Oct. 18, 1927. 1,645,532

W. HUELLER

NEEDLE MECHANISM

Filed May 26, 1923 4 Sheets-Sheet 1

Fig:1.

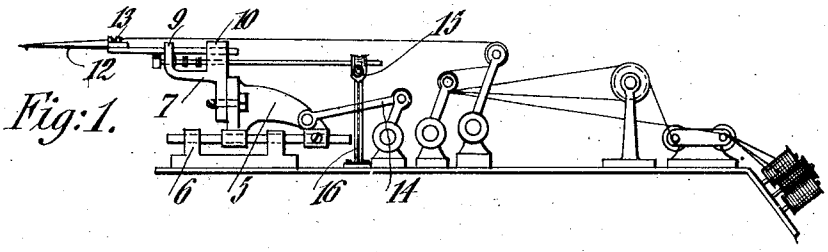


Fig:10.

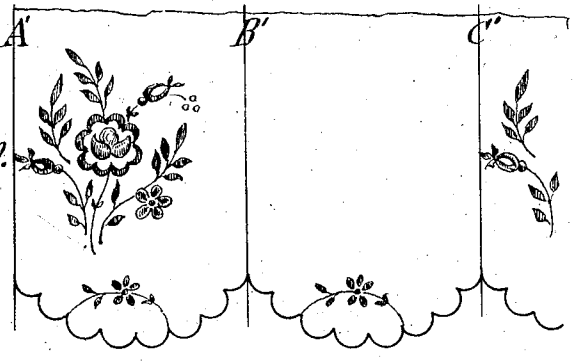


Fig:11.

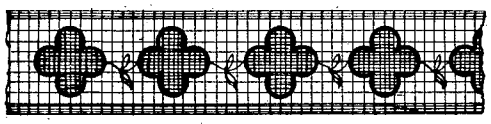


Fig:9.

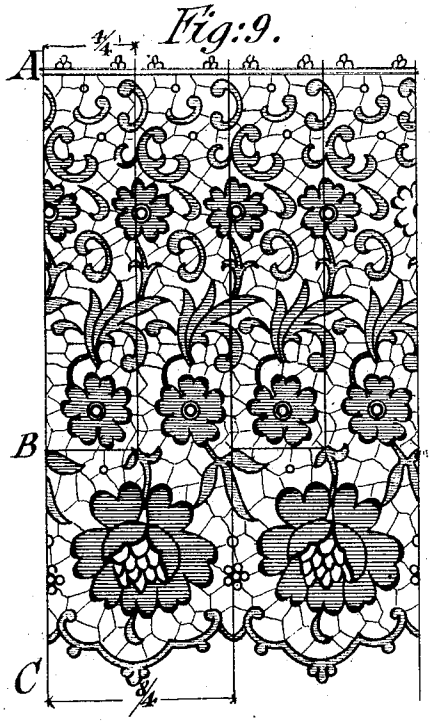
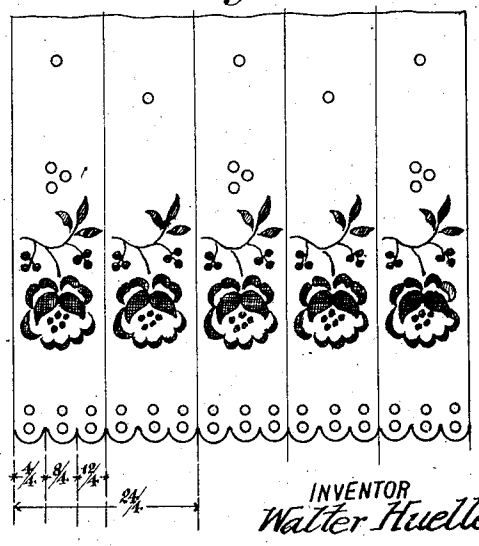


Fig:12.



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Fig. 2.

