SINGER AUTOMATIC SWING-NEEDLE MACHINES OF CLASS 401

Fig. 265. Machine 401A

The instructions on pages 1 to 79 generally apply to Class 401 Automatic Swing-Needle Machines.

Specific instructions which apply only to Machines of Class 401 appear on pages 125 to 162.

For detailed information concerning OPERATION of Machines of Class 401, see regular instruction book, Form 20857.
PREPARATION OF MACHINE FOR INSPECTION

Before any extensive inspection is undertaken to find causes of faulty operation, machine should be thoroughly cleaned and oiled.

Remove all lint, dust or other foreign particles from machine.

Remove motor, light and wiring harness, as described on pages 145 to 147 and dip machine in large container of Varsol. If grease or dirt has become considerably hard and tacky it may be necessary to leave machine in Varsol for several hours.

Wipe machine clean and dry.

Oil the machine as instructed below and on page 127.

Wipe away all surplus oil.

See pages 4 to 7 for general tips on setting up and inspection.

LUBRICATION

Fig. 266 Front View - Oiling
Open the face plate to oil the places indicated in Fig. 268. Tilt machine back on its hinges. Set the controls at A-K-5 for access to take-up linkage.

Keep all gears well lubricated with SINGER GEAR LUBRICANT.

Fig. 267 shows the two sets of gears beneath the machine bed.

Fig. 269 shows the other two sets of gears at top of arm. To reach these gears, loosen the two screws A, Fig. 266 and remove arm top cover.
TO SET PRESSER FOOT AT CORRECT HEIGHT

Fig. 270. Setting Presser Foot at Correct Height

**IMPORTANT:** Unless presser foot is set at correct height, attachments for this machine may not fit correctly on presser bar.

**CAUTION:** Throat plate must be down, flush with bed slide, while setting presser foot height.

**CHECK:**

Raise presser bar lifter B, Fig. 270, raising presser foot to highest position.

Bottom of presser foot should be .295 inch above top of throat plate.

Test alignment of presser foot to slots in throat plate and to feed. Fig. 271 shows presser foot in correct alignment. (See instructions on page 57.) Height of presser foot and alignment with slots in throat plate must be set at same time.

**NOTE:** On Machines of Class 401, the first four pairs of teeth are not lower than the rear teeth but are level with them, as shown in Fig. 274. Therefore, tissue paper cannot pass beyond front teeth when feed dog and presser foot are in proper alignment.

**SETTING:**

Loosen set screw C, Fig. 270. Raise or lower presser bar D as required.

Align presser foot and securely tighten screw C.
TO SET FEED DOG AT CORRECT HEIGHT

![Fig. 272. Machine Set for Sewing at 12 Stitches per Inch](image)

**PREPARATION:**
Remove bottom cover, motor hold-down plate and motor, as instructed on page 145.

Set throat plate position lever G, Fig. 272 at “DOWN” position for sewing and set machine for forward stitching at approximately 12 to 15 stitches per inch as shown at H in Fig. 272.

Turn machine pulley over toward operator until feed dog is at its highest position.

**CHECK:**
With feed dog at highest position, feed dog teeth should project .040 to .043 inch above top surface of throat plate, as shown in Fig. 274. Use Gauge No. G34202 for setting correct feed dog height as shown in Fig. 38A, page 30.

![Fig. 273. Feed Adjustments](image)

**SETTING:**
Loosen nut E, Fig. 273 and turn eccentric stud F until high point of eccentric is toward rear of machine bed, as shown in Fig. 273 (inset), making the distance between stud F and feed lifting rock shaft U as short as possible. Then turn eccentric stud F, as required to bring feed dog to correct height. Maintain this setting while tightening nut E securely.

![Fig. 274. Feed Dog at Correct Height](image)

**TO SET FEED DOG LENGTHWISE IN THROAT PLATE SLOTS**

**PREPARATION:**
Set feed dog at correct height as instructed above.

Set throat plate position lever G and stitch regulator H, as shown in Fig. 272.

**CHECK:**
Feed dog should be as close as possible to needle slot in throat plate without striking, to insure efficient performance of stitching mechanism.

**SETTING:**
Loosen nut J, Fig. 273.

Turn eccentric stud K until high point of eccentric is toward rear of machine bed, as shown in Fig. 273 (inset), making distance between stud K and feed rock shaft V as short as possible. Then turn eccentric stud K, moving feed dog toward front or rear as required. Securely tighten nut J.
TO SET FEED DOG SIDewise IN THROAt PLATE SLOTS
AND TO ELIMINATE NOISE IN FEED MOVEMENT

Fig. 275. Setting Feed Sidewise

PREPARATION:

Set feed dog at the correct height as instructed on page 129.

CHECK:

The feed dog should be located centrally (along the bed) in the feed dog slots of the throat plate.

SETTING:

Loosen set screws L and M, Fig. 275 that hold screw centers N and P and feed rock shaft V in position.

Loosen set screws Q and R, Fig. 275 that hold screw centers S and T and feed lifting rock shaft U in position.

Loosen screw centers S and T slightly to permit movement of feed dog toward left or right.

To position feed dog toward left, loosen screw center P and tighten screw center N an equal amount, as required.

To position feed dog toward right, loosen screw center N and tighten screw center P an equal amount, as required.

When feed dog is centralized in throat plate, make sure screw centers N and P hold feed rock shaft snugly (without end play or binding). Then securely tighten set screws L and M, Fig. 275.

Tighten screw centers S and T equally upon feed lifting rock shaft V so that shaft V rides freely without end play or binding. Then securely tighten set screws Q and R, Fig. 275.

NOTE: Check for end play or binding in feed bar O8, Fig. 275. To adjust, loosen nuts W8 and Z8 and turn screw centers J8 and H8, as required. Recheck sidewise position of feed dog, and adjust if necessary, as instructed above. Tighten nuts W8 and Z8.
TO ADJUST THREAD CLEARANCE

PREPARATION:

Remove needle, throat plate and bed slide.

CHECK:

Using narrow feeler gauge, Serial No. 187928, check these thread clearances —

At A2, Fig. 280, between bobbin case cushion spring and heel of bobbin case, there should be a clearance of .012 to .014 inch.

At B2 on other side of spring, between spring and bracket — clearance should be .012 to .014 inch.

At C2, between hook race and underside of spring — clearance should be .016 to .018 inch.

Clearance between rear corner of bobbin case and top of spring, shown at D2, Fig. 276 should be approximately 3/64 inch. This distance can be checked with a simple scale rule.

Check for wear and need for replacement of cushion spring and of screws E2 and F2, Fig. 276.

SETTING:

To adjust clearances at B2, C2 and D2, Fig. 276, loosen screws E2 and F2 and move cushion spring as required.

NOTE: Hole in spring for screw E2 is elongated and hole for screw F2 is oversize to facilitate adjustment.

Move spring toward rear to increase clearance C2 or toward front to decrease clearance C2.

