

March 12, 1940.

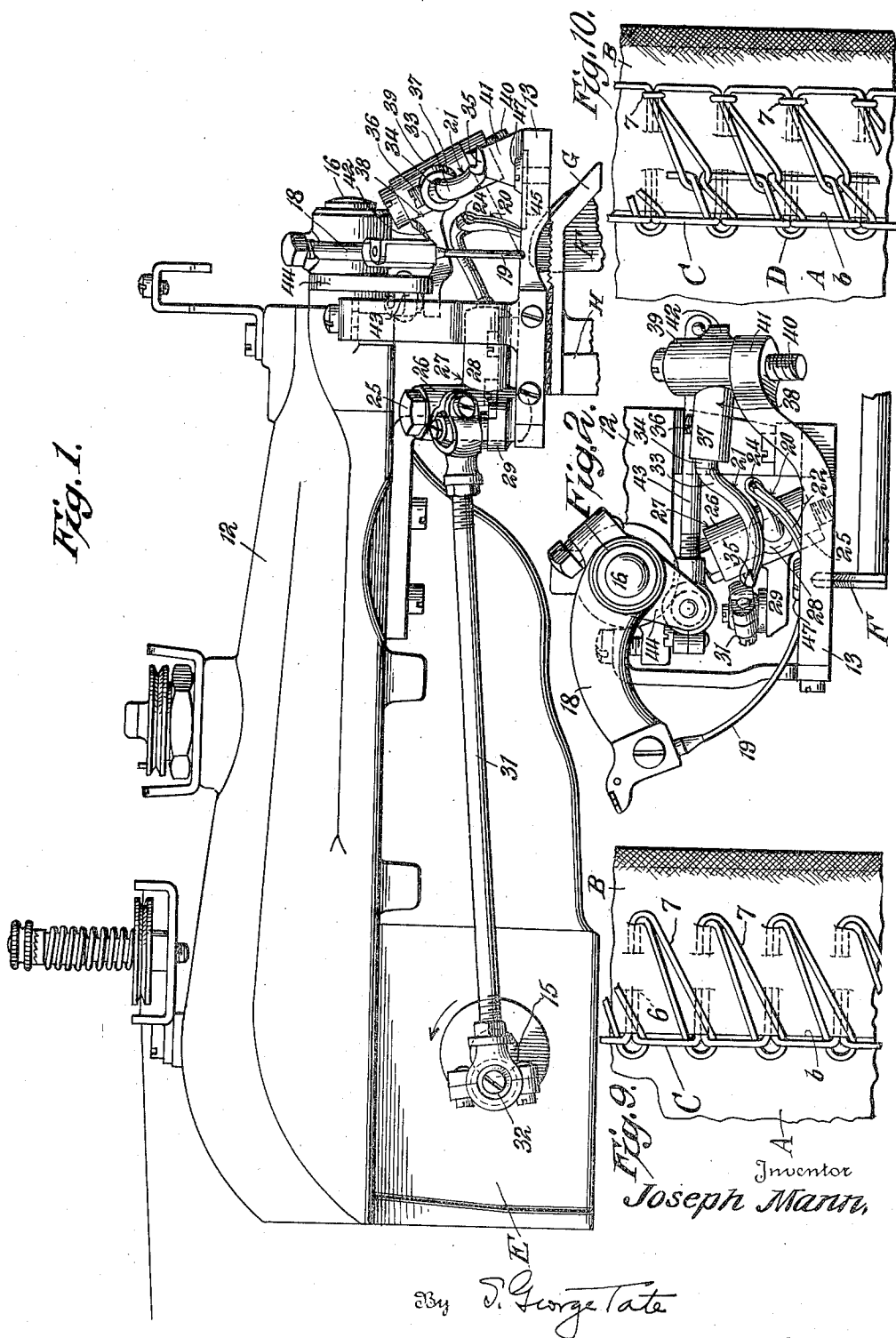
J. MANN

2,193,180

SEWING MACHINE STITCH FORMING MECHANISM

Filed Feb. 5, 1937

2 Sheets-Sheet 1



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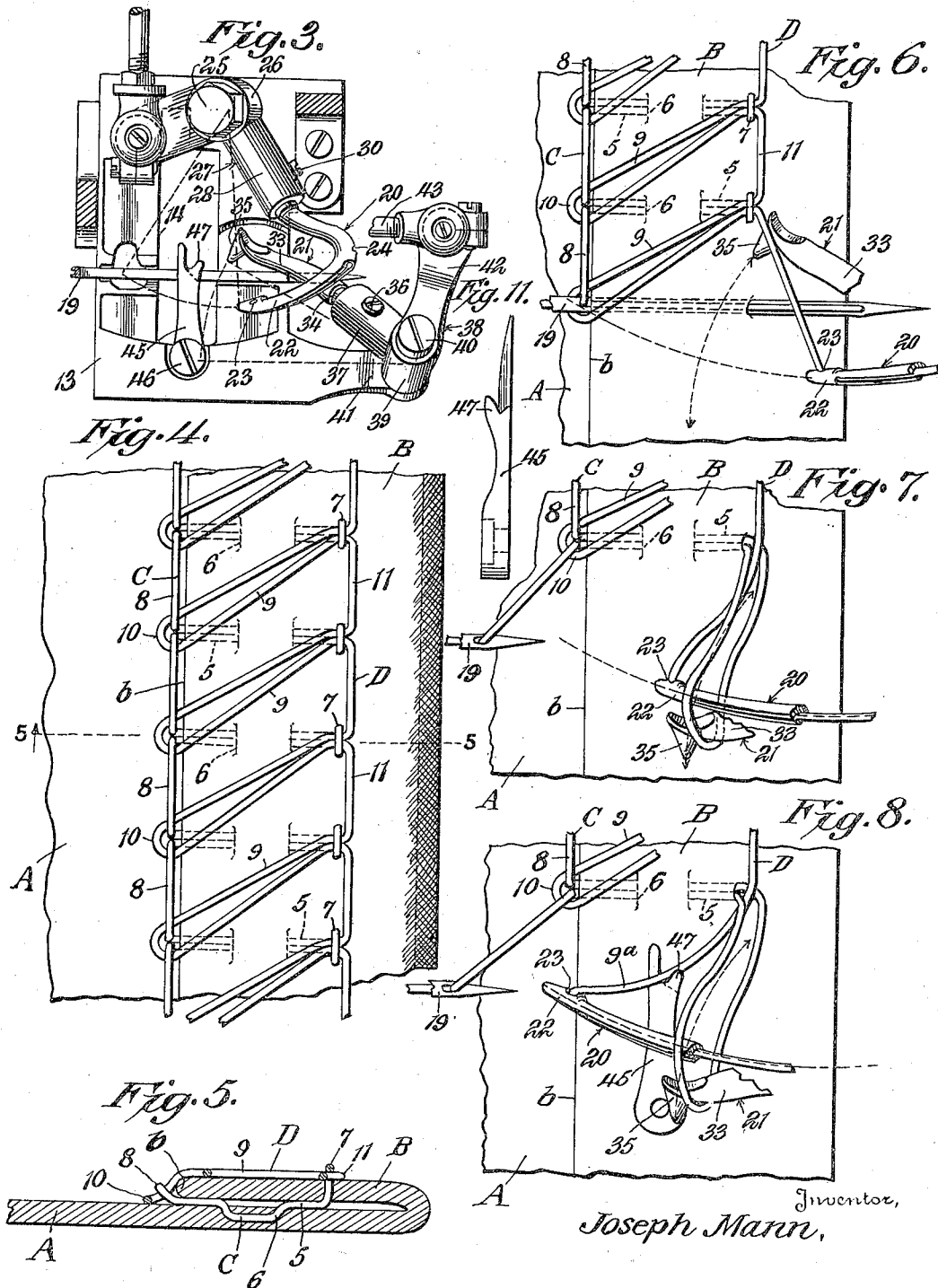
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SEWING MACHINE STITCH FORMING MECHANISM

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2 Sheets-Sheet 2



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SEWING MACHINE STITCH FORMING
MECHANISM

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Application February 5, 1937, Serial No. 124,325

20 Claims. (Cl. 112—177)

This invention relates to new and useful improvements in sewing machines generally, although more particularly to the stitch forming mechanism of a machine of the blind stitch type adapted especially for hemming operations.

