

May 5, 1953

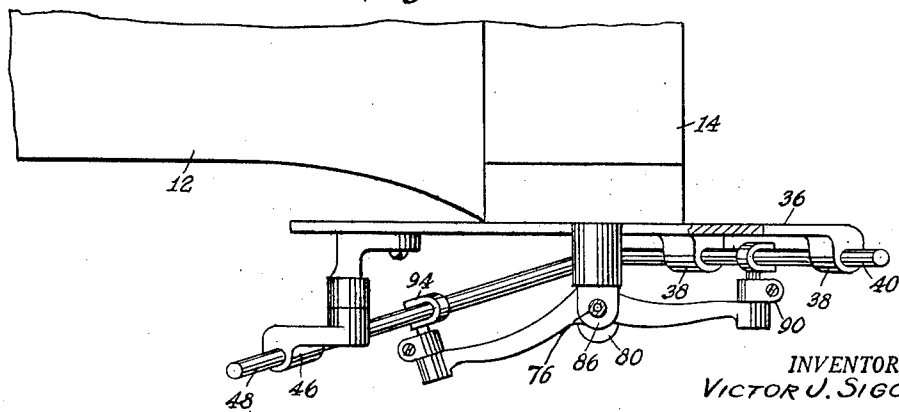
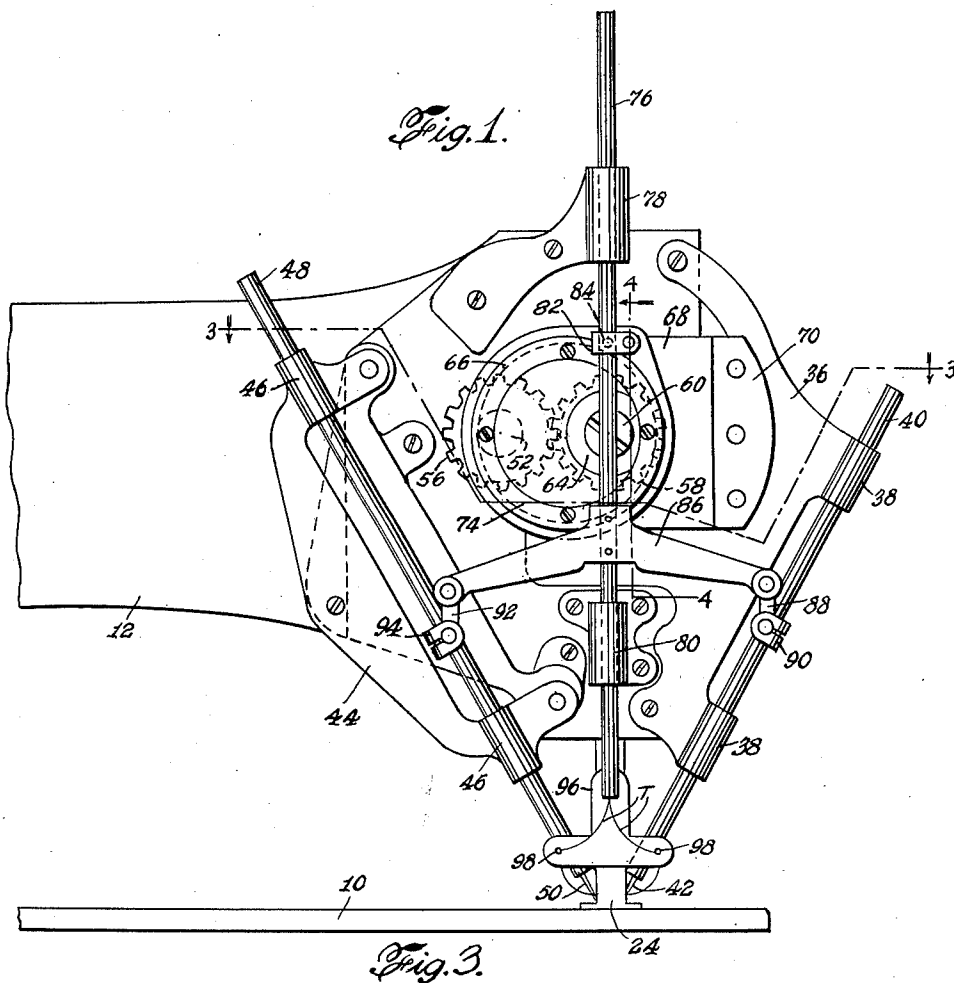
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2,637,290

