SEWING MACHINE FOR MAKING ONE-THREAD MACHINE SEAMS
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1. Sewing machines are already known for the one- or two-thread chain-stitch, serving the purpose of producing extensible seams. With the one-thread chain-stitch produced by means of the standard machine needle a quilting-stitch is obtained in the material on the entering side of the needle, and a loop on the exit side. The chain-stitch seam produced is easily undone.

A well known machine for the production of one-thread tambour- or lock-stitch seams is provided with a hooked needle passing through the material from above, and with a thread laying out device, rotatable about the needle axis below the workpiece, inserting the thread into the needle hook. With the needle rising out of the material the hooked needle lifts the loop, and with the feed dog pushing the material forward, the needle passes through the thread loop, pressed against the material by the loop holder. The tambour- (lock-) stitch seam used for ornamentation is characterized by chain-stitches on the upper, and quilting-stitches on the lower side of the material.

The chain-stitch kinds mentioned are only extensible to the limit allowed by the thread loop loosely lying on the material. If, however, a preliminary tension is imparted to the thread so that only a very slight interval forms when pulling apart the two material portions sewn together, than the seam is not extensible anymore in the longitudinal direction owing to the junction quilting-stitch and to the chain-stitch tightly drawn.

This invention relates to a sewing machine for making a one-thread machine seam, which is distinguished by a high degree of extensibility compatible with a tight tension of the thread and a high resistance against undoing and ripping up of the portions of material sewn together, and which consists—on the entering or stitching-in side of the material—of chain stitches and quilting-stitch-like junction stitches, which are connected on the exit side by quilting-stitch-like double seam webs.

According to the invention, the machine comprises an eye needle, a hooked needle moving synchronously with same and having a hook which, when viewed in the direction of material feed, is open in front and adapted to be covered temporarily by a positively controlled auxiliary needle, and a thread transmitter, preferably an oscillating looper, and which after both needles have pierced through the material, transmits the thread supplied by the eye needle as a loop on to the hooked needle, which during the return movement of the needle, the subsequent conveying of the material, and the next stitch of the needle, acts as a loop drawer and loop holder of the chain-stitch loop which is to be laid out on the entering, i.e., the stitching-in side.

The arrangement of the two needles, either one behind the other in the direction of material feed, with the hooked needle in front, or in a plane which is perpendicular to the direction of material feed, depends on whether the chain stitches and quilting-stitch-like junction stitches are to interlock, being staggered in the direction of the seam, and to be connected on the other side of the material by seam webs having the same direction, or whether said stitches are to lie alongside each other in rows and to have transverse seam webs.

Whereas in both cases the hook of the hooked needle is directed forward in the direction of feed, the eye of the eye needle is arranged in the first case transversely, in the second case longitudinally with respect to the feed direction.

According to the invention the hooked needle cooperates with a short auxiliary needle (loop stripper) tightly adhering to the front side of the hooked needle, which is driven separately, lagging behind the hooked needle by an angle of 90°, and temporarily covering the opening of the hooked needle during the exit of the needle, whilst retaining, during the entry of the needle, the thread loop previously stripped off.

The drawing discloses embodiments of the invention by way of examples,
Fig. 1 showing the sewing machine head according to the first mode of execution by way of a frontal elevation, partially in section with the front plate removed.
Fig. 2 is a longitudinal section through a part of the sewing machine head.
Fig. 3 is a section taken on the line III—III of Fig. 2, and
Fig. 4 is a section taken on the line IV—IV of Fig. 2.

Fig. 5 is a view of the eccentric controlling the looper, indicating the phases of the rotation of the eccentric coordinated to the individual motions of the catcher.

Figs. 6—10 illustrate, with reference to the machine shown in a position turned through 180° in regard to Fig. 1, the formation of the stitches during the sewing process in five phases following one upon the other.

Fig. 11 is a perspective illustration of the stitch formation according to the second mode of exe-
cution of the machine producing a two-row junction seam.

