No. 818,840. PATENTED APR. 24, 1906.

R. L. LYONS.

STITCH FORMING MEANS FOR SEWING MACHINES.

APPLICATION FILED DEC. 19, 1904.

3 SHEETS—SHEET 1.

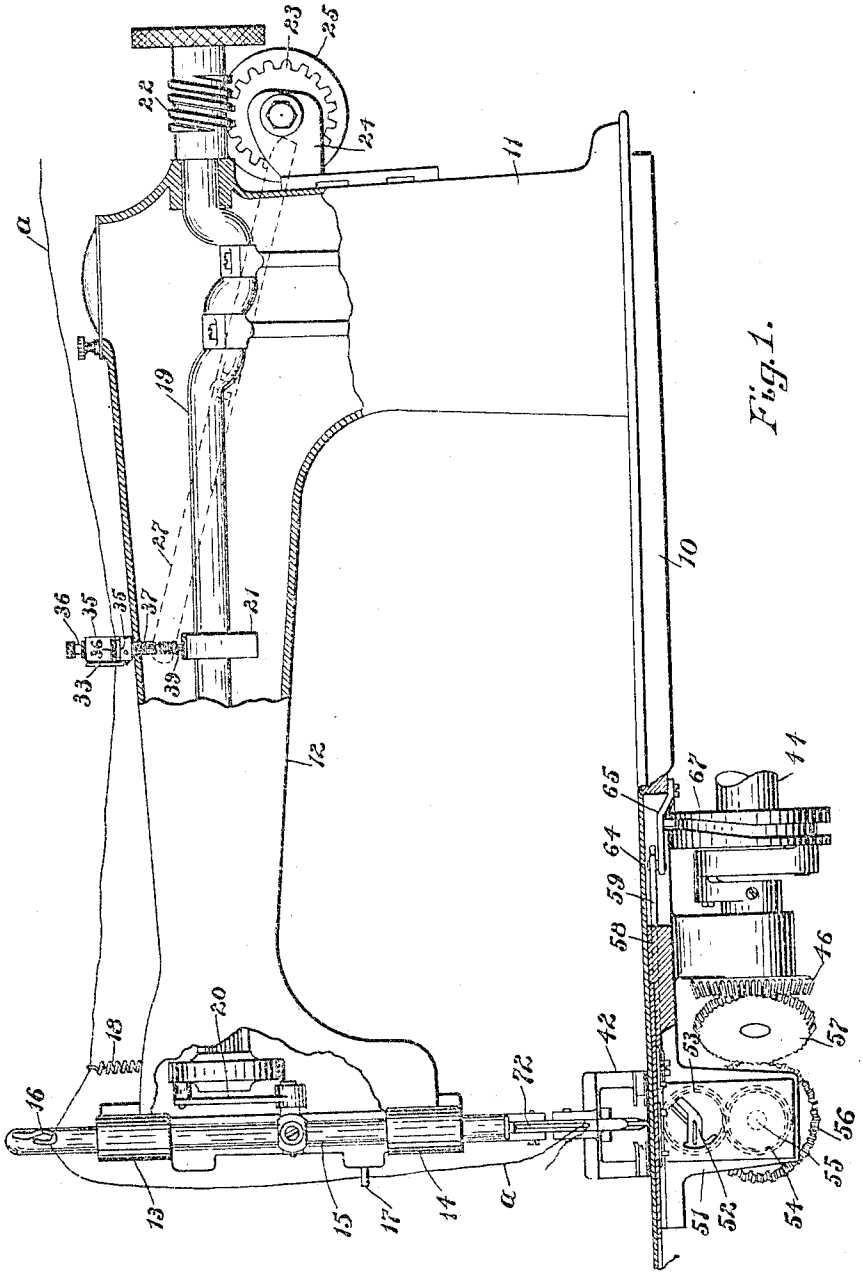

Fig. 1.

Witnesses:

Walter H. Naylor.

Raphael G. Blanc.