To adjust thread clearance at A2 (.012 to .014 inch), loosen set screw G2 and turn eccentric stud H2 as required to move spring and bracket toward or away from bobbin case heel. Securely tighten screw G2.

When all three clearances have been obtained, at same position of spring, securely tighten screws E2 and F2.

FEED TIMING

CAUTION: Feed eccentric is correctly set at the factory.

This timing should not be altered.
TO SET THE CHECK SPRING

SETTING THE STROKE:

Loosen screw L2 and move regulator O2 until right end of slot in regulator is 1/16 to 3/32 inch to right of head of screw L2, as shown in Fig. 277. Move regulator up toward left for shorter stroke or down toward right for longer stroke. Tighten screw L2.

SETTING THE TENSION:

Loosen stud set screw N2, Fig. 278 and remove entire assembly, as shown in Fig. 279. Hold tension assembly so that component parts are in position shown in Fig. 279.

Place end R2 of spring J2 in groove of sprocket Q2 so that spring will hang down as shown; with line of spring J2 parallel to a line that bisects the dividing line between the plus (+) and minus (−) lines on indicator G5, the extension P2 and the pin H5, as shown in Fig. 279. Increase or decrease tension by moving end R2 of spring J2 to some other groove in direction shown by arrows in Fig. 279. Replace assembly. Draw spring J2 to rest on stop K2, Fig. 277 and recheck tension. Tighten set screw N2, Fig. 278.

TO ADJUST NEEDLE THREAD TENSION

Use #50 mercerized thread.

Lower the presser bar.

Check for a slight perceptible tension on needle thread.

When tension is incorrect, turn thumb nut L5, together with the numbered dial D5, over toward the left until the "0" is at the top, as shown in Fig. 277.

Now insert pin C5 in various holes of the dial D5 until one is found which gives a slight perceptible tension when the thumb nut L5 is turned to the extreme left and the numeral "0" is on top of the dial, as shown in Fig. 277.
NOTE: There should be no tension when dial D5 is turned over toward left to a point between "0" and "1".

This tension gradually increases with the turning of the thumb nut L5 over toward the right; providing the full range of tensions required from light to heavy (with but one revolution of the thumb nut L5).

TO SET NEEDLE BAR AT CORRECT HEIGHT

PREPARATION:

Set red lever at #3 position and stitch selector knobs at A and K, as shown in Fig. 295, page 142.

Insert two needles (same size) up into needle bar.

CHECK:

Turn hand wheel over toward operator until needle bar is at its lowest point. At this position the UPPER timing mark on the needle bar should be level with lower end of needle bar ball bushing Z, as shown in Fig. 280.

Then turn hand wheel until hook point is behind needles. If needle bar is correctly turned, both needles will be an equal distance in front of the point of the hook.

SETTING:

Turn hand wheel over toward operator until needle bar is at lowest point.

Loosen screw W, Fig. 280.

Raise or lower needle bar, as required.

While maintaining needle bar at correct height, make certain needle bar is correctly turned, then tighten screw W.
TO CHECK THE POSITION OF THE NEEDLE IN RELATION TO STRAIGHT-STITCHING THROAT PLATE

Fig. 281. Needle Hole in Straight-Stitching Throat Plate

PREPARATION:

Set red lever at #3 position and selector knobs at A and K, for straight-stitching at central position, as shown in Fig. 295, page 142.

Install straight-stitching throat plate.

CHECK:

When the needle enters the needle hole in straight-stitching throat plate, the short-groove (flat shank) side of the needle should face slightly to the left of rear, as shown in Fig. 281.

Although the size of the needle may be changed to suit sewing requirements, the position of the flat shank side of the needle remains CONSTANT in relation to the needle hole in the throat plate.

Observe that the center of a Size #11 needle should be at the approximate center of the needle hole in the throat plate and that the center of each larger size needle advances toward the front of the needle hole.

This position is necessary to permit an increase in the diameter of the needle blade toward the front without disturbing the proper relationship between the needle and the sewing hook. This position of the needle will also maintain sufficient clearance for the needle thread.

At no time should the needle touch the edge of the needle hole. The needle should never strike the presser foot.

If the needle is incorrectly located in the throat plate hole:

- Needle bar setting may be incorrect from front to back or from right to left (see page 142).
- Needle bar shakes in ball bushings (see page 142).
- Needle or needle bar may be bent. (Replace.)
- Needle seat in needle bar may be clogged with dirt or be damaged (see page 126).
- Throat plate may be incorrectly seated (see page 152).

If the needle strikes the presser foot, any of the above conditions may be at fault, or:

Presser bar may be bent, damaged or turned out of position (see page 128).
Presser foot may be incorrectly seated on the presser bar
Presser foot may be bent. (Replace.)
TO ELIMINATE SIDE-SHAKE OR BINDING OF NEEDLE BAR

End play or binding of needle bar is usually the result of an incorrectly adjusted ball bushing at F3, Fig. 283 or H3, Fig. 283A.

To adjust lower ball bushing, first remove presser foot. Loosen screw A3, Fig. 280, page 133 and lower presser bar bushing B3, Fig. 283 and guide C3, Fig. 283.

Loosen set screw E3, Fig. 280.

Loosen or tighten adjusting screw at F3, Fig. 283, as required. (Use a 1/2 inch spanner wrench.)

Upper ball bushing may be adjusted with a 1/2 inch spanner wrench at H3 after loosening set screw G3, Fig. 283A.

CAUTION: Tightening the set screws E3 and G3 may tend to make the ball bushing bind slightly. Adjust accordingly, setting ball bushings individually. Then tighten set screws E3 and G3.

Replace needle thread eyelet C3 on groove in presser bar bushing B3, as shown in Fig. 283.

Replace presser bar bushing B3 with needle thread eyelet, as shown in Fig. 283.

Tighten set screw A3, Fig. 280.

CHECK THESE POINTS WHEN STITCH REGULATOR STICKS, CREEPS OR BINDS

1. Looseness of screws.
2. Dirt on, or damage to moving parts.
3. Feed rock shaft centers too loose or too tight.
5. Too much friction in friction fork on stitch regulator.
7. Worn or jammed slide block in feed forked connection.
8. Worn or damaged feed rock shaft.
10. Too much pressure on presser bar when sewing heavy material.

135
TO ELIMINATE END PLAY OR BINDING
OF FEED ROCK SHAFT AND FEED LIFTING ROCK SHAFT

Fig. 204. Elimination of End Play or Binding beneath Machine Bed

To eliminate end play or binding of feed rock shaft V, Fig. 284, loosen set screw L at right end of shaft and adjust screw center N, so that shaft rides snugly but freely, (without any left or right movement).

Securely tighten set screw L.

To eliminate end play or binding of feed lifting rock shaft U, Fig. 284, loosen set screw Q at right end of shaft and adjust screw center S, as required.

Securely tighten set screw Q.

Check and adjust feed bar for end play or binding, as instructed on page 130.

