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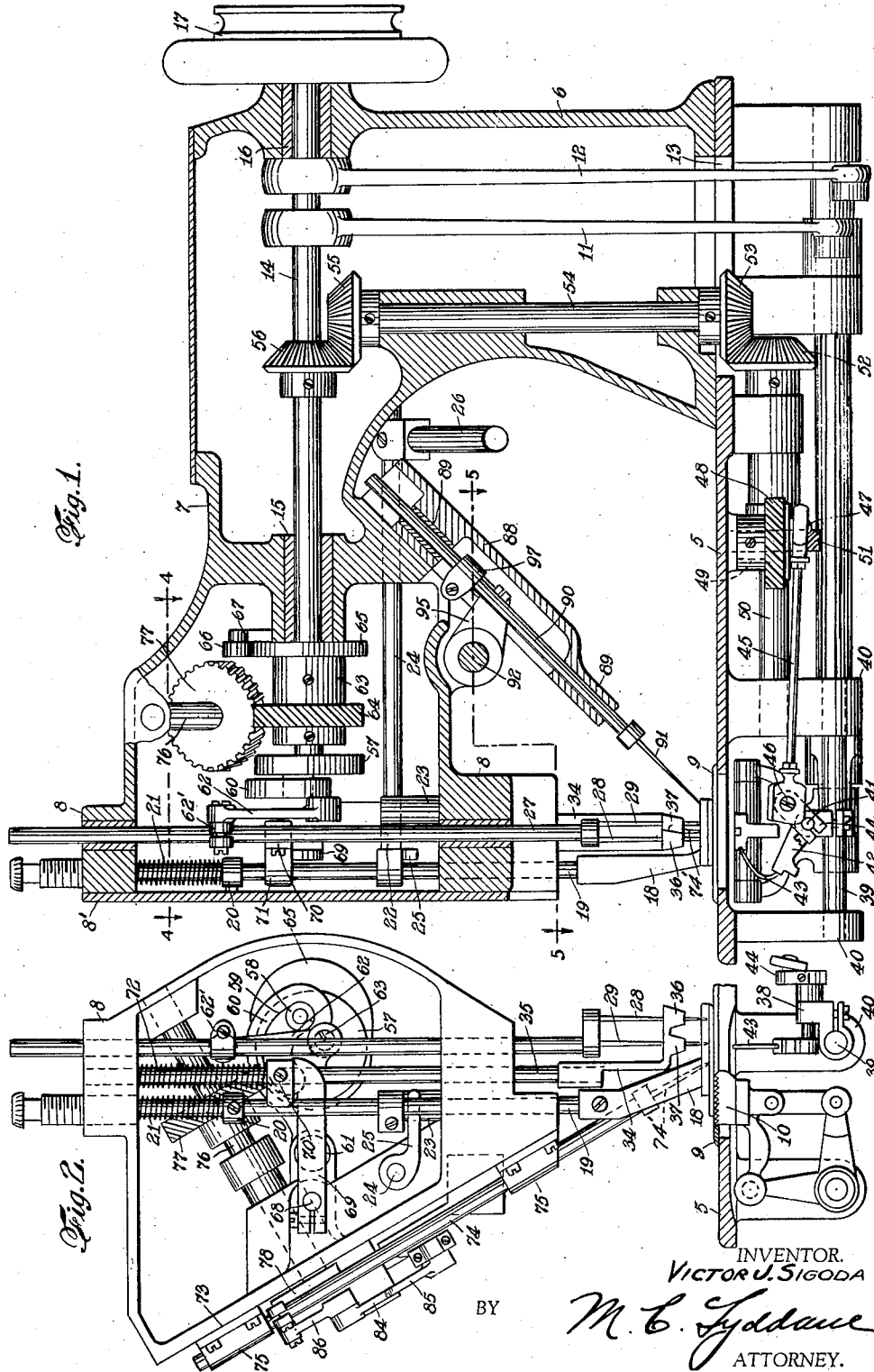
V. J. SIGODA