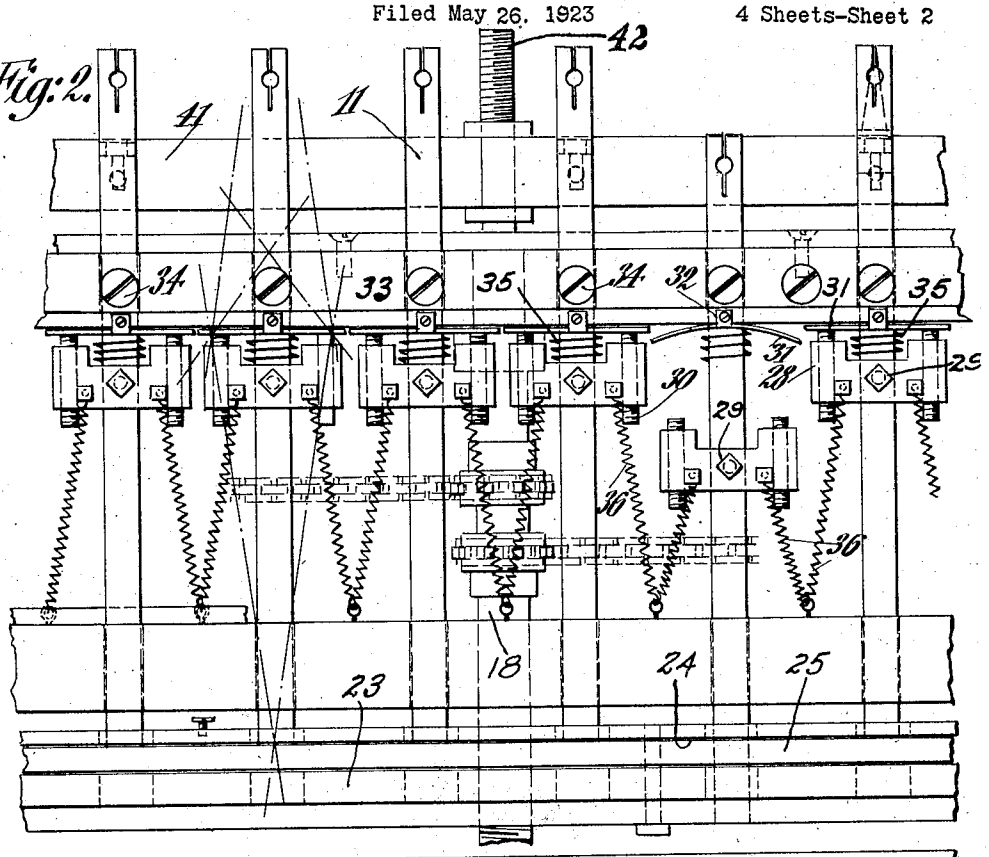


Fig. 3.

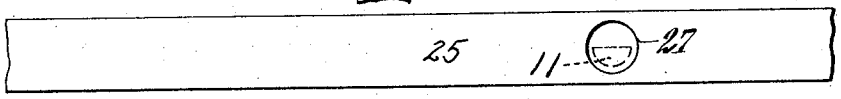


Fig. 4.

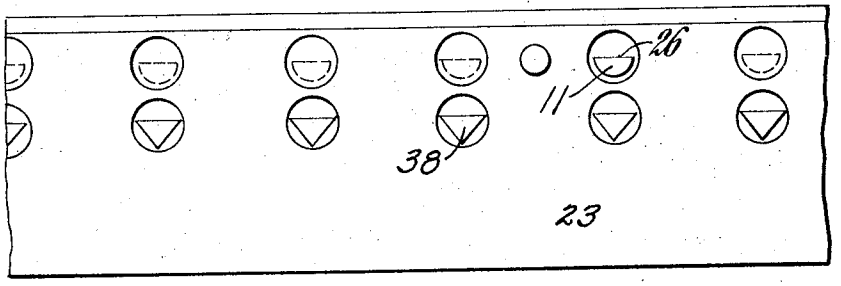
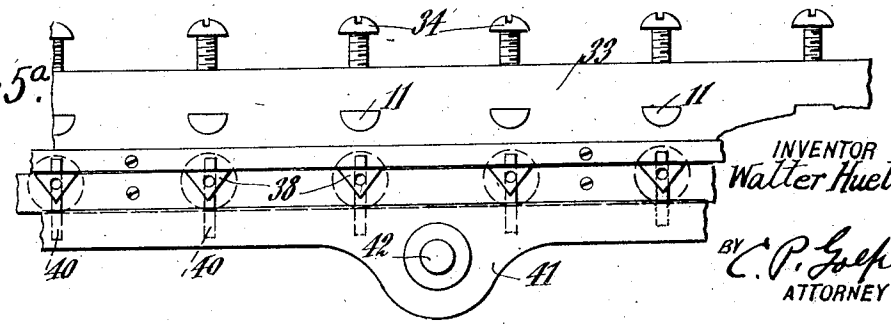


Fig. 5a.