As usual the sewing machine is provided with a head whose main shaft 1 drives by means of a crank 2 and a connecting rod 3 (pitman) the block 3a of the needle bar 3 together with the take-up lever 31.

The needle bar 4 carries the needle clamp 5 to which—when looking at the machine in the material transporting direction—the hooked needle 7 is screwed on in front with the hook forward, whilst behind a standard machine sewing needle 6 (eye-needle) is equally screwed on but with the thread eye located transversely to the sewing direction.

Only one upper thread is worked, said thread being supplied to the eye-needle 6, as usual, by way of the thread tensioner 30, the take-up lever 31, the thread guiding eye 32, and an eye in the needle clamp 5.

The thread transmitter 25, lodged in the bottom of the head and formed into a swinging looper executes equal rotary oscillations up to 360° about a vertical axis, located laterally in regard to the axes of the two needles 6, 7 and below same. Its shaft journaled in the bearings 27 carries the driving pinion 26 registering with a toothed arc 28 tightly screwed on the lever 28.

The swinging or oscillating motion of the machine 25 is derived, by way of a roller lever not-shown, from a cam 51 (Fig. 6) fastened to the main shaft 1.

Attached to the hooked needle 7 an auxiliary needle 8 (Fig. 1) is coordinated as thread stripper, lagging behind with respect to the up- and downward motion of the hooked needle, said needle 8 being driven, by way of the eccentric rod 16 and the lever 11, by the eccentric 9 fixed on the main shaft 1, and lagging by 90° in respect to the crank 2 (Figs. 1, 2 and 4). The lever 11 is connected for rotation to the lever 12 by means of a shaft 13a whose bearing 13 is fastened to a bar 16, arranged in the head, so that it can be lifted and lowered, whereby said lever 12 engages—by way of a link 14 (Fig. 2)—a block 15 tightly screwed on to the bar 16 of the auxiliary needle. A guide 19, fastened to the auxiliary needle bar 16, engages same against rotation by being slidingly guided along flat faces (Fig. 2) of the bar 16, carrying the bearing 13 of the auxiliary needle lever. At the lower end of the auxiliary needle bar 16, the holder 17 for that needle is fixed, an oblique arm bringing it closest to the hooked needle 7. The auxiliary needle 8 has a cylindrical fastener, tapers down conically towards the point, and is unilaterally flattened down to same.

Besides the auxiliary needle 6, the holder 17 carries a small guide plate 37 (Fig. 1), whereby the needle—with its flattened part—singly nestles to the front of the hooked needle 7, the plate 37 resting on its rear side, and preventing the hooked needle 7 from bending during the feed of the material 50.

The bar 4a, guiding the auxiliary needle, is—by a screw 21 (Figs. 2 and 4)—coupled to the presser foot bar 20, which permits of adjusting, at various levels, both the bar 4a guiding the auxiliary needle, and the bearing 13 for the auxiliary needle lever, fastened to same in conformity with the level of the presser foot 25 corresponding to the thickness of the material to be sewn. For this reason, the entering depth of the auxiliary needle 8 is operatively adapted to the thickness of the material.

On the upper side of the nut 21a of the screw 21 (Fig. 2), coupling the two bars 16 and 20, the free end of a robust and sturdy plate spring 22 is located whose other end is held fast by the head, said spring pressing the presser foot 25 downwards on the material 50. For lifting the presser foot 25 a lever 33, operable by means of the knee through a system of rods, not shown, and the usual hand lever 34 are used, whereby the presser foot bar 23 is lifted against the action of the plate spring 22 by way of the bearing 13 of the auxiliary needle lever, the guide bar 19, and the coupling screw 21.

The material feed dog 24 passes in the manner known through a recess of the needle plate 23.

The mode of operation of the new machine is best explained with reference to the Figs. 5-11.