Heretofore, unsuccessful attempts have been made on vertical needle machines to produce a flat overedge hem seam. In forming these prior seams, the hem was folded back onto the body fabric and the needle was directed through all three fabric layers, and consequently when the seamed hem was returned to its normal position, a ridge of fabric which formed the hinge, extended along the line of seam.

One of the principal objects of this invention is to provide a blind stitch sewing machine for producing a flat overedge hem seam without folding the hem back onto the body fabric.

Another object of the invention is to provide a horizontally reciprocatory threaded needle, a loop spreader and a loop taker which cooperate with the needle and with each other to lay a loop of thread across the line of seam into position to be entered by the needle, whereby a flat overedge seam will be formed.

A further object of the invention is to provide a chaining-off finger below and over which the thread loops are laid, whereby the machine will chain-off between articles being seamed.

A still further object of the invention is to provide the chaining-off finger with a retainer which functions to retain the rearwardly extending leg of the thread loop extending over the finger, against forward movement whereby the needle will with certainty enter said loop.

With these and other objects in view which will more fully appear, the nature of the invention will be more clearly understood by following the description, the appended claims, and the several views illustrated in the accompanying drawings.

In the drawings—

Figure 1 is a side elevation of a sewing machine arm showing the application of my invention,

Figure 2 is a front elevation thereof,

Figure 3 is a plan view of the presser foot, showing the stitch forming instrumentalities,

Figure 4 is an enlarged plan view of a hemmed seam constructed by my invention,

Figure 5 is a cross section taken on the line 5—5 of Figure 4,

Figure 6 is a detail view showing more or less diagrammatically, the seam and the stitch forming elements, the needle being shown at its extreme forward position,

Figure 7 is a similar view but showing the loop

spreader holding the needle thread loop open for entrance by the needle,

Figure 8 is a similar view but showing the looper thread loop in position to be entered by the needle,

Figure 9 is a detail plan view showing a seam produced by a single thread,

Figure 10 is a detail plan view showing a seam produced by three threads, and

Figure 11 is a side elevation of the chaining-off finger.

Like reference numerals designate corresponding parts throughout the several figures of the drawings.

Although my invention is particularly adapted for seaming a hem, it can be employed for joining superposed fabrics, or for joining the edge of a superposed fabric to the body fabric.

In Figures 4 and 5, I have illustrated a hem seam constructed by my invention. This seam includes a base layer A and a superposed layer B, the latter being preferably formed by a hem fold of the base layer and having an inner edge b. The line of stitches is formed by a needle thread C and a looper thread D. The needle thread is formed into a series of equally spaced loops 5 which are disposed in parallel planes arranged at right angles to the line of seam. The needle loops first pass under the inner edge b of the hem fold, then enter and emerge from the base layer A as at the points 6, and then the bights 7 thereof are projected through the hem fold B, and the connecting portions 8 between the loops being exposed and lying along the side of and in parallelism with the inner edge b of the hem. The looper thread D is formed into a series of equally spaced loops 9 which are disposed in parallel planes inclined to the needle loops 5. The loops 9 project through the bights 7 of the needle loops and over the hem fold B and their bights 10 overlap the inner edge b of the hem fold and are concatenated with the necks of the next adjacent needle loops, the connecting portions 11 of the looper thread extending in a line which parallels the inner edge b of the hem fold.

It will, therefore, be seen that the seam produced on my machine is flat and is therefore devoid of the objectionable ridge heretofore made on a vertical needle machine.

A machine which embodies my invention and which is capable of producing the seam above described, includes a main frame E having a forwardly extending arm 12, to the free end of which is fixed a horizontal presser foot 13 having

an opening 14. A reciprocatory ridge-forming element F functions to project ridges or hems of the body fabric A and hem B upwardly through the opening 14 into needle penetrating position.

