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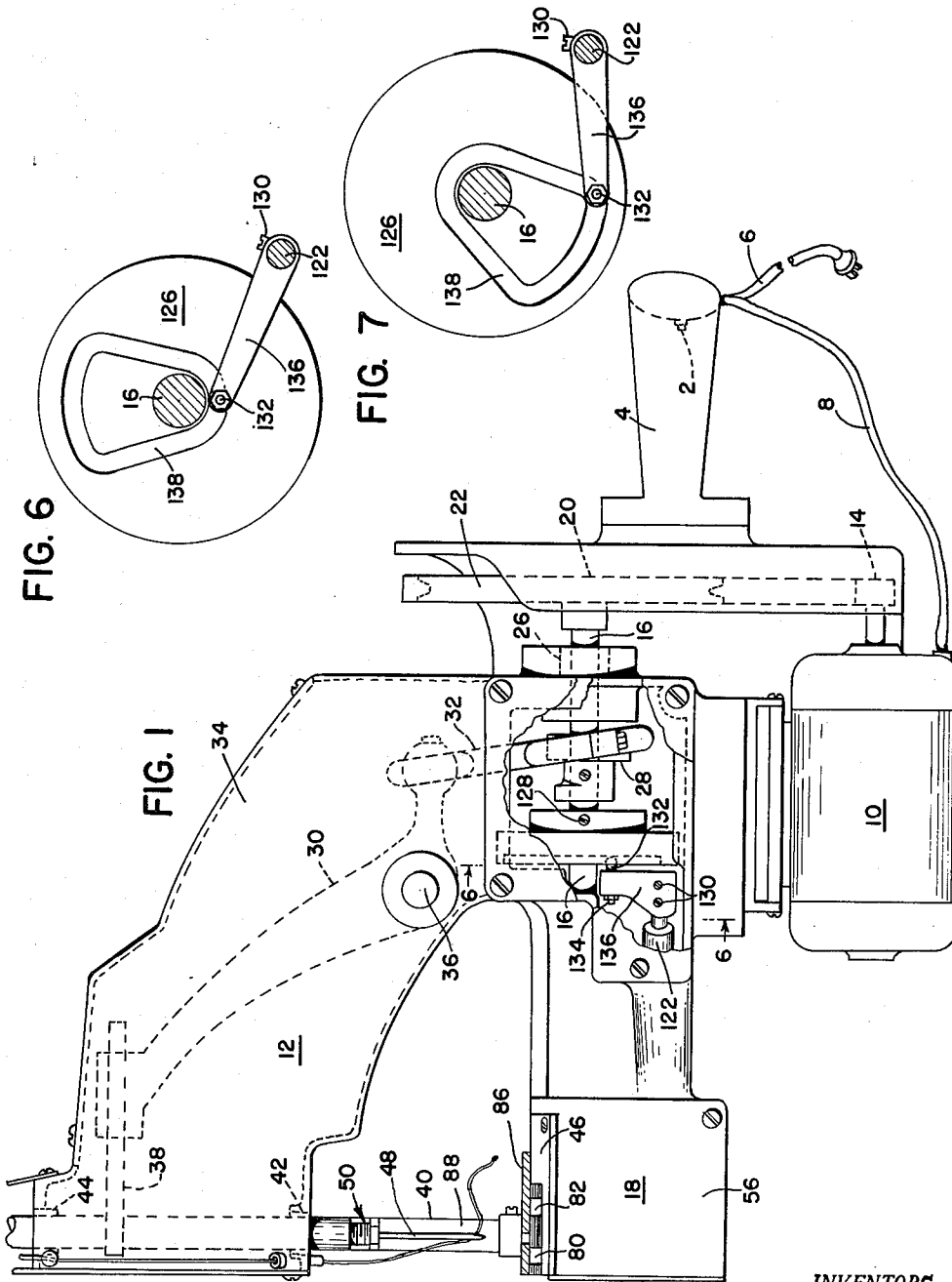
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LOOPER MECHANISM FOR A SEWING MACHINE

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2 Sheets-Sheet 1



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LOOPER MECHANISM FOR A SEWING MACHINE

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The present invention relates generally to sewing apparatus and more specifically to an improved stitch forming mechanism for a sewing machine.

In the sewing art machines are known for automatically sewing cloth or fabric and/or paper materials and normally include a threaded needle means which is reciprocated through the material to be sewn and which needle is associated with a mechanism performing stitches in said materials.

