M. SCHOENFELD.

SHUTTLE MECHANISM FOR EMBROIDERING MACHINES.

APPLICATION FILED OCT. 8, 1910.

991,173. Patented May 2, 1911.

Fig. 1.

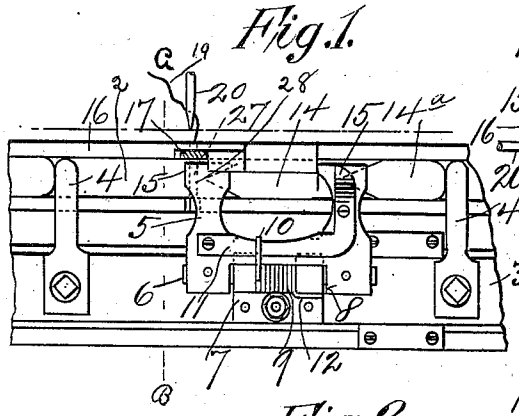


Fig. 4.

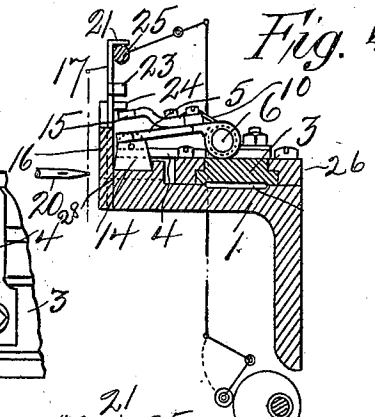


Fig. 2.

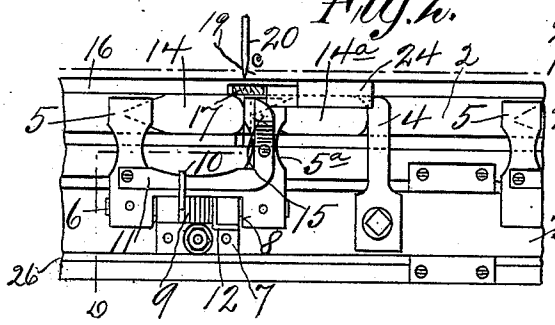


Fig. 5.

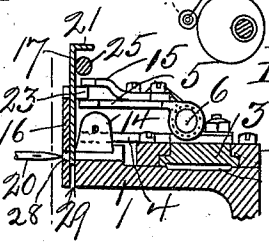


Fig. 3.

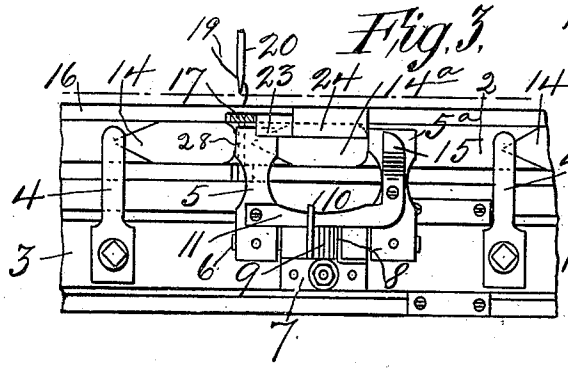


Fig. 7.

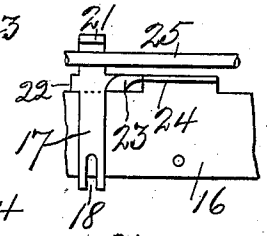
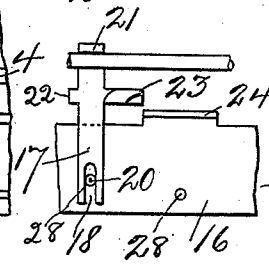


Fig. 6.



Witnesses:

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SHUTTLE MECHANISM FOR EMBROIDERING-MACHINES.

991,173. Specification of Letters Patent. Patented May 2, 1911.

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To all whom it may concern:

Be it known that I, MORRIS SCHOENFELD, a citizen of the United States, and a resident of Rorschach, in the Canton of St. Gall, Switzerland, have invented certain new and useful Improvements in Shuttle Mechanism for Embroidering-Machines, of which the following is a specification.

The present invention relates to a mechanism for replenishing the shuttles of an embroidering machine.

