R. ZAHN.

AUTOMATIC EMBROIDERING MACHINE.

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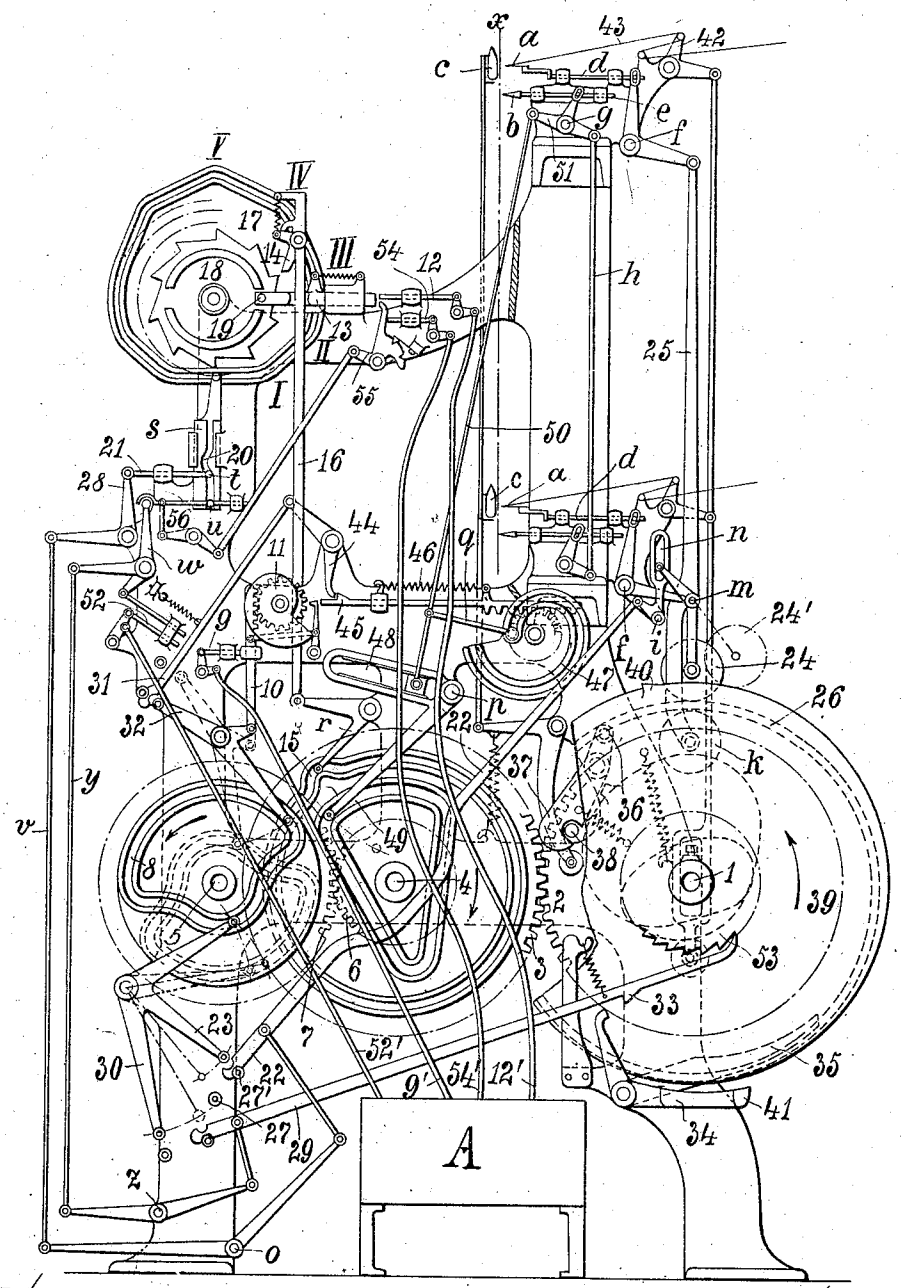

Witnesses:
P. F. Nagle.
L. Doville.

Inventor.
By Robert Zahn.
Wiedersheim & Fairbanks.
Attorneys.