5 The fabric is intermittently clamped against the underface of the foot by a vertically movable work clamp G, and an intermittent feed dog H operates through the work clamp to feed the fabric rearwardly when the work clamp is lowered. A main shaft 15 is journaled in the frame and has one end projecting across the rear end of the arm 12. An oscillatory needle shaft 16 which extends longitudinally of the arm 12 is journaled therein, and is driven from the main shaft by the usual connections, not shown. A needle arm 18 is fixed to the front end of the needle shaft 16 and carries a needle 19 which is threaded with the needle thread C. The shaft is located directly above the ridge-forming element F and consequently the needle is reciprocated horizontally across said element and across the presser foot opening 14, the forward or penetrating stroke of the needle being from left to right. A machine, as thus far described, is shown in the Mueller Patent 1,947,-
25 950, Feb. 20, 1934.

A loop taker 20 which in the present case is threaded, cooperates with the needle 19 to move a loop of looper thread D into position for entrance by the needle, and a loop spreader 21 which in the present case is non-threaded, cooperates with both the needle and the loop taker 20 to spread the needle thread loop into position for entrance by the loop taker 20. Thus, in the completed seam a needle thread loop 5 will project through the looper thread loop 9 at the left hand side of the seam and a looper thread loop 9 will project through a needle thread loop 5 at the right hand side of the seam. It will also be noted that the switch forming mechanism which, as shown, comprises the needle 19, the threaded loop taker 20 and the non-threaded loop spreader 21, operates entirely above the presser foot.

The loop taker 20 includes a beak 22 and an attaching shank arranged at substantially right angles to each other, the beak being provided with a thread eye 23 near its point and with a thread guide eye 24 at its heel. Fixedly mounted on the presser foot 13 in rear of the needle path and at the right of the presser foot opening 14, is a bearing 25 which inclines upwardly towards the left, and journaled thereon is the hub 26 of a bell crank lever 27 which includes arms 28 and 29, the former extending forwardly and the latter extending towards the left. The shank of the loop taker 20 is attached to the arm 28 by a screw 30. The beak 22 of the loop taker 20 projects downwardly to the left, and when the lever 27 is oscillated the loop taker 20 will be reciprocated laterally in a slightly arcuate path across the line of seam and in an inclined plane. The loop taker 20 in its forward movement travels from right to left and the path of travel inclines downwardly and rearwardly, the eye 23 thereof being just below and in line with the needle travel when the loop taker 20 is at the end of its forward stroke and when the needle is at the beginning of its forward or penetrating stroke. The other arm 29 of the bell crank lever 27 is connected by a link 31 to an eccentric pin 32 fixed to the end of the main shaft 15.

The term "backward and forward" as applied to the needle 19 and to the loop taker 20, has reference to their reciprocatory strokes and is

not to be considered with respect to the front and the back of the machine.

The loop spreader 21 comprises a beak 33 which is curved downwardly from its horizontal supporting shank 34, the free end of the beak terminating in a forwardly projecting finger 35. The shank 34 is attached by a screw 36 to an arm 37 of a bell crank lever 38 having a hub 39 which is fulcrumed on a rearwardly inclined bearing 40 fixed to an extension 41 which projects laterally from the front right hand corner of the presser foot. The other arm 42 of the bell crank lever 38 is connected by a link 43 to a rock arm 44 fixed to the forward end of the needle shaft 16. The loop spreader 21 reciprocates across the needle path in an upwardly and forwardly inclined path, the spreader finger 35 moving from a point located in rear of the needle path and on the right of the presser foot opening 14 to a point well in front of said needle path, the loop spreader path being at substantially right angles to the loop taker path and inclined with respect to the line of feed.

In operation, when the needle is at the forward end of its stroke, the spreader finger 35 of the loop spreader 21 is located directly in rear of the needle, and the loop taker 20 is substantially at the end of its backward stroke. See Figure 6. As the needle begins its backward stroke the spreader finger 35 is moved forwardly to pick up the needle thread loop and spread the same upwardly and forwardly into position where it will be entered by the loop taker 20 during the beginning of its forward stroke. See Figure 7. The loop taker 20 thus moves its thread loop downwardly and rearwardly to the left and into position where it will be entered by the needle on its next forward or penetrating stroke.

