R. ZAHN.

EMBROIDERY MACHINE.

APPLICATION FILED FEB. 5, 1910.

1,031,159.

Patented July 2, 1912.

4 SHEETS—SHEET 1.

Fig. 1.

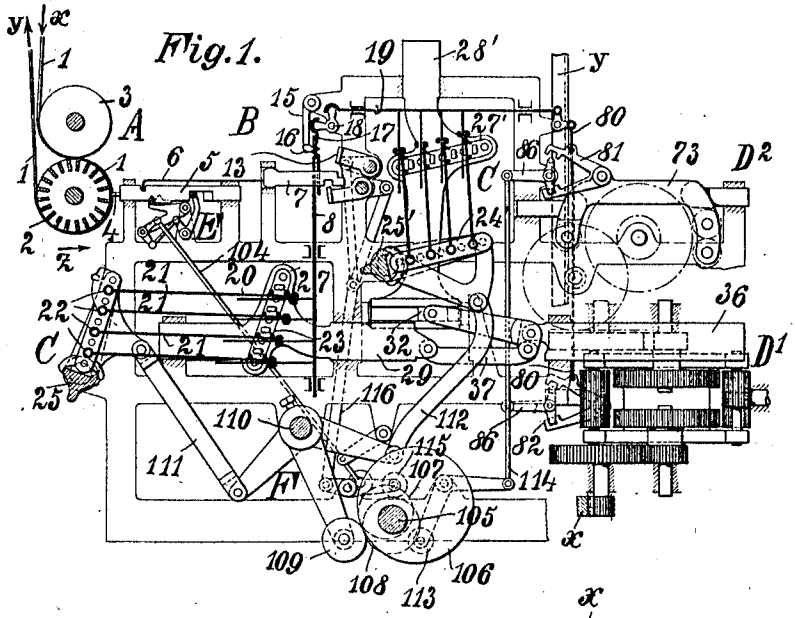
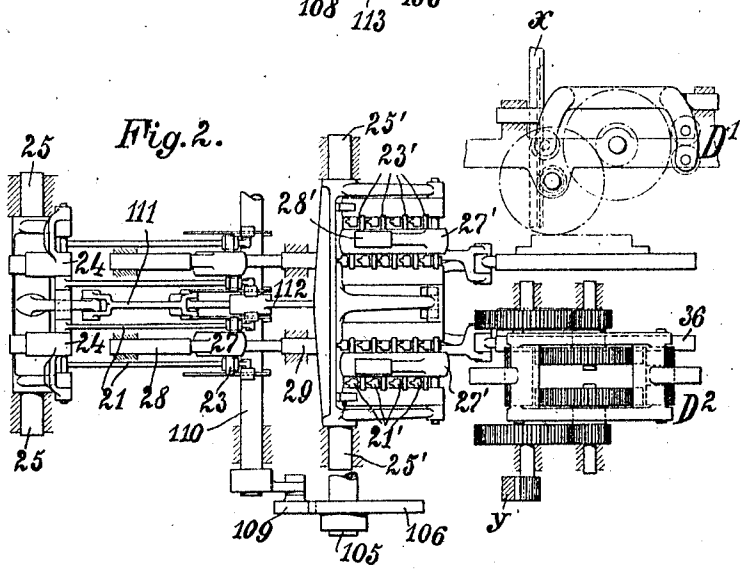


Fig. 2.



Witnesses:

Joseph Schickle

Robert H. Niel

Inventor:

Robert Zahn

R. ZAHN.

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4 SHEETS—SHEET 2.

Fig. 3.

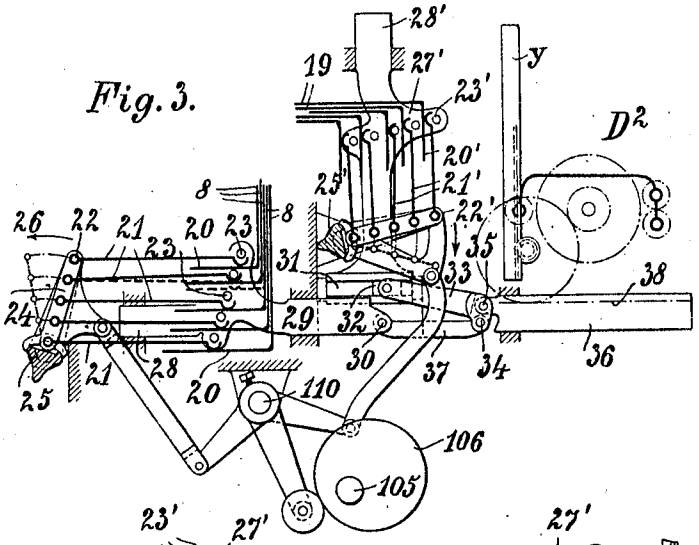


Fig. 4.

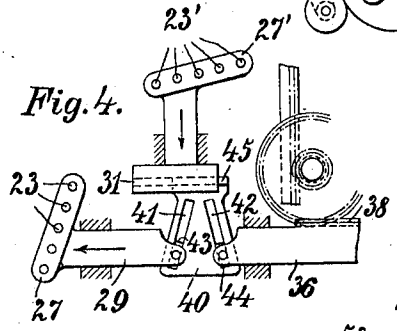


Fig. 5.