Inventor:

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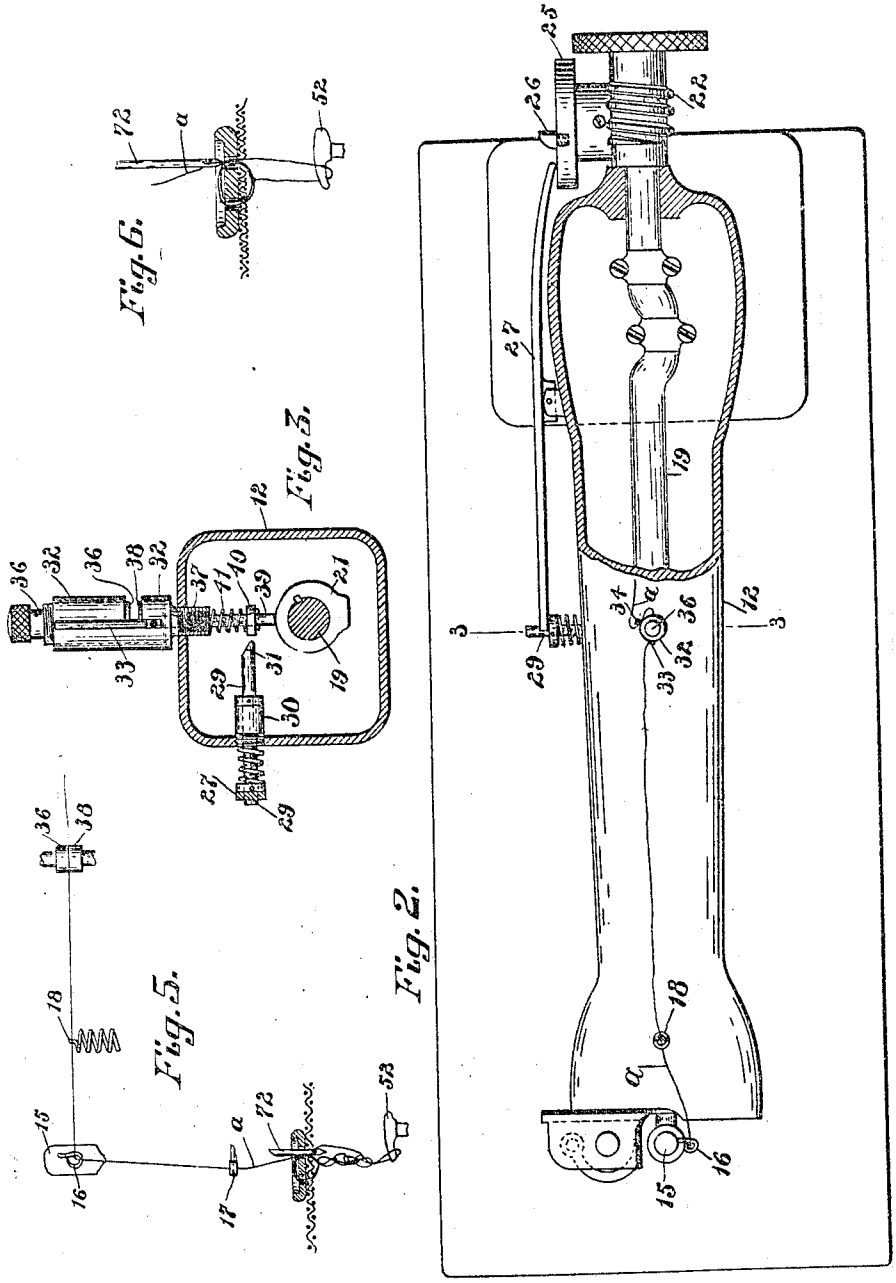