UNITED STATES PATENT OFFICE

ROBERT ZAHN, OF PLAUEN, GERMANY.

AUTOMATIC EMBROIDERING-MACHINE.

1,027,789. Specification of Letters Patent. Patented May 28, 1912.

Application filed December 17, 1909. Serial No. 533,509.

To all whom it may concern:

Be it known that I, ROBERT ZAHN, subject of the Emperor of Germany, residing at Plauen, Saxony, in the Empire of Germany, have invented certain new and useful Improvements in Automatic Embroidering-Machines, of which the following is a specification.

The object of this invention is a device in automatically working, embroidering machines by which the adjustment of the various mechanisms is so effected during the changing over from the embroidery to the perforating operation that first of all only the driving mechanism for the operation of the needles is thrown out of action, while the driving mechanisms for the shuttles remain in action and are thrown out of action shortly afterward. The reverse order of movements takes place if the machine is to change over from the perforating to the embroidery operation. Important advantages are thereby obtained for an automatic working machine, which hitherto were obtainable only if the embroidering machine was operated manually by the attendant with the aid of the known pantograph.

The accompanying drawing illustrates the novel device in combination with certain parts of a known embroidering machine in a diagrammatical manner.

As in known embroidering machines the cloth x x to be embroidered is secured vertically. The needles a and the perforators b are, in accordance with the design to be produced, forced into the work from the front side thereof, while the shuttles c are reciprocated at the rear side of the work x x.

The needles a are carried by guide bars d and the perforators b are arranged on similar rods e. The bars d are operated in a reciprocating manner by bell crank levers which oscillate about fulcrums f, the upper or lower levers being connected by rods 25, so that the upper and the lower needle series a perform similar movements at all times. The rods e too for the perforators are reciprocated by bell crank levers pivoted about stationary pivots g, and the upper and lower bars are also caused to perform similar movements by means of the connecting rod h.

Secured to the main shaft 1 of the embroidery machine is a disk 39 on the flat face of which is arranged an eccentric rib 26. The inner and the outer faces of this rib 26 are in contact with two rollers k and 24 respectively. The roller k is rotatably journaled at the lower end of the rod 25 and the roller 24 is carried by the arm of a bell crank lever which is capable of oscillating about the pivot m. If this bell crank lever is rocked the roller 24 is brought into the position 24′, that is to say out of contact with the rib 26. While the roller 24 is in contact with the rib 26 and the main shaft 1 is rotating, the rod 25 is caused to perform vertical movements according to the shape of the rib 26. In this manner the needles a receive their horizontal working movements. If however the roller 24 is swung into the position 24′, the movement of the needles a ceases, although the main shaft 1 may continue to rotate.

There is no novelty in the device formed by the parts 26, k and 24, as these are known already in such embroidering machines which are not automatic, but are controlled manually by the attendant with the aid of a pantograph. What is novel however is the manner in which the roller 24 is rendered adjustable so as to assume the position 24′ for the purpose of automatic working, and to this end the following arrangement is provided.

Turning about a stationary pivot i is a slotted lever n with the slot of which engages the bell crank lever carrying the roller 24, and which is capable of being rocked about the stationary pivot m. Flexibly attached to the other arm of the lever n is a rod 22, the lower end of which is yieldingly connected by a pitman to a bell crank lever oscillating about the stationary pivot o, in such a manner that the rod 22 can be lifted off a stationary abutment 27′, into engagement with the end of a lever 23. As the lever 23 constantly oscillates, it moves the rod 22 so that in its lower position it may be caused to engage with an abutment 27. Here the rod 22 remains until by a further movement of the lever rocking about the pivot o, it is again caused to engage with the lever 23, and is moved thereby to 27′. The means for rocking the lever which oscillates about the pivot o will be explained later on.