In embroidering machines of the very large type wherein hundreds of needles arranged in longitudinal rows operate simultaneously in the production of embroidered designs on a common fabric the principal cause of defects and the principal cause of delay in the operation of the machine arises from the necessity of replenishing the shuttles as they become exhausted of their threads and as their threads become broken during the operation of the machine. Heretofore the operators have been obliged to watch carefully all the shuttles of the machine, which generally number in the hundreds, and when an exhausted shuttle, or when one wherein the thread has become broken is found, it has been replenished by replacing it with a fresh shuttle, by hand. No matter how careful the operators may be they are apt to overlook a shuttle for such a time that the embroidered design being produced by the needle corresponding with the defective shuttle becomes defective because of the absence of the locking action of the shuttle thread. If the machine continues in its operation with a shuttle in such a condition the strip of embroidery is defective and the defects must be corrected by hand work after the fabric is removed from the machine, which materially adds to the cost of production of the embroidery.

The object of the present invention is to produce a device which will automatically replace a shuttle which has become exhausted of its thread or which has a broken thread with another shuttle with a fresh supply of thread and in such a way that it does not require the stopping of the machine while the change is being made. After the change has been made the operator has only to remove the exhausted or defective shuttle and place a fresh shuttle in a suitable reserve position after the automatic exchange of shuttles has taken place. In this way the product of the machine is improved, fewer operators are required to take care of the shuttles and the output of the machine is materially increased. I prefer to utilize my invention in such a way that the replenishing will take place individually as to each shuttle although my invention is not limited to such application.

To accomplish the above objects I have provided a shuttle which is in operative relation with its respective needle and in a suitable reserve position I provide for each needle a reserve shuttle having a thread supply, which latter shuttle is adapted to replace the first shuttle when the same becomes exhausted of its thread or when its thread becomes broken. This replacing of the defective shuttle by the fresh one is adapted to take place while the machine is in operation, and in order to effect this change of shuttles automatically I have provided means for testing the shuttle threads, preferably individually, periodically at the most desirable time, and by suitable mechanism this detecting mechanism operates to exchange the fresh shuttle for the one which has become exhausted or the thread of which is broken.

I prefer to arrange the shuttles on a common longitudinal track where there is arranged an active shuttle for each needle, that is, a shuttle which reciprocates across the path of the needle, while in close proximity to such shuttle, but not where it will engage the sewing thread, is a reserve shuttle which can be advanced into the active position when the first shuttle is to be replaced by the latter one; and there is also a space reserved for the reception of the shuttle which is replaced by the new shuttle.

The device is very simple and does not complicate nor impede the shuttle action; and while the device is automatic in its action nevertheless it is certain.

I prefer to make the thread testing elements operate periodically after a given number of stitches have been made rather than have the same active at all times and I have therefore made the same operative periodically after five stitches have been made each time by the machine, though my invention in its broad aspect is not limited to such action.

In the drawings forming a part of this application, Figure 1 is a plan view of the preferred form of my invention, showing the parts in the position just preceding a

stitching operation, and showing but one set of elements, it being understood that the same are multiplied throughout the length of the machine. Fig. 2 is a similar view showing the parts in a different position, that is, after the forward operation of the shuttle takes place for the locking of the threads, Fig. 3 is a similar view showing how the mechanism operates to change the shuttle drive from the defective shuttle to the reserve shuttle for effecting the change of shuttle, Fig. 4 is a sectional view taken on the line A—B of Fig. 1, Fig. 5 is a sectional view taken on the line C—D of Fig. 2, Fig. 6 is an elevation of the thread testing or detecting element in one of its positions, and Fig. 7 is a similar view thereof showing the same in another position.

I have shown the shuttle mechanism supported upon a longitudinal bar 1 of angle metal in the usual way and this bar serves to support the various working parts of the device as well as acting as a track for the shuttles, which latter I have here shown as longitudinally reciprocating, which I prefer in the present embodiment of my invention. The bar 1 is provided with a race 2 for guiding the shuttles in their reciprocations and behind the race I have provided the guiding plates 26 which hold and guide the shuttle drive bar 3, by which the various shuttles of a longitudinal row are operated. On the front face of the bar 1 I have provided a needle plate 16, and a needle groove 28, is provided through the needle plate and in the shuttle track just below the path of the shuttle in the usual way, there being one such groove for each needle 20 as in the present practice.