I may desire to substitute a non-threaded loop taker or spreader for the threaded loop taker 20 in which case both the loop taker and the loop spreader will cooperate with each other and with the needle to form an overedge flat seam employing only a single thread, as shown in Figure 9, or I may desire to substitute a threaded loop taker for the loop spreader 21 in which case both the loop taker and the loop spreader will cooperate with each other and with the needle to form a flat overedge seam employing three threads, as shown in Figure 10.

In order for the machine to continue the formation of stitches, either at the end of a seamed fabric or between a seamed fabric and a fabric which has just been inserted in the machine, I have provided the presser foot with a chaining-off finger 45 which is attached at its front end to the front end of the foot by a screw 46. This finger extends rearwardly above the presser foot opening 14 and intersects the needle path, the needle passing under the finger. This finger supports the concatenated needle thread loops 5 and the looper thread loops 9 which respectively extend below and above the finger. Integral with the finger and located immediately in rear of the needle path is a rearwardly and upwardly projecting retainer 47 which functions to retain the rear leg 9^a of the looper thread loop 9 from bowing forwardly and consequently said loop is held open and the needle will with certainty enter said loop.

In operation, the needle moves forwardly under and across the chaining-off finger 45 and enters and emerges from the body fabric or base layer A at the point 6 and then continues its movement and passes upwardly through the hem or super-

posed layer B. At this time, the spreader finger 35 is in rear of the needle path, so that when the needle begins its backward stroke the loop spreader 21 moves forwardly to engage the needle thread loop 5 and spread the same forwardly across the path of the loop taker 20. The loop taker 20 then moves forwardly and downwardly entering the spread needle thread loop, and carrying its own loop 9 rearwardly over and across the chaining-off finger 45 to a position where it will be entered by the needle during the next forward movement of the latter. When the loop taker 20 reaches the end of its forward stroke the leg 9^a of the looper thread loop will be held against forward movement by the retainer 47 which is mounted on the chaining-off finger, and consequently the needle will with certainty enter the looper thread loop.

It is of course to be understood that the details of structure and arrangement of parts may be variously changed and modified without departing from the spirit and scope of my invention.

I claim:

1. In a sewing machine stitch forming mechanism, the combination with a horizontal presser foot having an opening, of means for projecting a ridge of body fabric upwardly through the opening into needle penetrating position, and a stitch forming mechanism operating entirely above the foot and including a threaded needle mounted for horizontal reciprocations across the ridge forming means, and two reciprocatory loop taker and loop spreader elements cooperating with each other and with the needle, one of said elements being supported on the foot.

2. In a sewing machine stitch forming mechanism, the combination with a horizontal presser foot having an opening, of means for projecting a ridge of body fabric upwardly through the opening into needle penetrating position, and a stitch forming mechanism operating entirely above the foot and including a threaded needle mounted for horizontal reciprocations across the ridge forming means, and two reciprocatory loop taker and loop spreader elements cooperating with each other and with the needle, one of said elements being supported on the foot, said elements being fulcrumed on separate and vertically inclined axes respectively located in rear of the needle path and in front of the needle path.

3. In a sewing machine stitch forming mechanism, the combination with a horizontal presser foot having an opening, of means for projecting a ridge of body fabric upwardly through the opening into needle penetrating position, and a stitch forming mechanism operating entirely above the foot and including a threaded needle mounted for horizontal reciprocations across the ridge forming means, and two reciprocatory loop taker and loop spreader elements cooperating with each other and with the needle, one of said elements being supported on the foot, said elements being fulcrumed on separate and vertically inclined axes respectively located in rear of the needle path and in front of the needle path, both of said axes being located on the side of the ridge forming means opposite the needle when the latter is at the beginning of its forward stroke.

4. In a sewing machine stitch forming mechanism, the combination with a horizontal presser foot having an opening, of means for projecting a ridge of body fabric upwardly through the opening into needle penetrating position, and a

stitch forming mechanism operating entirely above the foot and including a threaded needle mounted for horizontal reciprocations across the ridge forming means, and two reciprocatory loop taker and loop spreader elements cooperating with each other and with the needle, said elements being fulcrumed on separate and vertically inclined axes respectively supported on the presser foot in rear of the needle path and in front of the needle path, both of said axes being located on the side of the ridge forming means opposite the needle when the latter is at the beginning of its forward stroke.