MULTIPLE NEEDLE STITCHING MECHANISM

Filed July 2, 1947

3 Sheets-Sheet 1



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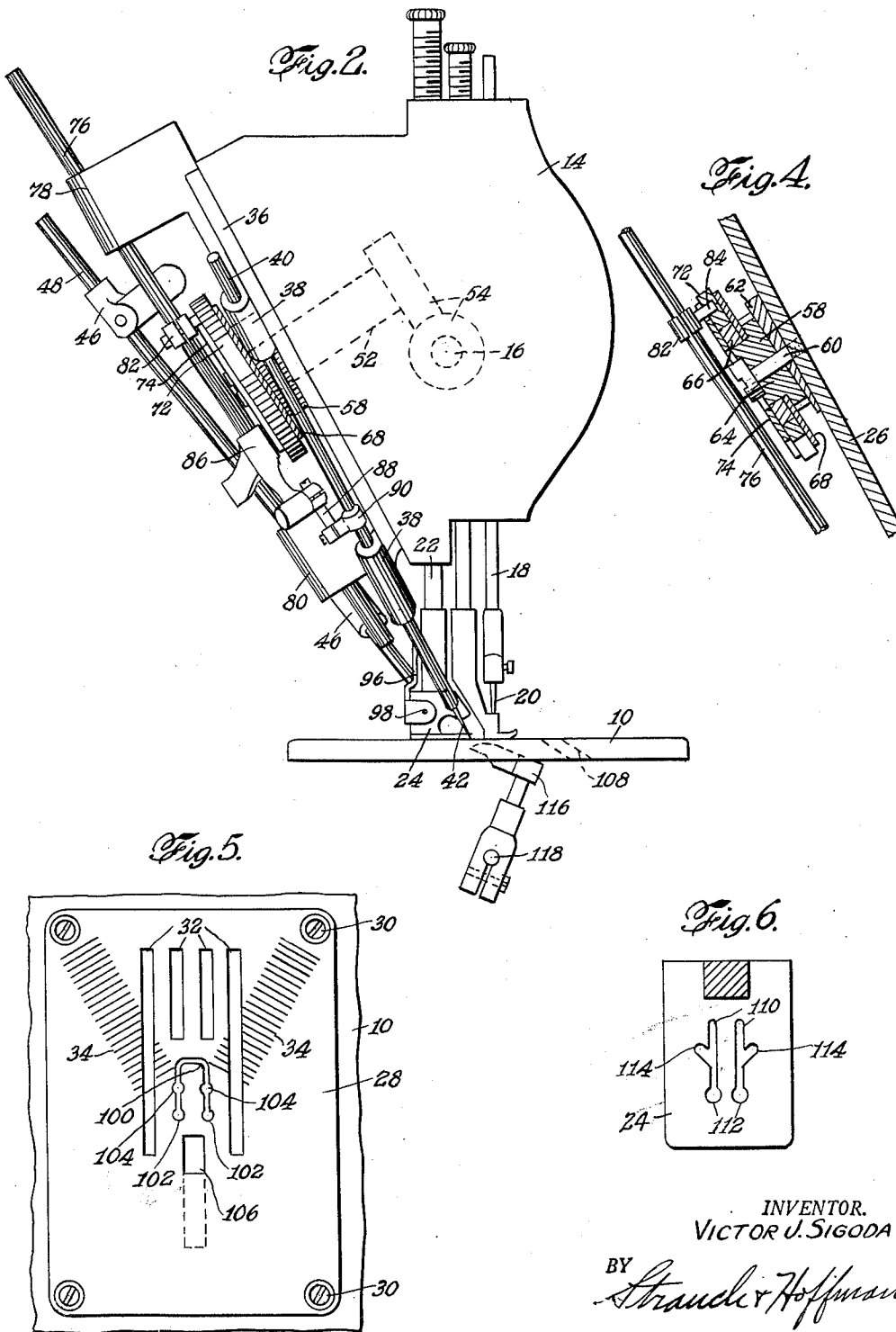
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MULTIPLE NEEDLE STITCHING MECHANISM