The driving mechanism for the operation of the perforators b is as follows: Of the two bell crank levers which oscillate about the top and bottom pivots g and drive the perforators b, the upper one is rigidly con-

nected to a lever 51, pivotally attached to which is a rod 50. The lower end of the rod 50 is movably connected to a slide which is movable within the slotted arm of a lever 48. The lever 48 is integral with a roller carrying arm, the roller of which is guided in a cam groove 49 of a wheel 3, which latter is driven by a wheel 2 on the shaft 1. The lever 48 oscillates about a fixed pivot *p*. The nearer the slide is drawn within the slotted lever 48 to the pivot *p* the smaller is the throw of the rod 50 and of the perforator *g*. The farther the said slide is moved outwardly within the slotted lever arm 48, the greater is the throw of the parts mentioned. In order to automatically control the throw of these parts, the following device is arranged. Attached to the rod 50 is a pitman *q* the other end of which engages with a spiral shaped groove of a cam or plate 47. Meshing with a toothed wheel which is rigidly connected with the plate 47 or its shaft, is a rack 45 which normally is pressed against the end of a lever 44 by a spring 46 connected at one end to some fixed point and at the other end to the rack. On the lever 44 being moved to the left, the spring 46 draws the rack 45 to the left until its end comes in contact with a cam disk 11, the circumference of which has a spiral shape. The disk 11 can be adjusted by means of a rack 10 automatically, as will be further explained. The means whereby motion is transmitted to the auxiliary embroidery implements, as the shuttles *c* and thread guides 42, may be the same as in any ordinary embroidering machines. It should, however, be mentioned that all these mechanisms are driven from the shaft 1 in the usual manner. The shaft 1, however, receives its driving movement by means of the gearing 2, 3, which derive it from the shaft 4. The disk 39 is rigidly secured on the main shaft 1. The toothed wheel 2 is loosely rotatable on the main shaft 1, and is capable of being coupled with the disk 39 by means of a pivoted pawl 37 arranged on the disk 39 and caused, by means of a spring, to engage with a pin 38 which is secured to the disk 2. The rear end or tail of the pawl 37 is provided with a roller 36 which, as a rule, is quite free while the disk 39 rotates. Beneath the disk 39, however and movably arranged thereon is a curved member 35. When this curved member 35 is moved in upward or inward direction, it projects into the path of the roller 36 and causes the pawl 37 to be thrown out of engagement with the pin 38. In order to stop the disk 39 at a determined point, each time it is uncoupled by the curved member 35 in the above explained manner, a tooth 40 arranged on the circumference of the disk, strikes against an abutment 41 and thereby arrests the disk 39. The two shafts 1 and 4 have the same speed of rotation owing to the wheels 2 and 3 being of equal size. The shaft 5, however, rotates at half the speed of the shaft 4 because the wheel 7 which turns it has twice as many teeth as the wheel 6 on the shaft 4.

The wheel 3 is provided with a cam groove which is circular with the exception of one cam portion 15. A bell crank lever *r* engages with this groove and is pivotally connected to a rod 16. Arranged at the upper end of the rod 16 is a spring controlled pawl 14, capable of being brought into engagement with the ratchet teeth of a disk 17. The rod 16 is caused to pass through an opening of a slide 13 which normally is held to the right by a spring, as shown in the drawing. In this position the pawl 14 cannot engage with the teeth of the disk 17. If, however, the slide 13 is moved to the left, the pawl during each operation of the rod 16 will advance the disk 17 to the extent of one tooth. Arranged on the disk 17 are two semi-circular ribs 18, between the opposite ends of which is a pin 19 on the slide 13, so that normally the disk 17 is prevented from rotating. If however the slide 13 is moved to the left, the pin 19 moves behind the rib 18 and the slide 13 cannot again be drawn to the right by its spring until the opposite space between the ribs 18 enables the pin 19 to pass outward. At this moment the slide 13 moves back to its normal position and the disk 17 is arrested.

In the disk 17 is a cam groove I, II, III, IV, V, adapted to guide the roller of a slide *s* in such a manner that during the intermittent rotation of the disk 17 by means of the pawl 14, the slide *s* according to the shape of the curve is likewise moved intermittently in downward and then again in upward direction. The slide *s* is also provided with a cam groove, of which the two end portions are straight and in line while its central portion is curved or has a short bulge 20. In engagement with this groove are two rollers *t* and *u*. The roller *t* is attached to a rod 21 connected by a bell crank lever and a connecting rod *v*, to the lever, which is rotatable about *o*. The roller *u* is secured to a rod 28 capable of being moved up and down by a bell crank lever 56 in such manner that the end of the rod 28 is caused to engage with a lever *w* in order to operate the latter. The lever *w* is connected by a rod *y* to the lever which is rotatable about the stationary pivot *z*.