The latter device is well known in the sewing machine art and is generally referred to as a looper mechanism. The term looper mechanism and the term stitch forming mechanism are considered synonymous for purposes of the instant application.

Looper mechanisms presently known in the art are generally conceded to be somewhat complicated both in their manner of construction and in method of operation. For example, such devices frequently consist of a multiplicity of parts which preform compound movements during the stitch forming operation. Thus because of the foregoing, considerable expense is involved in the manufacture of such mechanisms together with the continued possibility of maintenance problems. Furthermore, the complexity of such devices is due in part to their direction of movement relative to the needle eye and the compound seizing and releasing movements of the mechanism in a plurality of directions relative to the said needle eye.

Thus in view of certain defects in the art it is one object of the instant invention to provide broadly an improved stitch forming mechanism for a sewing machine.

A further object of the invention is to provide a substantially simplified stitch forming mechanism for a sewing machine.

Another object of the invention is to provide an improved stitch forming mechanism for electric sewing machines which preforms loop seizing and releasing movements of the thread carried by the needle of the machine obliquely of the eye of said needle.

A still further object of the invention is to provide an improved stitch forming mechanism for sewing machines wherein the movements of said stitch forming mechanism are reciprocal only at an oblique angle relative to the eye of the sewing needle.

These and other objects and advantages of the invention will become apparent from the following specification, the appended claims when taken in conjunction with the accompanying drawings which form a part of this application and in which drawings like characters indicate like parts throughout the several views.

To the above end generally stated the invention consists of the following devices and combination of devices hereinafter described and defined in the claims.

Referring to the drawings:

FIG. 1 is a vertical side elevational view of the improved sewing machine with certain portions thereof broken away for clarity.

FIG. 2 is a partial front elevational view of the improved sewing machine of FIG. 1 with the front cover of the base removed to show the looper mechanism in loop holding position and with certain portions of the machine broken away for clarity.

FIG. 3 is a partial front elevational view of the sewing

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machine showing the looper mechanism in a non-seizing position.

FIG. 4 is a diagrammatic plan view showing the angular relationship between the main drive shaft and the looper shaft of the sewing machine.

FIG. 5 is a sectional view of the base of the machine as taken generally along and in the direction of lines 5-5 of FIG. 2.

FIG. 6 is a front elevational sectional view taken generally along and in the direction of lines 6-6 of FIG. 1 showing the cam mechanism and associated parts for causing movement of the looper shaft.

FIG. 7 is a front elevational sectional view like FIG. 6 but showing the cam and associated parts in a different position relative to the main drive shaft of the sewing machine.

FIG. 8 is a front elevational view of the looper mechanism taken generally along and in the direction of lines 8-8 of FIG. 3 but showing the looper as it first engages the loop formed by the needle; and

FIG. 9 is a diagrammatic view having no direct correlation with the sewing machine but presented to illustrate the manner in which stitches are formed in a material.

Presenting now a detailed description of the invention. The improved sewing machine as seen more specifically in FIGS. 1-3, is driven by an electric motor 10 which is suitably attached to the underside of the main frame or casting 12 of the sewing machine. The motor 10 through its drive pulley 14 serves to rotate a main drive shaft 16 inside the base 18 of the frame 12 via a driven pulley 20 and a drive belt 22. A handle 4 is attached to the frame 12 and is provided with suitable electrical cables 6 and 8 and an on-off switch 2 for energizing and stopping the electric motor 10.

The base 18 is substantially hollow throughout unless otherwise noted in the ensuing classification and the main drive shaft 16 extends in a substantially horizontal plane, longitudinally through said base 18.

The main drive shaft 16 is suitably journaled for rotation in bearings 24 and 26 on the frame 12 and is provided inside the said frame 12 adjacent the pulley 20 with a conventional type eccentric 28 which is attached to overhead connecting arms 30 and 32. These connecting arms 30 and 32 project upwardly into the substantially hollow upper or overhead portion 34 of the frame 12 and arm 30 is pivotal about a transverse pivot pin or pintle 36 on the frame 12. Arm 32 is likewise provided with a conventional ball joint connection between its lower end and arm 32 and is slidably connected at its forward upper end portion to a rod 38 which extends normally to a vertically disposed needle shaft 40. This needle shaft 40 is journaled in bearings 42 and 44 on the frame 12 for reciprocal movement to and from a throat plate 46 on the top surface of the frame base 18. Thus as the main drive shaft 16 is rotated, arms 30 and 32 provide movement to the needle shaft 40 and reciprocate the same to and from the said throat plate 46. The needle shaft 40 as shown on the drawings also carries at its lower end portion a vertically disposed eyed stitching needle 48 attached thereto by a threaded chuck 50 on the lower end portion of the needle shaft 40.