2,369,183

MULTIPLE NEEDLE STITCHING MECHANISM

Filed Oct. 5, 1939

4 Sheets-Sheet 1



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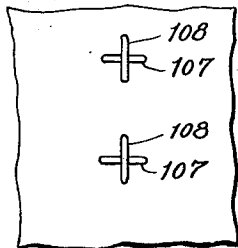
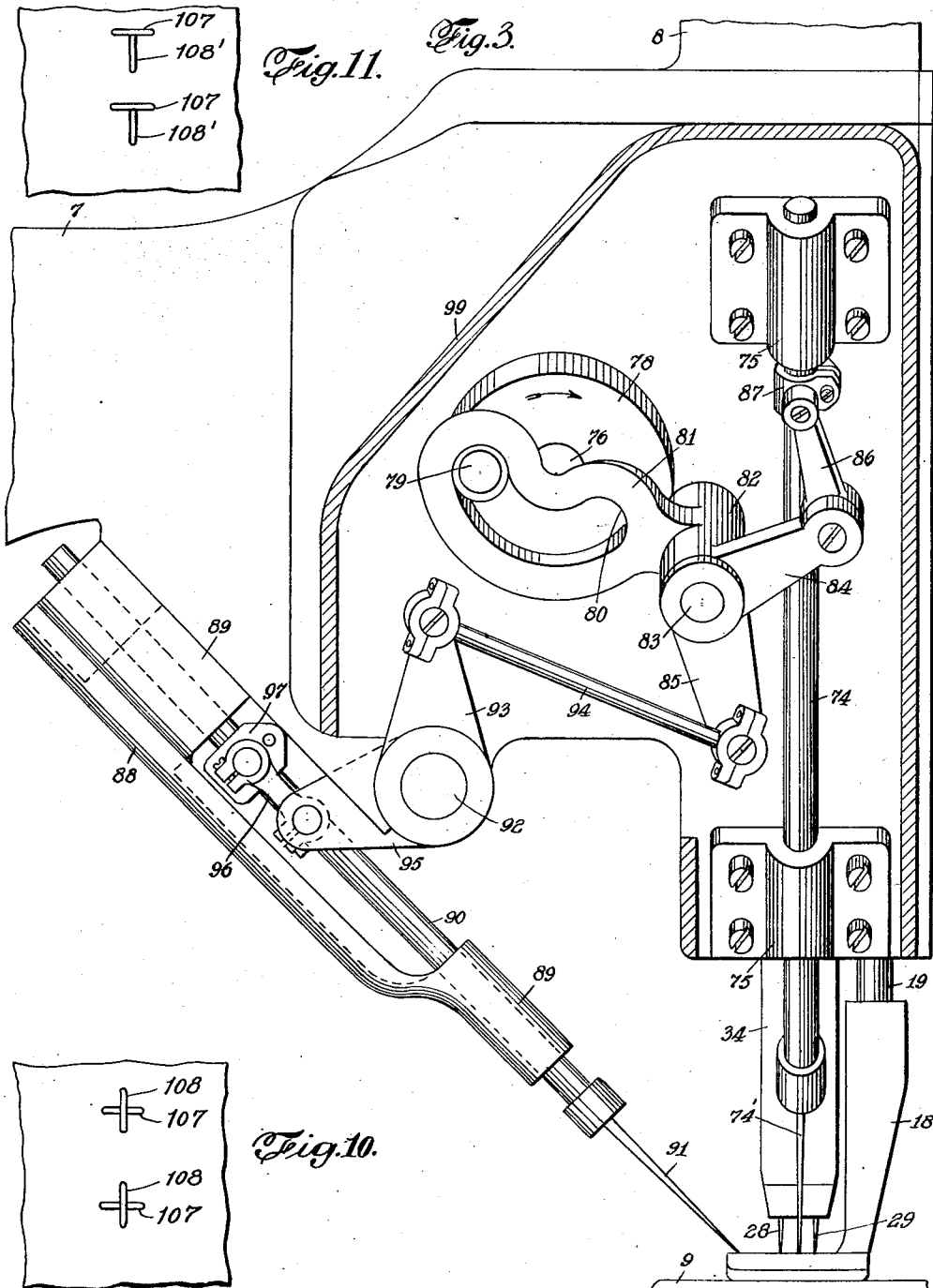
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MULTIPLE NEEDLE STITCHING MECHANISM

Filed Oct. 5, 1939

4 Sheets-Sheet 2



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Feb. 13, 1945.

