

July 15, 1952

R. OLLEO, SR

2,603,173

SEWING MACHINE

Filed March 31, 1948

9 Sheets-Sheet 1

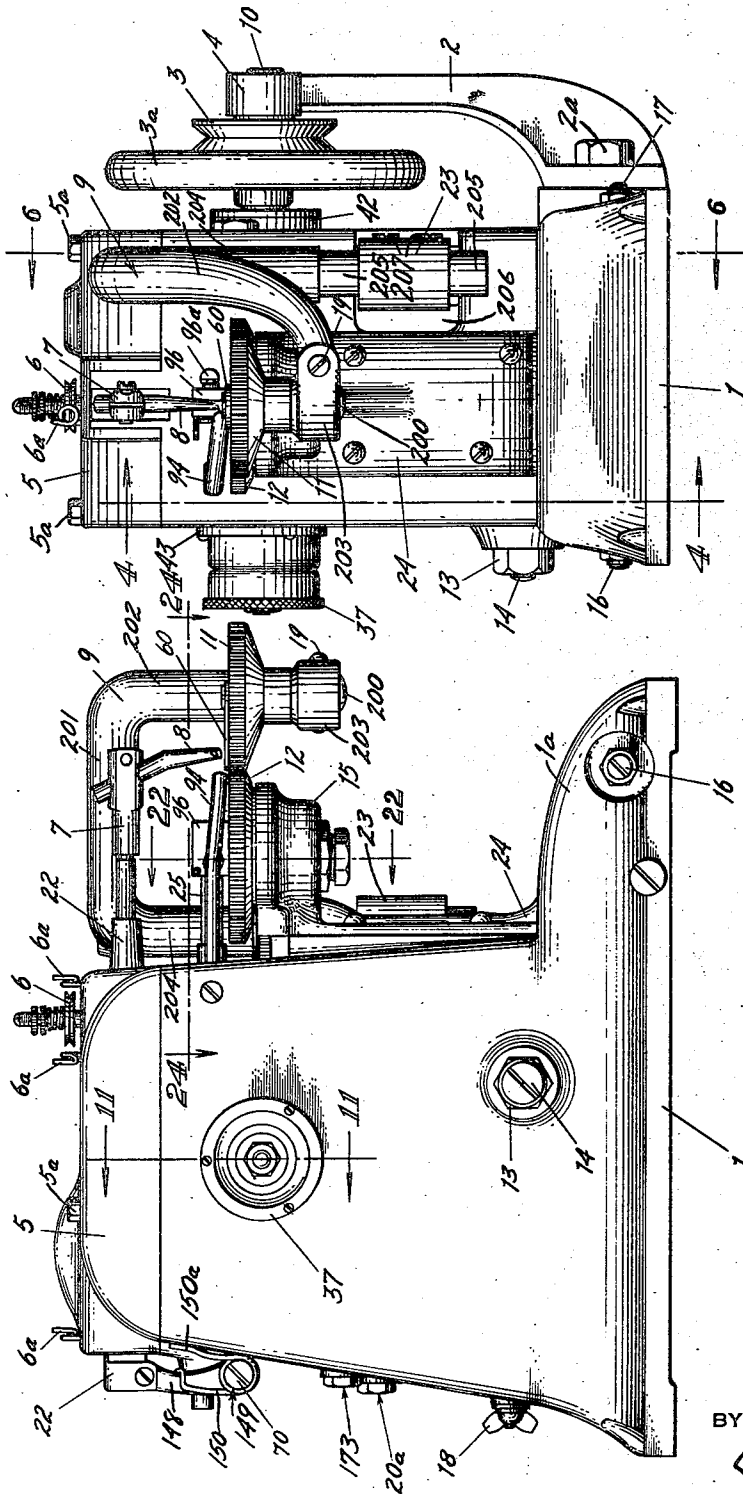


FIG. 2

FIG. 1

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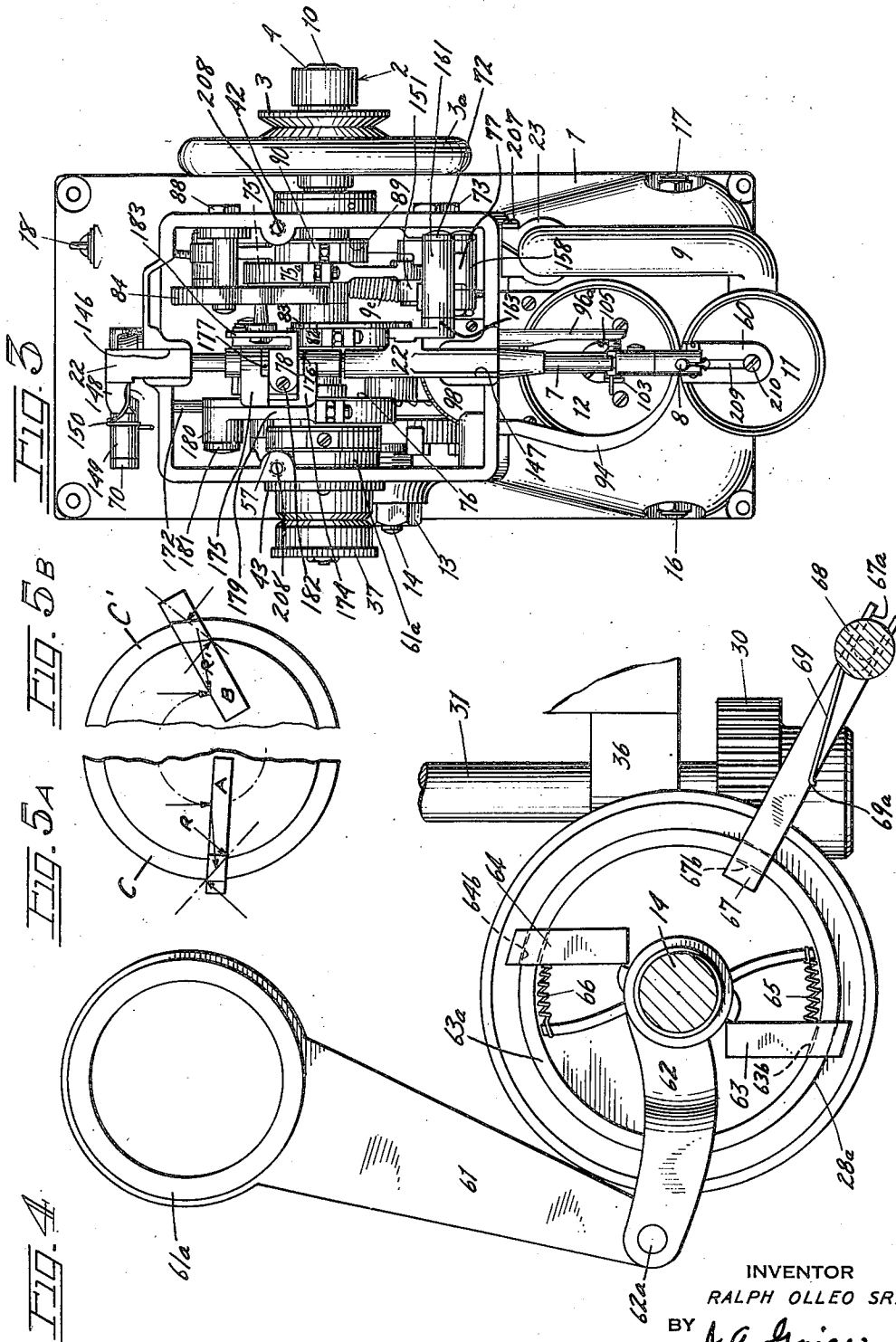
July 15, 1952

R. OLLEO, SR
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9 Sheets-Sheet 2



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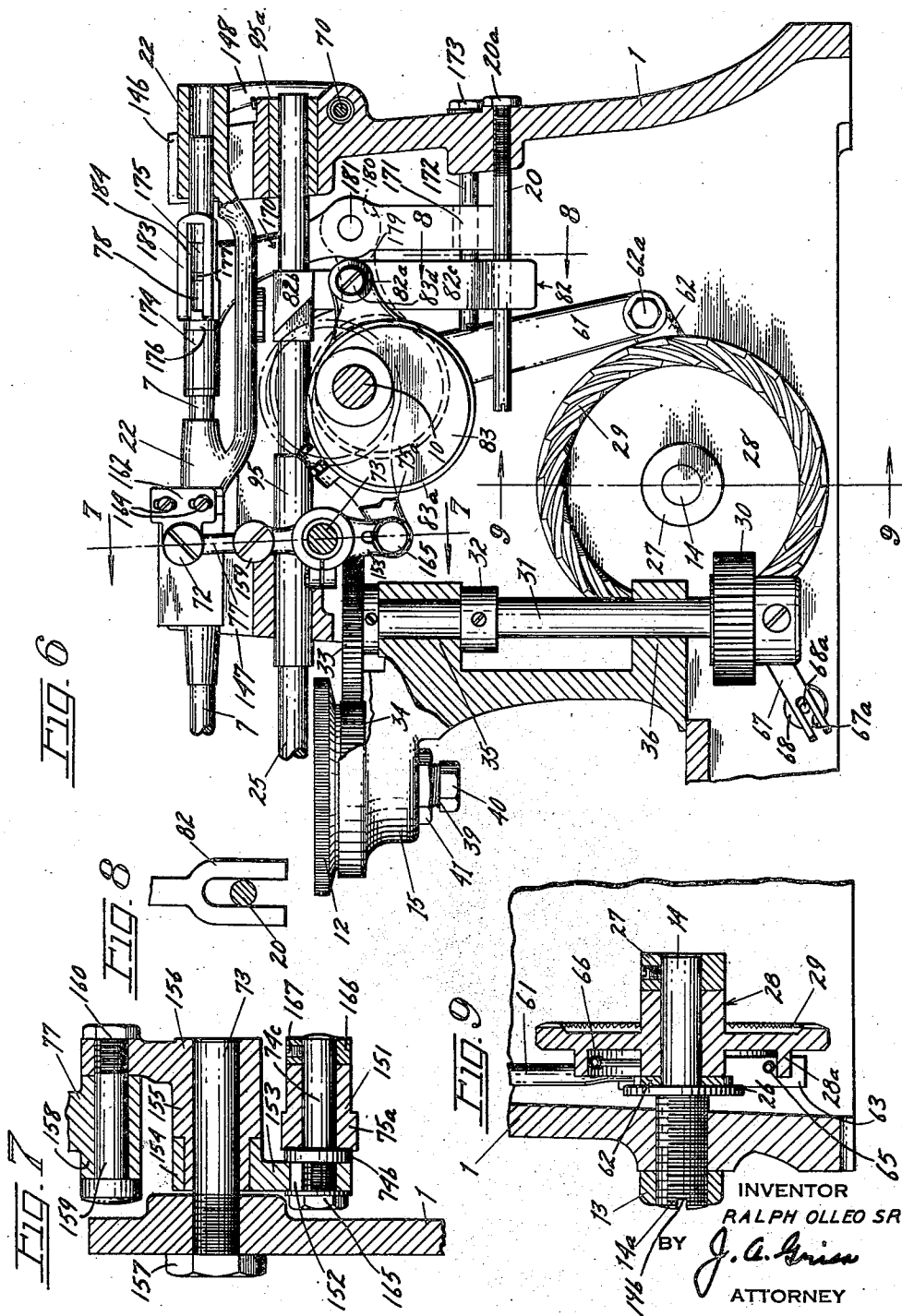
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FIG. 10