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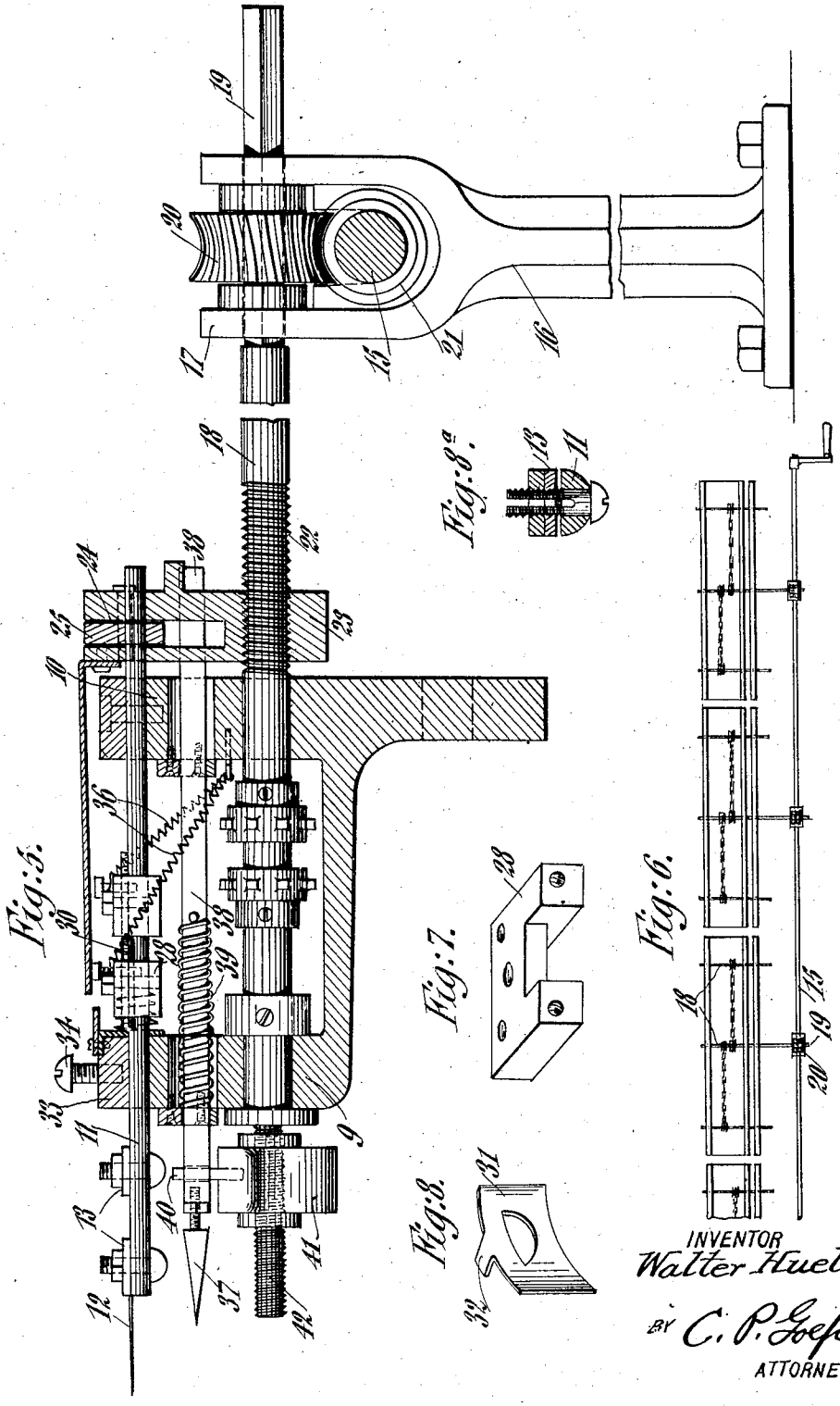
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NEEDLE MECHANISM

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Fig: 13.