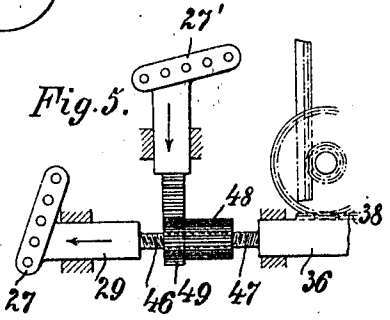


Fig. 6.

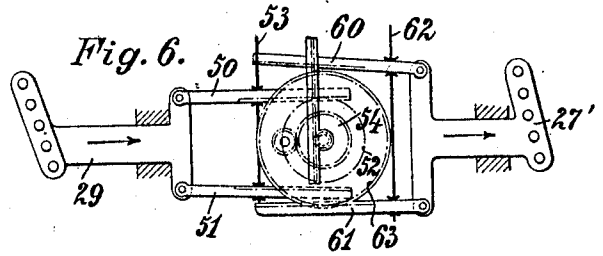
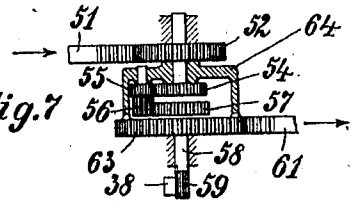


Fig. 7



Witnesses:

Joseph Kuhle

Robert H. Vier

Inventor:

Robert Zahn

R. ZAHN.

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4 SHEETS—SHEET 3.

Fig. 9.

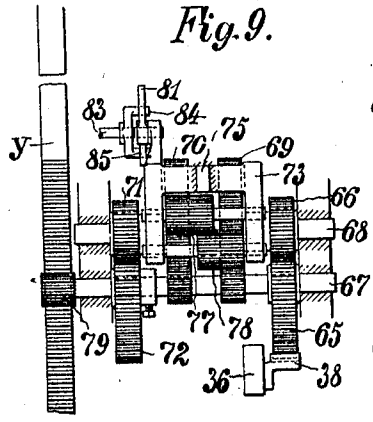
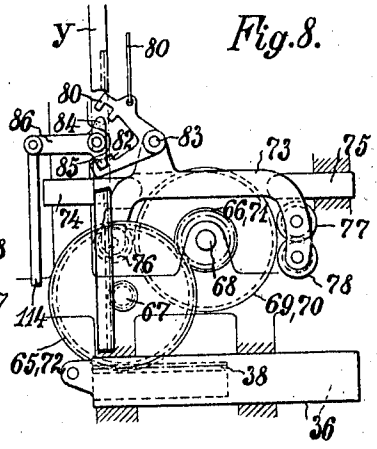


Fig. 8.



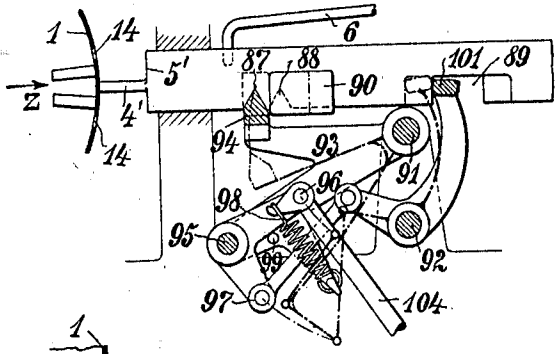


Fig. 10.

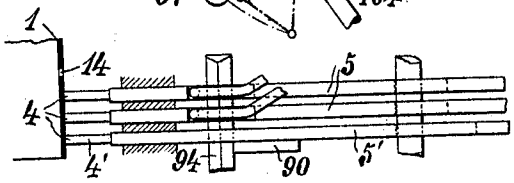


Fig. 11.

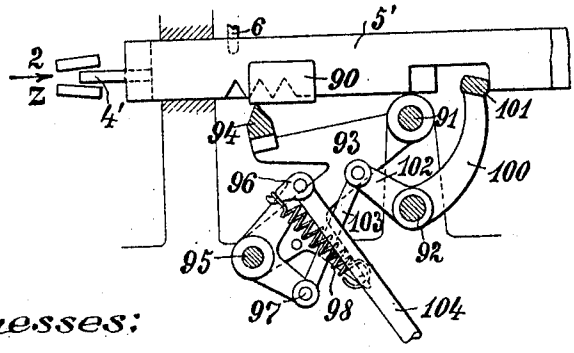


Fig. 12.

Witnesses:

Joseph Kühle

Robert H. Nier

Inventor:

Robert Zahn

R. ZAHN.

EMBROIDERY MACHINE.

APPLICATION FILED FEB. 5, 1910.

1,031,159.

Patented July 2, 1912.

4 SHEETS—SHEET 4.

Fig. 13.