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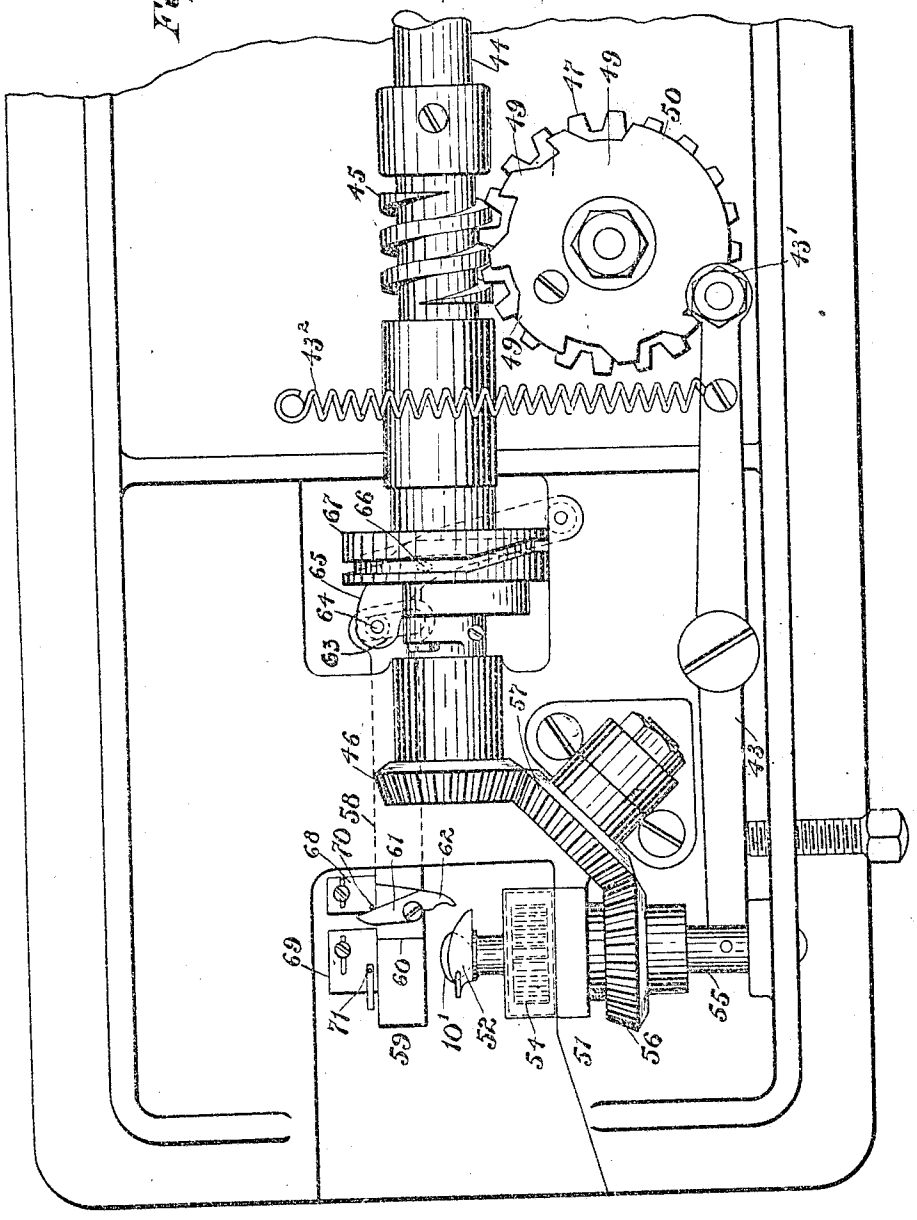
3 SHEETS—SHEET 3.

Fig. 4.



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UNITED STATES PATENT OFFICE.

ROBERT L. LYONS, OF WALTHAM, MASSACHUSETTS.

STITCH-FORMING MEANS FOR SEWING-MACHINES.

No. 818,840. Specification of Letters Patent. Patented April 24, 1906.

Application filed December 19, 1904. Serial No. 237,376.

To all whom it may concern:

Be it known that I, ROBERT L. LYONS, of Waltham, in the county of Middlesex and State of Massachusetts, have invented certain new and useful Improvements in Stitch-Forming Means for Sewing-Machines; and I hereby declare that the following is a full, clear, and exact description of the same, reference being had to the accompanying drawings, forming part of this specification.

This invention relates to improvements in stitch-forming means for sewing-machines, and particularly to single-thread sewing-machines for forming a group of stitches.

One object of the invention is to sever the thread beneath the work at the completion of a group of stitches without the use of mechanical severing devices other than the work.

Another object of the invention is to sever the thread beneath the work through the instrumentality of mechanism located above the work.