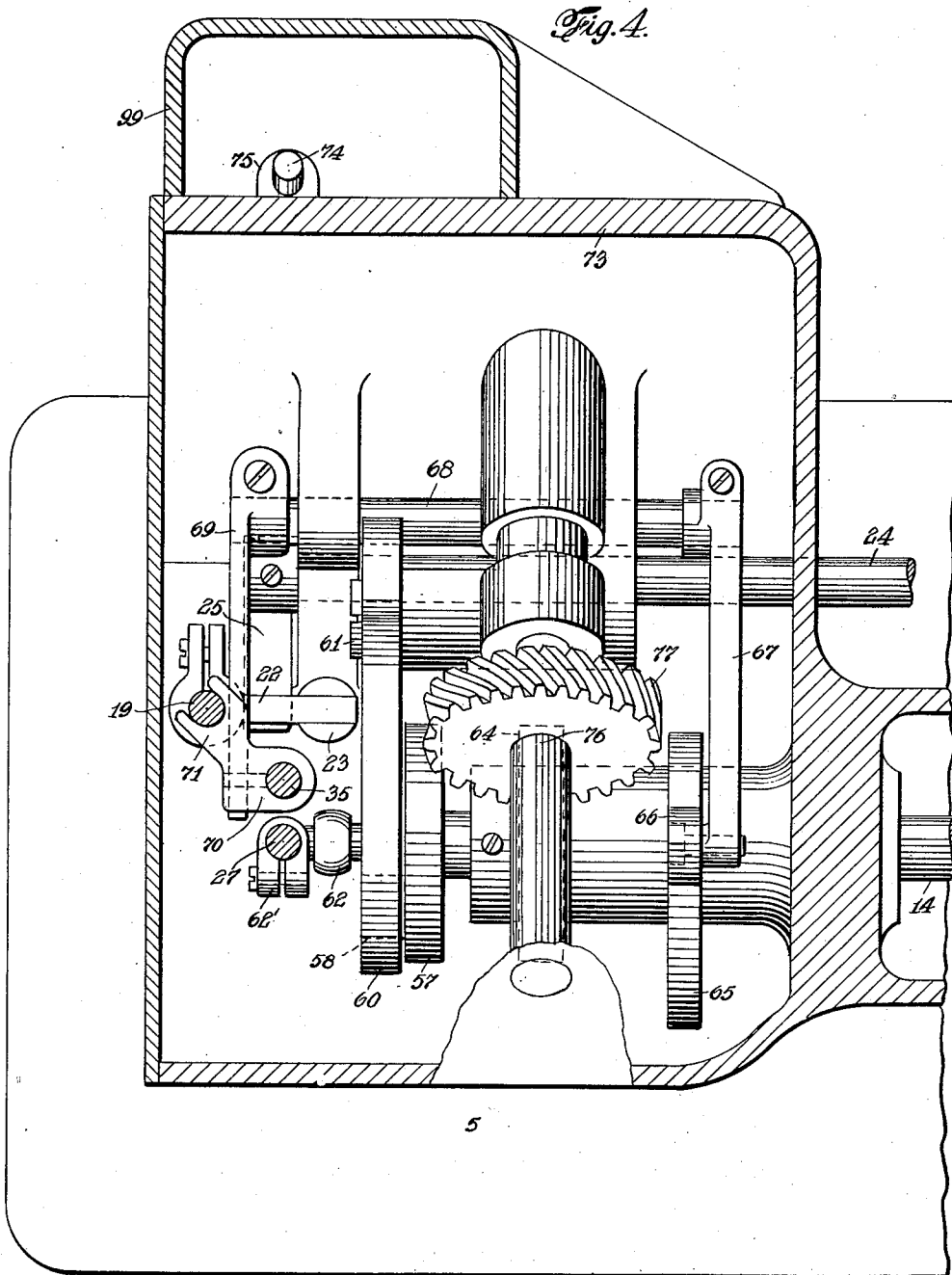
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MULTIPLE NEEDLE STITCHING MECHANISM

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4 Sheets-Sheet 3



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MULTIPLE NEEDLE STITCHING MECHANISM

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Fig. 5.

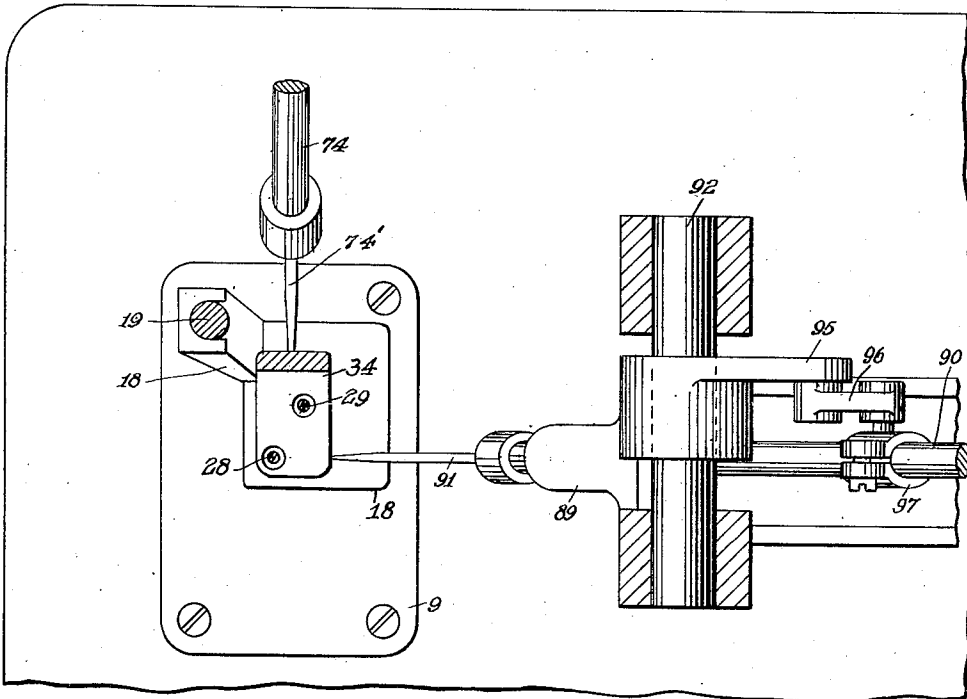


Fig. 6.

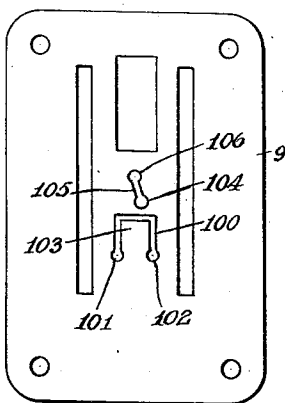


Fig. 7.