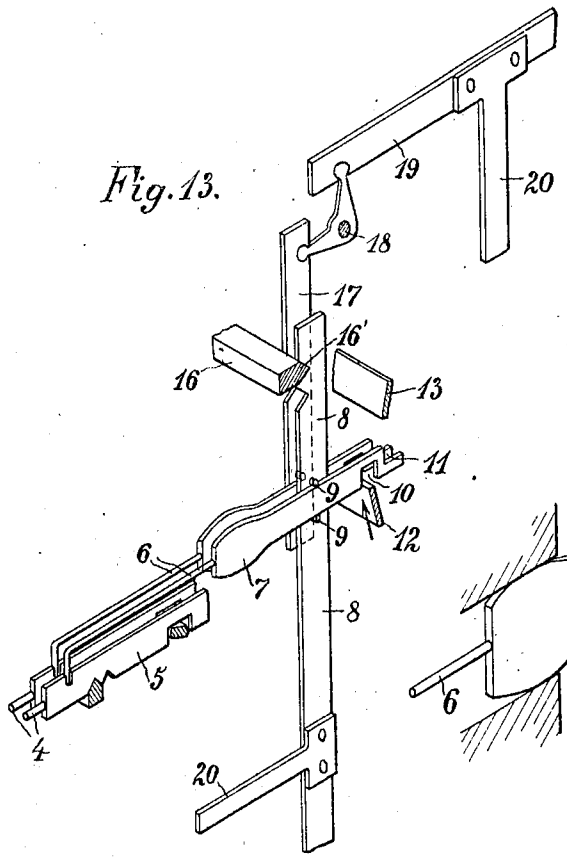


Fig. 14.

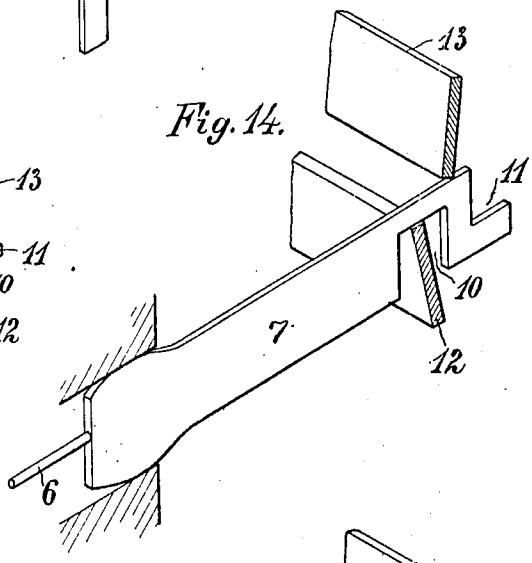
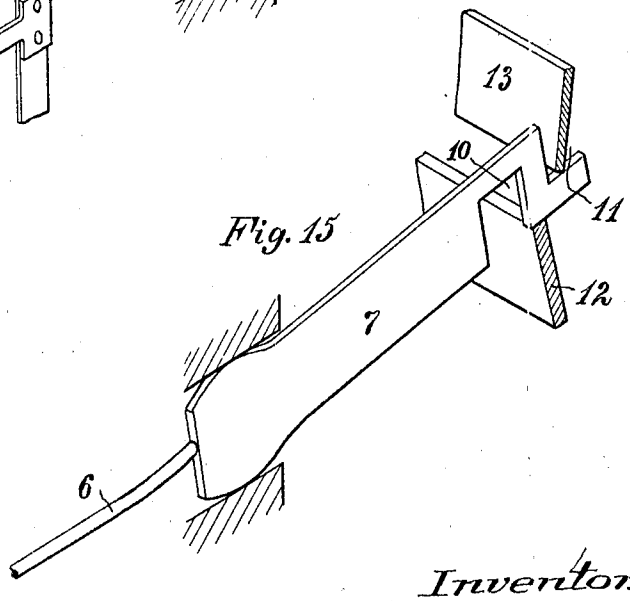


Fig. 15



Witnesses:

Joseph Schlitz

Robert H. Parker

Inventor:

Robert Zahn

UNITED STATES PATENT OFFICE.

ROBERT ZAHN, OF PLAUEN, GERMANY.

EMBROIDERY-MACHINE.

1,031,159. Specification of Letters Patent. Patented July 2, 1912.

Application filed February 5, 1910. Serial No. 542,305.

To all whom it may concern:

Be it known that I, ROBERT ZAHN, a resident of Plauen, in Saxony, in the Empire of Germany, factory manager, have invented certain new and useful Improvements in Embroidery-Machines, of which the following is a specification.

This invention relates to embroidery machines of the automatic type and has for its object to provide such machines with means for displacing the embroidery frame under the control of a perforated record strip or pattern card commonly known as the jacquard card.

The invention moreover comprises devices in coöperation with one another and combined in the manner hereinafter fully explained and shown by way of example in the accompanying drawings in which—

Figure 1 is a lateral elevation illustrating more or less diagrammatically an automatic embroidery machine according to this invention. Fig. 2 is a plan view of certain parts of Fig. 1. Fig. 3 shows again parts of Fig. 1, representing one form of a mechanism according to the present invention. Fig. 4 is a lateral view of a mechanism according to another form of this invention. Fig. 5 is a lateral view of a third constructional form. Fig. 6 is a lateral view of a fourth example of which Fig. 7 is a plan view. Fig. 8 illustrates on an enlarged scale, parts shown in the right-hand portion of Fig. 1. Fig. 9 is an elevation of the same parts viewed from the right-hand side. Fig. 10 represents a detail of Fig. 1. Fig. 11 is a plan view thereof. Fig. 12 represents a repetition of the parts shown in Fig. 10, but in a different working position, and Figs. 13 to 15 are perspective views of a detail of Fig. 1 in different working positions.