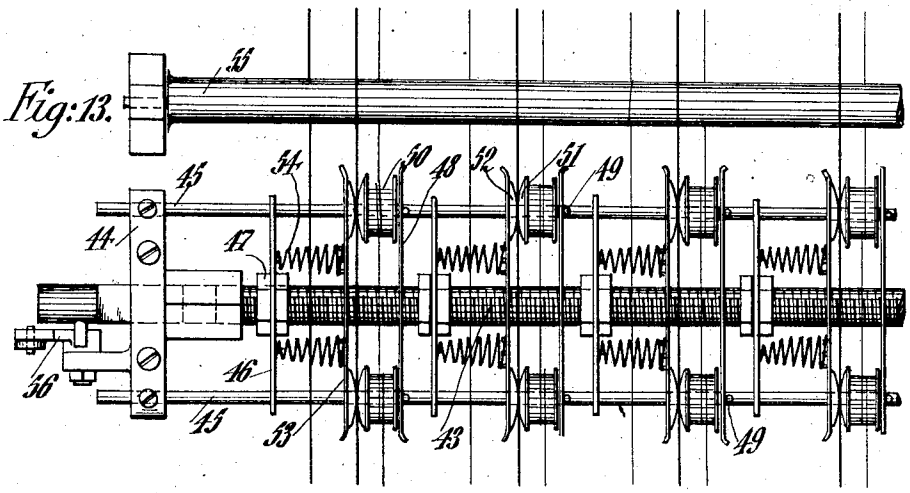


Fig: 14.

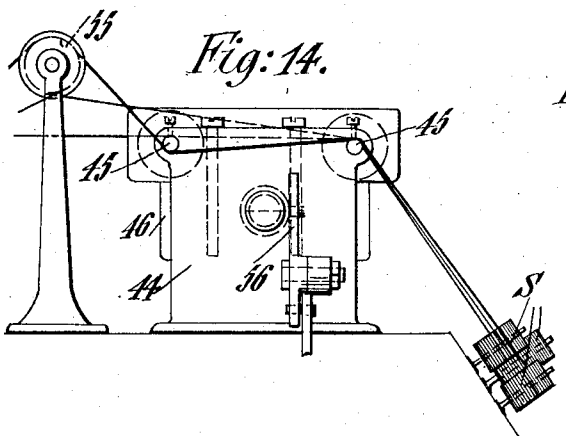


Fig: 15.

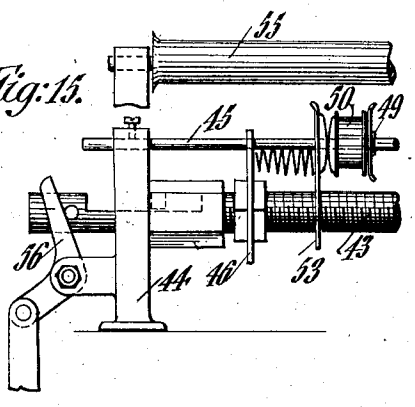


Fig: 16.

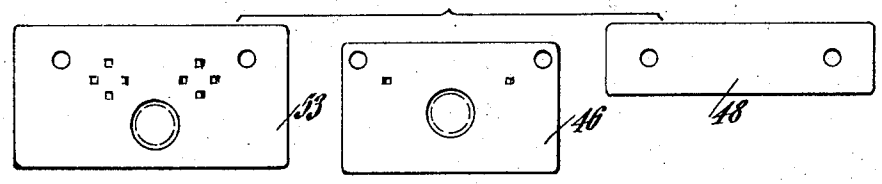


Fig: 18.

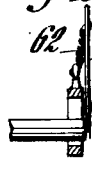
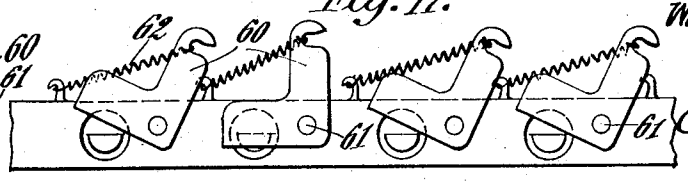


Fig: 17.



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UNITED STATES PATENT OFFICE.

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NEEDLE MECHANISM.

Application filed May 26, 1923. Serial No. 641,592.

This invention relates to needle mechanism for embroidery machines and has for its primary object to provide a mechanism adaptable to embroidery machines of present standard construction whereby the operation of the needles may be easily and quickly changed in the embroidering of intricate designs upon dress goods, laces and other materials.

