Sept. 7, 1943. W. E. NICHOLS 2,328,668

SEWING MACHINE

Filed July 11, 1941 2 Sheets-Sheet 1

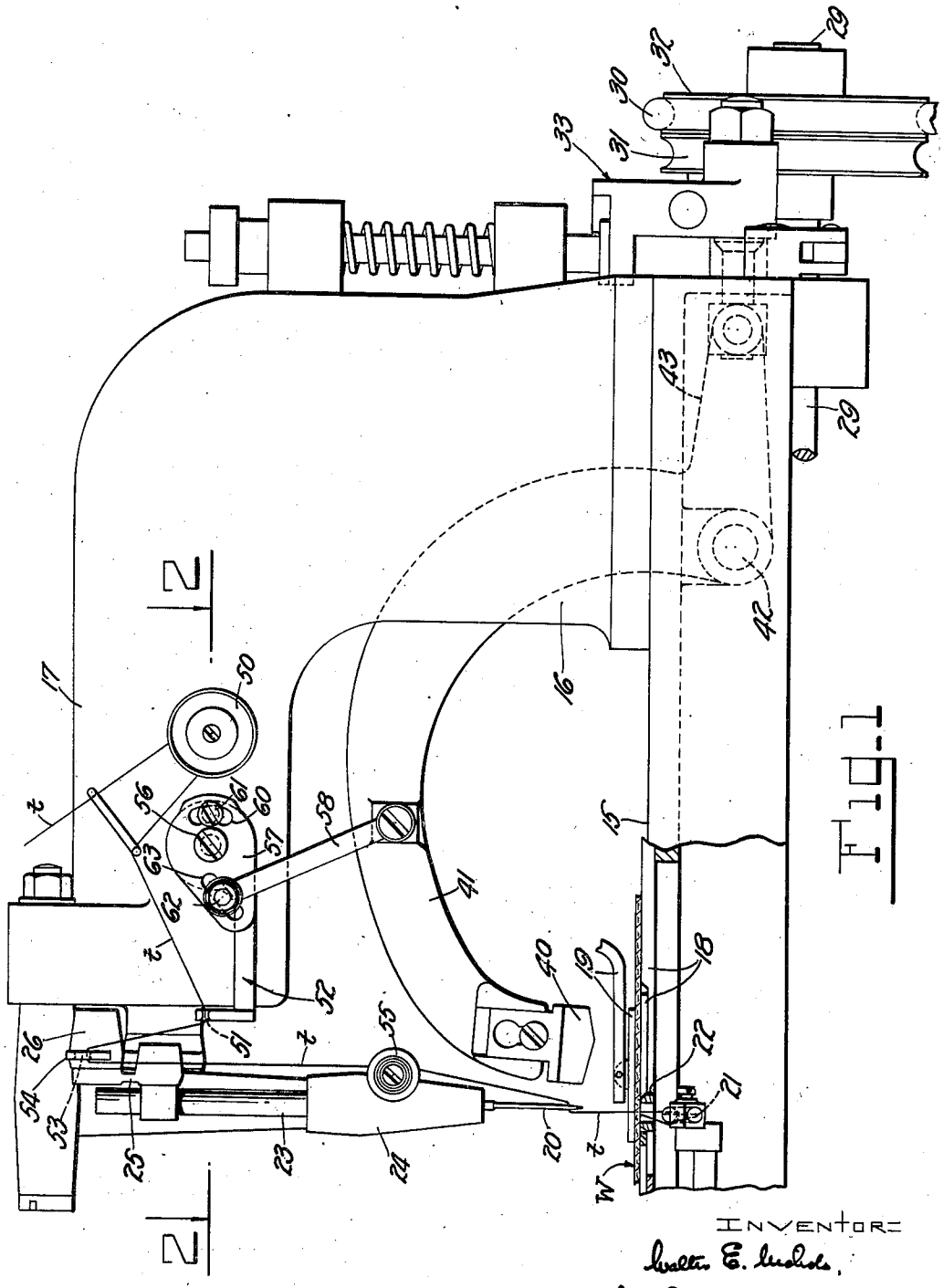


FIG. 1

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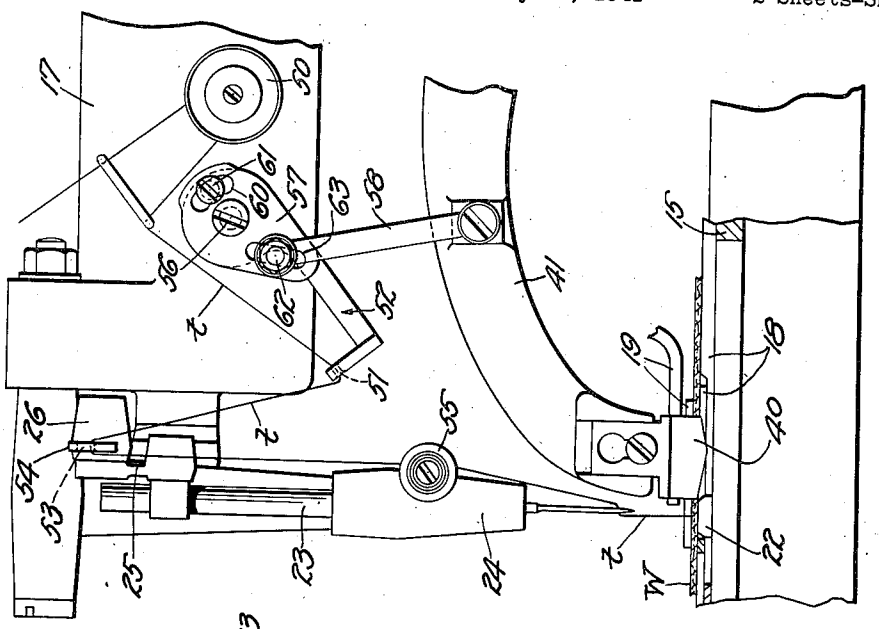


Fig. 3

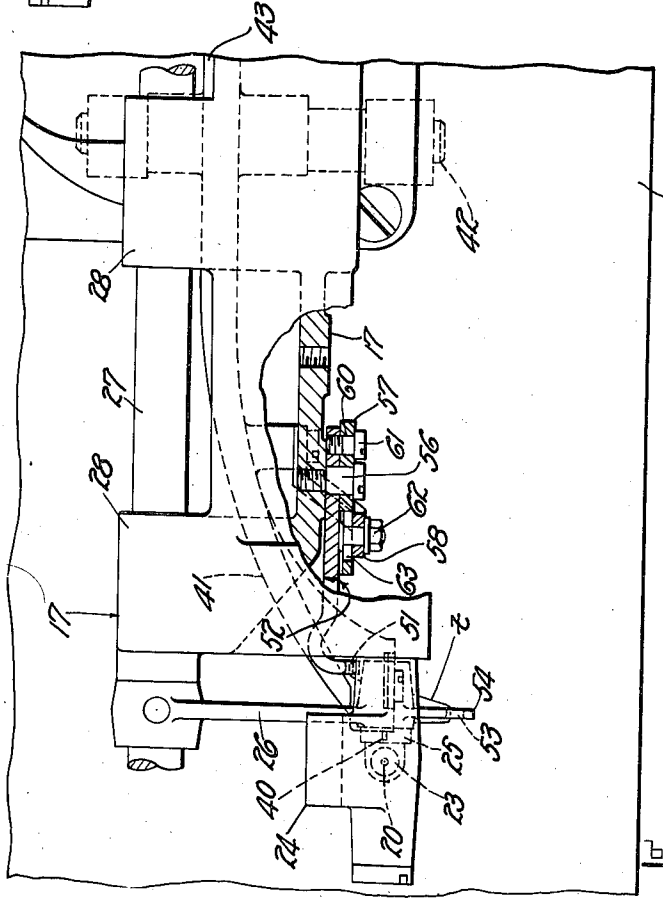


Fig. 2

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UNITED STATES PATENT OFFICE

2,328,668

SEWING MACHINE

Walter E. Nichols, Milton, Mass., assignor to The Reece Button Hole Machine Company, Boston, Mass., a corporation of Maine

Application July 11, 1941, Serial No. 401,931

9 Claims. (Cl. 112—242)

This invention relates to sewing machines and especially, though not exclusively, to button hole sewing machines of the type known as "straight hole" machines, described, for instance, in Patents Nos. 714,284, November 25, 1902; 749,776, January 19, 1904; 1,088,652, February 24, 1914; 1,402,073, January 3, 1922, and 1,483,307, February 12, 1924.