5. In a sewing machine stitch forming mechanism, the combination with a horizontal presser foot having an opening, of means for projecting a ridge of body fabric upwardly through the opening into needle penetrating position, and a stitch forming mechanism operating entirely above the foot and including a threaded needle mounted for horizontal reciprocations across the ridge forming means, and two reciprocatory loop taker and loop spreader elements cooperating with each other and with the needle, one of said elements being supported on the foot, one said element traversing the needle path and the other moving in a path inclined to the needle path and across the path of said one element.

6. In a sewing machine stitch forming mechanism, the combination with a horizontal presser foot having an opening, of means for projecting a ridge of body fabric upwardly through the opening into needle penetrating position, and a stitch forming mechanism operating entirely above the foot and including a threaded needle mounted for horizontal reciprocations across the ridge forming means, a reciprocatory loop taker element cooperating with the needle and movable in its forward stroke across the needle path and above the needle, and a reciprocatory loop spreader element cooperating with the loop taker element and with the needle and movable in its forward stroke in a plane diagonal to the needle path and below and across the path of the loop taker element for moving a loop of thread into position to be entered by the needle, one of said elements being supported on the foot.

7. In a sewing machine stitch forming mechanism, the combination with a horizontal presser foot having an opening, of means for projecting a ridge of body fabric upwardly through the opening into needle penetrating position, and a stitch forming mechanism operating entirely above the foot and including a threaded needle mounted for horizontal reciprocations across the ridge forming means, and a reciprocatory non-threaded loop spreader element and a reciprocatory threaded loop taker element cooperating with each other and with the needle, one of said elements being supported on the foot.

8. In a sewing machine stitch forming mechanism, the combination with a horizontal presser foot having an opening, of means for projecting a ridge of body fabric upwardly through the opening into needle penetrating position, and a stitch forming mechanism operating entirely above the foot and including a threaded needle mounted for horizontal reciprocations across the ridge forming means, and a reciprocatory non-threaded loop spreader element and a reciprocatory threaded loop taker element cooperating with each other and with the needle, said loop spreader traversing the needle path for moving the needle thread loop into position to be entered by the loop taker, and the loop taker

traversing the spreader path in a plane diagonal to the needle path for moving the looper thread loop into position to be entered by the needle, one of said elements being supported on the

5 foot.
 9. In a sewing machine, the combination with a horizontal presser foot having an opening; of means for projecting a ridge of fabric upwardly through said opening into needle penetrating position; and a stitch forming mechanism operating entirely above the foot and comprising a reciprocatory threaded needle, a reciprocatory loop spreader element, and a reciprocatory threaded loop taker element, and means for operating the
 10 needle, the loop spreader element and the loop taker element in timed relation whereby the loop spreader element will engage and spread the needle thread loop into position to be entered by the loop taker element, and the loop
 15 taker element will then enter the spread needle thread loop and then move the looper thread loop into position to be entered by the needle, one of said elements being supported on the foot.

10. In a sewing machine, the combination with a horizontal presser foot having an opening; of means for projecting a ridge of fabric upwardly through said opening into needle penetrating position; and a stitch forming mechanism operating entirely above the foot and comprising a reciprocatory threaded needle having its path of movement across said ridge forming means with its penetrating stroke being from left to right, a reciprocatory loop spreader having a forward and backward movement on the
 30 right of the opening, and a reciprocatory threaded loop taker having its path of movement in front of the needle path and from one side of the ridge forming means to the other, and means for operating the needle, the loop spreader and the loop taker in timed relation whereby the loop spreader will engage and spread the needle thread loop into position to be entered by the
 40 loop taker, and the loop taker will then enter the spread needle thread loop and then move the looper thread loop into position to be entered by the needle.