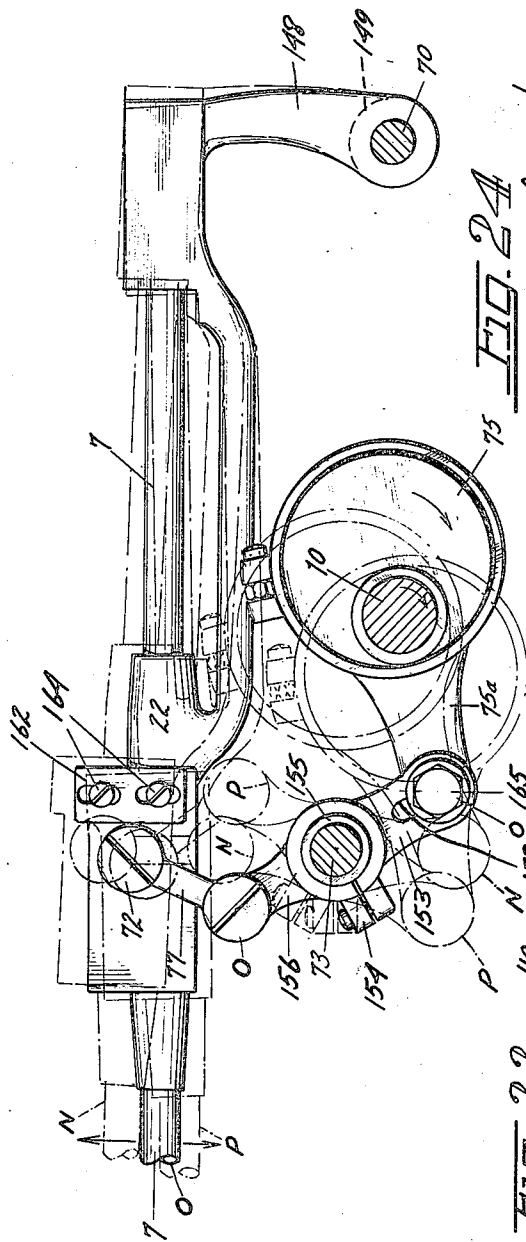


FIG. 24

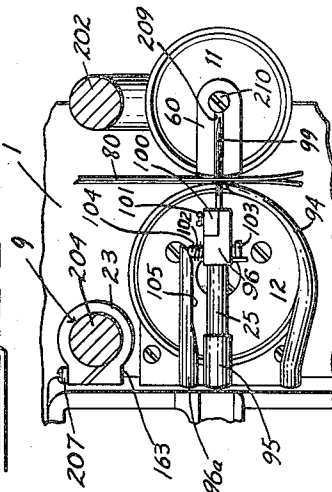
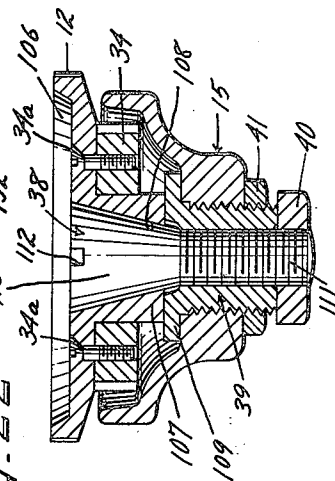


FIG. 22



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Fig. 13

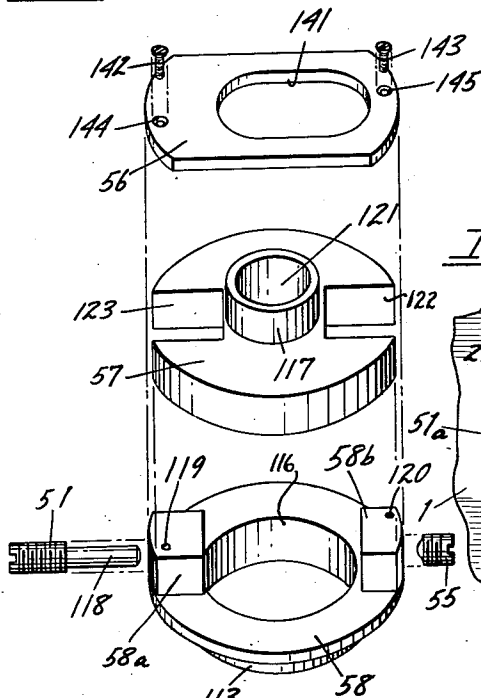


Fig. 15

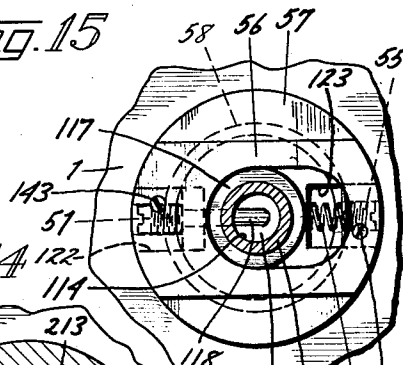


Fig. 14

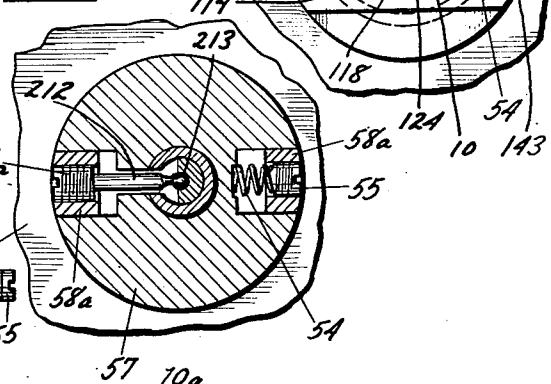


Fig. 11

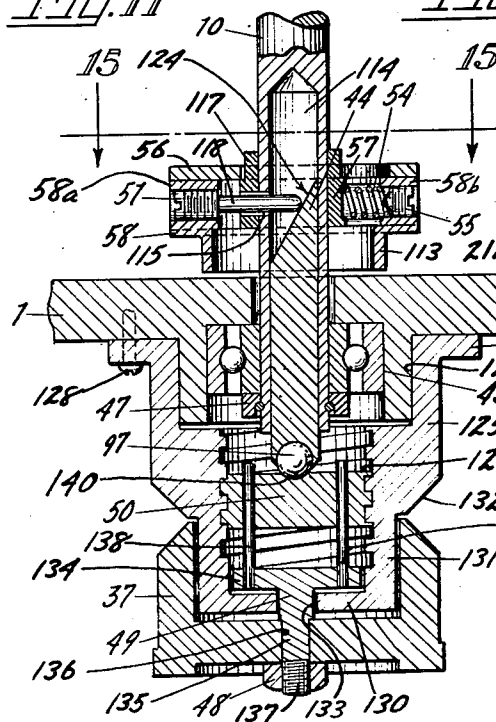
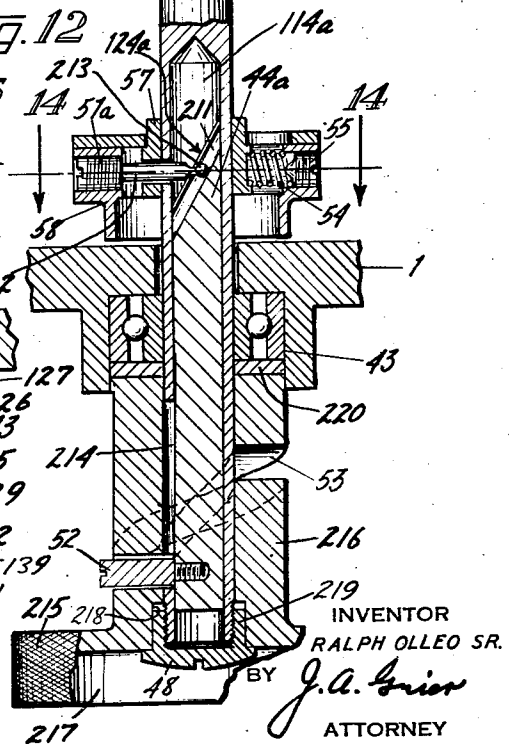