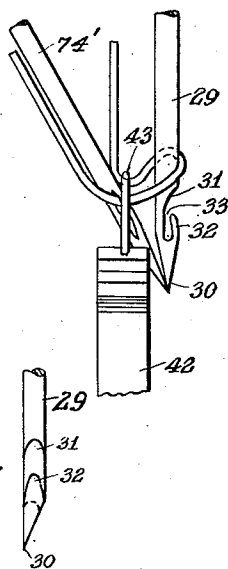


Fig. 8.

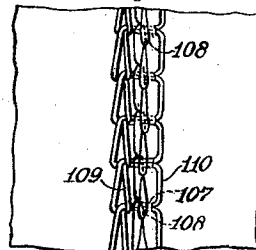


Fig. 9.

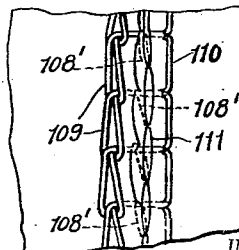
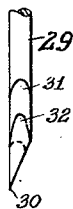


Fig. 7a.



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UNITED STATES PATENT OFFICE

2,369,183

MULTIPLE NEEDLE STITCHING
MECHANISM

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Application October 5, 1939, Serial No. 298,029

12 Claims. (Cl. 112—98)

This invention relates to embroidery stitch mechanism and has for its general object and purpose to provide a multiple needle machine for forming ornamental or embroidery stitching having a needle operating mechanism so constructed and arranged as to operate the relatively movable needles in properly timed relation and at high speed to accurately produce the ornamental embroidery stitching in a predetermined design.

It is a more particular object of the invention to provide a vertically reciprocating stitch forming needle together with a co-operating thread carrying needle movable in an obliquely angular path relative to the stitch forming needle, and mechanism operatively connected with the main shaft of the machine for actuating said needles in properly timed relation to each other.

It is a further object of the invention, in one practical embodiment thereof to provide, in combination with a plurality of vertically reciprocating hook or latch needles, two sets of thread carrying needles, each obliquely disposed relative to the hook needles and in planes of operation at right angles to each other, each of said thread carrying needles co-operating with one of the hook needles.

It is an additional object of the invention to provide a multiple needle machine for the above purpose, in which, by the use of interchangeable throat-plates and variation in the number of hook needles and thread carrying needles employed, the operator may selectively produce any one of a large variety of ornamental or embroidery stitching designs.

It is also an additional object of the invention to provide a multiple needle machine as above characterized in which the conventional four-motion material feed mechanism is employed and in conjunction with which I provide a needle operating mechanism which will function in an efficient and reliable manner with a minimum of vibration and noise in the relative movement of its several parts.

With the above and other objects in view, the invention consists in the improved embroidery stitch mechanism, and in the form, construction, and relative arrangement of its several elements, as will hereinafter be more fully described, illustrated in the accompanying drawings, and subsequently incorporated in the sub-joined claims.

In the drawings, wherein I have selected for illustration one simple and practical embodiment of the invention, and in which similar reference

characters designate corresponding parts throughout the several views:

Fig. 1 is a vertical longitudinal sectional view of a multiple needle stitch forming machine embodying the present invention.

Fig. 2 is an end elevation of the needle guide head with the face plate removed and the machine base shown in section.

Fig. 3 is a detail elevation on an enlarged scale showing the operating means for the obliquely inclined thread carrying needles.

Fig. 4 is a horizontal sectional view taken substantially on the line 4—4 of Fig. 1.

Fig. 5 is a similar horizontal sectional view taken on the line 5—5 of Fig. 1.

Fig. 6 is a plan view of the needle throat-plate.

Fig. 7 is a detail elevation on an enlarged scale showing the relative positions of one of the hook needles and one of the thread carrying needles after penetration of the material and the engagement of the thread loop by the hook carrying needle, and Fig. 7a is a detail view of the hook needle.

Fig. 8 is a detail plan view of the reverse side of a section of fabric material illustrating the ornamental or embroidery stitch design produced thereon by the present invention.

Fig. 9 is a similar view illustrating a different relative arrangement of the embroidery stitches which may be produced by one selected adjustment of the material feed mechanism.

Figs. 10 and 11 are detail views, similar to Figs. 8 and 9, respectively, showing the finished designs on the right side of the fabric.

Referring in detail to the drawings, 5 indicates the base or bed-plate of the machine. At one end of this bed-plate a hollow standard or pedestal 6 is suitably fixed thereto and at its upper end has integrally formed therewith a horizontally extending arm 7 terminating in a needle guide head 8. This guide head is open on one side to afford access to the needle operating mechanism, but is normally closed by the detachable face plate 8'.

Below the guide head 8 the throat-plate 9 is mounted on the base or bed-plate 5 in the usual manner. This throat-plate and the base 5 are provided with one or more coinciding slots to receive the toothed portion or portions of a four-motion feed dog 10. Any conventional means, commonly used in the art, may be employed for imparting the required horizontal and vertical oscillating motions to the feed dog 10. In the present instance, I have illustrated a standard type of feed dog operating mechanism

actuated by the vertical rods or bars 11 and 12, extending downwardly through the pedestal 6 and an opening 13 in the bed-plate 5, and connected at their upper ends with suitable operating eccentrics fixed to the main shaft 14, which is rotatably supported in suitably spaced bearings 15 and 16, respectively, provided in the arm 7. To one end of this shaft externally of the pedestal 6 the usual drive wheel 17 for connection with an electric motor or other convenient source of power, is suitably fixed.