The numerous mechanisms of the complete arrangement will hereinafter be considered in groups which are located at about the places indicated in Fig. 1 by the letters A, B, C, D, E, F. These mechanisms so intimately interengage with one another as to render their distinct separation practically impossible. The grouping above indicated has therefore only the object to facilitate the understanding of the specification. The various groups embrace the following mechanisms:

A. The jacquard apparatus.

B. The mechanisms for determining the throws or lengths of the displacements of the embroidery frame.

C. The mechanism for adding up or totaling the large and the small movements.

D. The mechanisms for determining the direction of movements.

E. The safety device.

F. The driving mechanism.

A. *The jacquard apparatus.*—A paper strip 1. is fed between the rollers 2, 3, and is advanced intermittently in the direction *x*, *y*, and after each advance is moved against a row of jacquard needles 4 in the direction of the arrow *z*, see also Figs. 10, 11, and 12. Each jacquard needle 4 is secured to a prismatic bar 5. These bars 5, are journaled in the machine frame so as to be movable in their own longitudinal direction. Engaging with each bar 5, is the hook-shaped end of a wire 6, the other end of which is rigidly secured on a bar 7. Thus if one of the bars 5 is moved in the direction of the arrow *z*, the bar 7, connected with it by the wire 6 is forced to perform the same movement as will be clearly understood from Fig. 13. Arranged between the horizontal bars 7 are vertically movable bars 8 diagrammatically indicated in Fig. 1 by thick lines and shown in perspective view in Fig. 13. Secured to each bar 8 and projecting laterally therefrom are two pins 9, (Fig. 13) between each two of which a bar 7 is guided. If therefore one of the bars 7 is raised or lowered, the corresponding vertical bar 8 is forced by the pins 9 to rise or to descend accordingly. The rear end of each bar 7 is provided at its lower edge with a recess 10 and on its upper edge with a recess 11. Capable of entering the recess 10 is the upper edge of a cross bar 12, and adapted to engage with the upper recess 11 is the lower edge of a transverse bar 13. If, owing to the movement of the record strip or pattern card the whole of the jacquard needles 4 are pressed back as will be understood from an inspection of Fig. 1, the recesses 10 and 11 of all adjacent bars 7, are caused to coincide in a continuous line respectively. These recesses thus form two troughs 10 and 11 which are so located with regard to the transverse bars 12 and 13 as to enable the bar 12 to enter the recesses 10 when moved in upward direction as indicated in Fig. 14. If, in this case, the bar 13 is moved downwardly it does not enter

the recesses 11 but comes to rest upon the upper edge of the bars 7, thereby depressing the latter.

As already mentioned the record strip 1 (Fig. 1) is provided with a large number of perforations so distributed as to form any desired pattern. Some of these perforations are indicated at 14 in Figs. 10 and 11. If the drum or roller 2 is moved in the direction of arrow z only those bars 5 are pushed back, whose needles 4 encounter the solid paper surface. This operation is exactly the same as that known in jacquard devices of a loom. Some of the needles and their corresponding bars 5, 6, 7, however, are not forced back during this movement of the roller 2, but retain their position. In this case the recesses 11 are opposite the bar 13 as indicated in Fig. 15, whereas the recesses 10 are not in the path of the bar 12. Thus if the bar 12 is raised it raises the bars 7 and consequently also the corresponding bar 8.

A driving mechanism which is immaterial to the invention and therefore is not shown in the drawing causes the rocking of a lever 15 shown in Fig. 1 in order to enable its hook-shaped end 16 to engage with recesses 16′ in the bars 8 and to thereby safely hold these bars for a moment in that elevated position to which they have been raised by the bars 7. As a rule there are eighteen jacquard needles or pins 4, and accordingly eighteen bars 5, eighteen wire hooks 6, and eighteen bars 7, whereas only nine bars 8 are arranged to extend in downward direction. The other nine bars are marked 17 and extend in upward direction (see Figs. 1 and 13). These upwardly directed bars are likewise raised or lowered by the transverse bars 12 and 13. The movements of the nine bars 17 are transmitted by bell crank levers pivoted on a stationary pivot 18, to bars 19.

Those parts of the jacquard mechanism which have so far been explained, namely, the eighteen jacquard needles 4 and the bars 8, 17, and 19 serve for automatically moving the embroidery frame of an embroidery machine only in one direction namely horizontally. An equal number of parts is provided to effect the movements of the embroidery frame also in the other viz. vertical direction. This is apparent from the provision of the double sets of wheels D′ D² shown in Figs. 1 and 2 and hereinafter explained. The set of wheels D′ equipped with a toothed rack x serves for transmitting the horizontal movements and the wheels D² provided with a rack y are arranged for the transmission of the vertical motion. The two racks x and y are connected by transmitting means to the embroidery frame. The two wheel sets D′ and D² are of entirely similar construction but as regards their arrangement in the machine they are set at right angles to each other so that the representation of the set D′ in Fig. 1 may in a way be looked upon as being a plan view of the representation of D² in the same figure while in Fig. 2 the illustration of D² may be said to represent a plan view of D′ in that figure.

From the foregoing description it will be understood that in the complete mechanism of a machine as shown in Fig. 1 the parts 4, 5, 6, 7, etc., will be contained thirty six times. Of this total eighteen parts are allotted to the wheel set D′ and the other eighteen to the wheel set D² and of each of these eighteen parts nine belong to the bars 8 and the other nine to the parts 17, 18, 19. For the sake of completeness and as will hereinafter be explained, it should here be mentioned, that besides the thirty-six jacquard needles 4 which only determine the movements of the embroidery frame in vertical or horizontal direction, there are in the same row other jacquard needles for the purpose of so controlling the two sets of wheels D′ D² that each vertical movement is caused to take place at one time upwardly and at another time downwardly, while the horizontal movements are accordingly controlled to take place alternately each to the left and to the right. Moreover one jacquard needle 4′ is arranged with the object of protecting the whole mechanism against injury, say in case the machine is started accidentally or by unauthorized persons in the absence of a jacquard strip 1.