Referring now to the main drive shaft 16 the same is sufficiently long with its forward end portion terminating in an eccentric 52, see FIG. 2, which is positioned in a movable block 54 in the forward end portion 46 of the base 18. The movable block 54 is mounted for both vertical and lateral movements within the base 18 and has attached to its upper end portion a feed dog 58. A pair of vertically disposed guide posts 60 are slidably mounted in holes 62 in the block 54 at their upper end portions and are fixedly secured at their lower ends by

screws 64 to a laterally movable support block 66. This support block 66 is accordingly confined for lateral movement between a retainer block 68 and a transverse rod 70. This latter rod 70 being retained in the base 18 by screw 72 and the first noted support block being retained in said base by bolts 74. Thus the block 54 is moved both vertically and laterally of the base as the main drive shaft 16 rotates the eccentric 52. Accordingly as the block 54 is rotated counterclockwise the feed dog 58 moves up and to the left and down and to the right in response to the above movement of the block 54. Likewise, horizontally disposed serrated fingers 76 and 78 on the feed dog 58 project upwardly through slots 80 and 82 in the throat plate 46, see FIG. 1, and serve to feed the material 84 through the machine in timed relation to the stitching movements.

Positioned immediately above the material 84 and the throat plate 46 is a presser foot 86. This presser foot 86 is attached to a vertical shaft 88 slidably mounted in the upper forward end of the frame 12 parallel to the axis of the needle 48 and is provided with a collar 90 inwardly of the frame 12. A compression spring 92 surrounds the shaft 88 and is interposed between the collar 90 and the inside top surface of the frame 12. Thus by loosening a screw 94 which attaches the collar 90 to the shaft 88 variations can be made in the amount of pressure applied to the presser foot 86.

Turning now to the manner in which stitches are formed in the material thread is supplied to the needle 48 from a spool 96 supported on bracket 98 and 100 positioned along one side of the frame 12, see FIG. 2. The thread is guided to the needle by a plurality of guides 102, 104, 106 and 108 and is of course threaded through the needle eye 110. As the needle is moved downward by the needle shaft 40 it passes an opening 112 in the presser foot 86, through the material 84 and an aperture 114, see FIG. 3, in the throat plate 46 and terminates its downward movement in the position shown in FIG. 3. At this point the eye of the needle is slightly below the beak or point of a looper 116 and will next be described.

The looper 116 is secured by a set screw 118 to a looper holder 120 on a looper shaft 122. The looper shaft 122 extends horizontally through the base 18 of the frame 12 angularly of the drive shaft 16 and is rotatably journaled in suitable bearings, not shown, within the frame. As can be seen in FIGS. 4 and 5 the looper beak 116A is positioned obliquely of the axis of the needle eye 110 and its movements as indicated by an arrow 124 is in a path obliquely of the needle eye 110 on opposite sides of the needle 48. Movement is provided to the looper by its draft 122 which is activated by a cam 126 on the main drive shaft 16. As seen in FIGS. 1, 6 and 7 the cam 126 is substantially circular in shape and is secured to the main drive shaft 16 by a set screw 128. A connecting arm 136 is secured to the looper shaft 122 by set screws 130 and is provided at its end portion adjacent the cam with a cam follower 132 having a threaded end secure by a nut 134 to the connecting arm 136.

A cam slot 138 is provided on the forward face of the cam 126 and the follower 132 projects into the slot 138 to provide movement to the looper shaft 122 as the main shaft 16 is rotated. The cam slot 138 is shaped so that as the main shaft 16 rotates the follower 132 will move the connecting arm 136 from the position shown in FIG. 6 to the position shown in FIG. 7. Consequently such movement is transmitted to the looper shaft 122 and the looper 116 is moved through the path previously described. Thus the looper 116 is provided with movement to preform loop seizing and releasing movements as will hereinafter be described.

As seen more specifically in FIG. 8 the needle 48 causes a bight or loop 140 to be formed in the thread as the said needle moves to its upper most position. The timing of the previously described cams 126 is such that the looper is moved clockwise, as best seen in FIGS. 2

and 3, obliquely of the needle just as the bight is formed causing its beak to enter the loop. Since the thread carried by the needle is free to slide through the needle eye 110 the looper beak carries the thread to the right of the needle 48 while said needle is moving to its upper position.