Fig. 12



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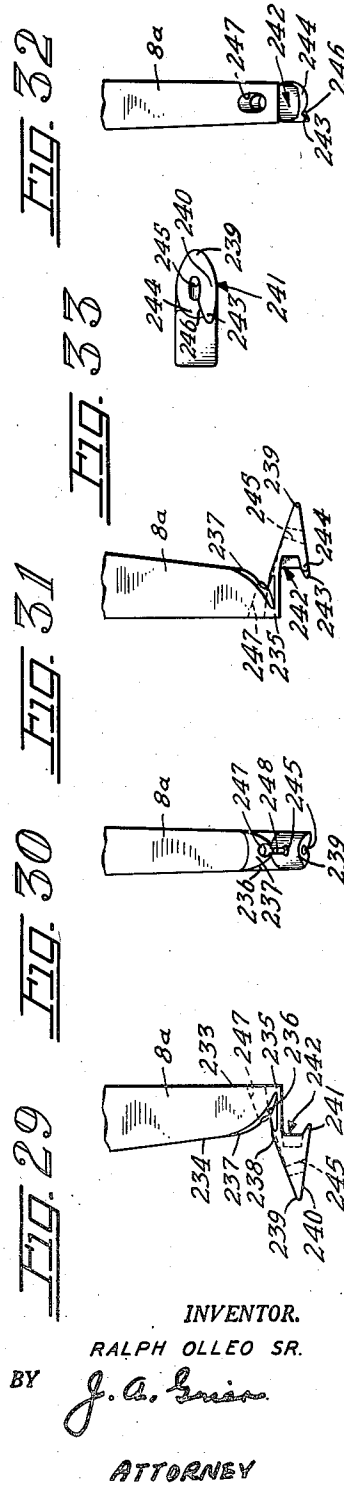
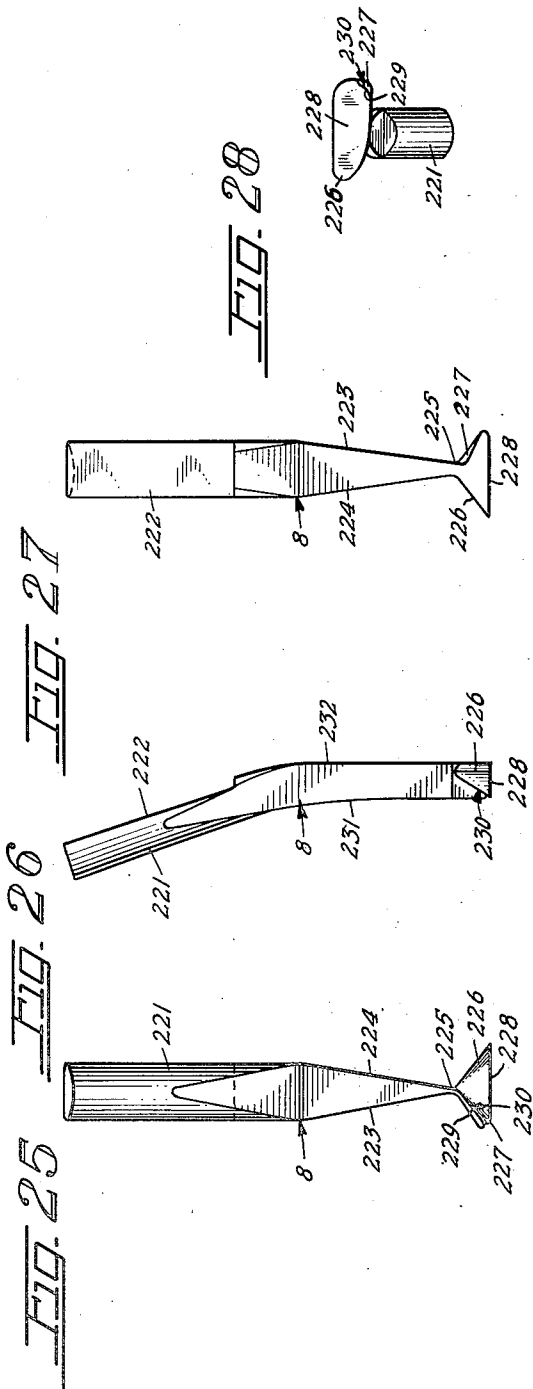
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2,603,173

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FIG. 36

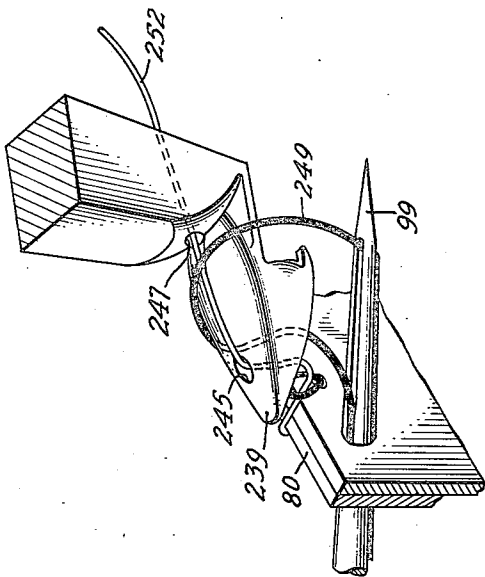


FIG. 35

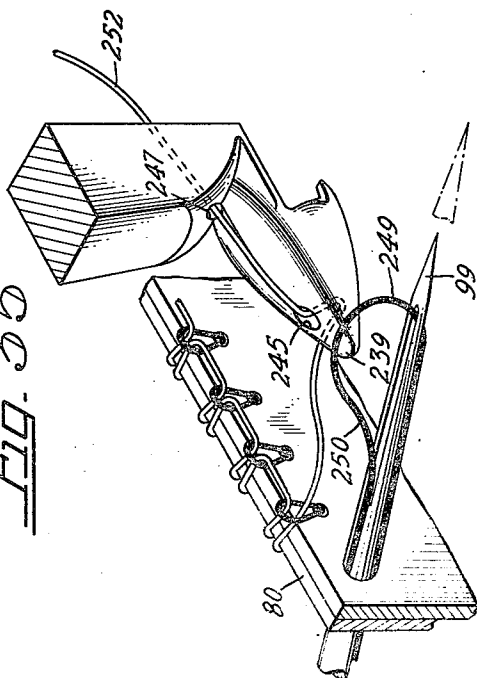
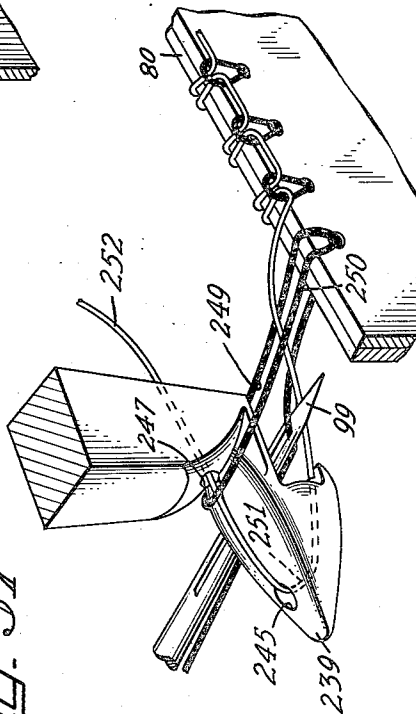


FIG. 37



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UNITED STATES PATENT OFFICE

2,603,173

SEWING MACHINE

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composed of Ralph Olleo, Sr., Ralph Olleo,
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Application March 31, 1948, Serial No. 18,255

14 Claims. (Cl. 112—16)

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This invention relates to improvements in sewing machines and is directed more particularly to improvements in machines of the overseam type which are used for stitching furs, gloves, and many other articles wherein stitches are formed about the edges of the fabrics or other webs of which said articles are formed.

In machines of this type, a pair of aligned discs lying on a horizontal plane grip and advance the material in steps in accordance with the desired spacing of the stitches. These discs also serve to position the material in a vertical plane to the desired height of seam.

A needle bar horizontally reciprocates a needle back and forth across the point of contact of the feeding discs and consequently, the needle passes through the material to be sewn. A looper device, moved in timed relation with the needle, enters and picks up the loop of thread at the needle on one side of the fabric, raises it, and carries it over the top of the material and down to a position on the other side of the material, where it positions or holds the loop to enable the needle to pass through the same to complete the stitching and begin the formation of the succeeding stage. As soon as the needle begins to enter the loop, the looper drops it and as the needle stroke is completed, the looper returns to the first side of the material to a position ready to pick up the next loop formed by the needle.

One of the objects of the invention is to provide novel means for driving and stabilizing the needle bar.

Another object of the invention is the provision, in an overseaming machine, of improved mechanism for carrying the looper bar in an oscillating, non-reciprocating looper frame, and to provide novel means for raising and lowering the looper to form the over stitching. An important part of this object is my novel adjustment means for positioning the looper bar frame in a vertical plane for properly coordinating the several functions of the looper with the needle.

Yet another object of the invention is the provision, in an overseaming machine, of improvements in the method of driving the material feed rollers or discs, thereby providing a better driving for the feeding and providing a greater working space for material depending from the feed rollers.

Another object of the invention is the provision, in an overseaming machine, of means to regulate the size of the stitches through a greater range than has heretofore been obtained, by the use of a differentially adjustable mechanism including an expandable throw eccentric.

A further object of the invention is the provision, in a machine of the character described, of means for adjusting and locking the height or position of the material feed drive disc relative

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to the needle and also providing means for compensating for wear therein.

Other objects of the invention, among which are (1) the provision of a new method of three point bearing support for the main shaft; (2) the provision of means for taking up lost motion in the feed disc drive gears at the point of clutch assembly; (3) the provision of an improved over-running clutch to positively develop the intermittent motion required by the material feed discs; (4) the provision of a rocker cam mechanism with novel means of adjustment to facilitate the setting of the transverse or radial motion of the looper; (5) to provide new means for properly positioning the rocker cam roller to facilitate the timing of the looper cycle; (6) to provide new type of manual adjustment for regulating the spacing of the stitches, and others, will be apparent to those skilled in the art upon a study of the accompanying drawings and the following specification.

Referring to the drawings, which are given by way of example to illustrate the invention:

Figure 1 is a side elevation of the machine showing the arrangement of the external parts and showing the increased working space about and particularly below the material feed discs;

Figure 2 is a front elevation of the machine shown in Figure 1;

Figure 3 is a plan view of the machine shown in Figures 1 and 2, with the top covering removed, exposing the internal mechanism;

Figure 4 is an elevation, somewhat schematic, taken along the lines 4—4 of Figure 2, and illustrating one embodiment of my improved feed disc clutch drive mechanism for imparting intermittent motion to the feed discs from the over-running clutch drive mechanism;

Figure 5a is a schematic diagram comparing the force vectors of conventional perpendicularly slotted dogs of the prior art;

Figure 5b is a diagram of my new and improved arrangement, disposing the feed dogs angularly with respect to the leading edges of the dogs;

Figure 6 is a sectional elevation, taken along the lines 6—6 of Figure 2;

Figure 7 is a sectional elevation, taken along the lines 7—7 of Figure 6;

Figure 8 is a fragmentary elevation, partly in section, as seen along the lines 8—8 of Figure 6;

Figure 9 is a sectional elevation, taken along the lines 9—9 of Figure 6;

Figure 10 is a view, showing the relative positions of the looper bar mechanism in several positions along its path of movement;

Figure 11 is a sectional elevation, taken along the lines 11—11 of Figure 1, and showing details of my adjustable stitch size regulator and one embodiment of my expandable throw eccentric;

Figure 12 is a sectional elevation, similar to

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Figure 11, but showing an alternative form of my manually adjustable stitch regulator and a modified form of my expandable throw eccentric mechanism;

Figure 13 is an exploded view of my expandable or adjustable throw eccentric mechanism;

Figure 14 is a sectional view, taken along the lines 14—14 of Figure 12, and showing details of the elements in one form of my expandable throw eccentric mechanism;

Figure 15 is a plan view, partly in section, of the embodiment of my expandable throw eccentric mechanism shown in Figure 11, as seen along the lines 15—15 of Figure 11;

Figure 16 is an elevation, with some elements deleted, and showing in detail my three point bearing supports for the main shaft of the machine;

Figure 17 is a perspective view, showing my improved rocker cam and one embodiment of my adjustable cam follower;