11. In a sewing machine, the combination with a horizontal presser foot having an opening; of means for projecting a ridge of fabric upwardly through said opening into needle penetrating position; and a stitch forming mechanism operating entirely above the foot and comprising a reciprocatory threaded needle having its path of movement across said ridge forming means with its penetrating stroke being from left to right, a reciprocatory loop spreader having a forward and backward movement on the right of the ridge forming means, the loop spreader swinging about an axis inclined to the vertical whereby its loop spreading will be upwardly and forwardly to a point in front of the needle path and the chord of the arc of movement will be inclined to the left, and a reciprocatory threaded loop taker having its path of movement in front of the needle
 65 path and from one side of the ridge forming means to the other, and means for operating the needle, the loop spreader and the loop taker in timed relation whereby the loop spreader will engage and spread the needle thread loop into position to be entered by the loop taker, and the loop taker will then enter the spread needle thread loop and then move the looper thread loop into position to be entered by the needle.

12. In a sewing machine, the combination with
 75 a horizontal presser foot having an opening; of

means for projecting a ridge of fabric upwardly through said opening into needle penetrating position; and a stitch forming mechanism operating entirely above the foot and comprising a reciprocatory threaded needle having its path of movement across said ridge forming means with its penetrating stroke being from left to right, a reciprocatory loop spreader having a forward and backward movement on the right of the ridge forming means, and a reciprocatory threaded loop taker having its path of movement in front of the needle path and from one side of the ridge forming means to the other, and means for operating the needle, the loop spreader and the loop taker in timed relation whereby the loop spreader will engage and spread the needle thread loop into position to be entered by the loop taker, and the loop taker will then enter the spread needle thread loop and then move the looper thread loop into position to be entered by the needle, the loop taker swinging about an axis inclined to the vertical whereby its loop entering movement will be downwardly and rearwardly, the chord of the arc of movement being inclined rearwardly.

13. In a sewing machine, the combination with a horizontal presser foot having an opening; of means for projecting a ridge of fabric upwardly through said opening into needle penetrating position; and a stitch forming mechanism operating entirely above the foot and comprising a reciprocatory threaded needle having its path of movement across said ridge forming means with its penetrating stroke being from left to right, the needle swinging about a horizontal axis located directly over the ridge forming means, a reciprocatory loop spreader having a forward and backward movement on the right of the ridge forming means, the loop spreader swinging about an axis inclined to the vertical whereby its loop spreading movement will be upwardly and forwardly to a point in front of the needle path and the chord of the arc of movement will be inclined to the left, and a reciprocatory threaded loop taker having its path of movement in front of the needle path and from one side of the ridge forming means to the other, and means for operating the needle, the loop spreader and the loop taker in timed relation whereby the loop spreader will engage and spread the needle thread loop into position to be entered by the loop taker, and the loop taker will then enter the spread needle thread loop and then move the looper thread loop into position to be entered by the needle, the loop taker swinging about an axis inclined to the vertical whereby its loop entering movement will be downwardly and rearwardly, the chord of the arc of movement being inclined rearwardly.

14. In a sewing machine, the combination with a horizontal presser foot having an opening; of means for projecting a ridge of fabric upwardly through said opening into needle penetrating position; and a stitch forming mechanism operating entirely above the foot and comprising a reciprocatory threaded needle having its path of movement across said ridge forming means with its penetrating stroke being from left to right, the needle swinging about a horizontal axis located directly over the ridge forming means, a reciprocatory loop spreader having a forward and backward movement on the right of the ridge forming means, the loop spreader swinging about an axis inclined to the vertical and mounted on the foot in front of the needle path whereby its loop spreading movement will be upwardly and forwardly to a point in front of the needle path and

the chord of the arc of movement will be inclined to the left, and a reciprocatory threaded loop taker having its path of movement in front of the needle path and from one side of the ridge

5 forming means to the other, and means for operating the needle, the loop spreader and the loop taker in timed relation whereby the loop spreader will engage and spread the needle thread loop into position to be entered by the loop taker, and
10 the loop taker will then enter the spread needle thread loop and then move the looper thread loop into position to be entered by the needle, the loop taker swinging about an axis inclined to the vertical and mounted on the foot in rear of the
15 needle path whereby its loop entering movement will be downwardly and rearwardly, the chord of the arc of movement being inclined rearwardly.