B. *The mechanism for determining the extents of movements for the displacement of the embroidery frame.*—The bars 8 in practice are arranged as shown in Fig. 1 in one row side by side, so that the foremost bar obstructs from view all those arranged behind it. In Fig. 3 some of these bars are shown diagrammatically in order to indicate that each bar 8 is provided with a horizontal arm 20. Gliding on each horizontal arm 20 is the right hand end of a coupling rod 21. The left hand end of each coupling rod is rotatably secured on a pin 22. The right hand end of each coupling rod is claw shaped so as to enable its being coupled with a pin 23. For the sake of simplicity these pins 23 are in Fig. 3 indicated by circles. In reality, however, they are of rectangular shape as shown in Fig. 1. The pins 22 are secured to a lever 24 journaled in the machine frame so as to rock about pivots 25 (see also Fig. 2) and operated by a powerful driving mechanism so as to oscillate to the extent indicated by the arrow 26 in Fig. 3. As will be seen from Fig. 2 two such levers 24 are arranged. Attached to each lever are nine coupling rods 21. Of these latter, four are shown located at one side (Fig. 1) and five at the other side of the lever 24 (Fig. 3), owing to diagram-

matic representations having been resorted to. Otherwise all nine coupling rods 21 would have to appear in Fig. 1, but this deviation from the reality has been resorted to for the sake of clearness. During the oscillation (26) of the lever 24 the coupling rods 21 are given different throws. The uppermost coupling rod 21 receives the largest throw owing to its fulcrum 22 being remotest from the pivot 25 of the lever. There are as many pins 23 as there are coupling rods 21, and of these pins again four are shown on one side (Fig. 1) and five on the other side (Fig. 3) of a slide 27, 28, 29, 30 both ends of which are of prismatic shape and which is movably journaled in the machine frame. Upon the raising of one of the bars 8 its arm 20 raises the corresponding coupling rod 21 so as to couple it with the corresponding pin 23. The slide 27 is thereby forced to perform a movement the length of which is determined by the distance of the corresponding pin 22 from the fulcrum 25. A mechanism similar to that controlled by the vertical bars 8 is provided for the horizontal bars 19. The reference numbers 20′, 21′, 22′, 23′, 24′, 25′, 26′, 27′, and 28′ have for the second apparatus exactly the same meaning as have the numbers 20, 21, 22, 23, 24, 25, 26, 27, 28, described in connection with the first apparatus. There is only one difference between these two devices viz: The horizontal slide 27, 28, 29 carries at its right hand end a link or bolt 30 whereas the vertically guided slide 27′, 28′, has its lower end provided with a horizontal prismatic notch 31 guided in which is a prismatic sliding head 32.

C. *The mechanism for adding up the large and the small movements.*—The slides 27, 27′ thus serve to allot the movements varying in extent in accordance with the coupling effected by the jacquard mechanism, from the graduated levers to the other organs and are, therefore, designated in the claims as allotting members. Yieldingly attached to the sliding member 32 of the slide 27′, 28′, 31′ is a bell crank lever of which one arm 33 is very long and the other 34 very short. The ratio of length of these two arms is 10:1. The fulcrum of this bell crank lever 33, 34 is constituted by a pin 35 which is secured to a horizontally movable slide 36. The pivot 30 on the slide tail 29 is connected with the lever arm 34 by a link 37. One side of the slide 36 is provided with a rack 38 by which the wheels D^2 are caused to rotate.

The operation of the mechanism 30, 31, 35 is as follows: Assuming by way of example, that the slide 27, 28, 29 is caused to perform a horizontal movement while the slide 27′, 28′, 31 is stationary. The sliding member 32 is thus caused to reciprocate in the slot 31 and the slide 36 is made to travel exactly the same distance as the slide 27, 28, 29. Supposing now the slide 27, 28, 29 to be stationary and the slide 27′, 28′, 31 to be caused to make a vertical movement, it will be seen, that this movement is transmitted to the slide 36 by the lever 33, 34 at the ratio of 10 to 1. Assuming now the slide 27, 28, 29 to travel horizontally a distance of say 5 mm. and simultaneously the slide 27′, 28′, 31 to perform a vertical movement of say 3 mm., these two movements are both transmitted to the slide 36 which is thus moved to the extent of 5.3 mm., owing to the throw of 5 mm. being directly transmitted to the slide 36, whereas the throw of 3 mm., owing to the proportion of the lever arms 33, 34, is reduced to the tenth part of the movement performed by the slide 27′, 28′, 31. In this manner the throw of the slide 36 may be varied at will according to the operation of the bars 8 and 19 under the action of the jacquard apparatus. Its shortest displacement viz: 0.1 mm. slide 36 receives in the event of the slide 27 being stationary and the slide 27′ being drawn down by that coupling rod 21′ which in Fig. 3 is farthest to the left that is to say which is nearest the pivot 25′. A throw of 0.9 mm. is transmitted to the slide 36 upon the slide 27 being again stationary while the slide 27′ is drawn down by that coupling rod 21′ which in Fig. 3 is farthest to the right that is to say remotest from the fulcrum 25′. The throw of the slide 36 becomes one complete mm. when slide 27′ is stationary and slide 27 is moved to the right by that coupling rod 20 which in Fig. 3 occupies the lowermost position. The largest possible throw of the slide 36 is 9.9 mm. and it is attained when both slides 27 and 27′ are moved by those coupling rods 21 and 21′ respectively, which are remotest from the corresponding fulcrums 25 and 25′. The above numbers are of course mere examples and the question as to whether the shortest throw should be 0.1 mm. and the longest 9.9 mm. depends entirely on circumstances and on the minimum throw chosen under particular conditions. Thus if for instance for the minimum throw 0.25 mm. is chosen, the corresponding maximum throw would be 24.75 mm.