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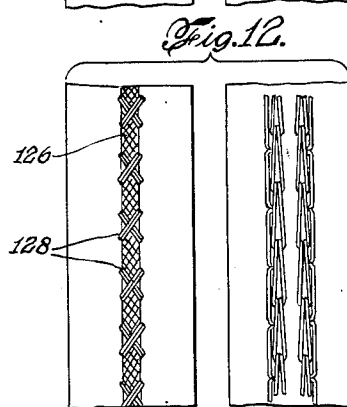
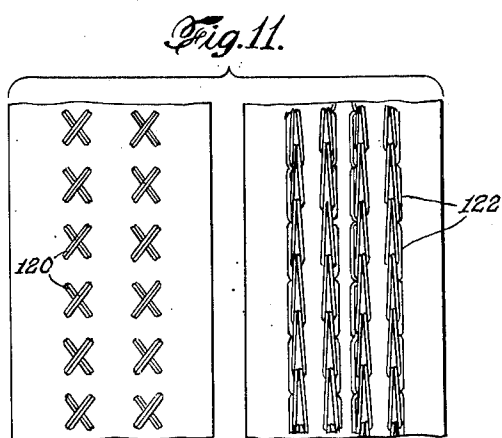
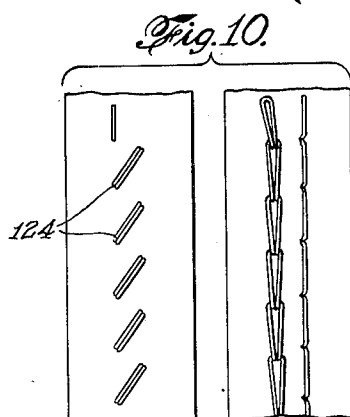
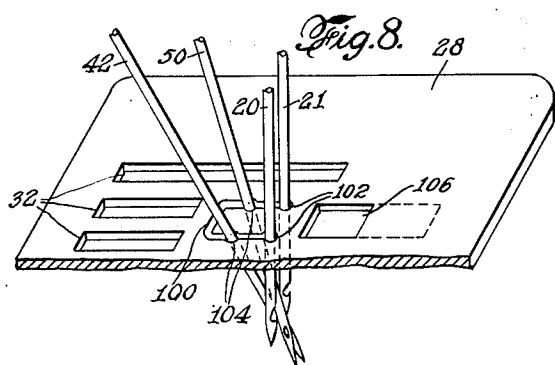
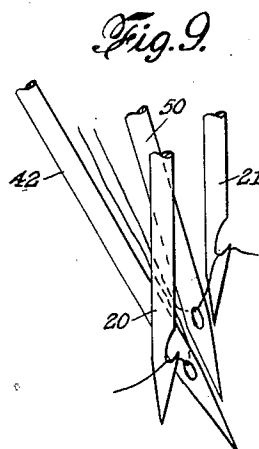
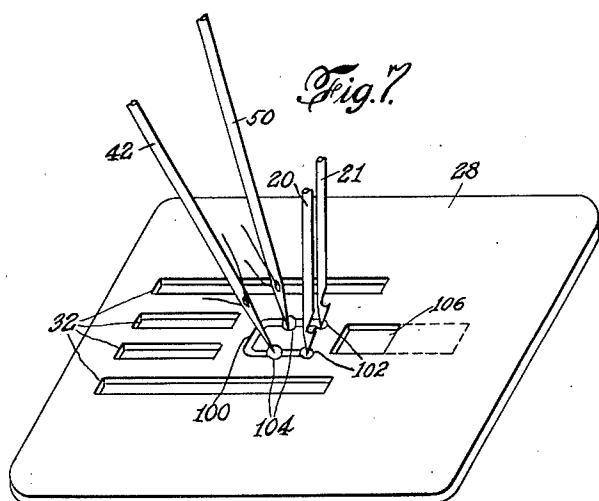
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MULTIPLE NEEDLE STITCHING MECHANISM

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3 Sheets-Sheet 3



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MULTIPLE NEEDLE STITCHING MECHANISM

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15 Claims. (Cl. 112—98)

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This invention relates to multiple needle stitching mechanism for applying ornamental or embroidery stitching to fabric materials, and has for its general object and purpose to simplify and improve the machine of this type disclosed in Patent No. 2,369,183, issued February 13, 1945, whereby various novel ornamental stitch designs may be accurately produced at high operating speeds.