An embroidery machine embodying my present improvements provides in the one machine a combination of three features which have heretofore only been found in separate machines, namely, a needle carriage having stable or fixed needles; secondly, means for automatically controlling the operation of needles mounted to reciprocate upon the carriage in accordance with the design being embroidered, or the different colors of the design, and thirdly, a hand operated means for controlling the stitch forming movements of the reciprocating needles.

It is also an object of my present improvement to provide improved means for applying relatively different tensions to threads or cords of different weight which are used in embroidering various designs.

It is also an important feature of my present invention to provide a means for controlling the operation of needles in sections in accordance with the design being embroidered and also in accordance with the different colors in the designs, and in the provision of means which will insure the absolute stability of the individual needles in operation so that extreme accuracy is obtained and the production of faulty and unsalable goods obviated.

It is another object of the invention to provide automatically operating perforating means associated with each needle and adapted to provide an opening therethrough the work with respect to which the stitches are applied by the needle.

With the above and other objects in view, the invention consists in the improved needle mechanism for embroidery machines, and in the form, construction and relative arrangement of the several parts as will be hereinafter more fully described, illustrated in the accompanying drawings and subsequently incorporated in the subjoined claims.

In the drawings wherein I have illustrated 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 side elevation of the needle mechanism and its operating means as constructed in accordance with my present improvements;

Figure 2 is a top plan view of a part of the needle mechanism;

Figure 3 is a detail elevation of the pattern plate;

Figure 4 is a similar view of the plate holder;

Figure 5 is a longitudinal section through the needle carriage;

Figure 5ª is a fragmentary front end elevation of the carriage;

Figure 6 is a plan view illustrating the needle carriages arranged in series and operated from a common power shaft;

Figures 7 and 8 are detail perspective views of parts of the needle stabilizing machine;

Figure 8ª is a detail sectional view showing the needle clamping device;

Figures 9, 10, 11 and 12 illustrate examples of different kinds of work executed by the machine;

Figure 13 is an enlarged plan view illustrating the tensioning means for the threads or cords;

Figure 14 is an end elevation thereof;

Figure 15 is a fragmentary side elevation showing the brake applying means;

Figure 16 is a detail view showing the different parts of said tensioning means;

Figure 17 is a detail fragmentary view showing a hand operated means for controlling the stitch forming operations of the needles.

Figure 18 is an end view, partly in section of the device shown in Figure 17.

Embroidery machines of the type to which the present invention is applicable, are designed to operate upon materials over a width of ten to fifteen yards, and apply the embroidery across the entire width of the material. In such machines the needles are arranged in groups, the series of needles in each group being mounted upon a sliding carriage. Heretofore, these needles have been arranged in stable or fixed relation to the carriage, and in order to change the design or the coloring, it was necessary to change the positions of the needles in the carriage by hand so that only certain of the needles would operate. In cases where it

was attempted to make this change automatically, as by the use of changeable pattern plates, it was found that the necessary stability of the needles in operation could not be maintained. Such machines operate at a speed of about 120 revolutions per minute and it was found practically impossible to produce the desired automatic change in the operation of the needles without complicating the mechanism, in view of the relatively small space within which the needles must operate. This difficulty I have succeeded in overcoming in my present invention and have provided an arrangement in which the working of the needles may be automatically changed, without complicating such machines as heretofore constructed and also maintaining the desired stability of the needles in operation.

As shown in Figure 1 of the drawings, each needle carriage 5 is mounted to reciprocate towards and from the work upon a suitable support 6, the carriage preferably including a base section and a removable needle supporting section 7. This latter section of the carriage is provided with spaced longitudinally extending flanges 9 and 10, respectively, upon which the needle holding rods 11 are mounted for axial movement. To one end of each of these rods, the needle 12 is detachably secured by a suitable clamping device 13. The needle carriages 5 are reciprocated by a suitable actuating means 14 arranged at the rear of the carriage, and between this carriage actuating means and the needle carriages a power shaft 15 extends the entire length of the machine.

A standard 16 is also mounted rearwardly of each needle carriage and has a forked upper end 17 through which the power shaft 15 extends. Through openings in the spaced arms of the standard, the square end 19 of a shaft 18 is loosely positioned, said shaft at spaced points being journaled in the flanges 9 and 10 of the needle carriage and moving as a unit with said carriage when the latter is reciprocated. The shaft 18 is rotated by means of a worm gear 20 engaged upon the square portion 19 thereof between the arms of the fork 17 and having meshing engagement with the worm 21 on the power shaft 15.