Figure 18 is a fragmentary elevation, showing the path followed by the looper per se with respect to the feed discs, the needle, and the material being worked;

Figure 19 is a side elevation of my improved rocker cam, showing the method of driving this cam and novel adjustment features;

Figure 20 is a sectional elevation taken along the lines 20—20 of Figure 19 and showing one means for adjusting and locking the rocker cam in an adjusted position;

Figure 21 is an end view of the rocker cam as viewed in Figure 19;

Figure 22 is a sectional elevation taken along the lines 22—22 of Figure 1, showing the feed drive disc assembly and adjustments for height and means to compensate for wear;

Figure 23 is a view similar to Figure 10, except that it illustrates the mechanism for reciprocally driving the looper bar, while Figure 10 shows the mechanism for producing the gyratory movement;

Figure 24 is a plan view of the feed discs and a portion of the needle bar, as seen along the lines 24—24 of Figure 1;

Figure 25 is a full rear view of my single thread looper, in the sense as positioned at 8 in Figure 2;

Figure 26 is an elevation of the looper shown in Figure 25, as seen in Figure 1, or the left side as seen in Figure 2;

Figure 27 is a front elevation of the looper, as seen in Figure 2;

Figure 28 is a view of the bottom end or sole of the looper of Figure 25 looking upwardly;

Figure 29 is a fragmentary front elevation of my double thread looper;

Figure 30 is an elevation of the looper as seen from the left side of Figure 29;

Figure 31 is a rear of the looper of Figure 29;

Figure 32 is a fragmentary elevational view of the looper as seen from the right side of Figure 29;

Figure 33 is a view of the bottom of the double thread looper shown in Figures 29 to 32, inclusive, looking upwardly at the bottom of Figure 31;

Figure 34 is a perspective view of a portion of a modified form of my machine, wherein my double looper is employed, and the machine is provided with two sources of thread, one of which delivers thread to the needle and the other of which delivers thread to the looper, and the two conjointly produce a double chain stitch;

Figure 35 is a diagrammatic sketch showing

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a double thread looper (similar to the one shown in Figure 29) in use, said looper being in a position to enter the loop of thread thrown up by the needle;

Figure 36 is a sketch, similar to Figure 35, except that the toe of the looper has entered the loop; and

Figure 37 is a sketch similar to Figures 35 and 36, wherein the looper has picked up the loop and has moved it over to the other side of the goods where the advancing needle may pass through it.

Referring first to Figures 1, 2 and 3, the machine has a hollow casing or frame 1 which encloses most of the mechanism and the upper end of this frame or casing is provided with a closure plate 5. Supported in the frame 1 by spaced bearings 42 and 43 is a main shaft 10. Although these bearings are shown as ball bearings, I reserve the right to use bearings of other types, such as sleeve bearings, roller bearings, or needle bearings.

The shaft 10 extends from the right side of the casing, as seen in Figures 2, 3 and 16, and a bracket 2 is secured to the frame by means of bolts, such as the bolts 2a. The upper end of the bracket 2 has a boss 4 formed thereon and within this boss is mounted a ball bearing 4a which forms an outboard bearing for the shaft 10. Secured to the shaft between the bearing 42 and the bearing in the boss 4 is a grooved pulley 3 which has formed integral therewith a flywheel 3a. By providing two main bearings and an outboard bearing for supporting my main shaft, any tendency for distortion by any downward thrust or deflection which may be created on the shaft by the tension of the drive belt on the pulley wheel 3 is eliminated, thereby contributing substantially to the efficient operation of my new and improved machine. It reduces wear and eliminates the tendency to bind, as is the case in many machines of the prior art.

Disposed in said casing ninety degrees with respect to the axis of the main shaft 10, referring to Figure 6, is a needle bar 25 which reciprocates in bushings 95 and 95a mounted in alignment in the casing 1. The needle bar driver 82 has a tubular clamp portion 82b which embraces the needle bar 25 and has clamping screws on the side thereof opposite the side shown in Figure 6.

The needle bar driver has a depending web portion 82c the lower end of which is bifurcated and forms a working fit on a guide rod and stabilizer 20, which threadedly engages a hole formed in the casing 1 and which is locked therein by a lock nut 20a outside of the casing. Thus, the needle bar driver moves the needle bar and is guided and stabilized by the rod 20. The spacing between the needle bar 25 and the stationary guide rod 20 is such that the needle bar driver 82 is of substantial length. Therefore, any tendency for the needle bar to move rotatively is minimized, and wear on the guide rod 20 or on the bifurcated portion of the depending web cannot cause the needle to strike the guide 60 or displace the thread from its normal path.

Now, for motivating the needle bar driver, a connecting rod 83a has a shouldered screw 83d forming a wrist pin engaged by the extension 82a. The connecting rod 83a embraces and forms a working fit on an eccentric 83 which is secured on the shaft 10. Thus, as the shaft 10 rotates, the throw of the eccentric is transmitted via the connecting rod 83a to the needle bar driver 82, and

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thereby the needle bar 25 is reciprocated in the bushings 95 and 95a.

The needle bar 25 has formed on the outer end thereof a rectangular head 96 (Figures 1, 2 and 24). This head is notched and has a hole to accommodate a needle 99. A clamping block 100 fills the notched portion and is provided with a screw 101 by means of which the needle may be clamped therein. A thread presser member has a shank 102 which is reciprocally mounted in a cross hole in the head 96. On the end of the shank 102 is a thread presser disc 103. The shank projects from the right side of the head 96, as may be seen in Figure 24, and is provided with a spring 104 which urges the presser disc 103 to the right, so that when the thread is between the disc 103 and the head, it is firmly held against the head.

Projecting from the casing 1 is a rod 96a, the left face 105 of which constitutes a camming surface with which the right end of the shank 102 cooperates. Thus, when the needle bar is moving inwardly, the end of the shank 102 engages the cam surface 105 and is moved to the left, thereby freeing the thread.

Referring now to Figures 1, 2, 3, 6 and 22, the base 1a of the casing 1 projects to the right as seen in Figure 1, thereby leaving a greater space for the material being worked. It will also be noted that the casing has a balcony-like extension 15, which is very shallow and forms a housing for a driving feed disc 12.

In machines of the prior art, the drive feed disc, and in some instances, both feed discs, are carried on vertical shafts which extend upwardly from the base and leave very little space below the discs for the material being sewn. My new and improved arrangement has no shafts extending downwardly to the base and therefore a maximum space is provided below the feed discs to accommodate the work being handled, and therefore my machine is adapted to a wider use than machines of the prior art.

The feed disc 12 has a shallow depression 106 formed therein and it has a depending boss 107 with a tapered hole 108 formed therein. Mounted on the exterior of the boss 107 is a gear wheel 34 which is secured to the feed disc 12 by means of screws 34a. A threaded bushing 39 threadedly engages a hole formed in the housing 15 and has on its upper end a flange 109 upon which the lower end of the boss 107 rests. This threaded bushing is engaged by a lock nut 41 by means of which it may be locked in any adjusted position.

A shaft 38 upon which the feed disc 12 rotates, has a tapered portion 110 which forms a working fit with the tapered bore 108. The shaft 38 also has a threaded shank 111 which threadedly engages a corresponding hole in the bushing 39. The upper end of the shaft is provided with a slot 112 to facilitate the adjustment of the shaft 38. This slot can be engaged by a screw driver and the shaft may be screwed into the bushing until there is no lost motion and yet the feed disc may rotate freely. Thereafter, the shaft may be locked in the adjusted position by means of a lock nut 40.

If it is desired to raise the feed disc 12, for example, due to wear of the lower surface of the boss 107, or for any other purpose, it may be raised by loosening the lock nut 41 and rotating the bushing 39 and obviously any wear in the tapered hole 108 or the tapered portion 110 of the shaft may be compensated for by loosening the lock nut 40 and screwing the shaft 38 inwardly.

Referring now to Figure 6, a gear 33 carried on the upper end of a vertical shaft 31, meshes

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with the gear 34. The shaft 31 is journaled in suitable spaced bearings 35 and 36 formed in the casing 1 and lost motion is prevented by the collar 32 contacting the lower end of the bearing 35 while the hub of the gear 33 contacts the upper end of the bearing 35.

Secured to the lower end of the shaft 31 is a special gear 30 which is motivated by a combination gear and over-running clutch unit 28. The combination over-running clutch and gear 28 is journaled on a shaft 14 and its hub is positioned between a shoulder 26 formed on the shaft 14 and a collar 27.

In Figure 9, to the left of the shoulder 26, the shaft has a portion 14a which is threaded and which threadedly engages a corresponding hole in the side wall of the casing 1 and the threaded shaft, where it extends beyond the casing wall, is provided with a lock nut 13. A screw slot 14b is formed in the outer end of the shaft 14. The gear portion of the combination member 28 constitutes teeth 29 which mesh with the special gear 30. Now, when it is desired to eliminate backlash between the teeth of the gear 30 and the teeth 29, the lock nut 13 may be loosened and by means of a screw driver engaging the slot 14b, the shaft may be screwed in a direction to eliminate the backlash, following which the nut 13 may again be tightened to retain this adjustment.

The over-running clutch portion of the combination member 28, which is the portion on the opposite face to that containing the teeth 29, may be seen in enlarged detail in Figure 4, the over-running clutch being generally designated by the numeral 28a and including an annular web 63a, which is engaged by slots in the dogs 63 and 64. The slots formed in my dogs are not lateral, so as to position the dog radially, as has been customary heretofore in the prior art, and the reason for this is as follows

Referring to Figure 5a, I show a conventionally slotted dog A, wherein the slot is lateral of the dog, and this slot straddles the ring C. In this arrangement, the resultant vector R is downwardly and outward from the center.

In Figure 5b, I show a diagrammatic representation of my arrangement of the feed dogs designated by the letter B. It will be noted that the axis of the slot in the dog which straddles the ring C' is disposed at an angle of less than 90° from the axis of the dog, instead of exactly 90°, as is shown in Figure 5a.

From this, it will be noted that I obtain an instantaneous biting action on the ring C', as shown by the vector R'. Therefore, I obtain a favorable component of forces which produce instantaneous and positive engagement and the wear on both the ring and the dogs is substantially reduced. Contrasted with this, the arrangement shown in Figure 5a representing the prior art, has an unfavorable component of forces which tend to move the dogs in the direction of rotation before they are securely locked with the clutch rim, resulting in slippage, non-uniform operation, and excessive wear.

In Figure 4, the dogs 63 and 64 have non-curved slots 63b and 64b respectively, and these slots straddle the annular rim 63a.