Another object of the invention is to improve the sewing-machine with reference to the stitch-forming and thread-severing means.

The invention consists in means for forming a group of stitches and, as so called, "knotting" the thread at the completion of said group of stitches, together with means for locking the thread above the work, and other means for taking up the thread between the point at which it is locked and the work.

The invention also consists in such other novel features of construction and combination of parts as shall hereinafter be more fully described, and pointed out in the claims.

Figure 1 represents a side elevation of the improved sewing-machine, parts of the same being broken away. Fig. 2 represents a plan view of parts of the same. Fig. 3 represents a cross-sectional view taken on line 3 3, Fig. 2. Fig. 4 represents a bottom plan view of parts of the machine, particularly with reference to the means for moving the work with respect to the path of the needle and for holding the work, at the completion of a group of stitches, in position to receive two or more loop-delivery actions of the needle. Fig. 5 represents a diagrammatic view of portions of the machine and the work at or about the time the chain is formed after the group of stitches has been formed and approximately as the last upward stroke of the needle commences, which effects the taking up of the thread to break the same below the work. Fig. 6 represents an enlarged view of portions of the same as the loops of the knotted portions of the thread are generally arranged at the time the thread is severed and approximately indicating the point at which the thread is severed.

Similar numbers of reference designate corresponding parts throughout.

In carrying this invention into practice I first form a group of stitches by producing a relative movement between the needle and the work by any well-known means, or by a combination of both of said movements, the number of stitches in said group depending upon the nature of the work, as usual. At about the completion of the group of stitches I stop the lateral movement of the work or the vibration of the needle, so that a series of loops of thread are carried by the needle to the looper, preferably without embracing any portion of the work. Approximately at this time I clamp or lock the thread from movement to the needle, and during the subsequent reciprocations of the needle-bar and its take-up exert a strain on the thread which, in view of the tightened "knots," so called, and the natural elasticity of the thread above the work, together with the leverage exerted by the loop or loops of the knotted portion on the main thread, effects the breaking of the main thread close to the knotted portion or at one of the latter loops of the knotted portion.

As shown in the drawings, in its preferred form 10 indicates the bed-plate of the machine, having the frame 11, carrying the arm 12, which at its forward end is provided with the needle-bar guides 13 and 14, in which the needle-bar 15 is mounted to slide vertically. The needle-bar is furnished with the thread-guide 16, and a similar guide 17 is secured to the guide 14 or to some convenient part of this portion of the arm 12, while at the upper portion of this arm is the thread-guide 18, preferably of a yielding nature or mounted to yield under a strain on the thread.

In the arm 12 is rotatably mounted the needle-bar shaft 19, which is pivotally connected by the connecting-rod 20 with the needle-bar 15 to effect the reciprocation of the needle-bar when the shaft 19 is caused to rotate, as is usual in machines of this general nature. On this shaft 19 is secured the cam 21, and preferably on that portion of this shaft extending beyond the bearing in the frame 12 is secured the worm 22, which en-

gages with the gear 23, rotatably mounted in the bracket 24, secured to this portion of the machine and furnished with the member 25, to which the cam 26 is removably secured, whereby other cams of greater or less throw or dwell may be substituted for the cam shown.

Pivotally mounted on the arm 12 is the lever 27, one end of which is positioned in the path of the cam 26, while the other end of this lever bears against the end of the outwardly-spring-pressed rod 29, which works in the bearing 30, secured in the wall of the arm 12 and has the inner bevel 31.

At the upper part of the arm 12, approximately above the location of the cam 21, is secured the casing 32, having thread-guides 33 and 34 and the opening 35. In the upper portion of this casing is preferably adjustably secured the clamping member 36, the lower end of which when adjusted preferably extends below the upper edge of the opening 35. The lower part 37 of said casing 32 is tubular and extends through the wall of the arm 12 and in this lower part is movably mounted the clamping member 38, having the rod extension 39 furnished with the collar 40, between which collar and the lower fixed portion 37 of the casing 32 is the expansion-spring 41, by which the rod 39 is pressed toward the cam 21 to move the clamping member 38 away from the member 36.