A main presser-foot 18 is fixed to the lower end of the rod 19 which is vertically movable through the guide head 8. Within said guide head the collar 20 is fixed upon the rod 19 and between said collar and the upper end of the guide head an expansion spring 21 is interposed and normally urges said rod downwardly to yieldingly hold the presser-foot 18 in operative relation to the material as it is fed over the throat-plate 9 in the oscillating motions of the feed dog 10.

Below the collar 20, a laterally extending arm 22 is fixed to the rod 19 and has its end portion disposed within a bifurcated upper end of a vertical stud 23 on the guide head 8, whereby rotative movement of the rod 19 is prevented.

A horizontally disposed rock shaft 24 is mounted on the arm 7, one end of said shaft having an arm 25 fixed thereto and extending beneath the arm 22 on the rod 19. To the other end of the rock shaft 24 a suitable hand operated member 26 is fixed whereby said shaft may be rocked to apply a lifting pressure by the arm 25 against the arm 22 and thereby raise or elevate the main presser-foot 18 to an inoperative position against the action of spring 21.

A needle bar or rod 27 is mounted in the guide head 8 for vertical reciprocatory movement and is provided at its lower end with suitable holding means for a plurality of parallel stitch forming needles. These needles may be either of the open hook type as shown in Fig. 7 of the drawings or they may be of the pivoted latch type, an example of which is disclosed in Patent 1,714,928, granted to me on May 28, 1929. In the present instance I have shown two of these hook or latch needles generally indicated at 28 and 29 respectively. These needles are laterally spaced apart and the needle 28 is also positioned in forwardly spaced relation from the needle 29. Each of these needles preferably is formed with an offset point 30 which is in alignment with the peripheral surface of the needle shank. At a suitably spaced distance above the point 30 the needle shank is formed with the thread receiving recess 31 and the inturned hook 32. This hook terminates in spaced relation to the side wall of the recess 31 to provide a thread entrance 33 to said recess and the outer side face of said hook is also substantially in longitudinal alignment with the peripheral surface of the needle shank. These hook needles are of the same length and their points 30 are located in the same horizontal plane.

An auxiliary presser-foot 34 is fixed to the lower end of the rod or bar 35, also mounted for vertical reciprocatory movement in the guide head 8. This presser-foot is provided with offset spaced apart fustro-conical, vertically depending lugs 36 and 37 respectively each of which has a central bore or guide passage for the needles 28 and 29 respectively. These lugs 36 and 37 are adapted, in the operative position of the auxiliary presser-foot to be received within similarly shaped openings in the main presser-foot 18 and

directly engage the material and thread loops to securely hold the same upon the throat-plate 9 during the movements of the needles 28 and 29 through the material.

Below the bed-plate 5, a suitable bearing 38 is secured on the rod 39 which is fixed at its opposite ends in the spaced lugs 40, depending from the bed-plate. In this bearing, a rock shaft 41 is journaled intermediate of its end, the axis of said shaft being parallel with the line of feed of the material. To one end of this shaft an arm 42 is fixed and carries a thread loop forming hook 43 which is adapted to form a thread loop to be received by the hook of the stitch forming needle 29, in the manner to be hereinafter explained.

To the other end of the rock shaft 41 an arm 44 is fixed and with said arm the pitman rod 45 is pivotally connected at one of its ends 46. The other end of this rod is operatively connected with an eccentric 47 integrally formed with a spiral gear 48 loosely mounted on the fixed vertical shaft 49. A horizontal shaft 50 is also journaled in suitable bearings beneath the bed-plate and carries the spiral gear 51 in constant mesh with gear 48. To one end of shaft 50 a bevelled gear 52 is fixed and is engaged with a similar gear 53 on the lower end of the vertical shaft 54 mounted within the pedestal 6. The upper end of this shaft is provided with the bevelled gear 55 in mesh with a similar gear 56 fixed on the main shaft 14.

To one end of the shaft 14 a disk 57 is secured and has an eccentrically located stud 58 projecting laterally therefrom. This stud is movable in a cam slot 59 provided in an arm 60 which is pivotally mounted at one of its ends in any suitable manner, as at 61, upon a fixed part of the guide head 8. The lower end of a link 62 is pivotally connected, as at 63, to the arm 60 and has its upper end pivotally connected with a collar 62' on the needle bar 27. It will thus be apparent that vertical oscillating motion is transmitted through shaft 14 to the arm 60, and through the link connection 62, it is translated into a vertical reciprocating motion of the needle bar 27.