TO ELIMINATE END PLAY OR BINDING OF HOOK DRIVING SHAFT

To eliminate end play or binding of hook driving shaft K3, loosen two set screws O and two set screws P8, Fig. 284. Then loosen set screw D3 in collar J3, Fig. 284 and two set screws A7 in bevel gear G8 at right end of shaft.

Check for end play on rotating hook shaft. To adjust, loosen set screw Z3. Press gear Y up against its bearing and retighten screw Z3.

NOTE: KEEP ALL GEARS IN MESH. (See CAUTION at top of page 154.)

Hold hook bracket U8 against lug V8 and push bushing L3 toward left against bevel gear at left end of shaft K3 so that there will be no looseness nor binding. Securely tighten two set screws P8 and two set screws O, Fig. 284. Press collar J3 firmly against bushing L3 and tighten set screw D3. Adjust gear mesh at right end of shaft K3 so that there is neither backlash nor binding. While maintaining this adjustment, tighten the two set screws A7 in gear G8.

Check timing of hook, as instructed on page 143.

Adjust position of hook in relation to needle as instructed on page 144.
TO ELIMINATE END PLAY OR BINDING OF UPRIGHT ARM SHAFT

To eliminate end play or binding of upright arm shaft P3, Fig. 284, page 136, loosen set screw in lower bevel gear W3.

See CAUTION on page 154.

While pressing downward upon shaft P3 from top of machine, set gear W3 firmly against bearing on casting and tighten its set screw.

Adjust hook driving shaft for end play or binding, as instructed on page 136.

Adjust horizontal arm shaft for end play or binding, as instructed below.

TO ELIMINATE END PLAY OR BINDING OF HORIZONTAL ARM SHAFT

Fig. 285. Adjustments for End Play or Binding of Arm Shaft

When horizontal arm shaft binds, first check to make certain that mesh between the arm shaft worm and the cam stack worm wheel is not too tight. Do this by removing cam stack as instructed on page 158. If the binding is thus released, the eccentric shaft H8, Fig. 323, page 159 requires adjustment, as instructed on page 159.

If arm shaft still requires adjustment for end play or binding, loosen set screw M3 in collar N3, Fig. 285. Turn hand wheel until set screw Z2 on eccentric appears in hole in cap of connecting rod as shown in Fig. 285. Loosen screw Z2.

While keeping timing screw Z2 in groove provided for it in arm shaft, push needle bar crank toward hand wheel end of machine and press bevel gear Y2.

Fig. 285 firmly in mesh, without backlash or binding, with bevel gear at top of upright arm shaft. (See CAUTION at top of page 154.)

Tighten set screw Z2 and check for free running.

Press collar N3 firmly against bushing in head of machine and tighten set screw M3.

Check timing of hook, as instructed on page 143.

NOTE: If there is considerable play between hand wheel and hand wheel gear, remove and disassemble hand wheel assembly, as instructed on page 150 and check seating of spring D6, Fig. 310.
TO SET THE INDEX PINS AT THE CORRECT HEIGHT

(See Fig. 286)

PREPARATION:

Remove arm top cover and special disc.

Remove lamp shade. Unfasten sewing light from arm of machine, as instructed on page 146.

CHECK:

Set selector knobs at J and R, as shown in Fig. 286.

At this setting, top surface of followers O3 and R3, should be 1/64 inch below top surface of cam stack S3, as shown in Fig. 286.

Position of followers O3 and R3 is determined by height of index pins T3 and W3, respectively.

SETTING:

Loosen set screw V3 (see inset at top left of Fig. 286) in rear of machine arm.

Raise or lower the rear index pin T3, as required.
Securely tighten screw V3.

Loosen set screw U3, on the front of machine arm.

TO TIME THE CAM STACK

PREPARATION:

Remove arm top cover and special disc.

Using selector knob Z7, Fig. 286 bring rear follower O3 in contact with edge of top cam on cam stack, S3, Fig. 287.

Turn hand wheel over toward you until timing mark X3, is at point of contact with rear follower O3, as shown in Fig. 287.

CHECK:

At this setting, the needle bar should be at its lowest position.

SETTING:

Remove stud and spring Y3, Fig. 287.

Turn hand wheel over toward you slowly until needle bar is at its lowest position.
Loosen each of the three clamping screws Q3, Fig. 287 (just one turn).

While holding needle bar at its lowest position, rotate entire cam stack clockwise, with the hand, until timing mark X3 reaches point of contact with rear follower O3, as shown in Fig. 287.

Tighten the three clamping screws Q3.

Replace stud and spring Y3. Tighten stud.

Replace special disc and arm top cover.

TO SET CAM SELECTOR ARM STOPS

PREPARATION:

Remove arm top cover.

Check adjustment of worm wheel shaft, as instructed at bottom of page 159.

Make certain that screws F9, Fig. 286 and D8, Fig. 287 are securely tightened.

Set selector knobs at D and L, as shown in Fig. 322, page 158.

Turn hand wheel over toward front of machine until followers O3 and R3, Fig. 287, rest upon high points of bottom (zigzag) cam in cam stack S3.

CHECK (Use feeler gauge):

At the above setting, when rear knob L8, Fig. 286 is drawn toward front as far as possible, clearance between front follower R3, Fig. 287 and high point of bottom cam should be .010 to .012 inch.

Also, when front knob Z7, Fig. 286 is pressed toward rear as far as possible, clearance between rear follower O3, Fig. 287 and high point of bottom cam should be .010 to .012 inch.

SETTING:

Loosen set screw C9, Fig. 287.

Set rear knob L8 at position L.

Move stop E9, Fig. 287 toward front until its front surface contacts rear face of selector arm M8, as shown in Fig. 287.

Tighten set screw C9.

Recheck clearance between front follower R3 and bottom cam, as instructed.

Tighten set screw A9, Fig. 287.

Set front knob Z7 at position D.

Press stop bushing B9, Fig. 287 toward the rear until it contacts head of screw D8, Fig. 287.

Tighten screw A9.

Recheck clearance between rear follower O3 and bottom cam as instructed.
TO ZERO-OUT THE MACHINE

PREPARATION:

Remove the arm top cover. Set the index pins at correct height, as instructed on page 138. Time the cam stack, as instructed on page 139.

CHECK (at #1 Position):

When machine is running with selector knobs set at "A" and "L" and red lever set at #3 position, move red lever slowly to #1 position as shown in Fig. 289. Movement of the needle bar driving arm F4, Fig. 288 and needle bar vibrating bracket C4 should stop at same time that movement of red lever stops at #1 position.

SETTING:

Loosen clamping screw B4, Fig. 288.

Move red lever to #3 position.

Run machine and move red lever slowly toward left to point where there is no movement of needle bar vibrating bracket C4. DO NOT PASS THIS POINT.

Maintain this position of red lever and move left stop plate A4 forward against bight amplitude bracket beneath cam stack.

Hold stop plate at this setting and securely tighten screw B4.