The constructional forms shown in Figs. 4 to 7 illustrate how the adding up of large and small movements may be effected by means of mechanism other than the one above described. In these figures the parts to which functions are allotted similar to those performed by certain parts described with reference to Fig. 3 are marked with similar reference letters. The trapezoidal plate 40 in Fig. 4 is provided with two slots 41, 42 acutely inclined to one another and adapted to receive the prismatic sliding blocks 43, 44. The block 43 is connected with slide 29 and block 44 is attached to

slide 36. The upper edge of the plate 40 carries a prismatic bar 45 which is capable of sliding in a groove 31 of the slide 27′ upon the two slides 29, 36 being reciprocated in horizontal direction. On the slide 27′ being lowered or raised, the two slides 29, 36 are caused to approach or to move apart from one another respectively. In Fig. 5 the adding mechanism is provided with two oppositely threaded spindles 46, 47 attached respectively to the slides 29, 36 and connected by an externally toothed nut 48. Engaging with the circumferential teeth of this nut is a rack 49 which is secured to the slide 27′. According to Figs. 6 and 7 the slides 29, 27′ are both arranged horizontally and transmit their movements to a differential gear. To this end two racks 50, 51 are so attached to the slide 29 as to allow their alternate engagement with a toothed wheel 52 according to whether the connecting rod 53 is moved down or in upward direction. The toothed wheel 52 is rigidly connected with the differential wheel 54 and the latter is connected by means of a planet gear 55, 56 with a second differential wheel 57 the shaft 58 of which carries a small pinion 59 which engages with the rack 38 on the slide 36. Similarly the other slide 27′ has yieldingly attached to its two racks 60, 61 capable of being alternately coupled with a pinion 63 which forms part of the differential gear casing 64.

The operation of this mechanism is as follows: If the slide 27′ is held stationary and the slide 29 is moved with one of its racks 50, 51 in engagement with the pinion 52 the latter rotates the pinion 54 which in turn rotates the planet gear 55, 56. This planet gear transmits its movement to the differential wheel 57 whose shaft 58 in rotating the pinion 59 displaces the rack 38. During this operation the casing 64 remains stationary. If, however, the slide 29 is held stationary and the slide 27′ is moved its rack 60 or 61 causes the casing 64 to rotate in which case the planet gear 55, 56 rolls on the pinion 54 which now should be imagined to be stationary, thereby rotating the toothed wheel 57. The two connecting rods 53 and 62 by which the racks 50, 51 and 60, 61 are alternately thrown in or out of action respectively are controlled by the jacquard mechanism and thereby determine the rotation which the pinion 59 is to receive for the purpose of operating the rack 38.

D. *The mechanism for determining the direction of the movements.*—It will have been seen from the foregoing description that the slide 36 (Figs. 1, 3, 8 and 9) secured to which is the rack 38 (Figs. 3, 8) is so governed by the jacquard mechanism, as to receive a throw of varying length. But with regard to direction all of these movements of the slide 36 are alike that is to say the slide 36 advances always in one and the same direction and then returns to its initial position. Now the mechanism shown in Figs. 8 and 9 has for its object to so transmit the movements of the slide 36 to the rack *y* as to cause the latter to move either in one direction or in a direction opposite thereto. The rack 38 engages with a large wheel 65 which in turn meshes with a small pinion 66. Both wheels 65 and 66 are loosely rotatable on shafts 67, 68. The pinion 66 and a pinion 69 are rigidly connected together by a common hub so as to be rotatable on the shaft 68. The pinions 70 and 71, however, are fast on the shaft 68 and the pinion 72 is fast on the shaft 67. The pinions 69 and 70 are of equal size and so are the wheels 66 and 71, and the pinions 65 and 72. An iron frame 73 movably journaled at 74, 75 is provided with three cylindrical pinions 76, 77, 78. The pinion 76 is of a breadth enabling it to engage simultaneously with the pinions 69 and 70. The pinions 77, 78 engage with one another at their inner ends while their outer ends are in mesh with 70 and 69 respectively. With the frame in its intermediate position as shown in Fig. 8 all three cylindrical pinions 76, 77, 78 are out of gear with the wheels 69, 70. Upon moving the frame 73 to the right (in Fig. 8) the pinion 76 couples the wheels 69, 70 whereby the latter rotate in the same direction. If the frame 73 is moved to the left, the pinion 77 engages with wheel 70, and the pinion 78 with wheel 69 so that both the wheels 69, 70 and wheels 65, 72 are caused to rotate in opposite directions. By means of the small pinion 79 these rotary movements are transmitted to the rack *y* which operates the embroidery frame.