A stationary thread positioner or spreader 142 is provided beneath the thread plate 46 and has inclined side surfaces 144 and 146, see FIG. 9, on its bottom surface across which the thread is positioned by the movement of the looper. The timing of the cam is such that the looper retains the loop over the spreader 142 and in this interval the feed dog 58 has, as previously described, moved the material 84 laterally of the needle 48 so that the needle will enter the material forwardly of the previous stitch. The needle 48 enters the loop formed by the looper and the spreader each time it moves to its downward position and as the needle enters the loop the looper 116 is again moving to its position on the opposite side of the needle 48. Thus the looper releases the loop against the needle as said needle continues its downward movement to its lower most position and as it starts its next ascent the looper beak 116A again enters the bight in the thread and forms a new loop over the spreader 142.

In the above specification we have presented a disclosure of the basic principles of our invention together with some of the embodiments by which the invention can be carried out.

While there are herein disclosed but a limited number of embodiments of the structure, process and product of the invention herein presented, it is possible to produce still other embodiments without departing from the inventive concept herein disclosed, and it is desired, therefore, that only such limitations be imposed on the appended claims as are stated herein or required by the prior art.

What we claim is:

1. In a sewing machine having a pointed eye needle adapted to carry the thread and to move upward and downward to pass through the material being sewn, a first elongated drive shaft means, a feed dog mechanism for movement of the material being stitched, said first elongated drive shaft means disposed horizontally and adapted to operate said feed dog mechanism at its forward end, said first drive shaft means having a forward full revolution cam, means for moving said feed dog mechanism vertically as well as horizontally, said first drive shaft means having a rear full revolution cam means mounted generally coaxially of said rearward end of said first drive shaft means, a second elongated drive shaft means disposed generally horizontally and adapted to be driven at its rearward end by said rear full revolution cam means, said second drive shaft means extending forwardly toward said first drive shaft means at an oblique angle thereto, a looper mechanism mounted at the forward end of said second drive shaft means for engaging the thread carried by said needle during a sewing operation and adapted to move in synchronism with said feed dog mechanism whereby said sewing and looping operation will cooperate with the movement of said material by said feed dog mechanism.

2. The invention according to claim 1, wherein said feed dog mechanism comprises a first and second support block means, said first support block means being slidably mounted for substantially horizontal movement and said second support block means being slidably mounted upon said first block means for substantially vertical movement, said feed dog mechanism further including a feed dog fixed to said second support block means, said second support block means having a circular bore, said forward full revolution cam means comprising a circular cam portion in said bore in complementary relation, said circular cam being mounted in offset relation upon said forward end of said first drive shaft means whereby the rotation of said first drive shaft means will cause said

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circular cam to move said second support block means and said feed dog vertically and horizontally along an arcuate path whereby said feed dog of said feed dog mechanism may engage said material to provide said movement of said material.

3. The invention according to claim 1, wherein said second elongated drive shaft means is provided with a lateral arm at its rearward end with projection means at the outer end of said arm, and said rear full revolution cam means includes a continuous groove extending entirely around the central axis of said rear cam means, and is adapted to receive said projection means for guidingly moving said lateral arm and rotating said second elongated drive shaft means.

4. In a sewing machine provided with a supporting frame, a pointed eye thread-carrying needle mounted for vertical reciprocating movements relative to said frame and operative between a first position above a material to be sewn and a second position in which the eye of said needle is positioned below said material, a first shaft means extending horizontally of said frame and rotatable about an axis intersecting the vertical axis of said needle, a second shaft means extending horizontally of said frame angularly of said first shaft means, a looper means provided with a loop seizing and releasing means alongside said needle when said needle is in said second position, said looper means attached to said second shaft means at a point below said needle eye, and means cooperating with said first and second shaft means imparting reciprocating loop seizing and releasing movements to said looper means obliquely of said needle eye, a movable

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feed dog mechanism below said material, an eccentric means on said first shaft means imparting movement to said feed dog means, said eccentric means causing both vertical and lateral movement to said feed dog means, a first means for guiding said feed dog means during said vertical movement and a second means for guiding said feed dog means during said lateral movement, said movements causing said feed dog means to feed said material through said machine in timed relation to the movements of said needle, said feed dog means including a duality of rods on which said feed dog means is slidably mounted and said second means for guiding said feed dog means includes a sliding block on which said first guide means is mounted and means on said frame for slidably retaining and guiding said second means during said movement.

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