CHECK (at #5 Position):

When the machine is running with selector knobs set at "D" and "K" and red lever set at #3 position, move red lever slowly to #5 position, as shown in Fig. 290. Movement of needle bar driving arm F4 and needle vibrating bracket C4, Fig. 288, should stop at same time that movement of red lever stops at #5 position.

SETTING:

Loosen clamping screw E4, Fig. 288.

Move red lever to #3 position.

Run machine and move red lever slowly toward right to point where there is no movement of bracket C4 or needle bar driving arm F4. DO NOT PASS THIS POINT.

Maintain this position of red lever and move right stop plate D4 forward against bight amplitude bracket beneath cam stack.

Hold stop plate at this setting and securely tighten screw E4, Fig. 288.

Fig. 288. Setting Bight Amplitude Stop Plates

Fig. 289. Setting: A-L-1

Fig. 290. Setting: D-K-5
TO CENTRALIZE THE NEEDLE BAR DRIVING ARM WITH THE DISC SELECTOR ARM BRACKET FOLLOWERS

**PREPARATION:**
Remove arm top cover.
Zero-out machine correctly, as instructed on page 140.
Set red lever at #3 position, as shown in Fig. 292.

**CHECK:**
When the bight amplitude (RED) lever is set at #3 position, the center line of the needle bar driving arm F4 should coincide with a point midway between the followers O3 and R3, Fig. 291.

**SETTING:**
Loosen clamping screw G4, Fig. 291.
Push bight amplitude control lever bracket H4 toward the left as far as possible against the stop A4, Fig. 288.
Align center line groove J4, Fig. 293 with #1 position, as shown in Fig. 293.
Tighten screw G4.
Move red lever as far as possible to the right against the stop D4, Fig. 288. Groove J4 should now be in line with #5 position, as shown in Fig. 294.
If groove J4, Fig. 294 is not in line with #5 position, divide the "off" distance in half and, after loosening screw G4, position the red lever on bracket H4 so that it is an equal distance, from the center position #3, at stop positions #1 and #5.
Securely tighten screw G4.
Replace arm top cover.

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**Fig. 291. Centralizing Needle Bar Driving Arm**

![Diagram](image)

**Fig. 292. Red Lever at #3 Position**

![Image](image)

**Fig. 293. Red Lever at #1 Position**

![Image](image)

**Fig. 294. Red Lever at #5 Position**

![Image](image)
TO CENTRALIZE THE NEEDLE IN NEEDLE HOLE
IN STRAIGHT-STITCHING THROAT PLATE

PREPARATION:

Set red lever at position #3 and stitch selector
knobs at A and K, as shown in Fig. 295.

Remove arm top cover and face plate.

Install straight-stitching throat plate.

Remove presser foot regulating thumb screw U2,
Fig. 296.

Select a Size #11 needle. Check it for straightness
and insert in needle bar.

SETTING (Front to Rear Position):

Loosen clamping screw S2 and set screw T2,
Fig. 296.

Turn hand wheel until needle is in needle hole in
throat plate.

While holding eccentric hinge pin V2, Fig. 296
down against casting and holding vibrating bracket
C4, Fig. 296 up against shoulder of eccentric V2,
turn eccentric V2 (with spanner wrench) until needle
is located centrally from front to rear in needle hole
in throat plate.

Press down upon eccentric V2 and tighten clamping
screw S2, Fig. 296.

Press collar W2 up against bracket C4 and tighten
screw T2, Fig. 296.

SETTING (Left to Right Position):

Loosen two clamping screws N7, Fig. 296.

Turn hand wheel until needle is in needle hole in
throat plate.

While holding needle bar driving arm F4, to keep
it from moving, move vibrating bracket C4, Fig. 296,
as required to bring needle in center (left to right) of
needle hole in throat plate.

Maintain this setting of bracket C4 and tighten
two screws N7.

Check timing of hook, as instructed on page 143.

Check front to rear position of hook as instructed
on page 144.
TO TIME THE ROTATING HOOK

Fig. 297. Hook Correctly Timed

PREPARATION:

Set needle bar at correct height, as instructed on page 134.

Time the needle vibrating mechanism, as instructed on pages 138 to 142.

Select a Size #18 needle, tested for straightness, and insert it correctly in needle bar.

Remove throat plate, bed slide and bobbin case.

Remove bottom cover. (Feed dog is removed in Fig. 297 to show point of hook, but it need not be removed to time the hook.)

Set red lever at #3 position and selector knobs at A and K, as shown in Fig. 295, page 142.

CHECK:

Turn hand wheel over toward operator until LOWER timing mark (see Fig. 297) is level with lower edge of needle bar ball bushing Z, Fig. 297, on upward stroke of needle bar.

At this position of needle bar, point of rotating hook should be at center of needle, as shown in Fig. 297.

SETTING:

Loosen the two set screws A7, Fig. 298 in gear G8.

While maintaining position of needle bar, so that lower timing mark remains level with lower end of bushing Z, Fig. 297 turn gear Y, Fig. 299 A, page 144, on hook shaft, until hook point is located in position shown in Fig. 297.

Securely tighten two set screws A7, Fig. 298 making certain that gears G8 and W3, Fig. 298 are correctly meshed without binding or back lash.

NOTE: Hub of gear G8 should not bear against face of bushing at N8, Fig. 298.

Replace bottom cover, bobbin case, bed slide and throat plate.
TO SET THE POSITION OF THE HOOK POINT TO OR FROM THE NEEDLE

PREPARATION:

Set needle bar at correct height as instructed on page 133.

Set red lever at #1 position and stitch selector knobs at A and K.

Select a Size #18 needle, tested for straightness, and insert it correctly in needle bar.

CHECK:

Turn hand wheel over toward operator until point of hook is directly behind needle.

Distance between needle and position finger should be .018 inch, as shown in Fig. 299. (Use feeler gauge to check this distance.)

SETTING:

Loosen two screws O, Fig. 299A.

Move entire hook bracket assembly U8, Fig. 299A, over toward rear, moving hook point away from needle.

Place feeler gauge .018 inch, between needle and position finger.

Move hook bracket assembly U8 over toward front until correct setting is obtained.

Make certain that hook bracket U8 is snug against lug V8, Fig. 299A, on machine. Then securely tighten two screws O.

Check the timing of the hook, as instructed on page 143.
REMOVALS AND REPLACEMENTS
UPRIGHT ARM SHAFT

CAUTION: DO NOT REMOVE the upright arm shaft, from this machine. If this becomes necessary, the machine should be returned to the factory.

Both sets of bevel gears at the ends of the upright arm shaft have been lapped together at the factory and should be kept in mesh throughout all other removals and replacements.

THE MOTOR

Fig. 300. Removing Motor
Fig. 301. Location of Wires around Motor

CAUTION:

Remove plug from electric outlet before removing any electrical part from machine.