It is one of the important objects of the invention to provide a novel mounting and arrangement of a thread carrying needle, together with operating means for reciprocating said needle in a lateral and longitudinally, obliquely angled path with respect to the work and intersecting the path of vertical reciprocation of a thread receiving hook needle, whereby a row of stitches is formed on the right side of the fabric with the individual stitches diagonally disposed in parallel uniformly spaced relation.

It is another object of the invention to provide multiple needle stitching mechanism embodying a pair of laterally spaced, vertically reciprocating hook needles, and a pair of thread carrying needles mounted and arranged for reciprocating movement in relatively different, downwardly converging, obliquely angled paths which intersect below the bed plate of the machine, whereby each of said thread carrying needles cooperates with a diagonally opposite hook needle to produce diagonally crossed thread stitches on the fabric.

It is a further object of the invention to provide improved eccentric actuated means at one side of the machine arm, operatively connected with the main needle operating shaft mounted therein, and with the two obliquely inclined thread carrying needles, whereby the latter are reciprocated in properly timed relation with the reciprocating movement of the vertically movable hook needles.

An additional object is to provide novel actuating mechanism for the thread carrying needles, comprising a minimum number of elements of simple and rugged structural form, resulting in material economies in production costs and reasonably low maintenance expense.

With the above and other objects in view, the invention comprises the improved multiple needle stitching mechanism, and the construction and relative arrangement of its several parts, as will hereinafter be more fully described, illustrated in the accompanying drawings, and subsequently incorporated in the subjoined claims.

In the drawings, wherein I have selected for

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illustration one simple and practical embodiment of the invention, and in which similar reference characters designate corresponding parts throughout the several views:

Figure 1 is a fragmentary rear side elevation of a sewing machine arm, illustrating one mounting and arrangement of the present invention thereon;

Figure 2 is an end elevation;

Figure 3 is a horizontal sectional view substantially as indicated by the line 3—3 on Figure 1;

Figure 4 is a detail vertical sectional view taken substantially on the line 4—4 of Figure 1;

Figure 5 is a plan view of the needle or throat plate;

Figure 6 is a similar view of the presser foot;

Figure 7 is a perspective view of the throat plate, illustrating the relationship of the hook and thread carrying needles in their downward movement through the needle openings;

Figure 8 is a similar view, showing the thread carrying needles in intersecting relation below the throat plate, and cooperating with the diagonally opposite hook needles;

Figure 9 is a detail perspective view on an enlarged scale showing the hook and thread carrying needles at the start of their upward stroke, with the threads engaged in the needle hooks; and

Figures 10, 11 and 12 are plan views, each showing the right and wrong sides of a piece of fabric to which embroidery stitching of different ornamental designs has been applied by the present invention.

Referring in further detail to the drawings, 10 indicates the bed plate of the machine and 12 the usual hollow horizontal arm spaced above said plate and terminating in the head or housing 14 for the operating connections between the main longitudinal power driven shaft 16 mounted in said arm, and the vertically reciprocating needle bar 18. As herein shown, a pair of laterally spaced hook needles 20 and 21 respectively, are fixed in the lower end of the needle bar 18 in the usual manner.

The presser foot bar 22 is mounted for vertical reciprocation in the guide head 14, and is provided at its lower end with presser foot 24 which will be later described in further detail. As will be seen from reference to Figures 2 and 4, the rear side wall 26 of the needle bar guide head 14 is vertically inclined downwardly towards the presser foot 24. As seen in Figure 2, and the above mentioned patent, an auxiliary presser

foot guides and directs the reciprocating movements of the hook needles 20 and 21.

As shown in Figure 5 of the drawings, the needle or throat plate 28 is secured to the bed plate 10 by suitable screws indicated at 30. This plate is provided with a plurality of spaced, longitudinally extending slots 32 to accommodate the upwardly projecting toothed ribs of the usual four motion feed dog, which is operatively mounted beneath the bed plate 10. Preferably, the upper surface of plate 28 is provided with two diagonally extending series of serrations 34 at opposite sides of the slots 32 for the purpose of securely holding the fabric material between its intermittent feeding movements against lateral shifting movement beneath the presser foot 24.