The jacquard device A (Fig. 1) by means of the parts 4, 6, 7, 12, 18 and 19 already described, influences a pull rod 80 (Figs. 1 and 8) which governs bell crank levers pivoted at 83 on the frame 73 (Figs. 8 and 9) and provided with claws 81, 82. These claws are capable of engaging respectively with laterally extending pins 84, 85 on a three-armed rocker 86. If the claw 81 is caused to engage pin 84 the frame 73 moves in one direction. If however, as shown in Fig. 8, claw 82 is caused to embrace pin 85, the frame 73 is moved in the opposite direction. In this manner the jacquard device causes by means of the parts 80, 83, 86 the cylindrical pinions 76 or 77, 78 to be thrown into action alternately, thereby determining the direction of movement of the embroidery frame.

E. *The safety mechanism.*—The lever mechanism shown in Figs. 10, 11 and 12 serves a double purpose. It has been devised to safeguard in the first place each grouping of the jacquard needles at a deter-

mined moment, and as soon as the grouping has exerted its effect upon the mechanism B, to cause all jacquard needles to be advanced to their initial position. In the second place that device serves for retracting all jacquard needles and thereby to obviate damage in the event the machine is started, for instance, in the absence of a jacquard strip 1 on the roller 2, in which case the whole machine would be inoperative. Apart from the thirty-six jacquard needles 4, 5 (Figs. 1 and 11) governing the mechanism B (Fig. 1) and besides the two jacquard needles which govern the devices D′ and D² by means of the pull rod 80 (Figs. 1 and 8), provision is made for a special jacquard needle marked 4′, 5′ and being the foremost one shown in Fig. 11. There are no perforations in the jacquard strip to coöperate with this needle for, as mentioned, this needle is to become operative in the absence of the jacquard strip from the machine. Each jacquard needle bar 5 is provided on its underside with triangular notches, one 87 in front, and one 88 in the rear thereof. The distance between these notches is equal to the throw of the bars 5. Apart from the notches above mentioned, the bars 5 are each provided on their underside with a rectangular recess 89. The safety bar 5′ has in contra-distinction to the other needles, only one triangular notch 87. In the place of the rear notch 88, a plate 90 is secured to the bar 5′. Rotatably journaled in the machine frame beneath the safety bar 5′ are two shafts 91, 92. Each end of the shaft 91 has rigidly secured to it a lever 93, and these two levers are rigidly connected together by a prismatic rail 94. By raising these levers 93, the bar 94 enters one of the recesses 87 or 88. The other arm of the lever 93 carries a pin 95 rotatably mounted on which is a bell crank lever 96, 97. A powerful spring 98 causes this lever to bear aganist a pin 99 as shown particularly in Fig. 10. Each end of the shaft 92 has rigidly secured to it a lever 100 and these two levers are securely connected to one another by a cross bar 101 capable of engaging with the recesses 89 in the bars 5. Thus during the rotation of the shaft 92 the whole of the needle bars 5 are brought into a straight line by the bar 101 drawing back any bars 5 which may at that time be non-coincident with the others. The recess 89 in the needle bar 5′, however, is wider in the rear than the others. Consequently the frontmost needle 4′ is not drawn away from the roller 2 by the bar 101. Moreover, rigidly attached to the front end of the shaft 92 is a lever 102 connected by a link 103 to the bell crank lever 97, 96. Attached to the free end of lever arm 96 is a pitman 104 which is operated by the main driving gear of the machine.

During the regular working of the machine, that is to say with a pattern strip 1 on the roller 2, the safety needle 4′ by each movement of the roller 2 in the direction *z* is forced away therefrom in backward direction, owing to there being no perforations in the strip to coöperate with this needle. During this operation therefore the bar 94 is caused to engage in a regular manner with the recess 87 in the safety needle bar 5′. On the bar 94 descending, the bar 101 moves all needle bars 5 forward again into initial position, as shown in Fig. 10. In the event, however, of there being no jacquard strip 1 in the machine and the latter is started unintentionally or through an oversight, the lever mechanism described is caused to operate in the manner illustrated in Fig. 12 of the drawings. With no pattern strip in the machine the safety bar 5′ maintains its forward position and on the connecting rod 104 being raised, in starting, by the driving gear, the bar 94 is prevented from entering the triangular notches 87, 88, and is stopped by striking against the plate 90 on the safety needle bar 5′. The connecting rod 104, however, continues its movement, thereby causing the lever 96, 97, to be disengaged from the abutment 99 against the action of the spring 98. The lever arm 97 now rocks the shaft 92 together with the bell crank levers 100, 102 carried thereby, by means of the link 103 and thus causes the bar 101 to be moved to the right, with the result, that with the exception of the safety bar 5′, all other needle bars 5 are moved away from the roller 2 so as to be rendered inoperative.

F. *The driving mechanism.*—The main shaft 105 of the machine (Figs. 1, 2 and 3) carries a number of eccentrics of which three, 106, 107 and 108, are shown. In contact with the circumference of the eccentric 106 is a roller 109 rigidly secured to a crank arm on a shaft 110 which, moreover, carries two levers operating by means of connecting rods 111, 112, the slide operating levers 24, 24′ respectively. Engaging with the circumference of eccentric 107 is a roller 113 by which a rod 114 is vertically reciprocated (Figs. 1 and 8) so as to operate the levers 86. In engagement with the circumference of the third eccentric 108 is a roller 115 which operates the bars 12, 13, hereinbefore described, by means of a connecting rod 116. The connecting rod 104 may be operated by an eccentric on the shaft 105, or in any other suitable way.