In the flat face of the toothed wheel 7 is a cam groove 8. This cam groove has one large and one small concentrical portion. Two rollers engage with this groove and are connected respectively to three-armed levers 23, 30 and 32 which are caused to perform two short angular movements and to stop for a short space during each revolution of the shaft 5. The lever 23, 30 has the object

of moving the rod 22, at will, over to the pin 27 and then to the abutment 27′, and also of moving the rod 29 to the left and to the right. The object of the lever 32 is to move the rod 31 first into a higher position, and at another time into a lower position. Moreover the lever 32 has for its purpose to rotate the spiral groove or member 11 by means of the rack 10.

As regards the jacquard mechanism proper only a few parts are indicated in the drawing, because the jacquard apparatus itself forms no part of the present invention. However the slides 9, 12, 52 and 54 have been indicated. These four slides are reciprocated by the jacquard device in order to render the various groups of mechanism operative. I have shown a casing A intended for a jacquard apparatus of which the bars 52′, 9′, 54′ and 12′ are actuated to cause the movement of the slides 52, 9, 54 and 12. There are numerous jacquard apparatus of different constructions known and the jacquard apparatus A may be any of the known constructions.

The operation of the whole mechanism is as follows: Assuming the machine to be engaged in embroidery, and it is desired to change over to the perforating operation, the jacquard apparatus commences by adjusting the spiral curve or member 11 for the desired perforating depth. A jacquard needle which coöperates with the slide 9, brings about the engagement of the rack 10, which is influenced by the groove 8, with the toothed wheel of the spiral cam 11, and adjusts it according to the desired depth of perforation. Hereupon a second jacquard needle becomes operative in order to displace the slide 13 to the left by means of the slide 12. By this displacement the pawl 14 is brought into engagement with the cam disk 17. Each throw of the rod 16 produces the advance of the cam disk 17 to the extent of one tooth. In this operation the semicircular rib 18 moves to the rear of the pin 19, so that the slide 13 is forced to remain stationary during a semirevolution of the disk 17. On the first movement of the disk 17 to point I, the groove 20 of the slide s forces the rod 21 to the left and moves, by means of the rods v and the lever pivoted at o, the rod 22 on to the constantly oscillating lever 23. This lever 23 pulls the rod 22 downwardly and thereby rocks the slotted lever n attached thereto and the lever m together with the roller 24, so that the roller 24 and the rod 25 are no longer raised by the rib 26. The needles therefore cease to operate. In the second movemnt of the disk 17 to the point II, the slide s is again moved down slightly, whereby the rods 21 and v are drawn back and the rod 22 is coupled with the abutment 27. During the third movement of the disk 17 from II to III, the cam groove 20 remains stationary, while during the fourth movement of the disk 17 to IV, the cam groove 20 is moved into engagement with the rod 28, and moves the latter to the left. By this is obtained firstly the raising of the rod 29, by means of the rod y, onto the constantly moving lever 23 30, and secondly the rod 31 is moved on to the similarly constantly moving lever 32. The groove 8 causes the rod 29 to move to the left and the rod 31 in upward direction, after which the disk 17 performs its fifth movement to the point V, drawing the rod 28 to the right so that the rods 29—31 remain in their new position. At the end of the fifth movement of the disk 17, the pin 19 is brought in front of the space between the ribs 18, and the slide 13 is drawn back by the spring, the disk 17 therefore remaining stationary. During the movement of the rod 29 to the left, a projection 33 on this rod forces the member or brake shoe 34 against the circumference of the disk 39, whereby the curved member 35 is located concentrically with the shaft 1, so as to cause the roller 36 to ride up the member 35 while the pawl 37 will be disengaged from the pin 38 of the wheel 2, whereupon the wheel 2 is free to rotate on its shaft 1. The disk 39, thus braked, bears with its tooth 40 against the abutment 41 of the brake shoe, whereby all embroidering tools, except the perforators, are brought to a standstill.