To the rear side wall 26 of the head 14, a bracket member 36 is suitably secured and is provided with spaced guide bearings 38 in which a needle bar 40 is mounted for reciprocating movement at a laterally oblique angle at the outer side of pressure foot 24, and in a plane substantially parallel with the inclined wall 26. In the lower end of needle bar 40, a thread carrying needle 42 is secured.

A second bracket member 44 is also suitably mounted upon the wall 26 in a vertically inclined plane converging downwardly towards said wall. This bracket has upper and lower guide bearings 46 for a second needle bar 48 which is supported thereby for reciprocating motion in an obliquely angled path at the inner side of presser foot 24 and in downwardly converging relation to the needle bar 40. A second thread carrying needle 50 is suitably fixed in the lower end of the needle bar 48.

The needle bars 40 and 48 are simultaneously reciprocated in the same direction and in timed relation to the vertically reciprocating needle bar 18. For this purpose, I have herein shown a transverse shaft 52 suitably journaled on the rear wall 26 of the head 14, and having its axis disposed substantially at right angles to the plane thereof. Spiral gears 54 drivingly connect this shaft at its inner end with the main shaft 16 of the machine. At its outer end, a gear 56 is fixed to shaft 52 and is in constant mesh with a similar gear 58 rotatably supported upon a stud bolt 60 extending through a spacing block 62 between said gear and the outer surface of the inclined wall 26, and threaded in said wall. The gear 58 has a hub 64 upon which an eccentric 66 is keyed or otherwise fixed.

An annular strap or band 72 peripherally circumscribes the eccentric 66. An annular plate 74 fixed to eccentric 66 by screws, has its outer edge portion overlapping band 72. A plate 68, fixed between gear 58 and eccentric 66, also overlaps band 72, and carries a weight 70 at one end thereof to counterbalance vibrations set up in the rotation of the eccentric. The plates 68 and 74 thus retain the strap or band 72 in assembled position against axial displacement relative to the eccentric.

A vertically movable rod 76 is mounted to reciprocate in the vertically spaced guide brackets 78 and 80 secured to the wall 26. A collar 82 fixed to this rod carries a pin or stud 84 which is pivotally connected, as shown in Figure 4, with the eccentric strap or band 72. A member 86 is fixed to the rod 76 and provided with arms extending laterally from opposite sides thereof. One of said arms is pivotally connected by link 88 with a collar 90 secured to needle bar 40, while the other of

said arms is pivotally connected by means of a similar link 92 to collar 94 on the needle bar 48. It will thus be apparent that in the rotation of the eccentric 66, the rod 76 is vertically reciprocated in the guide brackets 78 and 80, and simultaneous and equal reciprocating motion is transmitted thereby to the two obliquely disposed needle bars 40 and 48. Preferably, the rod 76 is of tubular form to provide a guide for the threads indicated at T, which extend from the lower end of said rod through spaced guide apertures 98 in bracket 96 fixed to the presser foot 24, and hence through the eye openings in needles 42 and 50.

As seen in Figure 5 of the drawings, throat plate 28 between the outer side slots 32 for the feed dog, is provided with a narrow U-shaped slot 100 extending longitudinally thereof. The parallel legs of said slot at their forward ends communicate with openings 102 which receive the vertically reciprocating hook needles 20 and 21. In rearwardly spaced relation from these openings, the additional openings 104 are provided for the thread carrying needles 42 and 50. In advance of the needle openings 102, the throat plate may also be provided with a rectangular opening 106 to register with the upper end of a rearwardly inclined slot 108 in the bed plate 10, through which an ornamental tape may be fed from a roll suitably mounted below the bed plate to the underside of the fabric in its movement over the throat plate 28 and beneath presser foot 24.

The presser foot 24 is also provided with parallel, longitudinally extending slots 110 communicating at their forward ends with openings 112 aligned with the needles 20 and 21 and registering with openings 102 in the throat plate. A rearwardly inclined branch slot 114 communicates with the outer side of each slot 110 to receive the obliquely inclined thread carrying needles 42 and 50 in their movement through the openings 104 in throat plate 28.