REMOVAL:

1. Tilt machine back.
2. Remove bottom cover plate.
3. Remove motor hold-down plate, by removing screw from hole K4, Fig. 300.
4. Remove two electrical sleeve connections L4 from motor terminals M4, Fig. 300.
5. Slide motor out toward you, rocking it from side to side to facilitate removal.

NOTE: Remove grit or hardened grease from worm gear on motor shaft, before replacing motor.

REPLACEMENT:

1. Make sure that wire P4, Fig. 301 is correctly located around and under cylindrical tube Q4; then up behind three-pin terminal N4, as shown in Fig. 301.
2. Slide motor into position, turning hand wheel slightly to facilitate correct gear mesh. Push motor clockwise firmly until motor butts against casting, as shown by curved arrow in Fig. 300.
3. Fit electrical sleeve connections L4, Fig. 300 to terminals M4.
4. Replace motor hold-down plate and bottom cover plate.

NOTE: See Wiring Diagram on page 162.
REMOVAL:

1. Remove two screws Q4 and lamp shade R4, Fig. 302.

2. Remove screw S4, Fig. 303 and allow light fixture to hang from arm.

3. Remove arm top cover.

4. Remove two wire connectors W4, Fig. 304 and disengage light fixture wire from motor leads.

5. Lift oil shield A5, Fig. 304 from arm casting.

6. Remove screw T4 and lead clip V4, Fig. 304, page 147.

7. Disengage rubber grommet U4, Fig. 303 from arm casting.

8. Remove light fixture with its leads and rubber grommet from machine.

REPLACEMENT:

1. Insert light fixture leads with rubber grommet up through hole provided for them in arm casting at U4, Fig. 303.

2. Install rubber grommet, as shown in Fig. 303.

3. Replace lead clip V4 and fasten with screw T4, Fig. 304.

4. Replace oil shield A5, as shown in Fig. 304, page 147.

5. Connect one light fixture lead to each of the motor leads and cap with wire connectors W4, as shown in Fig. 304.

6. Replace arm top cover.

7. Replace light fixture and fasten with screw S4, Fig. 303.

8. Replace lamp shade R4 and fasten with two screws Q4, Fig. 302.
REMOVAL:

1. Remove male-half of two-pin terminal Z4, Fig. 305.

2. Remove female-half of three-pin terminal N4, Fig. 305.

3. Remove motor and hold-down plate, as instructed on page 145.

4. Remove light fixture, as instructed on page 146.

5. Remove two screws X4, Fig. 305.

6. Loosen two screws Y4, Fig. 305 and push female-half of two-pin terminal into recess beneath bed of machine.

7. Remove two-pin terminal and wire leads through hole in arm provided for three-pin terminal.

REPLACEMENT:

1. Install both terminals with their wire leads in machine, as shown in Fig. 305.

2. Insert sewing light leads up through cavity provided for them in machine arm, as shown at B5, Fig. 305.

NOTE: Make certain that light leads are above the three-pin terminal and around the cylindrical tube, as shown in Fig. 301, page 145 and instructed in Step #1 under “REPLACEMENT” on page 145.

3. Fasten male-half of three-pin terminal N4 to machine with two screws X4.


5. Replace light fixture, as instructed on page 146.

6. Replace motor and hold-down plate, as instructed on page 145.

7. Replace female-half of three-pin terminal at N4, Fig. 305.

8. Replace male-half of two-pin terminal at Z4, Fig. 305.
REMOVAL:

1. Turn thumb nut L5, Fig. 307 to left (counter-clockwise) until "0" on numbered dial D5 stops at center line on indicator G5, Fig. 307.

2. Press in dial D5, separating pin C5 in thumb nut L5 from hole in dial D5; unscrew thumb nut L5 and remove it from stud Q2, Fig. 307.

NOTE: It is not necessary to remove stud Q2 from machine to disassemble the thread tension. It is shown removed in Figs. 306 and 307, to illustrate complete assembly. See page 132 for instructions on removal and replacement of entire tension assembly.

3. Other parts may be removed from the stud Q2 in the order which they are shown in Figs. 306 and 307.

REPLACEMENT:

1. Replace parts on stud Q2 in the order in which they are shown in Figs. 306 and 307.

2. Make certain that tension releasing pin H5 is in place as shown in Fig. 307.

3. Place the two tension discs K5 with their convex faces against flat disc X5 in center, as shown in Fig. 306. These three tension discs should be behind thread take-up spring thread guard M5, as shown in Fig. 307.

4. Pass eyelet N5, Fig. 306 of take-up spring under thread guard, having coils of spring above tension discs, as shown in Fig. 308.
5. Guide the tension disc assembly on the stud Q2, so that extension P2, Figs. 306, 307 and 308 enters hole, provided for it in machine arm and so that the tail R2, Fig. 308, inside the spring coil, enters one of the grooves at the rear of the stud Q2 (see also page 132).

6. Replace indicator G5, Fig. 307 with its large open side facing the split end of the stud — with plus and minus mark on top — “minus” at left and “plus” at right.

7. Hold these assembled parts against shoulder of stud, insert tension spring F5, Fig. 307 in indicator, with first half-coil of spring F5 straddling lower half of split stud.

8. Guide the stop washer on the stud Q2 so that extension S5 will be above stud.

**NOTE:** When spring and stop washer are correctly assembled, extension S5 will clear the first half-coil of the tension spring, as shown in Fig. 309.

9. Place the numbered dial D5, Fig. 307 so that the number “2” is opposite stop washer extension S5.

10. Push dial D5 to compress spring to facilitate replacement of thumb nut L5.

11. Replace thumb nut L5, carefully guiding pin C5 into one of the holes in dial D5.

12. Adjust assembly as instructed on pages 132 and 133.
REMOVAL AND DISASSEMBLY:

1. Remove small screw Y5 from stop motion nut Z5, Fig. 310.

2. Remove nut Z5 and clamp washer A6 from arm shaft.

3. Remove hand wheel assembly from arm shaft.

4. Remove screw P5 and counterbalance O5, Fig. 311 from arm shaft.

5. Remove hand wheel snap ring B6, Fig. 310 from hand wheel assembly with expansion pliers.


7. Remove gear spring D6, Fig. 310 from stud E6 of hand wheel.

ASSEMBLY AND REPLACEMENT:

1. Place gear spring D6, Fig. 310 into hand wheel so that loop G6 of spring grasps middle stud E6, Fig. 310 in hand wheel.

2. Place gear C6 on hand wheel, with stud J5 inserted in loop K6, Fig. 310 of gear spring.

3. Replace snap ring B6 on hand wheel, setting ring in groove L6, Fig. 310 on hand wheel sleeve.

4. Replace counterbalance O5, Fig. 311.

5. Insert screw P5 through counterbalance O5 and hole provided for it on arm shaft, as shown in Fig. 311.

6. Replace hand wheel assembly on arm shaft.

7. Replace stop motion clamp washer A6, Fig. 310 (three short studs M6 facing outward).

8. Replace and tighten stop motion nut Z5 and replace screw Y5 in hole H6, Fig. 310, in stop motion nut.

NOTE: If studs M6 interfere with screw Y5 when stop motion nut Z5 is loosened to release hand wheel, remove screw Y5 and nut Z5. Remove washer A6, rotate it 180° and replace it on arm shaft. Replace nut Z5 and screw Y5.
REMOVAL AND DISASSEMBLY:
1. Remove hand wheel, as instructed on page 150.
2. Remove screw R5, Fig. 312.
3. Disassemble as shown in Fig. 312.