Adjacent to the disk 57 a sleeve 63 is suitably secured upon the shaft 14 and at one end thereof is provided with a spiral gear 64. A cam 65 on the other end of said sleeve cooperates with the roller 66 mounted on one end of an arm 67 which is fixed at its other end to the rock shaft 68. To the other end of said shaft an arm 69 is secured and has upward bearing engagement against the collar 70 which is secured upon the auxiliary presser-foot rod 35. This collar is provided with an angularly offset forked arm 71 engaged with the main presser-foot rod 19 which prevents rotative movement of the rod 35. Between the collar 70 and the upper end of the guide head 8 a coiled spring 72 surrounds the rod 35 and yieldingly urges the same downwardly to position the auxiliary presser-foot in cooperative relation with the main presser-foot 18.

The rear side wall of the needle guide head 8 is disposed at a vertically oblique angle of approximately 60 degrees, as indicated at 73, in downwardly convergent relation to the needle bar 27. On the external face of said wall a needle bar 74 is mounted for reciprocating motion in the spaced bearings 75. A transversely inclined shaft 76 is mounted within the needle guide head and has its ends journaled in suitable bearings on the front and rear walls thereof. A spiral

gear 77 fixed on this shaft has constant meshing engagement with the gear 84. To one end of the shaft 76 at the outer side of wall 73 the disk 78 is fixed and carries an eccentric stud 79 operating in the cam slot 80 of an arm 81. This arm at one end has an integrally formed sleeve 82 oscillatably supported upon the stud shaft 83 which is fixed at one of its ends to the wall 73. This sleeve is provided at one end with radially extending arms 84 and 85 respectively disposed approximately at 90 degrees spaced apart relation to each other. The link 86 is pivotally connected to the outer end of the arm 84 at its lower end, the upper end of said link being pivotally connected to the collar 87 on the needle bar 74. It will thus be apparent that in the operation of the main shaft 14, oscillating motion is transmitted to the arm 81, which, through the above described connections is translated into a reciprocating motion of the needle bar 74. To the lower end of this needle bar, a single eye-pointed thread carrying needle 74' is connected and is adapted to cooperate with the hook needle 29.

To the under side of arm 7 the guide member 88 is suitably secured and positioned at an angle of approximately 45 degrees. This member is provided with longitudinally spaced guide bearings 89 for the needle bar 90. In the lower end of this needle bar there is also secured a single eye-pointed thread carrying needle 91 adapted to cooperate with the other of the hook needles 28. Reciprocating motion is imparted to the needle bar 90 through the medium of the transverse rock shaft 92 journaled in suitable bearings on the under side of the arm 7. This shaft at one end is provided with the arm 93 which is operatively connected by the link rod 94 or other equivalent means with the other arm 85 on the sleeve 82.

The other end of the rock shaft 92 is also provided with an arm 95 which is connected by the link 96 with the collar 97 secured upon the needle bar 90.

It will be readily understood from the above, and with reference to Fig. 3 of the drawings, that the two thread carrying needles operate in planes at right angles to each other and at relatively different oblique inclinations with respect to the perpendicular reciprocating hook needles 29 and 28 with which said thread carrying needles respectively cooperate. Also, it will be seen that the downward strokes of the thread carrying needles are simultaneous and slightly in advance of the downward movement of the hook needles 28 and 29 through the material so that the thread loops will be formed below the material to be received in the hooks of the hook needles in the manner illustrated in Fig. 7 of the drawings. In order to insure the proper thread loop engagement by the hook needles, the points 30 of the latter are offset from the axis of the needle shank as above explained and shown in Fig. 7a so that as the hook needle moves downwardly, the point thereof will enter through the thread loop in closely adjacent relation to the periphery of the eye-pointed needle.

It will be evident that, by reason of the provision of the eccentric stud 52 and cam slot 59, at the end of the upward stroke of the hook needles 28 and 29, there will be a dwell, before said stud or pin engages the end of the slot 59 to impart a downward thrust to the needle bar 27. The reciprocatory motion of the thread carrying needles 74' and 91 is however so controlled that

the stroke of the latter needles is slightly in advance of the hook needles.

As shown in Figs. 3 and 4 of the drawings, the actuating mechanism for the needle 74' is concealed and protected by a cover plate 99 removably secured by any suitable means to the wall 73 of the guide head 8.

As shown in Fig. 6, the throat-plate is provided with a U-shaped slot 100, the ends of said slot being in lateral alignment, and said plate at each end of the slot being provided with a suitably formed needle receiving opening 101 and 102 respectively. Between the parallel legs of the slot 100, the metal tongue 103, in cooperation with the presser-foot 18, maintains a requisite pressure upon the material.

In spaced relation to the intermediate portion of the slot 100 and centrally thereof, the plate 9 is provided with a needle receiving opening 104 which is connected by a narrow longitudinal slot 105 with the longitudinally spaced needle receiving opening 106. Of course, it will be understood that the presser-foot 18 is provided with suitably formed openings to register with the respective needle receiving openings of the throat-plate.