15. In a sewing machine stitch forming mechanism, the combination with a horizontal presser
20 foot having an opening, of means for projecting a ridge of body fabric upwardly through the opening into needle penetrating position, a chaining-off finger mounted on the foot and projecting
25 rearwardly along the opening above the ridge forming means, and a stitch forming mechanism operating entirely above the foot and including a threaded needle mounted for horizontal reciprocations across the ridge forming means and
30 under the finger, and two reciprocatory loop spreader and loop taker elements cooperating with each other and with the needle for moving a thread loop over the finger into position to be
entered by the needle.

16. In a sewing machine stitch forming mechanism, the combination with a horizontal presser foot
35 having an opening, of means for projecting a ridge of body fabric upwardly through the opening into needle penetrating position, a chaining-off finger mounted on the foot and projecting rearwardly
40 along the opening above the ridge forming means, and a stitch forming mechanism operating entirely above the foot and including a threaded needle mounted for horizontal reciprocations across the ridge forming means and under the
45 finger, and two reciprocatory loop spreader and loop taker elements cooperating with each other and with the needle, one of said elements being threaded and movable in a path inclined to the
50 needle path for moving its threaded loop across the opening and over the finger into position to be entered by the needle.

17. In a sewing machine stitch forming mechanism, the combination with a horizontal presser
55 foot having an opening, of means for projecting a ridge of body fabric upwardly through the opening into needle penetrating position, a chaining-off finger mounted on the foot and projecting rearwardly along the opening above the ridge
60 forming means, and a stitch forming mechanism operating entirely above the foot and including a threaded needle mounted for horizontal reciprocations across the ridge forming means and under the finger, and two reciprocatory loop
65 spreader and loop taker elements cooperating with each other and with the needle for moving a thread loop over the finger into position to be entered by the needle, one of said elements being threaded and movable in a path inclined to the needle path for moving its thread loop across the

opening and over the finger into position to be entered by the needle, said chaining-off finger being provided with a retainer located in rear of the needle path for retaining the element thread
5 loop extending over said finger in open relation to insure said loop being entered by the needle.

18. In a sewing machine stitch forming mechanism, the combination with a horizontal presser
10 foot having an opening, of means for projecting a ridge of body fabric upwardly through the opening into needle penetrating position, a chaining-off finger mounted on the foot and projecting rearwardly along the opening above the ridge
15 forming means, and a stitch forming mechanism operating entirely above the foot and including a threaded needle mounted for horizontal reciprocations across the ridge forming means and under the finger, and two reciprocatory loop
20 spreader and loop taker elements cooperating with each other and with the needle, one of said elements being threaded and movable in a path inclined to the needle path for moving its thread loop across the opening and over the finger into
25 position to be entered by the needle, said chaining-off finger being provided with a rearwardly projecting retainer located in rear of the needle path for retaining the leg of the element thread loop extending rearwardly to the last formed
30 stitch against forward movement whereby the needle will with certainty enter said element thread loop.

19. In a sewing machine for joining an edge of a superposed fabric to a body fabric, the combination with a horizontal presser foot having an
35 opening, of means for projecting a ridge of body fabric and the edge of the superposed fabric upwardly through the opening into needle penetrating position, and a stitch forming mechanism operating entirely above the foot and including
40 a reciprocatory needle for projecting a needle loop into and out of the base layer below the superposed fabric and then upwardly through the latter, and means for projecting a looper thread loop through the bight of the projecting needle
45 thread loop with the bight of the looper thread loop over the edge of the superposed fabric in position to be entered by the needle.

20. In a sewing machine for joining an edge of a superposed fabric to a body fabric, the combination with a horizontal presser foot having an
50 opening, of means for projecting a ridge of body fabric and the edge of the superposed fabric upwardly through the opening into needle penetrating position, and a stitch forming mechanism operating entirely above the foot and including
55 a reciprocatory needle for projecting a needle loop into and out of the base layer below the superposed fabric and then upwardly through the latter, a reciprocatory non-threaded loop spreader movable across the needle path and on one
60 side of the ridge forming means, and a reciprocatory threaded loop taker movable in front of and in a path diagonal to the needle path, said loop spreader moving the needle thread loop forwardly into position to be entered by the loop
65 taker, and the loop taker moving its thread loop to the other side of the ridge forming means into position to be entered by the needle.

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