Connected to the dog 63 is a tension spring 65 and a like tension spring 66 is connected to the dog 64. A dog driver arm 62 has pivotally connected thereto by means of a clevis pin 62a, a connecting rod 61, the upper portion 61a of which embraces an eccentric 113, as may be seen in Figures 11 and 13. The eccentric 113 is con-

nected on and moves with the main shaft 10 and it has cooperating therewith, stitch varying means which will be described in connection with Figure 11.

The connecting rod imparts reciprocating motion to the dog driver arm 62 and the operation of the over-running clutch is as follows: When the clutch dog driver arm 62 moves in a clockwise direction, it causes the angular slots in the clutch dogs 63 and 64 to instantaneously grip the rim 63a of the clutch and thereby impart rotating motion of the same. Now, when the driver arm 62 is moved in a counter-clockwise direction, it instantaneously releases the clutch dogs 63 and 64 and is assisted in doing so by the springs 65 and 66, respectively, and no motion is imparted to the clutch disc in a counter-clockwise direction.

The clutch also has a retainer dog 67 one end of which has a slot 67b formed therein, and this slot is lateral with respect to the axis of the dog 67 and it straddles the rim 63a. The opposite end of the retaining dog has a slot 67a formed therein and this slot engages a stud 68a carried on a boss 68 which is formed integral with the wall of casing 1. A spring 69 has one end anchored in the boss 68 and the other end has a loop 69a formed thereon which rides on the edge of the retaining dog 67. The clutch retainer dog 67 functions in an opposite manner to that of the driving dogs 63 and 64 so that when the clutch disc begins to move in a clockwise direction, the retainer dog releases instantaneously and is assisted in so doing by the spring 69. The spring 69 holds the retaining dog 67 in such position with relation to the rim 63a that the slot 67b formed in the retaining dog engages the clutch rim with a digging-in tendency at the upper left hand corner of the slot 67b and at the lower right hand corner. These corners have a "biting" engagement with the rim 63a which prevents counter-clockwise motion, as seen in Figure 4, but if the motion is clockwise this biting engagement does not obtain until the rim stops moving in the clockwise direction. However, it will instantaneously grip the clutch disc rim and prevent any counter-clockwise movement, if the same is produced by the slight return drag of the clutch dogs 63 and 64 or for any other reason. Therefore, it will be quite evident that the clutch disc rotates with intermittent motion and that this motion is uni-directional (clockwise) and furthermore the clutch disc is firmly retained after each intermittent motion.

Referring now to Figures 11, 13 and 15, the shaft 10 has formed therein from the outer end thereof a central axial hole 114, and a crosshole 115 formed in the shaft communicates with the hole 114. The eccentric 113 has a flange portion 58 which is larger in diameter and it also has a central hole 116 which is substantially larger than the diameter of the hub 117 on the member 57, to be presently described.

Extending axially from the flange portion 58 are oppositely disposed tenons 58a and 58b. The tenon 58a has a threaded hole therein to accommodate a screw 51 which has a shank 118, the right end of which, as seen in Figure 11, is rounded. The opposite tenon 58b has a threaded hole therein to accommodate a screw 55 which retains therein a helical spring 54. The tenon 58a has an axial threaded hole 119 and the tenon 58b has an axial threaded hole 120 formed

therein, the purposes of which will be presently described.

A cooperative member 57 of my expandable throw eccentric 113 has a hub 117 with a central hole 121 therein which forms a working fit on the shaft 10. The member 57 has oppositely disposed slots 122 and 123 formed therein and these slots are engaged by the tenons 58a and 58b with a smooth working fit. The member 57 has in alignment with the center of the slot 122 a radial hole which matches the crosshole 115 in the shaft and the shank 118, above described, extends through this crosshole and into the interior of the axial hole 114 in the shaft.

The spring 54 described above as retained in the tenon 58b by a screw 55, bearing against the bottom of the slot 123. Positioned in the shaft hole 114 is a plunger shaft 44, the upper end of which, as seen in Figure 11, has a beveled surface 124 formed thereon. The lower end of the shaft 44 has a hemi-spherical hole formed therein to accommodate a steel ball 97. The shaft 44 forms a working fit in the hole 114 and is movable in either direction endwise within the range of the beveled surface 124 against which the rounded end of the shank 118 bears. The spring 54 always ensures that the rounded end of the shank 118 is in contact with the surface 124. The steel ball, after being positioned in the hemi-spherical hole, is retained therein by spinning the lower end of the shaft 44 so as to embrace the ball past a plane extending through its lateral axis. The casing 1 has formed thereon a boss within which is supported the ball bearing 43. A support member 125 has a counterbore 126 formed therein to fit said boss and is provided with a flanged rim 127 through which screws, such as the screws 128, pass, to threadedly engage corresponding holes formed in the casing 1. The member 125 has a threaded hole 129 therein, one end of which communicates with the counterbore 126 and the other end of which is closed by an end web 130 formed integral with the member 125. The exterior of the member 125 has a portion 131 of reduced diameter with a tapering portion 132 therebetween. The shaft 10, near the end thereof, carries a retaining collar and snap ring 47 which abuts the ball bearing 43. The end web 130 has a central hole 133 formed therein. Within the hole 129 and adjacent to the closed end 130 is a disc member 134 which has a two-step shank 135 formed integral therewith. One step of this shank forms a working fit in the hole 133 and the other step fits a hole 136 formed in a stitch regulator knob 37. The stitch regulator knob is retained against a shoulder formed between the two steps by means of a nut 48 engaging the threaded end 137 of the shank 135. The disc member 134 has fixed therein spaced parallel pins 138 and 139 which are slidably engaged by corresponding holes formed in a threaded plunger 50, which has threads on the exterior thereof engaging the threads in the hole 129.

The plunger 50 has a spheroidal depression 140 which engages the ball 97. The adjustable throw eccentric is provided with a cap plate 56 which has an oblong hole 141 formed therein. This hole is provided for clearing the hub 117 for all positions of throw. This plate is retained by means of screws 142 and 143 passing through clearance holes 144 and 145 and engaging threaded holes 119 and 120 formed in the tenons 58a and 58b.

As the stitch regulator knob is rotated in a counterclockwise direction, the beveled surface

124 is advanced axially and cams the tenons 58a and 58b toward the left, as seen in Figure 11, thereby making the eccentric 113 more and more eccentric with respect to the axis of the shaft 10.

The movement of the shaft 44 axially within the hole 114, by rotating the stitch regulator knob, is effected as follows: As the knob 37 is rotated, the disc 134 moves therewith and the pins 138 and 139, which also move therewith, impart a rotative urge upon the threaded plunger 50 and this causes the plunger by virtue of the threads, to move axially and this movement is imparted to the shaft 44 via the ball 97.

By varying the eccentricity of the eccentric 113, the stroke of the connecting rod 61 and of the feed dog carrier 62 is varied, and this variation is imparted via the over-running clutch, the gear 28, the gear 30, the shaft 31, the gear 33 and the gear 34 to the driving feed disc 12. Differential adjustments of the eccentricity in the stitch regulator may be obtained by adjusting the screw 51 in its threaded hole, thereby changing the relation of the rounded end of the screw and the beveled surface 124.

Referring now to Figures 1, 3, 6, 7 and 10, the looper bar cradle 22 extends through and forms a working fit with slot 146 formed in the rear wall of the casing 1, and a slot 147 formed in the front wall of the casing 1. The rear end of the looper bar cradle has a depending arm 148 and a boss 149 formed on the lower end thereof has a bearing hole formed therein which is journaled on a stud 70, which is mounted on the outside of the rear wall of the machine. A spring 150 has a plurality of convolutions embracing the boss 149 and one end 150a of the spring bears against the rear wall of the machine and the other bears against the arm 148 so that the cradle 22 is urged in a counter-clockwise direction about the stud 70.

Now, the compound movement of the looper bar is comprised of three distinct movements which act at the same time. One of these movements is the movement of the looper bar cradle, another of these movements is the reciprocatory movement of the looper bar per se, and the third movement is the rotative movements of the looper bar about its axis.

The movement of the looper bar cradle is illustrated in Figure 10.

Referring first to Figure 3, attention is called to the connecting rod 75a which embraces an eccentric 75 which is secured to the shaft 10. (This gives the location of the eccentric on the main shaft 10.)

Now referring to Figure 10, the cradle 22 is seen in solid lines in an intermediate position indicated by the letter O. This is the position of the cradle when the looper per se is in the front position.

The dot-dash lines designated by P represent the lowest position of the cradle at the time the looper is in the rear position, and the dot-dash lines designated by the letter N indicate the extreme upward position of the cradle, which is the position when the looper is moving over the edge of the material prior to descending on the other side.

The eccentric 75 which is secured to the shaft 10 is embraced by one end of a connecting rod 75a, the other end of the connecting rod carrying a boss 151 (Figure 3) and a shouldered stud screw 74b (Figures 6 and 7) has a shank 74c upon which a bearing hole formed in the connecting rod 75a is journaled. The threaded end of the

shank 74c extends through a slotted hole 152 formed in a lever 153 and is engaged by a lock nut 165. By loosening the lock nut 165, the stud may be adjusted radially. The connecting rod is retained on the shank 74c by means of a collar 166 having a set screw 167 extending through and engaging the shank 74c. The lever 153 has formed integral therewith a clamping boss 154 which has a central hole therein forming a fit on the hub 155 of a lever 156. The hub 155 has a central bore which is journaled on a stud 73 which is mounted in the wall of the casing by threadedly engaging a threaded hole therein and is locked in position therein by means of a lock nut 157.

A link 77 has a hub 158 with a bearing hole therein which is journaled on a shouldered screw 159. This shouldered screw engages a corresponding threaded hole in the lever 156 and is secured therein by means of a lock nut 160.

The link 77 also has a hub 161 with a bearing hole therein, which is journaled on the shank of a screw 72. The threaded end of the screw engages a corresponding threaded hole formed in a boss 163 (Figure 3) formed on an adjustable bracket member 162 which is adjustably secured to the cradle 22 by means of screws 164 passing through elongated slots formed therein.

Referring again to Figure 10, the shaft 10, as seen from the end shown in this figure, rotates clockwise, as indicated by the arrow, and as the eccentric thereon moves in a clockwise direction from the position shown in solid lines, the connecting rod 75a swings the arm 153 about its axis 73 in a clockwise direction and therefore the arm 156 movable therewith causes the link 77 to move upwardly and consequently the left end of the cradle 22 swings upwardly. As the eccentric 75 continues to rotate, the arm 153 continues its movement in a clockwise direction, and as the arm 156, which is movable therewith, passes dead center, the member 77 linked thereto begins to swing the cradle 22 in a downward direction and thus the cradle is moved along a fixed path between two extremes, and since the right end of the cradle is fulcrumed at 70, the movement of the cradle is maximum on the left end thereof.