The present invention relates particularly to thread pull-off devices for machines of this and other types, and has for its main object the provision of novel means which not only pull from the thread supply an amount of needle thread sufficient to enable the needle to complete a stitch on its first reciprocation during each stitching cycle, but also assist the take-up in setting the last stitch in said cycle more firmly than was heretofore done.

Before explaining in detail the present invention it is to be understood that the invention is not limited in its application to the details of construction and arrangement of parts illustrated in the accompanying drawings, since the invention is capable of other embodiments and of being practiced or carried out in various ways. Also it is to be understood that the phraseology or terminology employed herein is for the purpose of description and not of limitation, and it is not intended to limit the invention claimed herein beyond the requirements of the prior art.

In the drawings:

Fig. 1 is a side elevation, partly in section, of a machine embodying the present invention, certain parts whose particular construction and arrangement are not essential to the understanding of the present invention, and which may be substantially as more fully shown and described in the patents above referred to, being omitted for the sake of simplicity of illustration.

Fig. 2 is a fragmentary plan view of the machine shown partly in section, the section being taken on the line 2—2 of Fig. 1.

Fig. 3 is a fragmentary side elevation of the machine similar to Fig. 1, showing certain elements in a different position, however.

The machine shown in the drawings, which, as above stated, may, as to its general organization, be similar to those described in the patents above referred to, comprises a bed 15 from which rises a standard 16, carrying an overhanging arm 17. The work W is carried by a work clamp or holder which comprises a clamp plate 18 and cooperating clamping arms 19, said work holder being movable as a unit over the bed, by mechanism not shown, in order to position the stitches along the sides of the buttonhole The stitch-forming instrumentalities comprise an eye-pointed needle 20 above the work and cooperating loopers or equivalent thread handling devices 21 below the work, there being a throat plate 22 carried by the bed 15 and having an opening through which the needle operates. The needle 20 is carried by a needle bar 23 which is axially reciprocated in a needle bar guide 24 by a link 25 and an arm 26 that is firmly mounted on a shaft 27, suitably journalled in bearings 28 (Fig. 2) and rocked in definite timed relation with a main shaft 29 (Fig. 1) by means which are not shown. Means, not shown, are also provided to vibrate the needle bar guide 24 transversely to the direction of feed of the work clamp in order to position the depth stitches along the sides of the button-hole.

The main shaft 29, which is journalled in suitable bearings in the bed 15, has power applied thereto by a belt 30 alternately engageable with fast and loose pulleys 31 and 32, respectively, under the control of a belt shifter (not shown) which is carried by a stop motion mechanism, generally indicated at 33 in Fig. 1 and disclosed in detail in the above referred to patents and also in the copending application of Joseph H. Pikul, Serial No. 401,932, filed July 11, 1941. A button hole cutter 40 is carried by a lever 41 which is journalled on a stub shaft 42 in the bed 15 and has a rearwardly extending arm 43 that is drivingly connected with the stop motion mechanism 33 in a manner fully disclosed in said Patent No. 714,284. For a clear understanding of the present invention, it is deemed sufficient to state that the stop motion mechanism 33 depresses the cutter 40, 41 into cutting engagement with the work W (Fig. 3) just before the completion of the last stitch in a sewing cycle of the machine, and quickly returns said cutter to its normal inoperative position (Fig. 1) on completion of said last stitch, i. e., when the stop motion mechanism has shifted the belt 30 from the fast pulley 31 to the loose pulley 32 and is about to stop the momentum of the moving machine parts by a recoil action which is fully described in said copending application.

The construction of the machine so far described, is, or may be, substantially as disclosed in the patents above referred to. The thread *t* from a suitable source passes to the eye of the needle 20 through a conventional, spring-controlled tension device 50, then through the eye 51 of a pull-off lever 52, then through the eye 53 in an extension 54 of the needle bar driving