For each needle I have provided a shuttle 14 which is shown in the active position with relation to the needle, that is, it is in such relation to the needle that upon each reciprocation of the shuttle drive the shuttle passes across the needle grooves 28 and passes through the loop of the thread which is passed through the fabric by the sewing needle 20. There is also provided for each needle a reserve shuttle 14^a, which lies behind the first or active shuttle in such a position that although it can be responsive to the reciprocations of the shuttle drive it does not pass over the needle groove during the operation of the same as a reserve shuttle. I prefer to make this reserve shuttle responsive to the reciprocations of the shuttle drive during its inactive period, so that its reciprocating action will aid in the exchanging of the reserve for the defective shuttle when it is necessary to make the change. There is thus provided at least two shuttles for each needle, which I prefer to arrange in longitudinal alinement in the common shuttle race and to the left (in Figs. 1 and 2) of the shuttle 14 and the finger 5 there is a blank space left in the shuttle race for the reception of the defective shuttle when the latter is displaced by the reserve shuttle.

The drive bar 3 is operated by mechanism well known in the art to produce a reciprocation at each stitching operation of the machine and as such mechanism is well known and requires no material modification for adaptation to the present invention I have omitted the same from the drawings. I prefer to attach immovably upon the drive bar 3 a shuttle drive finger 4 for engaging on the back end or heel of each of the shuttles 14^a, which is the reserve shuttle in each set. For the shuttle which is in the active relation, that is, the one which is being passed through the loop of the thread which is passed through the fabric by the sewing needle, I have provided driving elements which can be disengaged from the shuttle in such a way that it will leave the shuttle upon one of the return reciprocations of the shuttle drive and be reëngaged with the reserve shuttle in such a way that the latter will become active and will take the place of the first shuttle, which latter will then be advanced out of active relation with the needle. For this purpose, I have provided a hinged two finger drive member having the finger 5 for engaging the nose or front. end of the active shuttle 14 and the finger 5^a which engages the rear end of the same shuttle 14, the two fingers 5 and 5^a serving to reciprocate the shuttle 14 at each operation of the drive bar, across the needle groove and thus through the thread loop. The finger 5^a in addition to engaging the rear of the active shuttle also engages the nose of the reserve shuttle and causes the return reciprocation of the reserve shuttle, after its forward reciprocation by the finger 4. The finger 5 in addition to engaging the front end or nose of the active shuttle 14 also prevents the shuttle which has become exhausted and which has been advanced out of operative position from interfering with the shuttle 14 by reciprocating the exhausted shuttle in conjunction with the finger 4 that lies ahead of the exhausted shuttle.

The movable shuttle drive member is hinged by means of a pin 6 upon a block 7 which is carried by the drive bar 3, in such a way that the fingers 5 and 5^a can be raised out of engagement with the active shuttle for the purpose of reëngaging with the reserve shuttle when the shuttle change is to take place. The block 7 is provided with a cut out 8 and in this lies a spring 9 which surrounds the pin or shaft 6. One end 12 of this spring engages under the block 7, while the other end 10 presses down on a plate 11, which is carried by the movable finger members.

The needle plate 16 is provided with a bent over projection 24 which extends rearwardly and toward the shuttle side and it is so positioned, that when the fingers 5 and 5ª are reciprocated with the drive rod in the regular operation of the shuttle drive the fingers will travel beneath the projection 24, that is, when the fingers are in operative relation with the shuttle 14 they travel under this projection. Near each needle path I have provided a recess 29 in the bar 1 and against the rear face of the needle plate 16 I have provided a thread testing element 17 which is adapted to drop down in the recess 29 and across the path of the shuttle thread. The element 17 is provided with shoulders 22 extending laterally thereof which engage the upper edge of the needle plate 16 and determine the lower position of the element 17 by limiting its downward movement and the upper end is provided with a turned over portion 21 which is preferably turned toward the rear. There is a bar or rod 25 which engages under this turned over end 21 of all of the elements 17 of a row and it is adapted to retain the elements 17 raised except during certain periods, say upon each fifth stitch of the machine, when the bar 25 is automatically dropped. The element 17 is provided at its lower end with a slot 18 and in the upper position of the member 17 the slot 18 is adapted to expose the needle groove 28, while in the lower position the member 17 passes over the path of the thread. One of the projections 22 of the member 17 is provided with a projecting plate 23 which extends rearwardly or to the shuttle side and is so positioned that it will lie above the path of the part 15 when the shuttle drive is working regularly, but which will engage the part 15 when the member 17 is allowed to drop.