In Figure 10, the looper bar 7 is shown in position in the cradle but the linkages for reciprocating it and simultaneously rocking it, have been deleted for the sake of clarity.

Referring now to Figure 23, the elements for reciprocating the looper bar are shown. The looper bar cradle has aligned bearings 168 and 169 formed therein and the looper bar 7 forms a working fit in these bearings and is reciprocated therein by the mechanism shown in Figure 23, which will now be described.

A drive member 170 has a bifurcated portion 171 on the lower end thereof which straddles and forms a working fit on a rod 172 which threadedly engages a threaded hole in the frame 1 and which is locked thereon by means of a lock nut 173. The upper end of the drive member 170 is provided with two spaced bosses 174 and 175 which are split and provided with clamp screws. These bosses have holes formed therein carrying bushings 176 and 177 which bear against a clamping boss 73 to be presently described.

Between the bosses 174 and 175 is a clearance slot 178. When the driving member 170 is moved, the looper bar 7 moves therewith and the drive member slides back and forth on the guide rod 172. Now, in order to move the drive member

170, the eccentric 76 (see Figure 3) on the main shaft 10 is used. This eccentric is embraced by one end of a connecting rod 179. The other end of the connecting rod has a boss 180 formed thereon and this boss has a bearing hole formed therein which is journaled on a shouldered screw 181. The threaded end of the shouldered screw 181 threadedly engages a corresponding threaded hole formed in the driving member 170 so that as the main shaft 10 rotates in a clockwise direction, as seen in Figure 23, the eccentric 176 rotating therewith reciprocates the looper bar back and forth in the bearings 168 and 169 formed in the looper bar cradle 22.

The third motion described above as imparted to the looper bar, is that of causing it to partially rotate or gyrate along predetermined definite paths. A clamping boss 78 having a clamping screw 182 therein is positioned on the looper bar 7 between the bosses 174 and 175. Formed integral with the boss 78 in an L-shaped arm 183 (see Figure 3). The arm 183 has an elongated slot 184 formed therein (see Figures 6 and 17).

Although the boss 78 clamps the looper bar 7 between the bushings 176 and 177 in the bosses 174 and 175, respectively, these bosses and bushings are omitted from Figure 17 for the sake of clarity.

Adjustably mounted in the elongated slot is a tapered stud 185 which has a shoulder 186 bearing against the surface of the arm 183 and which has a threaded shank extending through the slot 184 which is threadedly engaged by a nut 86, and a washer 187. By loosening the nut 86, the stud 185 may be adjusted in the slot 184 parallel to the axis of the looper bar 7.

The adjustment of the tapered stud 185 in the slot 184 is effected by loosening the nut 86 and in this manner, I may advance or retard the motion of the looper. This feature facilitates the timing of the machine and provides a further setting in adjusting the relationship of the looper to the needle.

The outer end of the stud 185 has a ball 85 rotatively mounted thereon. This ball rolls in and slides slightly endwise in a follow cam outline 188 formed within a working cam member 84. The arcuate motions imparted to the looper bar 7 are a combination of the movement imparted to the stud 185 via the ball and are due in part to the outline 188 of the cam 84 and in part to the motion imparted to the cam element 84 by the eccentric 89.

The location of the eccentric 89 in the general assembly may be determined from Figure 3.

Referring now to Figures 19, 20 and 21, the eccentric 89 is embraced by one end of the connecting rod 90. The other end has a boss 189, in which a bearing hole is formed. A shouldered screw 191 has a shank upon which the bosses 189 and 190 are journaled and this screw threadedly engages correspondingly threaded holes formed in a boss 192 formed on an arm 193. The screw 191 extends through the boss 192 and is engaged by a lock nut 91.

The arm 193 has formed integral therewith a hub 194 which has a bearing hole formed therein. A shouldered screw 195 has a shank portion upon which the boss 194 is journaled and a threaded portion 196 which engages a threaded hole formed in the frame 1. The screw is locked by means of a lock nut 197. Also formed integral with the arm 193 and the hub 194 are arms 198 and 199. The follow cam element 84 has a depending lug 200 through which a shouldered

screw 93 passes and threadedly engages the arm 199.

The follow cam unit 84 also has in spaced relation to the depending lug 200, a second depending lug 201 which has an arcuate slot 202 formed therein. The center of the arcuate slot 202 is taken along a radius extending to the center of the screw 93 so that the right end of the follow cam unit 84, as seen in Figure 19, may be raised or lowered, and a screw 92 extending through a slot 202 and threadedly engaging the arm 198, is provided for locking the cam unit 84 in an adjusted position.

When the shaft 10 rotates in a clockwise direction, as seen in Figure 19, the follow cam unit 84 is moved back and forth on a path about the screw 195 as a center, and this motion, combined with the reciprocatory motion of the looper bar, imparts to it the gyratory motion for moving the end of the looper through the series of steps to be presently described.

Another important adjustment in timing the machine is the arrangement of the clamping split boss 154 which embraces the bushing 155 on the lever 156, the bushing being journaled on the fixed shaft 73. The clamping boss 154 may be loosened and moved relative to the bushing 155 for changing the angular relation of the lever 153 with respect to the lever 156. Another important adjustment is between the connecting rod 75a and the lever 153 which is effected by loosening the screw 74b and changing the position of the axis of 74b (in the slot 152) and consequently changing the effective length of the lever 153. These adjustments affect the up and down movement of the looper bar and consequently the up and down movement of the looper per se.

Referring now to Figure 18, the looper 8 is shown in solid lines as positioned adjacent to the needle 99 to the right of the material 80 being worked and the needle, after it has moved to its extreme position to the right, starts in the opposite direction and throws up a loop of thread which is engaged by the looper 8 and is carried by the looper upwardly and to the left through a highest position indicated in dot-dash lines 8a. After it reaches the highest position, it starts downwardly to the position shown dotted at 8b on the opposite side of the material 80, where there is a slight dwell. The needle which has in the meantime moved to an extreme position toward the left and is advanced toward the right again, then passes through the loop during said dwell. The looper 8 then drops the loop and moves over to the right side of the material, so as to assume the position shown in solid lines and pick up the succeeding loop thrown up by the needle. The path of the lower end of the looper is substantially along the curved dot-dash lines above referred to.

As the stitching progresses, the above action is repeated for each stitch formed.

The amount of throw in the drive eccentric for my looper bar is correlated to the amount of throw or vertical motion imparted to the looper bar cradle and also to the amount the needle bar is moved.

According to the prior art, it was necessary in order to obtain sufficient height of throw of the looper, to transmit an amount of throw to the looper frame sufficient to move the looper rocker links, which are connected to the looper bar frame through their necessary orbits. These orbits were such that the travel of the looper

frame was along a considerably longer longitudinal distance because of the fact that the rocker links moved about fixed centers and thus were only capable of producing an orbit in the form of a circular arc. The stroke of the looper frame must equal the chord of this arc, as taken from the two extremities of the orbit, and consequently an excessive amount of thread was drawn out. Also, the stroke of the needle bar was substantially greater than the stroke of my needle bar.

According to the present invention, and contrasted with the above, the movement given to the looper bar frame follows a curved path which might be termed a "modified hairpin curve." The height of throw of my looper is obtained independently of the stroke of the looper bar by means of the link and lever combination illustrated in Figure 10. The link 77 has its center of rotation (oscillation) varied during each cycle by means of the lever arm 156, so that the raising and lowering portions of the looper orbit are accelerated. This permits the longitudinal motion of the looper to be greatly reduced. Therefore, the necessary looper stroke is shorter and the amount of thread drawn out is well balanced with the stroke of the needle.

In Figure 10, the letters N, O and P correspond to the relative positions of the looper bar cradle 22 around the stud 73 anchored to the machine frame or housing #1. These relative positions are: N—the looper moving over the edge of the seam; O—the looper in the front position; and P—the looper in the rear position. The looper bar 7 travels to and fro or backwards and forwards in the looper bar cradle at the same time the looper bar cradle is oscillated in the vertical plane, so as to enable the looper to carry the loop up and over the top of the material.

The adjustable feature of the linkages for obtaining the proper coordination between the looper and the needle, particularly in the front and rear positions (which are the two low positions) is, as pointed out above, accomplished by changing the relation of the levers 153 and 156 (Figures 7 and 10). An additional provision, also described above, is the adjustment between the connecting rod wrist pin 74c and the slot 152 formed in the lever 153. Therefore, the ratio between these two arms may be altered, so as to transmit more or less motion to the looper cradle 22 through a greater range than has heretofore been possible.

From Figure 10, it will be seen that during one complete revolution of the eccentric 75, the looper bar cradle 22 is raised and lowered twice in the following manner.

Assuming the looper to be in the rear, and at its lowermost point, the looper bar cradle 22 is raised, while the looper bar 7 is moving forwardly and then is lowered in the forward position. The looper cradle is then raised, while the looper bar is returning to the rear position, and then lowered again to the original position assumed above.

A very important feature of my machine is that the motion so imparted to the looper bar cradle and to the looper bar, causes the looper to described a curve having a rapid raising and lowering in the rear position and relatively less rapid raising and lowering in the forward position. Due to this feature, a desirable characteristic or pattern for the loop and the thread is created and the looper is enabled to clear a high seam or bite without dragging.

My new looper arrangement enables the looper to draw up the stitch over any conventional height, seam or bite, by simply adjusting the thread tension nut 6. Therefore, with my machine, a wide variation in heights of seam or bite may be sewn without any change. By this I do not mean that the adjustment of the thread tension in any way enables the looper to clear various heights of seams but merely that the looper will draw up the thread over a small bite as well as a large bite by adjusting the thread tension nut 6. It will be understood that this nut has no connection whatsoever with the path of movement of the looper.

Machines of the prior art are limited in this scope because various ranges of stitches require various sizes of machines. My new and improved machine will cover the ranges covered by several separate machines of the prior art, and this is due mainly to the features described above.

Cooperating with the driving feed disc 12 is a pressure or idler feed disc 11 which is journaled on a fixed shaft 200 and rotates freely thereon (see Figures 1, 2 and 3). Secured to the upper end of the fixed shaft 290 by means of a screw 210, is a needle guard plate 60 which has a slot 209 formed therein forming a path for the needle (see Figures 3 and 24). A gooseneck pressure arm 9 has a generally horizontal portion 201 and formed integral with the right end of this portion, as seen in Figure 1, is a depending portion 202. This depending portion curves toward the left, as seen in Figure 2, and has on its extreme lower end a split boss 203 with a hole therein to receive a shaft 200. A clamp screw 19 is provided for clamping the shaft 200 therein. The gooseneck arm has formed integral with the left end of the horizontal portion 201, as seen in Figure 1, a straight vertical portion 204, the lower end portion 205 of which is of reduced diameter.