Fig. 6 shows the two needles 6, 7 at the beginning of the retrogression from their lowest level. The point of the thread transmitter 25 rotating in the direction of the arrow whose position corresponds approximately to the position A of the cam 51 (Fig. 5) catches the thread loop at, which it has caught, about the hooked needle 7 (Fig. 7). After an additional rotation of the cam 51 through the angle AOC whereby the cam follower 52, guided in the control slot of said cam, attains its outermost position to the left, the thread transmitter 25 reaches its limit position of 360° which is kept unaltered during the further rotation of the cam 51 through the angle BOC.

The thread loop at released by the thread transmitter 25 is pulled up by the hooked needle 7 through the material 50, and through the last thread loop at, formed during the preceding stroke of the needle and, to that moment, kept fast by the auxiliary needle 8 (Fig. 8) whereby—out of the thread loop a—on the lower side of the material 50 the double seam webs 6 are formed. The auxiliary needle 8, according with the hooked needle 7, but lagging behind same, then covers the hook opening so as to preclude the former thread loop being caught a second time. Fig. 9 shows the two needles 6, 7 on their return-stroke after having reached their topmost position, whilst the auxiliary needle 8 still occupies its topmost position. In the meantime the material feed dog 24 has advanced the material 50 by one stitch length, and prepared it for the subsequent stitch. It results therefrom that the thread loop a' is tensioned to the length of the chain-stitch a as desired, and that also the thread guided by the eye-needle 6 is tensioned for forming the quilting-stitch-like junction-stitch c.

In the meantime the thread transmitter 25 terminates its return-rotation by 360° corresponding to the motion of the cam 51 through the angle COD. During the further advancement of the cam 51 through the angle DOA back into the initial position its roll 52 remains in its outermost position to the right, corresponding to the position of the thread transmitter 25 in the Figs. 8 and 10. When the material feed dog 24 has completed the advance of the material 50, and when the needles 6, 7 have again begun to
stitch into same whereby the auxiliary needle lags behind releasing the hooked needle opening, the thread loop $a'$, previously drawn up, is stripped from the hooked needle 7, and is passed in the middle by the two needles 6 and 7, so as to complete the new chain-stitch loop $a$ and the quilting-stitch-like junction-stitch $c$.

When the needles 6 and 7 have left behind their lowest position, and the auxiliary needle 8 has again penetrated into the material 59 to be sewn, holding fast thereby the new chain-stitch loop $a$, the original position according to Fig. 6 is again attained.

The second, diagrammatically illustrated mode of execution of the machine according to Fig. 11 is adapted to produce a two-row seam by means of only one upper thread, said seam being characterized by the chain-stitches $a$, $b$ and the quilting-stitch-like junction-stitches $c$ being juxtaposed in rows whilst the connecting seam webs $d$ are arranged transversely. In contradistinction to the first embodiment the needles 6, 7 are arranged in a plane vertical to the feeding direction of the material 59 so that—looked at in the direction of transport—the hooked needle 7 is located in front whilst the thread eye at the eye-needle 6 occupies a longitudinal position. The oscillating position of the thread transmitter 25, again provided below the needle plate 23, and having its vertical axis laterally displaced in respect to the axes of the needles 6, 7, must be adapted to the new needle plane for which purpose the said transmitter must be fastened on its shaft in a position turned by $90^\circ$ respect to the former position. For the rest the formation of the stitches is effected as illustrated in the Figs. 5-10.

By way of a constructive reversal of the machine, particularly adapted for border quilting, the needles 6, 7 can be arranged in the bottom part of the head e. g. the arm so as to make them enter into the material 59 from below, in which case the thread transmitter 25, the auxiliary needle 8 including its driving parts, and the feeding device are arranged in the top part of the head.

What I claim is:

1. A sewing machine for making a one-thread machine seam consisting of chain stitches and quilting-stitch-like junction stitches on the entering side of the material connected on the exit side by quilting-stitch-like double seam webs, said machine comprising a main shaft, an eye needle, a hooked needle having a hook which is open at the front when viewed in the direction of material feed, means operating said eye needle and hooked needle to move said needles in synchronism through the material, a thread transmitter operably connected to means fixed to a stationary machine part, for guiding said thread transmitter on the needle exit side of the material across the paths of said two needles, an auxiliary needle lying closely along the front side of the hooked needle, first timing means operatively connecting said thread transmitter to said main shaft to move said thread transmitter in a timed relationship relative to the movement of said eye needle and hooked needle, whereby the thread transmitter is adapted to present a thread supplied by the eye needle as a loop to the hooked needle during the return movement thereof, and second timing means operatively connecting said auxiliary needle to said main shaft to move the auxiliary needle with a 90-deg. lag behind said eye needle and hooked needle along the front side of the hooked needle.