The operation of the device is as follows: Reference will be made to one of the needles and its shuttle mechanism, it being understood that the same is duplicated throughout the length of the machine in one or more rows. The mechanism starts from the position shown in Fig. 1. The needle 20 is first passed through the fabric in the well known manner and it enters the needle groove 28 and passes under the path of the shuttles. In Fig. 1 the arms 5 and 5ª are shown engaging on the opposite ends of the shuttle 14 which is the shuttle that is to operate in locking the threads of the needle shown in this view. Behind this shuttle and its drive fingers is another shuttle 14ª which will be reciprocated by the shuttle drive finger 4 at its rear and the finger 5ª at its forward end and though this shuttle will respond to the movement of the shuttle drive it will not pass the needle groove and therefore its operation will be an idle one. That is, the shuttle is reserved. At each stitching operation, that is, after the needle has been passed through the fabric and into the needle groove the shuttle drive bar 3 is reciprocated, and as a result the shuttles will be driven to the left, into the position shown in Fig. 2. In this movement the shuttle 14 passes through the loop of the thread 19 and the needle is then withdrawn, and the thread is drawn up by the action of the take up in the well known manner. The return movement of the shuttle drive will return the shuttle 14 to its first position, when the sewing thread will be locked by the shuttle thread. During this operation, when the thread of the shuttle 14 is working properly, the shuttle drive fingers 5 and 5ª move back and forth under the plate 24 and are not affected by the latter and the shuttle 14 is the only one which affects the locking of the thread. At regular periods, preferably upon every fifth stitch, the bar 25 is lowered by the means shown, at a time when the shuttle is in its forward position, that shown in Fig. 2. This bar 25 which had been previously holding up the thread testing elements 17 by engagement with the projections 21 will then permit the elements 17 to fall by reason of their gravity and the bifurcated lower end of the member 17 will straddle the thread 19 as shown in Fig. 6, and when the element 17 falls far enough it will be engaged by the thread 19 between the shuttle and the needle plate and the weight of the element 17 is such that if the thread 19 is in normal condition, that is, if not broken and if the shuttle has not become exhausted the element 17 will be supported by the thread and no change will take place in the shuttle operation. But should the thread be broken or the supply exhausted from the bobbin of the shuttle 14 during this testing operation, then the element 17 will not be resisted by the thread and in consequence thereof it will fall until the projections 22 rest upon the upper edge of the needle plate 16. This is timed to take place when the shuttle is in the position shown in Fig. 2 and the bar 25 remains in the lowered position until the shuttles begin their return reciprocation. When the shuttles return to their first position, if the element 17 be down to the position shown in Fig. 7, then the projection 23 of the member 17 will lie in the path of the finger 15, which latter is connected with the fingers 5 and 5ª in such a way as to move the latter therewith, and in fact the finger 15 is preferably a part of the plate 11. As the shuttle drive moves back the finger 15 will engage with the inclined surface of the projection 23 and as a result the finger 15 and with it the fingers 5 and 5ª will be raised in resistance to the spring 9, so that the fingers 5 and 5ª will rise above the shuttle 14. As the finger 15 passes from the projection 23 it continues to be sup-

ported by the plate 24, which corresponds in height with the projection 23 at this time, until the finger 15 passes over the plate 24. In retaining the finger 15 and thus the fingers 5 and 5ª raised they do not return the shuttle 14 as before but leave it and pass over it, until the finger 15 passes to the rear and off of the plate 24 when the spring 9, pressing down on the plate 11 forces the driving fingers down again and on opposite ends of the reserve shuttle 14ª. Upon the next forward movement of the shuttle drive the shuttle 14ª will be reciprocated across the needle groove, that is, in operative relation with the needle and the thread of this shuttle will lock the sewing thread of the needle 20 the same as did the shuttle 14 before. The shuttle 14 will now lie between the finger 5 and the finger 4 to the left and will be reciprocated but not in operative relation to the needle. The exhausted shuttle 14 may now be removed by hand by the operator during the running of the machine and a fresh shuttle can be placed in the position from which the shuttle 14ª has been removed, thereby providing another reserve shuttle to be advanced by the mechanism whenever the necessity arises. This automatic exchanging of the shuttles, preferably individually, goes on during the operation of the machine. It is easy for few operators to simply remove the exhausted shuttles and place the new reserve shuttle and as the detecting of the defect in the shuttle thread is automatic there will be no material defects in the product of the machine. Heretofore it has simply depended upon the skill and agility of the operator in detecting and replenishing the exhausted and broken thread shuttles.