lever 26 (see Fig. 2) which serves also as the take-up arm of the machine, and finally through an auxiliary, spring controlled tension device 55 on the needle bar guide 24. The pull-off lever 52 is pivoted at 56 to the overhanging machine arm 17 (see also Fig. 2), and drivingly connected with the cutter-carrying lever 41 through intermediation of an arm 57 and a link 58. The arm 57 is rotatably mounted on the pivot 56 and relatively angularly adjustable with respect to the pull-off lever 52 by means of the slot and screw connection 60, 61. The link 58 is also adjustable to and from the rotary axis of the arm 57 by means of the screw and slot connection 62, 63 (see also Fig. 2). During a stitching cycle of the machine, the take-up arm 26 oscillates in synchronism with the needle reciprocations and sets each stitch on each ascent of the needle, while the pull-off arm 52 being drivingly connected with the cutter-carrying lever 41, remains in the normal inoperative position shown in Fig. 1 until the formation of the last stitch in the sewing cycle. The cutter 40 is so operated by the stop motion mechanism 33 that the same descends into cutting engagement with the work W during the setting of the last stitch in a sewing cycle, i. e., during the last ascent of the take-up arm 26 in said sewing cycle, with the result that the pull-off lever 52 is simultaneously moved from the position shown in Fig. 1 into the lowermost position shown in Fig. 3. Such simultaneous and opposed movement of the take-up arm 26 and pull-off lever 52 results in their cooperation in setting the last stitch in a sewing cycle and in drawing extra needle thread or starting thread from the supply, as will be readily understood. The pull-off lever 52 is thereupon quickly returned to its normal inoperative position (Fig. 1) at the time, or very shortly after, the take-up arm 26 reaches its uppermost position, leaving between the tension devices 50 and 55 a length of thread *t* which is sufficiently slack to require, during the formation of the first stitch in the next sewing cycle and for reasons which will become apparent hereinafter, more than a full take-up action by the arm 26 in order to become taut. Any conventional thread-trimming device (not shown) may be provided underneath the throat plate 22 in order to sever the last needle thread loop (Fig. 1) held by the thread-handling device 21, whereby that leg of the loop is preferably severed which leads to the stitches in the work W in order to leave a maximum length of thread depending from the eye of the needle 20. The above referred to copending application Serial No. 401,932 discloses a thread trimming device which may be used advantageously here. This thread trimming device is operated when the mentioned recoil action of the stop motion mechanism takes place, and severs that leg of the loop which leads to the stitches in the work W. If this last mentioned thread trimming device is used, which becomes operative after the return of the cutter 40 and the thread pull-off lever 52 into their normal inoperative position shown in Fig. 1, the auxiliary tension device 55 exerts sufficient force on the thread *t* to enable the thread trimming device to perform its intended operation without drawing from the slack thread between the tension devices 55 and 50.

On the first down or work stroke of the needle 20 in the next stitching cycle, the needle draws in a length of the severed thread end depending therefrom until it penterates the work W. Once the needle has penetrated the work W, the thread is so abruptly bent through the needle eye and encounters so much friction on the needle and in the cloth that the thread will travel with the needle throughout the remaining work stroke thereof, thereby drawing some of the slack thread between the tension devices 55, 50 through the auxiliary tension device 55. When a looper 21 enters and enlarges the needle thread loop, the same will draw further slack thread through the auxiliary tension device, rather than draw the severed end of the thread through the work and spoil the first stitch. During the following ascent of the needle, the take-up arm 26 merely takes up the rest of the slack thread between the tension devices 55 and 50, thus preventing said take-up arm from pulling the first stitch from the work W. Substantially after the setting of each following stitch in the sewing cycle, i. e., shortly before the take-up arm 26 reaches its uppermost position during each of the following ascents of the needle, the take-up arm draws sufficient thread for the next stitch from the supply. To adjust the take-up action of the arm 26 to various weights or thicknesses of work materials, the pull-off arm 52 is angularly adjusted relative to the arm 57 by means of the screw and slot connection 61 and 60, as will be readily understood by those skilled in the art. In order to adjust the machine for more or less starting thread, the pivot connection between the link 58 and the arm 57 is adjusted to and from the rotary axis of the latter by means of the screw and slot connection 62, 63. When this last adjustment is properly undertaken, the leading or severed end of the thread is consumed without showing on the top side of the buttonhole, and any trace thereof is completely covered by the barring stitches thereat.

Inasmuch as the take-up arm 26 and the pull-off lever 52 move in opposite directions when cooperating to set the last stitch in a sewing cycle and to draw starting thread for the next sewing cycle from the thread supply, it stands to reason that the slack needle thread is taken up and said last stitch set considerably before the take-up arm reaches the end of its stitch-setting movement, with the result that the last stitch in a sewing cycle is set without fail and very firmly. The firmness of the stitch setting is, as usual, regulated by adjusting the conventional tension device 50 in a well known manner.