The shaft 18 is also provided with a threaded section 22 engaged in the opening in bar 23 which extends substantially the full length of the needle carriage and is provided in its upper edge with a slot or bifurcation 24 to receive a pattern plate 25. The upper side of each of the needle carrying rods 11 has a plane or flat face 26 so as to prevent said rod turning or rotating in the supporting flanges 9 and 10. The plate 25 is formed with spaced openings 27 arranged in accordance with the design to be worked in the material, said openings being in line with certain of the needle bars 11 so that when the plate holder 23 is moved with respect to the carriage by the rotation of the shaft 18, said plate will engage only certain of the rods 11 to cause a stitch forming movement of the needles carried thereby, while the other rods will pass through the openings 27 in said plate. The bar 23 at each side of the plate receiving channel 24 therein is likewise provided with openings corresponding in number to the number of the rods 11. As shown in Figure 2 of the drawings, the bar 23 has been moved forwardly and the entire series of needles with the exception of one has been actuated by the plate 25, while the single needle in line with the openings 27 in said plate has remained stationary.

In order that the needles shall move absolutely in a straight line without deviation in any direction, I have provided a stabilizing means therefor. To this end, a member 28 is fixed upon each of the rods 11 by a suitable set screw 29. At each side of the rod, an adjustable screw or pin 30 is threaded in the member 28 and is adapted for engagement against the concave face of a spring plate 31 at the opposite ends thereof, said plate being provided with an opening through which the rod 11 extends and having a lug 32 on its upper edge which is suitably fixed to the bar 33 which is secured upon the flange 9 and guides said rod. In this bar the set screws 34 are threaded which may be adjusted into engagement with the flat faces 26 of the rods so that any one or more of said rods may be securely fixed against axial movement. In addition to the spring plate 31, a coil spring 35 also surrounds each rod 11 and is initially placed under compression in the needle projecting movement of the rod before the screws 30 come into contact with the ends of said spring plate. For further stabilizing movement of the rods, I provide the coil springs 36 attached at one of their ends to the members 28 and at their other ends to the flange 10 at a point below the plane of the rods 11, said springs exerting a downward and rearward pull upon said rods. It will be apparent that owing to the provision of the spring plates 31 in conjunction with the coil springs 35 and 36, the needles are stabilized against any possible deviation from their straight line movement so that the formation of the embroidery stitches will be very accurately performed.

In many embroidery designs, the material being worked is perforated, and the embroidery stitches are applied around the edges of the perforation. For the purpose of producing these openings through the material, I provide the perforators 37 on the ends of the rods 38 which are mounted for axial movement in the flanges 9 and 10 independently of the needle rods 11. The rods 38 carrying the perforators 37 are normally urged rearward-

ly in the needle carriage by means of the coil springs 39. Each rod 38 forwardly of the carriage is provided with a stud or pin 40 which is engaged by the member 41 threaded on the extension 42 of the shaft 18 so that when said shaft is rotated, said member 41 is moved longitudinally of the shaft to thereby impart a longitudinal thrust to the rod 38 against the action of the spring 39, thus causing the perforator 37 to be protruded through the material.

