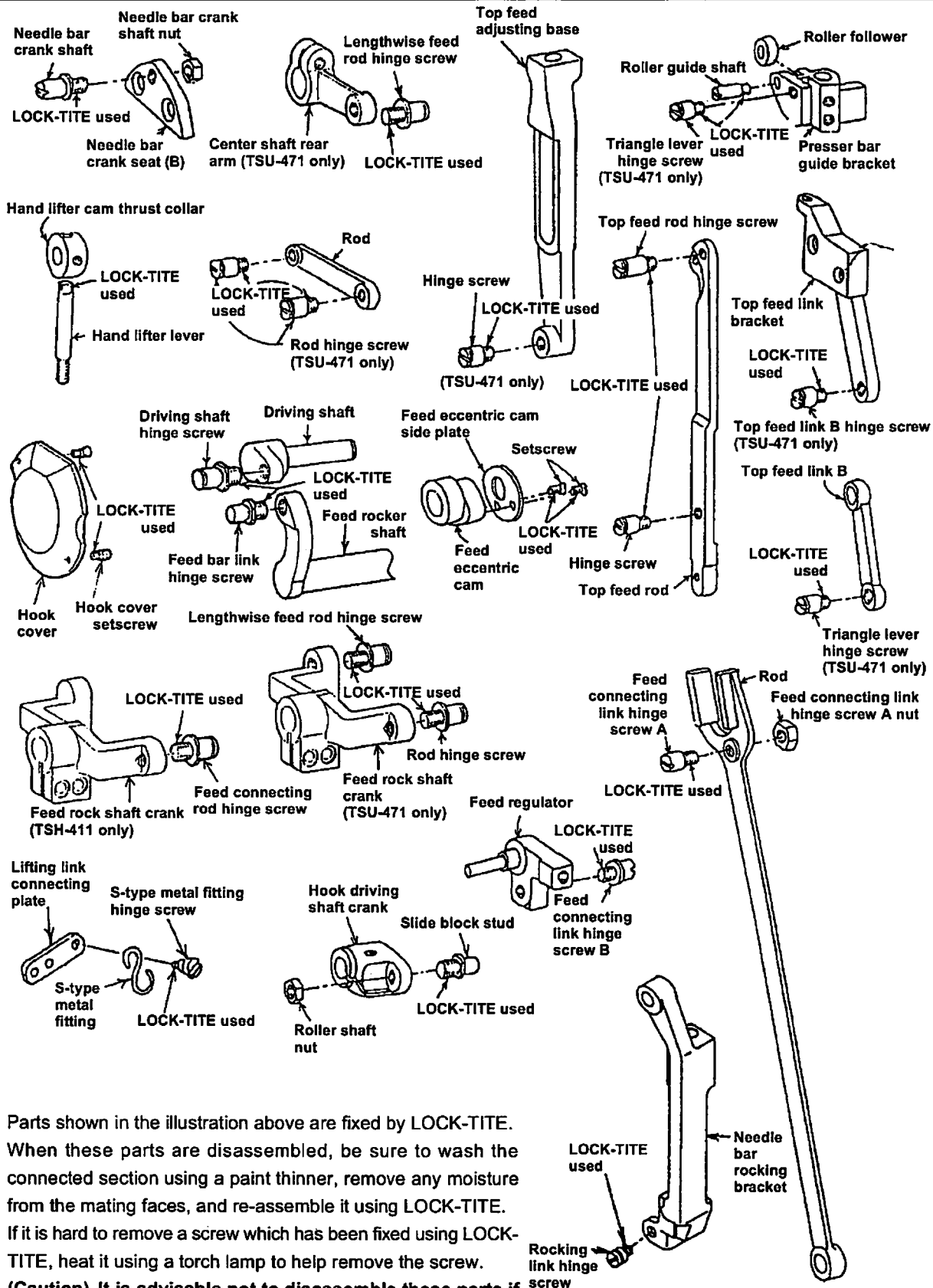
5) Top feed timing



Tip of needle is aligned with the top surface of throat plate when the needle as well as the presser foot come down. At the same time, the presser foot is aligned with the top surface of throat plate.