Below the bed plate 10, a pair of thread loop forming hooks or measuring fingers 116 are mounted upon an oscillating shaft 118 to engage the respective threads carried by the needles 42 and 50, after they have been received by the respective cooperating hook needles 20 and 21. These fingers function in substantially the same manner as the thread loop forming hook 43 described in Patent No. 2,369,183. Their operation is properly timed so that as the thread loops lie about the shank of the hook needles above the hook, the thread loop forming hooks or measuring fingers 116 engage the loop thread to tension it about the shank of the hook needle so that in the course of the upward stroke, the loop will be positively engaged by the hook. In so doing, enough thread is measured out to prevent breakage of the loop thread or puckering of the material. However elements 116 are not an essential part of the present invention and other conventional means may be employed for this purpose.

From the above description, the operation of my improved multiple needle stitching mechanism may be readily understood with reference to Figures 10 to 12 of the drawings. Thus, after each intermittent feeding movement of the fabric, and while it is held stationary on throat plate 28 by the presser foot 24, in the operation of the main shaft 16, the hook carrying needles 20 and 21 move downwardly through openings 112 in the presser foot and openings 102 in the throat plate, and simultaneously the thread carrying needles 42 and 50 are moved downwardly by operation of

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the eccentric 66 through the respective branch slots 114 in the presser foot and openings 104 in the throat plate. It will be apparent that, due to the oblique angular relation of the needles 42 and 50 with respect to each other and with relation to the vertically movable hook needles 20 and 21, below the throat plate the respective thread carrying needles will move between the vertical hook needles in intersecting relation to each other, and each thread carrying needle also moving in closely adjacent relation to the path of vertical movement of the diagonally opposite hook needle, as best shown in Figures 8 and 9 of the drawings. Due to the mounting of the thread carrying needle 50 in obliquely angled relation from the plane of operation of the needle 42, there is no liability of interference between the two needles as the points thereof move downwardly in intersecting relation between the spaced hook needles.

As shown in Figure 9 of the drawings, in the upward stroke of the needles, the threads carried by the respective needles 42 and 50 will be caught by the hooks of the diagonally opposite needles and drawn upwardly through previously formed thread loops on the upper side of the fabric, thus forming the diagonally crossed thread stitches on the underside of the fabric, which is the right side thereof, as shown at 120 in Figure 11 of the drawings. On the upper or wrong side of the fabric, the usual chain of interlocking thread loops 122 will be formed.

The machine may be operated with the use of only a single hook needle and cooperating thread carrying needle, in which event, a row of equidistantly spaced, diagonally parallel thread stitches 124 will be formed on the right side of the fabric, as shown in Figure 10. When the ornamental tape or braid 126 of Figure 12 is fed to the underside of the fabric through the opening 106 in the throat plate, this tape at spaced intervals will be securely bound or held on the surface of the fabric by the diagonally crossed stitches 128, which may be of contrasting color to the tape and the fabric, to provide an ornamental and attractive embroidery design thereon. Of course it will be understood that by providing interchangeable presser feet and throat plates for the machine and multiplying the number of thread carrying and hook needles, multiple rows of embroidery stitching may be produced in one operation of the machine.

From the above it will be seen that I have devised a very novel mounting and arrangement of the thread carrying needles with respect to the cooperating hook needles, together with simple and reliably functioning means for the high speed operation of the two sets of needles in properly timed relation to each other, whereby the row of ornamental stitches is accurately applied to the fabric. While the eccentric actuated means geared to the main shaft of the machine for reciprocating the thread carrying needles has been found highly efficient, other equivalent mechanisms may be employed in connection with the fundamentally novel features of the invention for transmitting simultaneous reciprocating motion to said needles. However, the disclosed construction comprises a minimum number of elements of simple and rugged structural form, which may be quickly and accurately assembled in proper cooperative relation to each other. It will be apparent of course, that this actuating mechanism for the thread carrying needles, may, if desired, be enclosed within a suitable protective housing attached to the rear side wall of the

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sewing machine arm. It will be also be evident that the comparative simplicity of my present improvements is conducive to low production costs and minimum maintenance expense.

The invention may be embodied in other specific forms without departing from the spirit or essential characteristics thereof. The present embodiment is therefore to be considered in all respects as illustrative and not restrictive, the scope of the invention being indicated by the appended claims rather than by the foregoing description, and all changes which come within the meaning and range of equivalency of the claims are therefore intended to be embraced therein.