The bed-plate 10 has the usual needle-hole 10′, adjacent to which is movably mounted the button-clamp or work-holder 42, of any usual construction, and preferably operated by means of the lever 43, pivotally supported at the under side of the bed-plate and pivotally connected with the button-clamp in the usual manner.

Journaled in bearings at the under side of the bed-plate 10 is the main shaft 44, having the worm 45 and the gear 46. Adjacent to this main shaft is rotatably mounted the gear 47, furnished with the cam 48, which works against the bearing 43′ at the free end of the lever 43, which end of said lever is drawn toward said cam by the usual spring 43^2, and having the peripherally-disposed cam-surfaces 49 49, by the action of which on said lever the button-clamp or work-holder is caused to vibrate or move. Between the group of cam-surfaces 49 49 is the dwell 50, which is so timed with regard to the completion of the group of stitches that it bears on the bearing 43′ at or about the time the last stitch is completed, the result being that the work and the needle retain their relative positions while this dwell 50 is moving against the bearing 43′, thus permitting the needle to deliver a series of loops through the same path in the work to the looper, and these loops being successively cast off by the looper onto the next succeeding loop produces a chain which, when drawn tight, becomes what is called a "knot" or a "knotted" finish, adapted to hold the group of stitches against accidental loosening.

Depending from the bed-plate 10 is the bracket 51, in which is journaled the shaft of the looper 52, this shaft having the gear 53, which is driven from the gear 54 on the shaft 55, which is journaled in bearings in the bracket 51 and in the bed-plate 10 and has the gear 56, which meshes with the gear 57, rotatably mounted and driven from the gear 46 on the main shaft 44.

At the under side of the bed-plate 10 is formed the guide 58, (indicated in broken lines in Figs. 1 and 4,) and in this guide is movable the slide 59, having the recess 60, in which is pivoted the finger 61, having the hook end 62. This slide 59 is also furnished with the diagonal slot 63, in which works the pin 64 of the levers 65, which is pivotally supported at the under side of the bed-plate 10 and has the pin 66, working in the groove of the cam 67, mounted on the main shaft 44.

Also at the lower side of the bed-plate 10, adjacent to the slide 59, are adjustably mounted the plates 68 and 69, carrying the stops 70 and 71, between which the end of the pivoted finger 61 works, these stops effecting the swinging of said finger on its pivot when the slide is moved back and forth to position the thread-loop on the looper and to prevent the distortion of said loop under stress of the moving button-clamp, whereby the loop on the looper is so positioned that it may be cast off on the next succeeding loop carried downward by the needle.

The thread *a a* is carried from any ordinary thread-supply around the guide 34, through the opening 35 of the thread-clamping device, behind the guide 33, and through the guides 18, 16, and 17, or through any suitable series of guiding devices to and through the eye of the needle.

In the sewing operation the thread *a a* is carried down through the work in the form of a loop, which loop is engaged by the hook of the looper in the usual manner, the thread being free to move to the needle through the open jaws of the clamping device. On the upward movement of the needle-bar 15 the guide 16 acts to draw the loop tight, and the cam 21 is so timed with relation to its action on the rod 30 that as the upward movement of the needle begins this rod is forced upward and the thread is clamped between the jaws 36 and 38, and hence cannot be drawn from this direction by the taking-up action of the upwardly-moving guide 16, thus necessarily effecting the drawing action on any loose thread which may be beneath the work.

The cam 48 is designed to be rotated at each complete sewing operation, included in which is the formation of a group of stitches during which the cam-faces 49 49 work against the bearing 43′ of the button-clamp-

actuating lever 43, the formation of the chain while the dwell 50 is working against said bearing 43′ and the drawing upward of the thread at the last upward stroke of the needle when the slack thread has been so utilized in forming the chain or knotted portion that there is not sufficient slack thread between the work and the thread-clamping device to permit the full upward movement of the needle without breaking the thread.