I claim:

1. In an automatic embroidering machine, means for allotting to the embroidery frame movements of varying extent embodying horizontal and vertical sliding members, horizontal and vertical rocking members, coupling rods at one end pivoted to each of said rocking members at different distances from the fulcrum thereof and at their free

ends adapted to temporarily engage said sliding members, means for coupling the respective rods to the said slides and means for transmitting to the embroidery frame the movements received by the said sliding members.

2. In an automatic embroidering machine, a jacquard mechanism, mechanisms for determining the throws of the embroidery frame embodying horizontal and vertical sliding members, horizontal and vertical rocking members, coupling rods pivoted to each of the said rocking members of different distances from the fulcrum thereof, jacquard controlled means for connecting said coupling rods to the said sliding members, means for transmitting to the embroidery frame the movements of the said sliding members and means for combining or totaling the movements of the said sliding members.

3. In an automatic embroidering machine, a jacquard mechanism, mechanisms for determining the throws of the embroidery frame embodying a sliding member, a rocking member, coupling rods at one end pivoted to the latter at different distances from the fulcrum thereof and at their free ends adapted to temporarily engage said sliding member, jacquard controlled bars adapted to operate the said coupling rods so as to couple the latter to the said sliding member, and means for transmitting to the embroidery frame the movements of the said sliding member.

4. In an automatic embroidering machine, a jacquard mechanism, mechanisms for determining the throws of the embroidery frame embodying horizontal and vertical sliding members, horizontal and vertical rocking members, coupling rods pivoted to each of the said rocking members at different distances from the fulcrum thereof, jacquard controlled bars adapted to operate the said coupling rods so as to couple the latter to the said sliding members, means for transmitting to the embroidery frame the movements of the said sliding members, and means for combining or totaling the movements of the said sliding members.

5. In an automatic embroidering machine, the combination with a driving part, of a jacquard mechanism, mechanisms for determining the throws of the embroidery frame embodying horizontal and vertical sliding members, horizontal and vertical rocking members, operated from said driving part, coupling rods at one end pivoted to each of the said rocking members at different distances from the fulcrum thereof and at their free ends adapted to temporarily engage said sliding members, jacquard controlled means for connecting the respective coupling rods to the said sliding members, and means for transmitting to the embroidery frame the movements of the said sliding members.

6. In an automatic embroidering machine, the combination with a driving part, of a jacquard mechanism, mechanisms for determining the throws of the embroidery frame embodying horizontal and vertical sliding members, horizontal and vertical rocking members operated from said driving part, coupling rods pivoted to the said rocking members at different distances from the fulcrum thereof, jacquard controlled means for connecting said coupling rods to the said sliding members, means for transmitting to the embroidery frame the movements of the said sliding members, and means for combining or totaling the movements of the said sliding members.

7. In an automatic embroidering machine, a jacquard mechanism, mechanisms for determining the throws of the embroidery frame, embodying horizontal and vertical sliding members, horizontal and vertical rocking members, coupling rods pivoted to the said rocking members at different distances from the fulcrum thereof, jacquard controlled means for connecting said coupling rods to the said sliding members, means for transmitting to the embroidery frame the movements of the said sliding members, means for combining or totaling the movements of said sliding members and means for determining the directions of the movements of the frame.

8. In an automatic embroidering machine, mechanisms for allotting to the embroidery frame movements of varying extent, a mechanism for combining or totaling the different movements embodying a driven part, a bell crank lever having its fulcrum arranged on the said driven part and its arms yieldingly connected to the said allotting mechanisms in such a manner that the movements of the one allotting mechanism are transmitted to the said driven member wholly, and the movements of the other allotting mechanism are transmitted to the same at the ratio corresponding to the proportion of the arms of the said bell crank lever.

9. In an automatic embroidering machine, a jacquard mechanism, mechanisms for allotting to the embroidery frame movements of varying extent one of said allotting mechanisms embodying a sliding member, a rocking member, coupling rods pivoted to the latter at different distances from the fulcrum thereof, jacquard controlled means for connecting said coupling rods to the said sliding member, means for transmitting to the embroidery frame the movements of the said sliding member, and means for combining or totaling the said various movements of the allotting mechanisms embodying a driven part, a bell crank lever having its

fulcrum arranged on said driven part and its arms yieldingly connected to the said allotting mechanisms.

10. In an automatic embroidering machine, a jacquard mechanism, mechanisms for allotting to the embroidery frame movements of varying extent one of said allotting mechanisms embodying a sliding member, a rocking member, coupling rods pivoted to the latter at different distances from the fulcrum thereof, jacquard controlled means for connecting said coupling rods to the said sliding member, means for transmitting to the embroidery frame the movements of the said sliding member, means for combining or totaling the said various movements of the allotting mechanisms embodying a driven part, a bell crank lever having its fulcrum arranged on said driven part and its arms yieldingly connected to the said allotting mechanisms, and means for determining the directions of such movements.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

ROBERT ZAHN.

Witnesses:
JOSEPH MIHLE,
ROBERT H. NIER.