The gooseneck pressure arm 9 is supported on a spring loaded support in the body of the machine. Formed integral with the support and extending through an opening 206 in the frame of the machine is a split boss 23 having a hole formed therein to accommodate the portion 205 of the gooseneck pressure arm. The portion 205 is clamped in the boss 23 by means of screws 207.

The height of the idler feed disc may be adjusted by loosening the screws 207 and raising or lowering the gooseneck pressure arm in the boss 23. The support, of which the boss 23 forms a portion is within the casing 1 and is pivoted on trunnions 16 and 17 carried in the base of the casing. Spring tension is applied to this support in a direction to urge the idler disc 11 into firm contact with the feed disc 12. This spring may be seen at 9c (Figure 3), and a wing nut 19 on the rear wall of the casing is provided for adjusting the tension of the spring. This wing nut may be seen in Figures 1 and 3. Means (not shown) is provided for urging the pressure arm in a direction to move the free disc 11 away from the driving disc 12 so that material may be inserted therebetween. By this arrangement, the pressure on the material being sewn is maintained to permit the driving disc 12 to feed the material with positive though intermittent motion, and due to the fact that the feed disc 11 is free, gathering and other effects may be obtained.

The machine is provided with a cover plate 5 which is secured to the upper end of the frame

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1 by means of cap screws 5a, engaging threaded holes 208 formed in the frame 1 (see Fig. 3), or by any other suitable means.

A series of thread guides 6a, which are in the form of loops, is disposed in alignment on the cover 5 and between the two guides on the right end, as seen in Figure 1, is a thread tensioner 6. Since thread tensioners are old in the art, it is considered unnecessary to describe the thread tensioner in detail.

Referring now to Figures 12 and 14, a modified form of stitch regulator is shown.

The shaft 10a has extending therein from one end an axial hole 114a into which is reciprocally positioned a shaft 44a. The shaft 44a has a beveled end surface 124a and formed in the beveled end and parallel to the surface thereof is formed a round bottom groove 211.

The elements 54, 55, 56, 57 and 58 of the expandable throw eccentric are identical with those described in connection with Figures 11 and 15, so they are indicated by the same numerals. However, the screw member which cooperates with the beveled surface 124 described in connection with Figure 11 is omitted in Figure 12, and in its place is a screw 51a, which has a shank 212, carrying on its extreme end a ball 213 which cooperates with the groove 211. This ball is maintained in contact with the groove at all times under the urge of the pressure of the spring 54.

The shaft 10a has a longitudinal slot 214 formed therein near the lower end thereof, as seen in Figure 12, and a shoulder screw 52 extends through this slot and threadedly engages the shaft 44a, near the lower end thereof.

A stitch regulator knob 215 has formed integral therewith a boss 216. The knob 215 has a counterbore 217 formed therein and communicating with the counterbore 217 is a second counterbore 218 which accommodates a tubular shank 219 of the screw 48. The interior of the tubular shank 219 is threaded and these threads engage corresponding threads formed on the exterior of the shaft 10a at its lower end, and thus the stitch adjusting knob 215 is secured onto the shaft.

The hub 216 has formed therein a helical slot 53 and the shank of the screw 52 forms a working fit in this slot. The knob 215 and its hub 216 are free to rotate on the shaft 10a and the upper end of the boss 216 bears against a thrust washer 220, which abuts the ball bearing 43.

When the knob 215 is rotated, for example in a counter-clockwise direction, the shank of the screw 52 advances around the helical slot 53 and causes the shaft 44a to move inwardly in the hole 114a and the groove 211, acting in turn against the ball 213 on the end of the screw 51a is urged to the left, as seen in Figure 12, thereby changing the throw of the eccentric and consequently changing the length of the increments of movement of the feed driving disc 12, and thereby the stitches are regulated.

Obviously, the shank of the screw 52 may be caused to travel in either direction in the helical slot 53, except at the extreme ends thereof.

In the arrangement shown in Figure 11, differential adjustments may be made by screwing the screw 51 inwardly to increase the maximum throw of the eccentric, or outwardly to reduce the maximum throw. The same is true in the arrangement shown in Figure 12, wherein such adjustments are made by means of screw 51a.

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Operation

The thread is led from the spool through the three thread guides 6a (Figure 1). However, before it is brought through the right end one, it is carried through the thread tensioner 6. From the right hand thread guide, the thread is passed through the automatic tensioner 103 and is then brought under the needle and threaded upwardly through the needle point.

With the material to be sewn positioned between the feed discs 12 and 11, said material being indicated by the numeral 80 in Figure 18 and projecting above the top edges of the feed discs a predetermined height, the machine is now ready to sew.

As the main shaft 10 rotates, the needle is moved forward and advances through the layers of material and continues to move a substantial distance forwardly to the maximum position shown in Figure 24. As the point of the needle penetrates the material 80, it enters the guide slot 209 formed in the guide plate 60 which serves both to guide and support the needle when the thread loop is picked up by the looper 8.

Now, as the needle begins moving in the opposite direction, the looper 8 is descending with a sweeping motion to the left, as seen in Figure 2, so that the toe of the looper passes directly over the needle at right angles to it and just clears the upper surface of the needle. By the time the looper reaches this position, the needle, having executed a portion of its return stroke, cause the excess thread which is brought through the seam, to lag behind and throw up a loop in substantially a vertical plane along the top edge of the needle.

As the looper 8 passes over the needle, its toe enters the loop and picks it up. The looper continues to swing to the left until the loop is engaged around the heel of the looper (the toe of the looper is the leading portion of the lower end of it and the heel is the trailing portion of the lower end of the looper).

As the loop becomes engaged around the heel of the looper, the looper by this time has been raised until its lower end is above the level of the upper edge of the material and the looper 8 then moves rearwardly and upwardly so as to make sure the top of the material is cleared. While this is occurring, the needle, continuing its return stroke and just as its point withdraws from the rear face of the material, the feed discs 12 and 11 begin to move and advance the material 80 the distance of one stitch space in accordance with the setting of the stitch regulator knob 31. By now, the needle has reached the limit of its return stroke and begins its forward stroke again.

By this time, the looper has reached the limit of its rearward motion and has descended behind the material into the cup-like cavity of the feed disc 12, and as it descends, it swings to the right and the heel of the looper, by the time the point of the needle has continued to advance, positions the loop thereon so that the needle may pass directly through the loop. Now, as the point of the needle enters the loop and is about to penetrate the material again, the feed discs 12 and 11 have ceased moving and therefore the material is again stationary.

The point of the needle then begins to enter the material and at the same time, the looper makes a slight radial movement to the left in order to clear the needle as the looper begins to move upward. Having cleared the needle and

moved upward slightly, the looper now makes a radial movement to the right which causes it to release the thread loop. Holding this radial position, the looper continues to rise and moves forward over the top of the material and down again and with radial motion to the left so as to pick up the next loop thrown up by the needle.

The description above has been in connection with the single thread looper. However, with my machine, I may employ a double thread looper which forms a double thread chain stitch.

I have found that I can remove the single thread looper and substitute a double thread looper without the necessity of readjusting the mechanisms for moving the looper, provided the single and the double thread loopers, when mounted in the looper bar chuck, have their "toes" in substantially the same relative positions insofar as orientation is concerned, and substantially the same height above the level of the needle in the machine.

In employing double thread loopers, in which the shape of the looper has no relation whatever to the shape of the single thread looper, it is necessary to adjust the mechanisms for moving the looper, employing the adjustments described above in connection with the single thread looper, but one distinct advantage which my machine has over the devices of the prior art is that the machine does not have to be torn down and other cams, etc., substituted for the ones now employed in the machine.

In order to clearly show what is meant by the relation of the "toes" of the loopers, the following detailed description of both the single thread looper and the double thread looper is given.

Comparison of the single thread looper with the double thread looper

The single thread looper is shown in detail in Figures 25-28 inclusive, while the double thread looper is shown in detail in Figures 29-33, inclusive.

Referring first to Figures 25-28, illustrating the single thread looper, the looper generally designated by the numeral 8 has a shank 221 which has a flattened portion 222 to facilitate proper orientation in the end of the looper bar. Right and left surfaces 223 and 224 of the looper converge to a point 225 where the looper is thinnest. Below this point, the looper is somewhat in the form of a shoe having a toe 226, a heel 227 and a sole 228. Extending down from the shank along the side 223 of the shoe is a web 229. This web terminates in the heel 227 of the looper and against this web, as may be seen in Figure 25, is formed a groove 230 for the thread.

In Figure 26, it will be noted that the front surface 231 and the rear surface 232 of the shank are slightly curved and extend downwardly to join the shoe.

In Figure 28, the shape of the sole 228 may be seen and it will be noted that the groove 230 and the web 229 terminate in the heel 227. The toe 226, as has been described above, is positioned by the looper bar to enter and pick up the looper thread thrown up by the needle after the needle has moved forward its maximum stroke and has started on its return stroke.

Now, if the toe of the double thread looper is properly oriented in the looper bar so that it is in substantially the same position as the toe of the single looper, it will enter and pick up the loop thrown up by the needle in the same manner.

Referring now to Figures 29-33, inclusive, the

double thread looper in a way resembles a woman's high heeled shoe, with the heel omitted. The shank 8a which may have an upper portion identical with the upper portion of the looper 8, has its right surface 233, Figure 29, practically vertical and its left surface 234 curves around to the point 235, which might be considered the heel. The central portion 237 of the surface 236 formed between the shank and the shoe per se blends into the upper curved surface 238 of the shoe and this curved surface extends to the toe 239. The sole 240 is substantially level and terminates in an overhanging portion 241, due to the formation of a notch 242 formed substantially level with the heel 235. This overhanging portion 241, as may be seen in Figure 33, is in the form of a lobe 243 which is level with and forms a continuation of the surface of the sole 240, and a second lobe 244, the surface of which is curved from a point above the level of the surface 240 to the lower end of a hole 245 extending through the instep of the shoe, thereby forming a shoulder 246 which forms a thread guide for the thread which passes through the hole 245. The double looper also has a second hole 247 formed in a lower portion of the shank and this hole terminates in the curved surface 237 above the instep of the foot of the looper. Along the instep of the foot, is formed a curve 248 which extends from the hole 247 to the hole 245 and forms a relieved guide for the thread from one of said holes to the other.

Now, if the machine has been adjusted to operate with the looper shown in Figures 25-28, inclusive, with a single thread, this looper may be removed from the looper bar, and the looper shown in Figures 29-33 may be substituted therefor, and the toe 239 of the latter looper would assume exactly the same position as the position of the toe 226 of the looper shown in Figures 25-28, and no other adjustments are necessary.