I claim:

1. In a sewing machine, stitch-forming mechanism including a needle and a take-up arm movable during each stitch-forming cycle to take up the needle thread, a device for operating said mechanism in a predetermined sewing cycle, comprising a plurality of stitch-forming cycles, to form a stitch group, a movable needle thread pull-off member, and means operated in timed relation with said device to move said member during the thread take-up movement of said arm in the last stitch-forming cycle of a sewing cycle such that said arm and member cooperate in drawing from the supply sufficient needle thread for the initial stitch in the next sewing cycle of said mechanism.

2. In a sewing machine, stitch-forming mechanism including a needle and a take-up arm movable during each stitch-forming cycle to take up the needle thread, a device for operating said mechanism in a predetermined sewing

cycle, comprising a plurality of stitch-forming cycles, to form a stitch group, a movable needle thread pull-off member between which and said take-up arm the needle thread extends freely, and means operated in timed relation with said device to move said member during the thread take-up movement of said arm in the last stitch-forming cycle of a sewing cycle such that said member cooperates with said take-up arm in setting the last stitch in said sewing cycle and in drawing from the supply sufficient needle thread for the initial stitch in the next sewing cycle of said mechanism.

3. In a sewing machine, stitch-forming mechanism including a needle and a take-up arm movable during each stitch-forming cycle to take up the needle thread, a device for operating said mechanism in a predetermined sewing cycle, comprising a plurality of stitch-forming cycles, to form a stitch group, a movable needle thread pull-off member between which and said take-up arm the needle thread extends freely, and means operated in timed relation with said device for moving said pull-off member during the movement of said take-up arm in the last stitch-forming cycle of a sewing cycle in opposition to said take-up arm so that said pull-off member and take-up arm cooperate to set the last stitch in said sewing cycle and to draw from the supply sufficient needle thread for the initial stitch in the next sewing cycle of said mechanism.

4. In a buttonhole sewing machine, stitch-forming mechanism including a needle and a needle thread tension and a take-up arm between said needle and tension, stopping means for said mechanism, a buttonhole cutter, means operated during the setting by said take-up arm of the last stitch in a sewing cycle of said mechanism for actuating said cutter, and a movable starting thread pull-off member between said needle and tension operated by said cutter when the latter is actuated.

5. In a buttonhole sewing machine, stitch-forming mechanism including a needle and a needle thread tension and an upwardly and downwardly movable take-up arm between said needle and tension, stopping means for said mechanism, a buttonhole cutter, means operated during the setting by said take-up arm of the last stitch in a sewing cycle of said mechanism for actuating said cutter, and an upwardly and downwardly movable member between said take-up arm and tension moved by the cutter, on actuation of the same, in opposition to said take-up arm to draw extra starting thread from the needle thread supply.

6. In a buttonhole sewing machine, the combination of stitch-forming mechanism including a needle and a needle thread tension and a take-up arm between said needle and tension, stopping means for said mechanism, a buttonhole cutter, means operated during the setting by said take-up arm of the last stitch in a sewing cycle of said mechanism for moving said cutter into operative position, a pivoted starting thread pull-off lever between said needle and tension, and a link between said cutter and pull-off lever to cause operation of the latter when the former is moved into its operative position.

7. The combination in a buttonhole sewing machine as set forth in claim 6, in which said link is adjustable to and from the pivot axis of said pull-off lever.

8. In a buttonhole sewing machine, the combination of stitch-forming mechanism including a needle and a needle thread tension and a take-up arm between said needle and tension, stopping means for said mechanism, a buttonhole cutter, means operated during the setting by said take-up arm of the last stitch in a sewing cycle of said mechanism for moving said cutter into operative position, a pivoted starting thread pull-off lever between said needle and tension, another arm pivoted coaxially of said pull-off lever and relatively angularly adjustably secured to the latter, and a link between said other arm and cutter to cause operation of said pull-off lever when said cutter is moved into its operative position.

9. The combination in a buttonhole sewing machine as set forth in claim 8, in which said link is adjustable to and from the pivot axis of said other arm.

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