ASSEMBLY AND REPLACEMENT:
1. Assemble in order indicated in Fig. 312.
2. Replace bobbin winder on machine arm, fastening it to machine arm by means of hinge screw R5.
3. Make sure that projection Q5 on frame spring S5 is inserted in hole T5 in machine arm.
4. Tighten hinge screw R5.
5. Replace hand wheel as instructed on page 150.

STITCH REGULATOR

REMOVAL:
1. Remove hand wheel, as instructed on page 150.
2. Remove two screws U5, Fig. 312, holding stitch regulator plate.
3. Move feed regulator V5, Fig. 312 to bottom of slot in indicator plate.
4. Remove large screw stud W5, Fig. 311 with its spring and washer from arm casting.
5. Pull entire regulator, with stitch plate out the front of the machine arm.

REPLACEMENT:
1. Install regulator V5, Fig. 312 in arm, making certain that slide fits on block on feed fork connection.
2. Replace large stud W5, Fig. 311 with spring and washer, so that stud holds slide to inside of arm.
3. Set indicator plate in position on front of machine arm and replace two screws U5.
4. Tighten screws U5.
5. Replace hand wheel, as instructed on page 150.
REMOVALS AND REPLACEMENTS

THROAT PLATE POSITION BRACKET
(See Figs. 313 and 314)

**REMOVAL:**

1. Remove bottom cover plate.
2. Remove throat plate.
3. Set position lever G in "down" position and while pressing left hand end of bracket J6 toward underside of machine bed, remove adjusting screw N6.
4. Swing bracket J6 outward, away from machine bed and remove two throat plate clamps Q6 with pins T6 and springs U6 from machine.
5. Set position lever G in "up" position, as shown in inset at right of Fig. 314, and remove screw F6 at front of machine bed.
7. Remove two screws Y6 at top of indicator plate V6.
8. Lift indicator plate V6, stop plate W6, spring X6 and lever G, from bed of machine.

**REPLACEMENT:**

Replace throat plate position bracket in the reverse order of its removal. Observe the following —

Lever G and spring X6 should be replaced with the curved portions of spring under cross-piece P6 of lever G. (Remainder of spring should extend toward left).

Hole Z6 of bracket J6 should be aligned with hole at bottom of lever G and with hole in front of machine bed, as shown in inset at top right of Fig. 314. Then fasten lever to bracket with screw F6.

Bracket J6 must be inserted in grooves R6 under machine bed, as shown in Fig. 314.

Adjusting screw N6 should be tightened flush with bottom of casting, as shown in Fig. 314.
REMOVALS AND REPLACEMENTS

FEED LIFTING ROCK SHAFT
(See Fig. 314, page 152)

REMOVAL:
1. Remove bottom cover plate.
2. Remove motor hold-down plate and motor as instructed on page 145.
3. Remove nut E and eccentric F, Fig. 314, disengaging feed lifting rock shaft U from upright connecting rod.
4. Loosen set screw S and remove screw center Q.
5. Remove screw stud O6, disengaging feed bar.
6. Remove feed lifting rock shaft U.

REPLACEMENT:
1. Install feed lifting rock shaft U in reverse order instructed for removal.
2. Adjust feed dog, as instructed on pages 129, 130 and 136.
3. Replace motor, as instructed on page 145.

FEED ROCK SHAFT ASSEMBLY
(See Fig. 314, page 152)

REMOVAL:
1. Remove bottom cover plate.
2. Remove motor hold-down plate and motor, as instructed on page 145.
3. Remove feed lifting rock shaft U, as instructed above.
4. Remove nut J, Fig. 314.
5. Remove eccentric K, disengaging feed rock shaft V from feed fork connection.
6. Loosen set screw L and remove screw center N.

7. Remove feed rock shaft V with feed bar and feed dog.

REPLACEMENT:
1. Install feed rock shaft V with feed bar and feed dog in reverse order instructed for removal.
2. Install feed lifting rock shaft U, as instructed above.
3. Adjust feed dog, as instructed on pages 129, 130 and 136.
4. Replace motor, as instructed on page 145.

HOOK DRIVING SHAFT
(See Fig. 314, page 152)

REMOVAL:
1. Remove rotating hook as instructed on page 154.
2. Loosen set screw D3, Fig. 314 on collar J3.
3. Loosen two set screws A7 in bevel gear.
4. Remove motor, as instructed on page 145.
5. Remove two-pin terminal, as instructed on page 147.
6. Loosen set screw X and remove gear from left end of hook driving shaft.

7. Slide shaft K3 toward right and out of machine through hole provided for two pin terminal in bed of machine.

REPLACEMENT:
1. Replace hook driving shaft in reverse order of its removal.

NOTE: Flat on shaft K3 must be toward left end of machine (hook bracket end), so that set screw X, Fig. 315 may be fastened upon it.
2. Replace hook as instructed on page 154.
3. Adjust and time hook assembly, as instructed on pages 130, 143 and 144.
REMOVALS AND REPLACEMENTS

CAUTION: Hook shaft gear Y, Fig. 315, and hand wheel gear C6, Fig. 310, page 150, may be removed to facilitate adjustments. DO NOT DISTURB THE MESH OF ANY OTHER GEAR IN THIS MACHINE. All other gears are mated and correctly timed. Replacements should be made at the factory.

ROTATING HOOK
AND POSITION FINGER

REMOVAL:

1. Remove needle, presser foot, throat plate, bed slide, bobbin case, feed dog and cushion spring bracket.
2. Remove bottom cover plate.
3. Mark the two bevel gears Y and O7, Fig. 315, with chalk or crayon, on one tooth of one gear and the corresponding space for that tooth between the teeth of the other gear, to facilitate re-assembly.
4. Loosen set screw Z3, Fig. 315.
5. Remove bevel gear Y from hook shaft.
6. Insert screwdriver through hole B7, Fig. 315, and loosen set screw C7.
7. Remove rotating hook assembly D7, Fig. 316.
8. Remove position finger from hook, as shown in inset at top right corner of Fig. 316. Keep position finger away from hook point.

REPLACEMENT:

1. Install position finger E7 on hook, as shown in Fig. 316. Slide position finger down and around ring on hook at point shown in inset at top right cor-

Fig. 315. Hook Shaft Bevel Gears

Fig. 316. Rotating Hook

ner of Fig. 316 keeping it away from hook point. Then move position finger to correct position at E7, Fig. 316.
2. Install rotating hook assembly D7 with position finger E7, as shown in Fig. 316.
3. Press down on finger E7 and tighten set screw C7.
4. Replace bevel gear Y on hook shaft.
5. Using marks, previously made at removal, as a guide, mesh the two hook shaft bevel gears Y and O7.
6. Turn hook shaft until flat is under set screw Z3 in gear Y and tighten screw Z3.