For the purpose of applying a proper tension to the thread and cord which is used in making the embroidery stitches, I have devised the mechanism shown in Figs. 13, 14 and 15 of the drawings. In the embroidery art there is used what are known as running stitches and cover stitches, each of which requires a different tension. It is possible with my present improvement to use at one and the same time, a fine needle carrying a fine thread and a heavy needle carrying a heavier thread. It is also possible to vary the tension applied to the heavy thread at any time independently of the tension of the finer thread. The different threads to be used are carried by spools S suitably mounted and supported. Adjacent thereto, a threaded shaft 43 extends the full length of the machine section and is mounted at its ends in suitable bearings 44. These bearings also support rods 45 arranged above the plane of said shaft at opposite sides thereof. At spaced intervals plates 46 are fixed upon the shaft 43 by nuts 47. Above the shaft 43 transversely disposed plates 48 are engaged at their ends upon the rods 45, stop pins 49 in said rods preventing movement of the plates 48 thereon in one direction. At one side of said plates flanged rollers 50 are mounted upon the rods 45 and have convex ends 51 to which the convex protuberances 52 on the ends of a plate 53 loosely engaged on the shaft 43 are opposed. These convex portions 51 and 52 of the rollers and the plate 53 are yieldingly held in engagement with each other by two springs 54 interposed between the plates 53 and the plates 46. The heavy cord carried by certain of the needles extends between the convex ends 51 of the rollers 50 and the convex projections 52 on plate 53 the proper tension being applied thereto by the action of the two springs 54. Such heavy cord is usually used for edging designs in the material. The fine cotton thread requires a different tension in certain designs and this tension is applied by winding the cotton threads around an emery roller 55. Silk threads, however, will not withstand the same tension as cotton thread, and therefore it is not wound around this emery roller but after extending around the spaced rollers 50, it merely passes over the face of the emery roller. It will thus be seen that the proper tension will be maintained upon the different kinds of thread and cord used in the machine. 56 indicates a braking device of any suitable type whereby the threaded rod or shaft 43 be axially shifted to apply additional pressure against the threads and regulate the feed thereof. The pressure of the expansion springs 54 against plate 53 may be independently adjusted by adjusting the nuts 47 along the threaded rod 43, and since the plates 46 are fixed to this rod in such positions, it will be evident that when said rod is shifted axially the springs 54 will be further compressed, thereby simultaneously increasing the pressure of all of the plates 53 upon the respective threads to the same extent.

Heretofore, adjustable tensioning springs have been used in such machines, but they have not been found practical, since it was impossible to maintain exactly the same uniform tension on the different threads. By providing the adjustable screw extending the entire length of the machine, and operating this screw as above described, the tensioning devices are simultaneously adjusted so that exactly the same degree of tension is applied to all of the threads.

From the foregoing description considered in connection with the accompanying drawings, it is believed that the several mechanical features of my present improvements will be fully understood. In Figures 9 to 12 of the drawings I have illustrated several examples of work of the kind executed by an embroidery machine equipped with my invention. Thus in Figure 9, I have shown a lace design in which the embroidery stitching is applied on a foundation of silk texture with a very fine cotton thread so that the stitches must be quite small and close together. The silk texture is subsequently burned away by an acid leaving a cotton design as the finished product. Therefore, it will be appreciated that the repeated operations of the needles must be absolutely exact and the tension on the threads at all times constant and even so as to obviate all possibility of separation of the repeated designs and damaging of the goods. In the design illustrated, that section of the lace between the lines A and B is what is called a 4/4 repeat, while the portion between B and C is an 8/4 repeat, the change being automatically made in the machine by the change of the pattern plates, and without making any change whatever in the needles. It is possible to do this owing to the use of the combined spring and emery roll tension which is applied to the threads carried by the needles. In Fig. 10, I have shown a design in which the operations occurring within the space from A′ to C′ are performed by forty needles while twenty needles operate in the space from A′ to B′.

This design may also be worked by the use of the hand operated needle controlling means shown in Figure 17 of the drawings, as it is not essential that the needle shall operate without the least vibration. This hand changing device consists of the angular levers 60 pivotally mounted as at 61 upon the bar 23, one of said levers being provided for each needle. The levers are normally held with one end positioned over the opening in the bar 23 in line with the needle by means of spring 62. Thus when it is desired to prevent the operation of any one of the needles in the reciprocation of the bar 23, the lever 60 is moved against the action of the spring 62 so as to permit the needle carrying rod to move freely through the opening in said bar. Thus any one or more of the needles may be rendered inoperative as required in accordance with the design being worked.

In Figure 11 of the drawings I have illustrated a section of fillet lace of fine cotton which is edged in with a heavy cord and is known in the trade as the best machine-made imitation of hand made fillet lace. It will be understood, of course, that a fine needle is used for the cotton while a relatively heavy needle is used with the cord. Owing to the fact that by means of the new spring tension above described, the proper tension may be maintained on the heavy cord independently of that used on the finer cotton which is wound around the emery roller, a very high grade product of this kind can be produced.

In Figure 12 I have illustrated a design stitch upon dress goods, in the execution of which 4/4 and 24/4 needles and perforators are used in the machine. Each of the scallops bordering the edge of the material and the flower design is in 12/4 repeat, while the openings are 24/4 repeat, the change being automatically made in changing the pattern plates, and with the accurate application of the proper colors, by reason of the improved tensioning means.