Adjustment Procedures	Results of Improper Adjustment
<p>1. Loosen two setscrews in the top feed cam.</p> <p>2. Turn the top feed cam to adjust the timing and fix it. (Standard)</p> <p>Adjust so that setscrew No. 2 faces exactly sideways when the needle bar is in the upper dead point of its stroke.</p> <div data-bbox="425 590 774 861" data-label="Image"> </div>	<p>When the timing is excessively advanced :</p> <ul style="list-style-type: none"> ○ Thread tightening is deteriorated. ○ Stitch length in terms of the graduations on the feed lever will change. (Stitch length is decreased.) ○ Reverse feed motion is applied to the walking foot. <div data-bbox="1292 323 1425 583" data-label="Image"> </div> <p>When the timing is excessively retarded :</p> <ul style="list-style-type: none"> ○ Thread tightening is deteriorated. ○ Stitch length in terms of the graduations on the feed lever will change. (Stitch length is increased.) <div data-bbox="1292 764 1425 1024" data-label="Image"> </div>

3. PARTS WHERE ANAEROBIC ADHESIVE (LOCK-TITE) IS USED



Parts shown in the illustration above are fixed by LOCK-TITE. When these parts are disassembled, be sure to wash the connected section using a paint thinner, remove any moisture from the mating faces, and re-assemble it using LOCK-TITE. If it is hard to remove a screw which has been fixed using LOCK-TITE, heat it using a torch lamp to help remove the screw. (Caution) It is advisable not to disassemble these parts if possible.

4. SELECTIVE CONNECTED PARTS LIST

Part No.	Name of part	Remarks
10519502	Thread take-up lever roller	Standard (Outer diameter $11.1^{+0.010}_{-0.008}$ mm)
21046107	Thread take-up lever roller	(Outer diameter $11.1^{+0.010}_{-0.008}$ mm)
21046206	Thread take-up lever roller	(Outer diameter $11.1^{+0.020}_{-0.002}$ mm)
21155007	Shuttle race back (1)	(Thickness $2.9^{+0.0}_{-0.03}$ mm)
21155106	Shuttle race back (2)	(Thickness $3.1^{+0.0}_{-0.03}$ mm)
21155205	Shuttle race back (3)	(Thickness $3.3^{+0.0}_{-0.03}$ mm)
21155304	Shuttle race back (4)	Standard (Thickness $3.5^{+0.0}_{-0.03}$ mm)
21155403	Shuttle race back (5)	(Thickness $3.7^{+0.0}_{-0.03}$ mm)
21155502	Shuttle race back (6)	(Thickness $3.9^{+0.0}_{-0.03}$ mm)
21155601	Shuttle race back (7)	(Thickness $4.1^{+0.0}_{-0.03}$ mm)

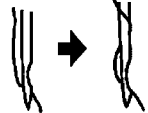
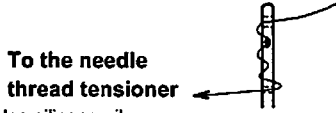

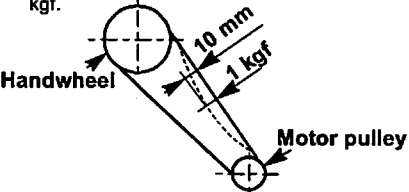
5. CONSUMABLE PARTS LIST

Part No.	Name of part	Remarks
MC532002300	Needle (794Nm = 230)	
21041850	Shuttle (asm.)	
21057401	Bobbin	
21059605	Thread take-up spring A	
21059704	Thread take-up spring B	