In the operation of the above described multiple needle mechanism, ornamental or embroidery stitching is produced in the design shown in dotted lines in Fig. 8 of the drawings. As heretofore observed, the thread carrying needles 74' and 91 are operated slightly in advance of the hook or latch needles 28 and 29. The obliquely inclined thread carrying needle 91 in its downward stroke, between intermittent movements of the material under the presser-foot 18, moves through the opening 102 in the throat-plate 9 and carries the thread loop below the material. The hook needle 28 moves downwardly through the opening 101 in the throat-plate in closely intersecting relation to the path of movement of the needle 91. In the upward movements of the needles the thread loop is engaged in the hook of the needle 28 whereby producing the double strand horizontal stitch 107 on the under side of the material between the openings 101 and 102 in the throat-plate.

The other thread carrying needle 74' moves downwardly through the opening 106 in the throat-plate and carries the thread loop below the material. The hook needle 29 moves downwardly through the opening 104 of the throat-plate and its point 30 enters through the thread loop closely adjacent to the periphery of the needle 74'. In the ascending movements of said needles, the oscillating member 43 moves between the needles to approximately the position indicated in Fig. 7 of the drawings. This member in the continued upward movement of the needles engages the thread loop to tension the same about the needle 29 and direct said loop through the entrance 33 and into the hook of the latter needle. In the upward movement of the said needle the thread loop is drawn upwardly through opening 104 in the throat-plate to form a single strand longitudinal stitch 108, substantially at right angles to the stitch 107. In the example shown in Fig. 8, the feed mechanism is so adjusted with respect to the operation of the needle mechanism that the stitch 108 extends over the stitch 107 to form a cross.

In each feeding stroke, the material is fed longitudinally beneath the presser-foot 18 while the needles are above the throat-plate 9. In such movement, a double strand longitudinally extending stitch 109 is formed by the hook needle

28 upon the upper side of the material between the left hand ends of adjacent horizontal stitches 107, while a single strand longitudinal stitch 110 is formed between the right hand ends of said horizontal stitches by the needle 91. In the following downward stroke of the hook needles, the auxiliary presser-foot lug 36 engages the end of the thread loop 109 and holds the same while the hook needle 28 passes downwardly there-through to receive the thread loop from the needle 91 and draw the same upwardly through said end of the previously formed loop 109 so that the latter loops are locked together in the form of chain stitch. Similarly, in the feed of the material the thread carried by needle 74' is formed into a longitudinal double strand stitch 111 and in the next downward stroke of the hook needles, the end of this thread loop is engaged and held by the lug 37 of the auxiliary presser-foot so that in the following stitch forming operation of needle 29, the thread will be drawn upwardly through the end of said loop to form the intermediate chain stitches between the stitches 109 and 110, as shown in the drawings. As illustrated in Fig. 9, the feed mechanism may be so adjusted that the stitches 108' will be positioned between the horizontal stitches 107, and closely adjacent to one of the latter in the T formation, as illustrated. Also it will be evident that by multiplying the number of hook needles and correspondingly multiplying the number of thread carrying needles 74' and 91, various ornamental designs may be produced. The individual threads may also be of contrasting colors.

From the foregoing description considered in connection with the accompanying drawings, it will be seen that I have devised a multiple needle stitching mechanism which is relatively simple in its construction, capable of operation at high speeds and which will efficiently function to produce ornamental embroidery stitching upon fabrics in a variety of different designs, in accordance with the predetermined selection of the operator. In the drawings I have disclosed one practical embodiment of the invention, which in actual use has given excellent results. Nevertheless, it is to be understood that the essential features of my invention may also be exemplified in various other forms of mechanism, and I accordingly reserve the privilege of adopting all such legitimate variations in the form, construction and relative arrangement of the cooperating elements which may be fairly considered as within the spirit and scope of the appended claims.

I claim:

1. In multiple needle stitching mechanism, a plurality of vertically reciprocating thread loop receiving needles and actuating means therefor, two thread carrying needles operating in vertical planes angularly related to each other and reciprocating in obliquely inclined paths with respect to the loop receiving needles, each of said thread carrying needles cooperating with one of the thread loop receiving needles, and means for actuating the thread carrying needles in timed relation with said loop receiving needles.

2. In multiple needle stitching mechanism, a pair of vertically reciprocating thread loop receiving needles and actuating means therefor, said needles being spaced apart laterally and in the direction of feed of the material, a thread carrying needle to cooperate with each of said loop receiving needles, said thread carrying needles being disposed in vertical planes of operation at right angles to each other and reciprocating in obliquely inclined paths, and means for actuating the latter needles in timed relation with the thread loop receiving needles.

3. In multiple needle stitching mechanism, a pair of vertically reciprocating thread loop receiving needles, spaced apart laterally and in the direction of feed of the material, two thread carrying needles disposed in angularly related vertical planes of operation and each reciprocating in an obliquely inclined path in cooperative relation with one of the thread loop receiving needles, a main presser-foot, an auxiliary presser-foot having spaced parts cooperating with the main presser-foot to engage and hold thread loops upon the material in the reciprocating movements of said loop receiving needles, means for actuating said auxiliary presser-foot in timed relation with the latter needles, and means for actuating the thread carrying needles in timed relation with the loop receiving needles.