What is claimed and desired to be secured by United States Letters Patent is:

1. In multiple needle stitching mechanism, a horizontal support over which the work is intermittently rearwardly fed, a vertically reciprocating hook needle movable through said support, a thread carrying needle rearwardly of the hook needle and movable through said work support, said thread carrying needle being mounted for reciprocation in a linear path in a downwardly converging relation to the hook needle and in a vertical plane oblique to a vertical plane parallel to the line of feed and intersecting same substantially in the axis of the hook needle, and actuating means for reciprocating said needles in timed relation, with said thread carrying needle moving below the work support in a path intersecting said path of reciprocation of the hook needle and in closely cooperating relation with said hook needle to form a thread stitch on one side of the work disposed diagonally of the line of feed thereof.

2. Multiple needle stitching mechanism as defined in claim 1, wherein said actuating means includes a main shaft, an eccentric geared to said main shaft, and means operatively connecting said eccentric with the thread carrying needle.

3. Multiple needle stitching mechanism as defined in claim 2, wherein said connecting means comprises a reciprocating member and linkage connecting said member with the obliquely inclined thread carrying needle.

4. Multiple needle stitching mechanism as defined in claim 1, wherein said actuating means comprises a main shaft, a tubular thread guide for the thread carrying needle mounted for vertical reciprocation, means operatively connecting said main shaft with said guide, and a motion transmitting connection between said thread guide and the obliquely inclined thread carrying needle.

5. In multiple needle stitching mechanism, a horizontal support over which the work is intermittently rearwardly fed, a pair of laterally spaced apart hook needles vertically reciprocating through said support, a pair of thread carrying needles in rearwardly spaced relation from the hook needles at opposite sides of the line of feed in laterally inclined downward convergent relation to each other, each of said thread carrying needles being mounted for reciprocation through said work support in a linear path in downwardly converging relation to its diagonally opposed hook needle and in a vertical plane oblique to a vertical plane parallel to the line of feed and intersecting same substantially in the axis of its closely cooperating diagonally opposed hook needle below said work support to form thread stitches on one side of the work in diagonally crossed relation to the feed path of the work, and means for actuating said thread

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carrying needles in timed relation with the reciprocation of said hook needles.

6. Multiple needle stitching mechanism as defined in claim 5, wherein said thread carrying needles are disposed at relatively different, downwardly convergent angles to the hook needles for movement relative to the latter in non-interfering, intersecting paths..

7. Multiple needle stitching mechanism as defined in claim 6, in which said actuating means comprises a power driven member operatively mounted between said thread carrying needles, and means for transmitting simultaneous and equal reciprocating motion for said member to the thread carrying needles in the same direction. 15

8. Multiple needle stitching mechanism as defined in claim 6, in which said actuating means comprises a power driven, reciprocable member mounted between and operatively connected with said obliquely inclined thread carrying needles to simultaneously and equally reciprocate said needles in the same direction. 20

9. Multiple needle stitching mechanism as defined in claim 6, in which said actuating means comprises a main operating shaft for said hook needles, a member mounted for reciprocation between said obliquely inclined thread carrying needles, motion transmitting linkage between said member and each of said needles, and means operatively connecting said member with said main shaft. 30

10. Multiple needle stitching mechanism as defined in claim 5, wherein said actuating means includes a power driven eccentric, a member mounted for reciprocation between the thread carrying needles operatively connected with said eccentric, and means for transmitting simultaneous and equal reciprocatory motion from said member to the thread carrying needles in the same direction. 35

11. Multiple needle stitching mechanism as defined in claim 5, wherein said actuating means

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comprises a main actuating shaft for the hook needles, a member driven from said main shaft movably mounted between the thread carrying needles, and linkage pivotally connecting said member with each of said needles to simultaneously and equally reciprocate said needles in the same direction.

12. Multiple needle stitching mechanism as defined in claim 5, wherein said actuating means comprises a main operating shaft for the hook needles, an eccentric mounted between said thread carrying needles and operatively driven from said main shaft, and means actuated by said eccentric connected with said thread carrying needles to simultaneously and equally reciprocate said needles in the same direction.

13. Multiple needle stitching mechanism as defined in claim 12, in which said eccentric actuated means comprises a vertically reciprocating member and motion transmitting means between said member and said thread carrying needles.

14. Multiple needle stitching mechanism as defined in claim 12, in which said eccentric actuated means includes a tubular thread guiding member for said thread carrying needles.

15. Multiple needle stitching mechanism as defined in claim 10, wherein the connecting means between said member and the eccentric includes means for counter-balancing vibration.

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