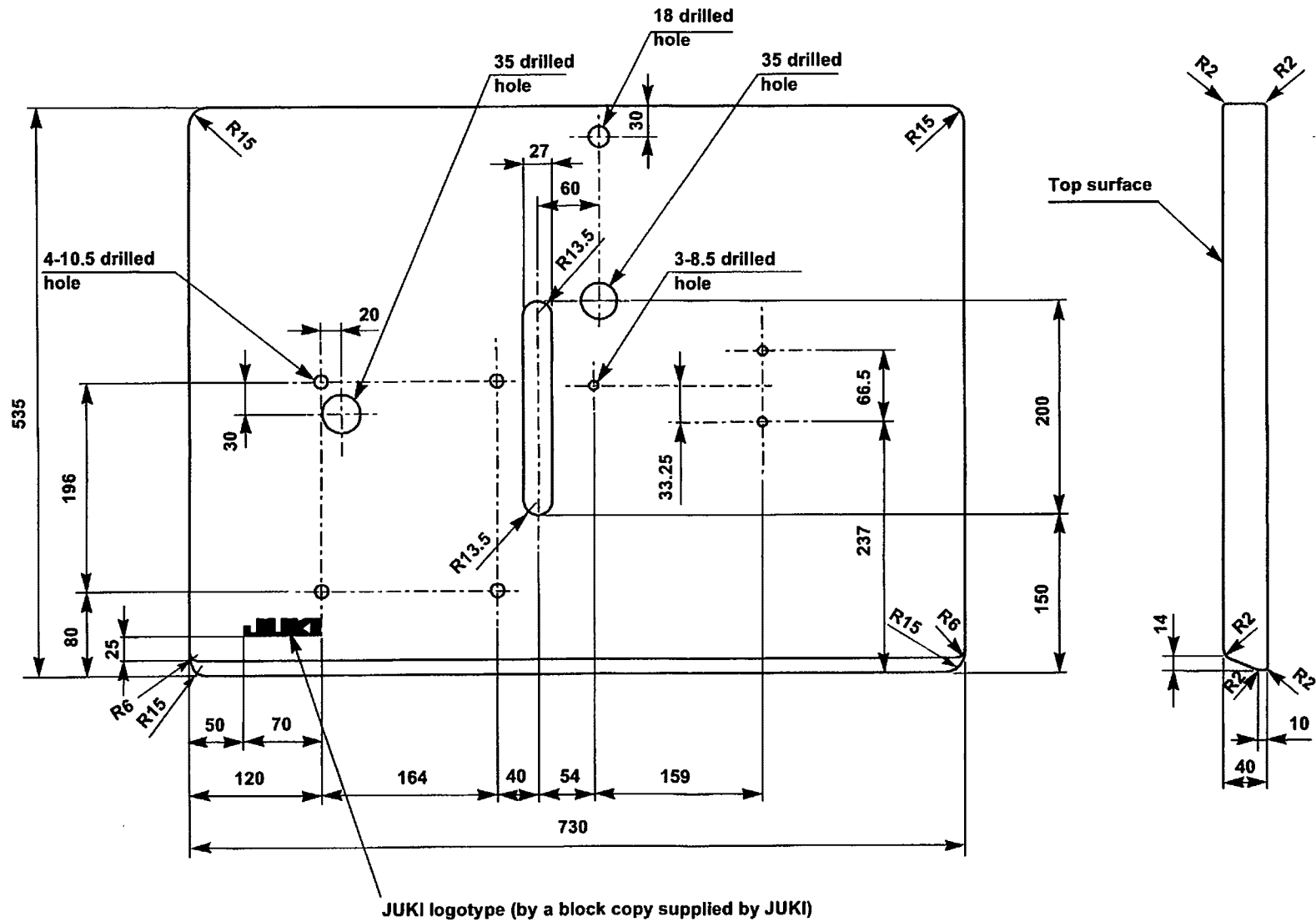
6. OPTIONAL PARTS

Part No.	Name of part	Remarks
21064605	Detector support arm	
NS6150430SSP	Detector support arm nut	
GAK720000A0	Air-type auto-lifter AK-72A	Knee switch type
GAK720000B0	Air-type auto-lifter AK-72B	Pedal kick-back type
21150404	Throat plate (short)	
21170303	Feed dog (herringbone)	For TSH-411
21166103	Presser bar connecting foot	For TSH-411
21166202	Presser bar for connecting foot	For TSH-411
SS8660512TP	Presser bar connecting foot screw	For TSH-411
21164058	Eye guard kit	