2. A sewing machine as set forth in claim 1, which comprises a first rod in said means operatively connecting said eye needle and hooked needle to said main shaft, a second rod operatively connecting said auxiliary needle to said second timing means, which are adapted to drive said second rod with a 90-deg. lag behind said first rod, said auxiliary needle having a cylindrical fastening part and tapering considerably towards a point, and being flattened on one side parallel to its axis, and a holder bent relatively to said first rod and carrying the auxiliary needle and a guide plate, said holder being fixed to the second rod, the auxiliary needle lying with its flat side against the front side of the hooked needle and the guide plate bearing against the rear side of the hooked needle.

3. A sewing machine as set forth in claim 2, which comprises connecting means operatively connecting said main shaft with said first rod in said means operatively connecting said eye needle and hooked needle to said main shaft, and in which said second timing means comprise an eccentric mounted on said main shaft with a 90-deg. lag behind said connecting means, and a lever system operatively connecting said eccentric to said second rod.

4. A sewing machine as set forth in claim 2, which comprises connecting means operatively connecting said main shaft with said first rod in said means operatively connecting said eye needle and hooked needle to said main shaft, and in which said second timing means comprise an eccentric mounted on said main shaft with a 90-deg. lag behind said connecting means, a lever system operatively connecting said eccentric to said second rod, a shaft, a bearing for said shaft, a guide part fixed to said second rod, and a guide rod carrying said bearing and engaging with said guide part to guide it along a straight line, a lever system comprising an eccentric rod operatively connected to said eccentric, an angle lever having two arms fixedly connected to said shaft, and a link articulated connecting one of said arms to said second rod, the other of said arms being connected to said eccentric rod.

5. A sewing machine as set forth in claim 1, comprising a presser foot positively connected to the auxiliary needle.

6. A sewing machine as set forth in claim 1, in which said second timing means comprise lever means operatively connected to said main shaft and said auxiliary needle, a shaft carrying said lever means, a bearing for said shaft, a movable carrier for said bearings, and which comprises a presser foot carrier positively connected to said presser foot and said carrier for said bearing, and a spring for loading said presser foot.

7. A sewing machine as set forth in claim 1, which comprises an oscillating looper constituting said thread transmitter, and in which said first timing means comprise a cam on said main shaft, said cam having a closed guide slot, and a transmitting member operatively connected with said oscillating looper and engaging with said guide slot, said guide slot having a deeper part for the guidance of the looper during its effective movement and a flatter part for the guidance of the looper during its return oscillation, said slot parts being connected by con-
7 centric curve parts which correspond to a stand-still of the looper.

8. A sewing machine as set forth in claim 7, in which said means for guiding the thread transmitter comprise pivot means about which said looper is pivotally movable and which are fixed to a stationary machine part, the axis of said pivot means being laterally spaced by the radius of the looper oscillation from the axes of the eye needle and the hooked needle, said two needles, when viewed in the direction of material feed, being arranged one behind the other, the hooked needle with a forwardly directed hook being in front and the eye needle with a transversely positioned thread eye being behind.

9. A sewing machine as set forth in claim 7, in which said means for guiding the thread transmitter comprise pivot means about which said looper is pivotally movable and which are fixed to a stationary machine part, the axis of said pivot means being laterally spaced by the radius of the looper oscillation from the axes of the eye needle and the hooked needle, said two needles being arranged in a plane perpendicular to the direction of material feed, the hook of the hooked needle when viewed in the direction of material feed, being directed forwardly and the eye of the eye needle being positioned longitudinally.

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