If it is desired to interrupt the perforating operation in order to displace the embroidery material x, x, a jacquard needle is caused to operate in connection with the rod 52. By this means the rod 31 is coupled with the lever 32 and the lever 44 presses the rack 45 back until the movement of the embroidery material x x has been effected. By a second operation on the rod 52, the slide 45 is then freed again. At the end of the perforating operation and if the embroidering operation is to commence again, the jacquard slide 12 is caused to push the slide 13 to the left for a second time, and the pawl 14 recommences to intermittently rotate the disk 17. During this operation the cam groove 20 of the slide s moves up again, displacing the rod 28 from the left, whereby the rod 29 is coupled with the lever 30, which latter again moves the rod 29 to the right. This causes the release of the brake 34 and the right-hand end of the rod 29 rotates by means of the ratchet wheel 33, the disk 39, so as to cause the rotation of the main shaft 1, which up to that moment was stationary. At the same time the curved member 35 frees the roller 36, whereby the pin 38 of the constantly rotating wheel 2, is caused to engage with the pawl 37. Thus the disk 39 is again carried around and all embroidering tools with the exception of the perforators and needles are again operative. The nee-

dles can as yet not operate for the reason that the roller 24 is still in the position 24'. During the further movement of the slide *s* upwardly, the cam groove 20 produces an action of rod 21 to the left, whereby the rod *v* is moved down and the rod 22 is brought into engagement with the lever 23. The lever 23 raises the rod 22, and the slotted lever *n* moves the roller from the position 24' back to the position 24, whereupon the needles *a* are rendered operative, and the normal stitching operation commences.

I claim:

1. In an automatic embroidery machine, perforating means, embroidering means comprising needle operating devices and several auxiliary implements for the embroidering operation, and means operable during the transition from the embroidering to the perforating operations to throw out first only the needle operating devices and afterward the several auxiliary implements for the embroidering operation.

2. In an automatic embroidering machine, perforating means, embroidering means comprising needle operating devices and several auxiliary implements for the embroidering operation, and devices for changing from embroidering to perforating and comprising means for first stopping the needles only and then throwing out of action the several auxiliary implements for the embroidering operation.

3. In an automatic embroidering machine, perforating means, embroidering means comprising needle operating devices and several auxiliary implements for the embroidering operation, devices for changing from embroidering to perforating and comprising means for first stopping the needles only and then throwing out of action the several auxiliary implements for the embroidering operation, and means whereby the reverse order of movement is produced in changing from embroidering to perforating.

4. In an automatic embroidering machine, means for perforating, means for embroidering comprising needle operating devices and several auxiliary implements for the embroidering operation, means for automatically regulating the desired perforating depth, means for changing from embroidering to perforating, and means for first throwing out of action the needles and then the several auxiliary implements for the embroidering operation.

5. In an automatic embroidering machine, perforating mechanism, embroidering devices comprising needle operating devices and several auxiliary implements for the embroidering operation, jacquard mechanism, means operated thereby for regulating the perforating depth, means for changing from embroidering to perforating, and means operable during such change for rendering the embroidering needles inoperative and later throwing the several auxiliary implements for the embroidering operation out of action.

6. In an automatic embroidering machine, needles, several auxiliary implements for the embroidering operation, perforators, means for operating the same, means for effecting the transition from embroidering to perforating, and means for throwing the needles only out of operation and then bringing the several auxiliary implements for the embroidering operation to a standstill.

7. In an embroidering machine, needles, several auxiliary implements for the embroidering operation, perforators, means for actuating the same, a spiral member, jacquard means for actuating the same, to regulate the perforating depth, means for shifting from embroidering to perforating, and means operable during such transition to first throw out the needles and then the several auxiliary implements for the embroidering operation.

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

ROBERT ZAHN.

Witnesses:
EUGENE NABEL,
B. T. MURPHY.