Of course, it is apparent that my present improvements are not necessarily limited to the specific examples of work to which I have above referred to but the automatic needle control mechanism for changing the working operations of the groups of needles automatically, may be advantageously employed in the execution of various other intricate embroidery designs upon silk, cotton or other materials in the rapid quantity production of work of this kind.

It is also possible in the present machine to apply various ornaments to the material such as beads, buttons, braid, pearls and the like which have heretofore been attached only in machines having a fixed or stable needle and it was not possible to use an automatic needle changing attachment such as that herein described. However, in view of the stabilizing means which I provide for the reciprocating needles, the automatic needle controlling and changing means may be used for the attachment of such ornamental articles.

It is also to be understood that while I have herein described one satisfactory and practical embodiment of my present improvements, the same are not necessarily limited thereto and I accordingly reserve the privilege of resorting to all such legitimate changes in the form, construction and relative arrangement of the several parts as may be fairly embodied within the spirit and scope of the invention as claimed.

I claim:

1. In combination with the reciprocating needle carriage of an embroidery machine and means for reciprocating said carriage, a series of spaced needle carrying rods mounted upon the carriage for independent axial movement, means yieldingly holding said rods normally in a retracted position on the carriage, means for selectively moving said needle carrying rods to cause a stitch forming operation of the needles thereon in the reciprocating movement of the carriage, said means including a holder for interchangeable pattern plates, movable with the carriage and independently thereof, and an actuating member for said holder also mounted in said carriage and movable therewith.

2. In combination with the reciprocating needle carriage of an embroidery machine and means for reciprocating said carriage, a series of spaced needle carrying rods mounted upon the carriage for independent axial movement, means yieldingly holding said rods in retracted position on the carriage, a plate adapted to be moved independently of the carriage to engage certain of said rods and cause a stitch forming operation of the needles thereon, said plate having openings through which other needle rods are adapted to pass, and means for actuating said plate.

3. In combination with the reciprocating needle carriage of an embroidery machine and means for reciprocating said carriage, a series of spaced needle carrying rods mounted upon the carriage for independent axial movement, means yieldingly holding said rods in retracted position on the carriage, a member movable independently of the carriage, removable means carried by said member to coact with the needle carrying rods and controlling the stitch forming operations of the respective needles, and means for actuating said member.

4. In combination with the reciprocating needle carriage of an embroidery machine and means for reciprocating said carriage, a series of spaced needle carrying rods mount-

ed upon the carriage for independent axial movement, a member movable independently of the carriage, removable means carried by said member to coact with the needle carrying rods and controlling the stitch forming operations of the respective needles, means for actuating said member, a perforator associated with each needle, and means for automatically actuating the perforators in the stitch forming operations of the respective needles.

5. In an embroidery machine, a needle carriage, a series of spaced needle carrying rods mounted upon said carriage, means yieldably holding the needle carrying rods in retracted position on the carriage, means for controlling the stitch forming operations of the needles, and means for stabilizing the movements of the needle carrying rods to prevent oscillation thereof with relation to said carriage.

6. In an embroidery machine, a needle carriage, a series of spaced needle carrying rods mounted upon said carriage, means for controlling the stitch forming operations of the needles, a transversely disposed member fixed upon each of said rods, a curved resilient plate secured to the carriage, adjustable pins carried by said member at each side of the rod to engage the ends of said plate, a coil spring interposed between said plate and said member, and additional springs connected to said member and to the carriage and tending to return said rod to its normal position, said springs and resilient plate stabilizing the working movement of the needle carrying rod with respect to said carriage.

7. In an embroidery machine, a plurality of reciprocating needle carriages extending the full length of the machine, a series of spaced needle carrying rods mounted on each carriage for independent axial movement with respect thereto, changeable pattern plates for actuating said rods and controlling the stitch forming movements of the needles, means for reciprocating said carriages, and means for moving the pattern plates with respect to the carriages including a common power shaft mounted between the carriages and the actuating means therefor.

8. In combination with the reciprocating needle carriage of an embroidery machine and means for reciprocating said carriage, a series of spaced needle carrying rods mounted upon the carriage for independent axial movement, a set-screw for each of said needle carrying rods whereby any one of the rods may be rigidly fixed upon the carriage, changeable pattern plates automatically actuated independently of the carriage to control the reciprocating movements of said needles in accordance with the design being embroidered, and hand operable means for changing the stitch forming operations of the needles.

In testimony that I claim the foregoing as my invention, I have signed my name hereunder.

WALTER HUELLER.