In order to support a second thread for use with the double looper (referring now to Figures 1 and 2) the second series of thread guides 6a are to be disposed along the cover plate 5 and between the two front thread guides a second thread tensioning disc assembly, like the one shown at 6, would be positioned.

A thread supporting arm 253 (Figure 34) would be secured to the machine and this arm would be provided with holes, one of which is shown at 254, through which the second thread 252 passes on its way to the double thread looper.

Operation of the machine when the double thread looper is employed

The first thread is threaded into the needle in the same manner as it is when using the single thread looper. The second thread is led downwardly and threaded through the hole 247. It is then threaded through the hole 245 and is then positioned so that it, in action, can lie against the shoulder 246 formed in the sole 240 of the looper.

In Figure 35, the needle 99 is advanced to the right its full stroke through the material 80 and has moved in the opposite direction, with the result that the loop 249 is formed in the thread 250.

In Figure 36, the toe 239 of the looper has entered and picked up the loop 249.

In Figure 37, the looper has carried the loop 249 over to the other side of the material 80, and the point of the needle 99, due to the fact that the needle at that time is moving to the right,

again enters the material. In doing so, it passes through a loop 251 formed in the thread 252, and following this, the looper withdraws from the loop 249 and drops it. However, the dropped loop engages the loop formed in the thread 252, and as both the loops 249 and 251 are pulled up, due to the tensioning devices, an interlocked chain stitch is formed about the edges of the material 80.

It will be noted that where the single thread looper is employed, the needle passes through the loop which has been previously picked up and carried over on the other side of the material, and the path of the needle is above the foot of the looper, whereas in the double thread looper, the needle passes through the space provided by the slot 242. By varying the tensioners through which each of the threads 250 and 252 pass, the positions of the interlocked loops with respect to the edges of the material may be controlled. For example, if it is desired to have the loop formed in the thread 250 substantially flush with the edges of the material, the tensioner through which the thread 250 passes may be set to exert slightly greater tension on the thread 250 than the tension exerted by the other tensioner upon the thread 252. On the other hand, if the interlocking line of the loops is to lie substantially along the line of the abutting surfaces of the material 80, the tension on the thread 252 would be increased and the tension on the thread 250 would be decreased.

From the above, it will be seen that if the comparative critical dimensions of the single and the double thread loopers are such, the length, the degree of bend, and the positions of the toes of the loopers are standardized, so that the timing of the looper with the relation of the needle is identical, whether a single or double thread looper is employed that can be interchangeably used and then no other adjustments other than the proper mounting of the loopers are necessary.

If the loopers vary so that they assume different radial positions or different longitudinal positions either to the front or to the rear, adjustments may be made by loosening the clamp screw 182 in the member 78 (Figures 3 and 17). This frees the looper bar 7 so that it may be moved toward the front of the machine or toward the rear of the machine, and at the same time, if desired, it may be moved radially. Therefore, it can be given a different forward or rear position, and at the same time, a different radial position with respect to the cam follower stud 185 (Figure 17).

After the proper adjustment is made, the screw 182 may be secured tightly to retain the adjustment. Should the loopers vary in height, adjustment may be made by loosening screws 164 in bracket 162 (Figure 6) and moving the bracket to the required position and thereafter re-tightening screws 164.

Although I have herein shown and described by way of example, a machine embodying my novel improvements and a modification thereof, for forming a double thread chain stitch, it will be understood that I am not limited to the exact arrangements herein shown and described, as many changes may be made within the scope of the following claims.

What is claimed is:

1. In an overseaming machine, a housing, a driven feed disc, a free feed disc in cooperative relation therewith for engaging the material to be sewn therebetween, stitching means and means

to reciprocate the same, and a looper including a looper bar and operative means to reciprocate the same, a fulcrumed cradle supporting said bar and means to move the same on its fulcrum in a vertical plane, said operative means including a drive member and means spaced apart from said cradle for steadying and damping out vibrations from said drive member, and means to impart gyratory motion to said looper bar, the resultant movement of said looper constituting a combination of the movements of all said last three means.

2. In an overseaming machine, a housing, a driven feed disc, a free feed disc in cooperative relation therewith for engaging the material to be sewn therebetween, stitching means and means to reciprocate the same, spaced pairs of vertical guides formed in said housing, a rigid cradle positioned in said guides and having one end thereof fulcrumed on said housing, a looper bar reciprocally carried in spaced bearings on said cradle and extending beyond the other end thereof to a position above the extremity of said stitching means and having a socket therein to support a looper, means to reciprocate said bar, means to swing said cradle in a vertical plane in said guides, and means operatively connected to said bar for imparting arcuate motion to it as it reciprocates.

3. In an overseaming machine, a housing, a driven feed disc, a free feed disc in cooperative relation therewith for engaging the material to be sewn therebetween, switching means and means to reciprocate the same, aligned vertical guide slots formed in said housing above and parallel to said stitching means, a cradle supported in said slots and having a depending portion on the rear end thereof, a boss carried by said portion and having a bearing hole therein, the axis of which is at an angle of ninety degrees with respect to the long axis of said cradle, fixed shaft means on said housing journaled in said bearing hole, spring means urging said cradle in a predetermined direction about said first axis, a looper bar reciprocally mounted in said cradle and extending beyond the front end of said cradle to support a looper in cooperative relation to said stitching means, means to reciprocate said bar, means to swing said cradle, and the looper bar and the looper carried thereby, in a vertical plane, and follow cam means reciprocally moved within said housing and operatively connected to said looper bar for imparting predetermined arcuate movements to said bar as it reciprocates.

4. A machine according to claim 3, in which the operative connections between said follow cam and said looper bar include adjustable means and means for locking the same to retain any adjustments made.

5. A machine according to claim 3, in which said follow cam means is adjustably mounted on the means for moving it reciprocally.

6. In an overseaming machine, a housing, a main drive shaft journaled in three main bearings, two of which are carried in said housing and the third of which is an outboard bearing carried in a bracket secured to said housing, a drive pulley mounted on said shaft between said outboard bearing and said housing, and a plurality of eccentrics within said housing and secured to and driven by said shaft, said eccentrics being comprised of an eccentric of variable eccentricity for actuating a material feeding device, an eccentric of fixed eccentricity for reciprocating a needle bar, a looper including a looper bar and

means including an eccentric for reciprocating the same, a cradle fulcrumed outside said housing and carrying said looper bar, means including another eccentric to move said cradle on its fulcrum in a vertical plane, and means including yet another eccentric for imparting gyratory motion to said looper bar for causing said looper to cooperate with a needle in said needle bar to perform overseaming operations.

7. In overseaming machines, a frame, a main shaft journaled in said frame, aligned holes in said frame having their axis disposed ninety degrees with respect to the axis of said shaft, a needle bar positioned in said holes, a stationary rod rigidly mounted in said frame in spaced relation to said needle bar, a driven member secured to and movable with said needle bar, said driven member having a slot formed in its lower end, the sides of which form a working fit with said rod, an eccentric on said shaft, and a connecting rod embracing said eccentric and connected to a wrist pin carried by said driven member, whereby the rotation of said shaft effects reciprocity motion of said driven member and said needle bar and the latter is thereby stabilized against any rotative tendencies.

8. In an overseaming machine, a frame, stitching means, a looper and means to move the same relative to said stitching means, cooperative feed discs for feeding the material being worked past said stitching means in steps, one of said discs constituting a drive disc, a drive gear secured to the undersurface of said last disc, a tapered bearing hole in said disc, a tapered stud on which said disc is journaled, said stud being mounted in an extension of said frame, and lockable means on said stud, whereby it may be adjusted to compensate for wear between said bearing hole and said stud.

9. A machine according to claim 8, in which said stud is carried in a threaded bushing which threadedly engages said extension, whereby said last feed disc may be adjusted for wear in its tapered bearing as aforesaid, and its height relative to said stitching means may also be adjusted.

10. In an overseaming machine, a housing, a main shaft journaled in said housing, stitching means and means to reciprocate the same, means to feed material to be sewn past said stitching means, looper mechanism including a looper bar frame, an eccentric on said main shaft for moving said frame in a vertical plane, and linkages between said eccentric and said frame, the hub of one of which is telescoped into the hub of the other, a support on which the inner of said hubs is journaled, and clamping means on one of said hubs adapted to be loosened to permit the angular relation of said levers to be adjusted for changing the path along which said frame is moved.

11. In a machine of the overseaming type, a double thread looper comprised of a shank having a foot portion formed integral therewith, said foot portion having a slot formed therein from the heel toward the toe and terminating intermediate said foot, said slot forming a passage for the needle of said machine, a hole formed in said shank adjacent to the juncture of said shank with said foot, a second hole extending downwardly from the instep of said foot via the sole thereof, said holes forming a passage for thread, and a thread shoulder formed on said sole and extending from said second hole to said slot.

12. In a machine of the overseaming type, a

double thread looper comprised of a shank having a foot portion formed integral therewith, said foot portion having a slot formed therein from the heel toward the toe and terminating intermediate said foot, said slot forming a passage for the needle of said machine, a hole formed in said shank adjacent to the juncture of said shank with said foot, a second hole extending downwardly from the instep of said foot via the sole thereof, said holes forming a passage for thread, a thread groove formed on the instep of said foot and extending from said first hole to said second hole, and a thread shoulder formed on said sole and extending from said second hole to said slot.

13. In an overseaming machine, a housing, a main shaft journaled in said housing, stitching means and means to reciprocate the same, means to feed material to be sewn past said stitching means, looper mechanism including a looper bar frame having a fulcrum external to said housing, an eccentric on said main shaft for moving said frame in a vertical plane, linkages between said eccentric and said frame, said linkages including adjustable means whereby the height of said frame and consequently the height of the foot of the looper carried thereby may be adjusted relative to the feed disc.

14. In an overseaming machine, a housing carrying a main shaft and mechanisms moved thereby for stitching and looping the stitches over the edges of the material being sewn, a drive feed disc having a vertical axis outside the confines of said housing, said disc lying in a horizontal plane adjacent to the path of the needle moved by said stitching mechanism, a comparatively short boss extending laterally from and forming an overhanging balcony on said housing subjacent to said disc with substantial open space therebelow and having a shaft mounted therein, adjustable means cooperating with said shaft for adjusting said feed disc on said vertical axis, said adjustable means including locking means adapted to be locked to retain any adjustment, a gear on said shaft and moved with said disc, stitch regulating means operatively connected to said main shaft and said gear, a free feed disc and means to support the same in cooperative relation to said first disc, a shallow base formed integral with said housing and disposed substantially below said balcony, whereby substantial space for the work being handled is provided between said balcony, said housing and said base.

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