When, therefore, the cam 48 has been so rotated as to bring the dwell 50 against the bearing 43′ the vibratory movement of the button-clamp ceases and the cam 21 is timed to actuate the thread-clamping member 38 through its rod 39 at approximately this point to carry the collar 40 above the level of the thin edge of the sliding rod 29. At the same time the gear 23 has been caused to rotate by the worm 22 on the needle-bar shaft to a point where the cam 26 forces outward this end of the lever 27, thus acting through said lever to move the rod 29 inward against the action of its spring and to engage the bevel end of said rod 29 under the collar 40 of the rod 39 to hold said rod 39 in the raised position, whereby the thread is clamped, while the cam 26 is beneath the end of the lever 27.

Attention is called to the fact that the thread-clamping device is actuated by the cam 21 at each upward movement of the needle-bar; but that this clamping device is locked in the closed position by the rod 29 during a series of stitch movements of the needle-bar only after the group of stitches is formed and during the formation of the chain which effects the knotting of the thread.

It will thus be seen that after the locking of the thread against movement toward the needle the slack thread will be utilized in forming the locking-chain until this slack thread is not of sufficient length to follow the complete upward movement of the needle-bar. A strain will then be brought on the loops of the chain to tighten them against the sewing-stitches until a comparatively rigid knot is formed, which is illustrated in only a comparative degree in Fig. 6, the thread *a a*, extending from this knotted portion around the looper and through the needle and the guides to the thread-clamp, this unused thread being adapted to yield somewhat under strain, so that when the strain of the upwardly-moving guide is brought on this yielding portion of the thread in a direction away from the rigid knot the thread will part approximately at the last link or loop of the chain, this parting being effected by the strain on the thread, combined with the bite formed by said last link or loop of the chain, and the leverage of one portion of said loop bent over the others.

It is of course obvious that other well known means may be used by periodically changing the lateral relation of the work and the needle, whereby the stitches are formed—as, for instance, any ordinary needle-bar-vibrating mechanism may be substituted for the movable button-clamp. Nor do I wish to confine myself to this specific form of thread-clamp or to its specific form of operation. It is also evident that in some forms of machines for forming groups of stitches the loop-positioner, including the slide 59, with its related parts, might preferably be omitted, as these parts are not included in the present invention.

Having thus described my invention, I claim as new and desire to secure by Letters Patent—

1. A sewing-machine comprising stitch-forming means including a needle and a looper, and means for locking the thread against feeding movement during a series of loop-delivery actions of the needle.

2. A sewing-machine comprising stitch-forming means including a needle and a looper, thread-clamping means through which thread is supplied to the needle, and means for locking said clamping means during a series of loop-delivery movements of the needle.

3. A sewing-machine comprising stitch-forming means including a needle, a looper, means for taking up the thread, a thread-clamping means through which the thread is supplied to the take-up means, and means for locking said clamping means during a series of loop-delivery movements of the needle.

4. The combination with a sewing-machine comprising means for producing a relative movement between the needle and the work, and means for suspending such movement during the formation of a series of stitches, of means for locking the thread against feeding movement during the suspension of relative movement between the needle and the work.

5. The combination with a sewing-machine comprising means for forming a group of stitches including a needle and a looper, and means for maintaining the relative positions of the work and the needle during a series of loop-delivery movements of the needle, of means timed with relation to the completion of the group of stitches, for locking the thread against feeding movement while the relative position of the needle and work is maintained.

6. The combination with a sewing-machine comprising means for producing a relative movement between the needle and the work, and means for suspending such movement during the formation of a series of stitches, of means for locking the thread against feeding movement whereby the continued loop-delivery movements of the nee-

dle will effect the drawing up of the chain-loops to form a knot and to ultimately break the thread.

7. The combination with a sewing-machine comprising a needle and operating mechanism therefor, of a needle-thread clamp, means for operating said clamp at each upward movement of the needle, and means for locking said clamp in the closed position during a series of movements of the needle.

8. The combination with a sewing-machine comprising a needle-bar, a drive-shaft therefor, a thread-clamp having a movable member adapted to be actuated by the rotation of said shaft, and means controlled by the rotation of said shaft for locking the movable member of the thread-clamp in the closed position during a series of rotations of the needle-bar shaft as described.

In testimony whereof I affix my signature in presence of two witnesses.

ROBERT L. LYONS.

Witnesses:
S. GOOSTRAY,
H. J. MULLER