While I have shown the shuttles, both active and reserve, placed in longitudinal rows in a common race I do not want to be understood as limiting my invention to this particular arrangement.

Various changes in the arrangement and construction are possible within the spirit and scope of my invention.

Having described my invention what I claim is;

1. In a shuttle mechanism for embroidering machines a sewing needle, an active shuttle for the needle and a shuttle drive therefor, a reserve shuttle for the needle, and means for testing the shuttle thread and adapted to cause the reserve shuttle to replace the active shuttle in the shuttle drive, upon the shuttle thread becoming broken or used up.

2. In a shuttle mechanism for embroidering machines a sewing needle, an active shuttle for the needle and a shuttle drive therefor, a reserve shuttle for the needle, and means for testing the shuttle thread between the active shuttle and the needle and adapted to cause the reserve shuttle to replace the active shuttle in the shuttle drive, upon the shuttle thread becoming broken or exhausted.

3. In a shuttle mechanism for embroidering machines, sewing needles, a shuttle track, a shuttle drive having fingers for engaging the shuttles, an active and a reserve shuttle for each needle, both of which are adapted to be operated by said drive fingers, and means for testing the shuttle thread and adapted to cause the active shuttle to be displaced and the reserve shuttle to assume the position thereof, relative to said drive.

4. In a shuttle mechanism for embroidering machines, a sewing needle, an active shuttle and a reserve shuttle for the needle, means for testing the shuttle thread and adapted to cause the reserve shuttle to replace the active shuttle upon the shuttle thread becoming broken or used up and means for causing a periodical testing of the shuttle thread by said testing means.

5. In a shuttle mechanism for embroidering machines, a sewing needle, a needle plate and an active and reserve shuttle for the needle, means adapted to rest upon the shuttle thread between the active shuttle and said needle plate to test the shuttle thread and adapted to effect the substitution of the reserve for the active shuttle upon the failure of said thread to support said testing means and means for making said testing means periodically active.

6. In a shuttle mechanism for embroidering machines, a sewing needle, an active shuttle for locking the needle thread, shuttle drive fingers for the active shuttle, a reserve shuttle and means adapted to test the shuttle thread to determine the condition thereof and adapted to cause the reserve shuttle to be substituted for the active shuttle between said drive fingers upon the shuttle thread of the active shuttle becoming broken or used up, whereby the reserve shuttle will be operated to lock the needle thread.

7. In a shuttle mechanism for embroidering machines, a sewing needle, an active shuttle for locking the needle thread, a shuttle drive rod having swinging drive fingers engaging and operating the active shuttle, a reserve shuttle and means for testing the thread of the active shuttle and adapted to cause the said drive fingers to swing free of the active shuttle and to engage the reserve shuttle upon the shuttle thread becoming inoperative.

8. In a shuttle mechanism for embroidering machines, a sewing needle, an active shuttle for locking the needle thread, a shuttle drive rod having swinging drive fingers engaging and operating the active shuttle, a reserve shuttle and means for testing the

thread of the active shuttle and adapted to cause the said drive fingers to swing, means adapted to cause the drive fingers to remain disengaged from the active shuttle until they can be engaged with said reserve shuttle and means for making said thread testing element periodically active.

9. In a shuttle mechanism for embroidering machines, sewing needles, a shuttle track and an active and a reserve shuttle for each needle, movable in said track, a shuttle drive rod having fingers for engaging the reserve shuttle and having movable fingers for operating the active shuttle provided with an engaging member, a plate normally lying out of the path of said engaging member, independent movable thread testing elements adapted to engage the threads of the active shuttles for the purpose of testing the same, and adapted to move into engagement with the engaging member of the swinging drive fingers, for the purpose of moving the latter into engagement with said plate, whereby the swinging drive fingers will be disengaged from the active shuttle and engaged with the reserve shuttle upon the return movement of the shuttle drive.

Signed at St. Gall, in the Canton of St. Gall, Switzerland, this 6″ day of September 1910.

MORRIS SCHOENFELD.

Witnesses:

ALBERT PHILLIPS,

RANDALL ATKINSON.