NOTE: The two set screws X and Z3 on the two bevel gears should be in line when hook shaft and hook driving shaft are correctly installed.
7. Check and adjust hook, as instructed on pages 136, 143 and 144.
8. Replace bottom cover plate.
9. Replace cushion spring bracket, feed dog, bobbin case, bed slide, throat plate, presser foot and needle.
REMOVALS AND REPLACEMENTS
FEED LIFTING ROCK SHAFT CONNECTING ROD

REMOVAL:
1. Remove arm top cover.
2. Remove two cap screws X2, Fig. 317 and remove connecting rod cap R8, Fig. 317.
3. Remove bottom cover plate and motor, as instructed on page 145.
4. Remove nut E and eccentric stud F, Fig. 318, disengaging connecting rod Q8 from feed lifting rock shaft U, Fig. 318.
5. Remove connecting rod Q8 from bottom of machine.

REPLACEMENT:
1. Insert connecting rod Q8, Fig. 318 into upright arm through bottom of machine, so that it fits around bottom half of gear hub on eccentric Y2, Fig. 317 and so that the oil hole in the lower end of the rod faces the front edge of machine bed.
2. Replace cap R8 over top half of gear hub and fasten cap to rod with two screws X2, Fig. 317.
3. Replace stud F and nut E, Fig. 318, engaging connecting rod Q8 to shaft U.
4. Adjust feed dog height, as instructed on page 129.
5. Replace motor and bottom cover plate, as instructed on page 145.
6. Replace arm top cover.

FEED FORKED CONNECTION

REMOVAL:
1. Remove stitch regulator, as instructed on page 151.
2. Remove motor, as instructed on page 145.
3. Remove nut J and stud K, Fig. 318, disengaging feed forked connection S8 from feed rock shaft V, Fig. 318.
4. Remove feed forked connection S8 from upright arm, through bottom of machine, so that it fits around eccentric Y2 from bottom, as shown in Fig. 317.
2. Engage feed forked connection S8 with feed rock shaft V, Fig. 318 and fasten with stud K and nut J.
3. Replace stitch regulator, as instructed on page 151.
4. Adjust position of feed dog, as instructed at bottom of page 129.
5. Replace motor, as instructed on page 145.
REMOVALS AND REPLACEMENTS

NEEDLE BAR

(See Fig. 319)

REMOVAL:
1. Remove needle clamp and needle clamp thread guide.
2. Remove arm top cover and face plate.
3. Loosen screw W and lift needle bar J7, up through bushings and out of machine.

REPLACEMENT:
1. Insert needle bar down through bushings, as shown in Fig. 319.
2. Replace needle clamp, needle clamp thread guide, and face plate.
3. Adjust needle bar height, as instructed on page 133.
4. Securely tighten set screw W.
5. Replace face plate and arm top cover.

PRESSER BAR
(See Fig. 319)

REMOVAL:
1. Open the face plate.
2. Remove presser foot and thumb screw.
3. Remove pressure regulating thumb screw U2.
4. Remove extension pin M7 and extension pin seat K7.
6. Loosen screw A3 and remove presser bar bushing B3, lower thread guide C3 and presser bar D.

REPLACEMENT:
1. Replace presser bar assembly in the reverse order of its removal.

Fig. 319. Needle Bar Assembly

2. Replace thread guide C3, as instructed on page 135.
3. Replace presser foot and presser foot thumb screw.
4. Replace pressure regulating thumb screw U2, Fig. 319.
5. Adjust presser foot at correct height, as instructed on page 128.
6. Align presser foot with slot for feed dog in throat plate, as instructed on page 128, and securely tighten set screw C, Fig. 319.

NEEDLE BAR VIBRATING BRACKET

(See Fig. 319)

REMOVAL:
1. Remove arm top cover and face plate.
2. Remove thumb screw U2.
3. Remove extension pin M7.
4. Mark edge of eccentric hinge pin V2 as shown in Figs. 319 and 320 so that its position in relation to casting may be readily regained.

5. Unhook spring P7 from hinge pin Q7, Fig. 320.

6. Loosen screw K9, Fig. 320 and remove pin Q7.

7. Loosen set screw T2 and remove collar W2, Fig. 320.

8. Loosen clamping screw S2 and remove large, eccentric hinge pin V2.

9. Remove needle bar vibrating bracket C4 from machine head.

REPLACEMENT:

Install needle bar vibrating bracket C4 in the reverse order of its removal. Observe the following —

Spring P7 must be hooked around hinge pin Q7, as shown in Fig. 320.

Make certain that when set screw T2 is tightened, bracket C4 moves without looseness or binding.

Turn hinge pin V2 so that marks made in Step 4 of "Removal" coincide. Then securely tighten clamping screw S2.

NEEDLE THREAD TAKE-UP

REMOVAL:

1. Remove arm top cover and face plate.

2. Remove needle bar vibrating bracket, as instructed on page 156 and above.

3. Loosen set screw H7, Fig. 320 over hinge stud R7.

4. Loosen small set screw F7 in needle bar crank S7, through hole in top of casting, as shown in Fig. 320.

5. Withdraw needle thread take-up T7, with link U7, hinge stud R7 and stud V7, Fig. 320 from machine head.

REPLACEMENT:

1. Install needle thread take-up in reverse order of its removal, outlined above.

2. Locate mark W7 on stud V7, as shown in Fig. 320, in relation to its set screw F7. Press firmly upon stud V7 and tighten set screw F7.

3. Turn hand wheel while setting hinge stud R7, to make sure there is no end play nor binding; then tighten set screw H7, Fig. 320.

4. Replace needle bar vibrating bracket as instructed above.

5. Replace arm top cover and face plate.
REMOVAL:
1. Set stitch selector knobs at A and K, as shown in Fig. 295, page 142.
2. Remove arm top cover and special disc.
3. Remove large screw stud Y3, Fig. 321 with spring and remove cam stack S3.

REMOVAL:
1. Remove cam stack, as instructed above.
2. Remove two screws Y7 and knob Z7, Fig. 321.
3. Remove screw A8, indicator B8 and spring C8, Fig. 322.
4. Remove screw D8, Fig. 321, at rear of selector arm shaft E8.
5. Remove screw H8 and withdraw shaft E8 from front of arm, releasing rear selector arm K8, and front selector arm and knob L8, Fig. 321.
6. Withdraw knob L8 from machine.
7. Remove followers O3 and R3, Fig. 321.