4. In multiple needle stitching mechanism, a vertically reciprocating thread loop receiving needle, a thread carrying needle reciprocating in an obliquely inclined path in cooperative relation with the loop receiving needle, a main presser-foot through which the latter needle reciprocates, an auxiliary presser-foot having a depending part through which the loop receiving needle reciprocates and adapted to cooperate with the main presser-foot to engage and hold a thread loop upon the material in the reciprocation of said needle, and means for actuating said thread carrying and loop receiving needles in timed relation with each other.

5. In combination with a supporting arm having a needle guide head at one end and a main shaft mounted in said arm, a vertically reciprocating needle bar mounted in said guide head, a second needle bar mounted upon one side of the guide head exteriorly thereof for reciprocating movement in an obliquely inclined path, a third needle bar mounted on said supporting arm for reciprocating movement in an obliquely inclined path and in a vertical plane of operation angularly related to the plane of operation of said second named needle bar, and means for simultaneously actuating the obliquely reciprocating needle bars in timed relation with the first named vertically reciprocating needle bar, from said main shaft.

6. In combination with a supporting arm having a needle guide head at one end and a main shaft mounted in said arm, a needle bar mounted in said guide head to reciprocate in a perpendicular path and actuating means therefor operatively connected to the main shaft, a second needle bar externally mounted upon one side of the guide head for reciprocating movement in an obliquely inclined path, a third needle bar mounted on said supporting arm for reciprocating movement in an obliquely inclined path and in a vertical plane of operation angularly related to the plane of operation of said second named needle bar, and interconnected actuating means for said second and third named needle bars operatively connected with said main shaft to actuate said needle bars in timed relation with said first named needle bar.

7. In combination, a vertically reciprocating hook needle, an eye-pointed thread carrying needle laterally spaced from the hook needle and mounted to reciprocate in a vertically oblique path at right angles to the path of feed of the material, a throat-plate having a U-shaped slot therein and an opening at each end of said slot,

70 hook needle, an eye-pointed thread carrying needle laterally spaced from the hook needle and mounted to reciprocate in a vertically oblique path at right angles to the path of feed of the material, a throat-plate having a U-shaped slot therein and an opening at each end of said slot,

said needles reciprocating through the respective openings in the throat-plate, and said thread carrying needle moving below the throat-plate in intersecting relation with said hook needle to deliver a thread loop to the hook thereof, and means for actuating said needles in timed relation to each other.

8. In combination, a pair of spaced apart hook needles mounted for unitary vertical reciprocation, two eye-pointed thread carrying needles operatively mounted in vertical planes at right angles to each other for reciprocating movement in obliquely inclined paths and in cooperating relation with the respective hook needles, a throat-plate having a U-shaped slot therein and a needle receiving opening at each end of said slot, one of said hook needles and one of said thread carrying needles reciprocating through the respective openings, said throat-plate in spaced relation from the intermediate portion of said slot having additional longitudinally spaced needle receiving openings and a thread receiving slot connecting said openings, the other of said hook needles and the other thread carrying needle reciprocating through the latter openings in the throat-plate, and means for actuating the two thread carrying needles in timed relation with the hook needles.

9. In multiple needle stitching mechanism, a vertically reciprocating thread loop receiving needle having a point at one end offset from the axis of the needle shank and in substantial alignment with the periphery thereof and provided in spaced relation from said point with a thread loop receiving hook having an entrance thereto out of longitudinal alignment with said point, an eye-pointed thread carrying needle mounted to reciprocate in a vertically oblique path and in intersecting relation to the path of reciprocation of the hook needle, the point of said hook needle descending through the thread loop closely adjacent to the shank of the thread carrying needle, and means operable between said needles to releasably engage the thread and direct the thread

loop through the hook entrance of the first named needle.

10. In multiple needle stitching mechanism, a vertically reciprocating thread loop receiving needle having a point at one end and a thread loop receiving hook spaced from said point, an eye-pointed thread carrying needle mounted to reciprocate in a vertically oblique path in intersecting relation to the path of reciprocation of the hook needle, the point of said hook needle descending through the thread loop closely adjacent to the shank of the thread carrying needle, and means movable between said needles to engage and tension the thread loop in the ascending movements of the needles and thereby direct said loop into the hook of the hook needle.

11. In multiple needle stitching mechanism, a vertically reciprocating thread loop receiving needle having a point at one end and a thread loop receiving hook spaced from said point, an eye-pointed thread carrying needle mounted to reciprocate in a vertically oblique path in intersecting relation to the path of reciprocation of the hook needle, the point of said hook needle descending through the thread loop closely adjacent to the shank of the thread carrying needle, and an oscillatory member operable in timed relation with said needles, movable between the needles in their ascending movements to engage and tension the thread loop and thereby direct said loop into the hook of the hook needle.

12. In multiple needle stitching mechanism, a main needle operating shaft, a needle bar mounted to reciprocate in a perpendicular path, actuating means therefor operatively connected with one end of the main shaft, a second needle bar mounted to reciprocate in an obliquely inclined path, said needle bars being disposed in parallel operating planes, and actuating means for said second needle bar including an operating shaft, independent of the actuating means for the first named needle bar and having driving connection with said main shaft.

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