7. PROBLEMS WITH SEWING AND CORRECTIVE MEASURES

Problem	Cause	Corrective measures
1. Thread often breaks, thread splits finely, or correct stitch cannot be formed (half-finished stitch).	<ol style="list-style-type: none"> ① Flaw is found out at thread path, needle point, shuttle blade point, or needle eyelet. ② Improper finish around the recess in the needle ③ Excessively tightened needle thread tension ④ The needle interferes with the blade point of the shuttle. ⑤ The timing of the needle and the shuttle is too early or too slow. ⑥ Due to heat generated by the needle ⑦ Excessive height difference at stepped section 	<ul style="list-style-type: none"> ○ Remove flaw by smoothing flaw with fine paper file. ○ Replace the needle with a new one. ○ Adjust the needle thread tension. ○ Refer to "(4) Clearance between the needle and the shuttle" on page 4. ○ Refer to "(2) Needle-to-shuttle timing" on page 2. ○ Decrease the sewing speed of the machine. Use silicone oil. ○ Increase the amount of movement of the thread take-up spring.
2. Stitches are often skipped.	<ol style="list-style-type: none"> ① The needle-to-shuttle blade point clearance is excessive. ② The timing of the needle and the shuttle is too early or too slow. ③ The presser foot pressure is insufficient. ④ The distance from the upper end of the needle eyelet to the blade point of the shuttle is not proper. ⑤ The needle is improperly selected. ⑥ The amount of movement of the thread take-up spring is excessive. ⑦ Overheated needle or shuttle, or thread is not pulled smoothly. ⑧ Reverse feed stitching is made at low speed on light-weight material using nylon thread. 	<ul style="list-style-type: none"> ○ Refer to "(4) Clearance between the needle and the shuttle" on page 4. ○ Refer to "(2) Needle-to-shuttle timing" on page 2. ○ Tighten the presser adjuster screw. ○ Refer to "(3) Height of the needle bar" on page 2. ○ Replace the needle with a one-count thicker needle. ○ Decrease the amount of movement of the thread take-up spring. ○ Use silicone oil. ○ Wind the needle thread around the needle. 
3. Improper thread tension, irregular stitch, or excessive bobbin thread tension	<ol style="list-style-type: none"> ① The thread path in the needle hole of the presser foot, in the needle hole of the feed dog, or of thread guides is poorly finished. ② The bobbin slides unsmoothly. ③ Weak bobbin thread tension ④ Bobbin thread is wound too tightly. ⑤ Needle thread flaps. (Needle thread flaps and comes out of the thread tension disk due to excessive needle thread tension.) (Needle thread flaps too much and is caught in other parts.) ⑥ Too thin bobbin thread is used to combine with needle thread. 	<ul style="list-style-type: none"> ○ Smooth the surface with a fine paper file or using a buff. ○ Replace the bobbin or the shuttle. ○ Adjust the bobbin thread tension. ○ Decrease the tension of the bobbin thread winder. ○ Thread the tension guide bar as illustrated below. ○ Use silicone oil. 
4. Poor gloss of the needle thread	○ Excessive height difference at stepped section	○ Use silicone oil.
5. Inconsistently finished seam (stitches are not made straight but made such as "≡".)	○ Needle is too thick.	○ Replace the needle with a thinner one. Use the cutting point needle. 
6. Bobbin thread tension cannot be increased.	○ The bobbin thread tension spring of the shuttle has become dusty or dirty.	○ Clean by removing the bobbin thread tension spring.
7. The belt slips. (Motor stoppage occurs, if an electronic-stop motor is used.)	<ol style="list-style-type: none"> ① The V belt is degraded. ② The V belt tension is not enough. 	<ul style="list-style-type: none"> ○ When degradation is found out to the V belt, such as wear, cracking, etc., replace with a new one. ○ Adjust the slack amount in the V belt to 10 mm/1 kgf. 

8. DRAWING OF THE TABLE



JUKI®

JUKI CORPORATION

INTERNATIONAL SALES H.Q.

8-2-1, KOKURYO-CHO,

CHOFU-SHI, TOKYO 182-8655, JAPAN

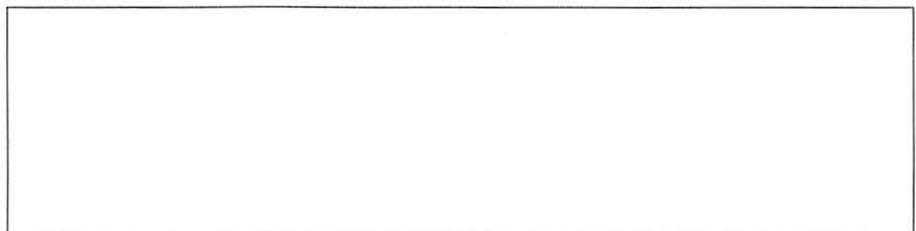
PHONE : (81)3-3430-4001 to 4005

FAX : (81)3-3430-4909 • 4914 • 4984

TELEX : J22967

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Please do not hesitate to contact our distributors or agents in your area for further information when necessary.

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