REPLACEMENT:
1. Replace followers O3 and R3, as shown in Fig. 321.
2. Replace knob L8 so that bracket on front selector arm M8 slides into its slot in front follower R3, Fig. 321.
3. Replace selector arm shaft E8 slipping it through front selector arm knob L8 and rear selector arm K8, Fig. 321. Make certain that bracket on rear selector arm K8 slides into its slot in follower O3.
4. Replace and securely tighten screw H8, Fig. 321 so that screw clamps down on counterbore on shaft.
5. Replace spring C8 and indicator B8, Fig. 322. Fasten with screw A8, Fig. 322.
6. Replace screw D8, Fig. 321 on rear of arm selector shaft.
7. Replace knob Y7, Fig. 321. Fasten knob to indicator B8, Fig. 322 with two screws Z7, Fig. 321.
8. Replace cam stack, as instructed above.
REMOVALS AND REPLACEMENTS
NEEDLE BAR DRIVING ARM

REMOVAL:
1. Remove arm top cover and face plate.
2. Remove cam selector arm shaft, as instructed on page 158.
3. Remove needle bar vibrating bracket, as instructed on pages 156 and 157.
4. Lift needle bar driving arm, F4, Fig. 323 from machine.

REPLACEMENT:
1. Install needle bar driving arm F4 in arm of machine, so that ball pivot Z8, Fig. 323 rides in socket provided for it in pattern selector Y8, as shown in Fig. 323.

CAUTION: Make certain tension arm G7, Fig. 323 is in correct position in relation to needle bar driving arm, as shown in Fig. 323.
2. Replace cam selector arm shaft as instructed on page 158.
3. Replace needle bar vibrating bracket, as instructed on page 157.

Fig. 323. Showing Location of Ball Pivot on Driving Arm
Fig. 323A. Eccentric Worm Wheel Shaft and Worm Wheel

IGHT AMPLITUDE AND PATTERN SELECTOR
(See Fig. 323)

REMOVAL:
1. Remove arm top cover, face plate and lamp shade.
2. Set stitch selector knobs at A and K as shown in Fig. 295, page 142.
3. Remove spring P7, Fig. 323.
4. Remove screw G4 from bight amplitude bracket H4.
5. Remove red lever J4.
6. Loosen set screw X8, Fig. 322, page 158 and remove entire cam stack assembly S3 with worm wheel eccentric shaft F8, Fig. 323 and screw stud Y3, Fig. 321, page 158.
7. Remove bight amplitude and pattern selector Y8 from machine arm.

REPLACEMENT:
1. Assemble cam stack as a complete unit to machine. Upper eccentric half of eccentric worm wheel shaft F8 should be turned toward the hand wheel end of shaft, as shown in Fig. 323A.
2. Make certain that needle bar driving arm ball bearing pivot Z8 is engaged with pattern selector, as shown in Fig. 323.
3. Set mesh between worm and worm wheel by turning shaft F8 clockwise until worm and worm wheel are engaged.
4. Turn shaft F8 so that there is no binding when arm shaft is rotated and there is a minimum amount of back lash between worm and worm wheel.
5. Tighten set screw X8, Fig. 322 at front of machine arm.
6. Replace spring P7, Fig. 323.
8. Adjust machine, as instructed on page 141.
9. Replace face plate, arm top cover and lamp shade.
REMOVAL: (See "CAUTION" at top of page 154.)

1. Remove arm top cover and face plate.

2. Remove needle bar vibrating bracket and needle thread take-up, as instructed on pages 156 and 157.

3. Remove cam stack, as instructed on page 158.

4. Remove hand wheel and counter-balance, as instructed on page 150.

5. Remove wire connectors W4, disengaging motor leads from light leads.

6. Lift oil shield A5 from arm casting.

7. Loosen screw N3 in collar M3, Fig. 324.

NOTE: KEEP GEARS IN MESH AT ALL TIMES.

8. Remove two screws G9 and remove connecting rod cap.

9. Using a 1/2 inch drift pin or another arm shaft (for Machine 401) drive arm shaft T8, Fig. 324, out of machine arm from right to left. Hold gear Y2 in mesh with gear on upright arm shaft.

REPLACEMENT:

1. Insert a new arm shaft T8, Fig. 324, in head of machine at left end and push it into machine arm from left to right, through collar M3, bevel gear and eccentric Y2 and feed forked connection S8, as shown in Fig. 324.

2. Make certain flat on arm shaft is under set screw N3, Fig. 324; then, while pressing firmly on needle bar crank, hold collar against casting and tighten set screw N3.

3. Make certain that feed timing screw Z2 is over groove provided for it in arm shaft. Tighten screw Z2.

4. Replace connecting rod cap and fasten with two screws G9.

5. Replace oil shield A5, as shown in Fig. 324.

6. Connect motor leads to light leads and replace wire connectors W4, as shown in Fig. 324.

7. Replace hand wheel and counter-balance, as instructed on page 150.

8. Replace cam stack, as instructed on page 158.

9. Replace needle thread take-up and needle bar vibrating bracket, as instructed on page 157.

10. Adjust machine as instructed on page 137.

11. Replace arm top cover and face plate.
HINTS FOR ADJUSTERS AND MECHANICS

CHECK THESE POINTS WHEN A MACHINE BINDS

1. Sprung or cracked bed or arm incurred during transit.
2. Bent arm shaft.
3. Arm shaft thrust collar (at front of arm) set too tight.
5. Tightness in needle bar vibrating bracket assembly or in bottom ball bushing assembly.
6. Needle bar vibrating bracket hinge pin not correctly seated.
7. Burr in needle bar driving arm ball pivot hole in high amplitude pattern selector.
8. Bent take-up lever.
9. Thread take-up stud set too tightly.
10. Misalignment of thread take-up lever link hinge stud.
11. Insufficient thread clearance.
13. Hook driving shaft collar set too close.
14. Tightness of hook driving shaft.
15. Insufficient clearance between hook driving shaft bushing (back) and gear.
16. Hook shaft bushing is "floating", even though fastening screw may be tight.
17. Gear meshes too tight. (See CAUTION at top of page 154.)
18. Feed dog striking ends of throat plate slot or rubbing side of throat plate.
19. Feed bar screw centers too tight.
20. Feed lifting connecting rod bent.
21. Feed lifting and feed rock shaft screw centers too tight.
22. Feed fork bent.
23. Insufficient clearance between arm and hand wheel bushing for heat expansion.
24. Worm wheel on cam stack set too close to worm on arm shaft.
25. Height of follower index pins not correctly set.
26. Burrs or damage to bearing surfaces.
27. Insufficient clearance between hand wheel and its recess in arm casting.

NOTE: See page 24 for hints on other causes of machine troubles, such as needle breakage and machine noise.

TO "RUN-IN" THE MACHINE

When a machine is completely assembled and adjusted, it should be checked for binding first. Lubricate the machine, as instructed on pages 126 and 127. Then "run-in" the machine with an electric motor, for from 5 to 10 minutes at medium speed or until all moving parts run smoothly when machine is turned over by hand.

"Running-in" a machine should be done after every installation of an arm shaft, a hook driving shaft or a cam selector mechanism, and after every general repair.