Nov. 4, 1947. K. A. STRITTER 2,430,087

SEWING MACHINE

Original Filed May 26, 1943

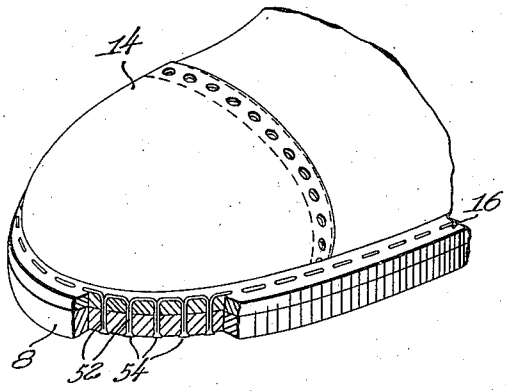


Fig.1

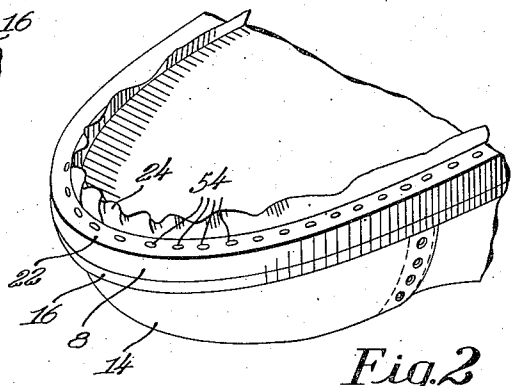


Fig.2

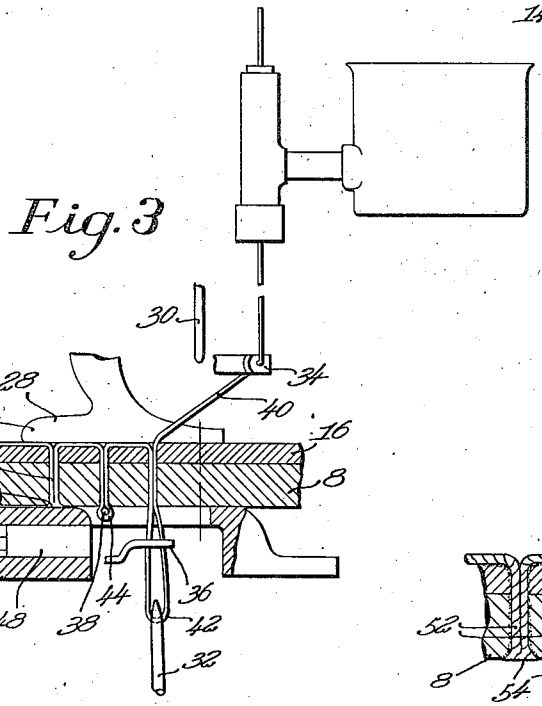


Fig.3

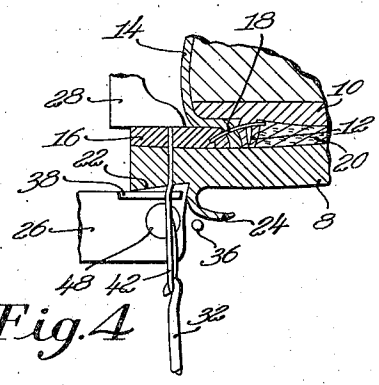


Fig.4

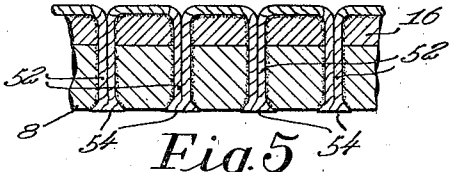


Fig.5

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UNITED STATES PATENT OFFICE

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SEWING MACHINE

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Original application May 26, 1943, Serial No. 488,481, now Patent No. 2,418,204, dated April 1, 1947. Divided and this application June 7, 1945, Serial No. 598,058

9 Claims. (Cl. 112—31)

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This invention relates to improvements in machines for inserting thread seams primarily intended for use in uniting relatively heavy pieces of work in which the substance of the work is more or less compressible and the thickness several times greater than the diameter of the thread employed in the seam, as distinguished from cloth sewing in which the thickness of the work is comparatively negligible. Although not so restricted in its application, the invention is herein illustrated with particular reference to a sewing machine designed for the attachment of outsoles to shoes, as disclosed in an application for United States Letters Patent Serial No. 488,481, filed May 26, 1943, in the name of the present inventor, of which the present application is a division, and which application has matured into Patent No. 2,418,204 April 1, 1947.

Heretofore, sewing machines have been proposed to secure together two or more layers of heavy sheet stock or other work by means of a fairstitch seam, the stitch loops of which extend through the layers and are enlarged or flattened at their closed ends so that the enlargements tend to hold the seam in place. Such seams, however, cannot be relied upon to hold heavy layers securely united if they are subjected to any substantial strain or flexure tending to separate them, inasmuch as the enlarged or flattened ends of the stitch loops offer no very substantial resistance to withdrawal of the loops from the stitch holes, the thread in the loops still retaining its flexibility.

One object of the present invention is to avoid the weakness and tendency to withdraw the stitches inserted by a machine for sewing a fairstitch seam by so constructing the machine that loops in the stitches formed thereby will be rigidly and positively locked to the stock operated upon.

With this object in view, the invention considered in one of its several aspects provides a sewing machine employing thread including a synthetic plastic material having a latent property for strong adhesion to leather stock or other work operated upon, which comprises the usual devices for compressing the stock and inserting a beam, together with means in the machine for processing the plastic material while the work is compressed, thereby to provide permanent, rigid locking heads at one side of the work for positively holding the stitches in place even under severe flexure or separating strains between pieces of stock so sewn together. Advantageously, the plastic may be contained within

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the fibers of the thread itself which is thus softened, rendered capable of being shaped and headed over upon the adjacent surface of the stock by suitable activation during progress of the sewing operations. As a result of compression and activation, the locking heads being formed from the plastic material are integrally connected with the fibers of the thread, so that a strong construction is provided. Preferably, the locking heads are of such an enlarged diameter that they will not pass through the perforations in the stock within which the threads are inserted. As a further means for locking the stitches in place, according to this feature of the invention, activation of the plastic material in the thread causes it to adhere to the stock also, thus enabling a firm bond to be obtained between the thread and the stock.

In its illustrated form, the machine is arranged with a hook needle to carry loops of thread through the stock or work, and the stock, being compressed at the point of operation of the needle, insures an intimate and firm contact between the thread in the loops and the substance of the stock. The improved machine also is of more general adaptability and is not limited in its usefulness to uniting separate pieces of stock or work but is capable of inserting stitches of a seam for decorative or other purposes in a single ply of material. For decorative purposes, the rigid locking heads offer many possibilities in contrasting effects where threads are employed, the fibers of which are colored.

The invention will now be explained in detail with reference to the accompanying drawings, in which

Fig. 1 is a perspective view of the toe portion of a Goodyear welt shoe the outsole of which has been attached by the machine of the invention, portions of the outsole and the welt having been broken away to show how the closed ends of the stitch loops are locked at the tread surface of the outsole;

Fig. 2 is a perspective view of the toe portion of the shoe illustrated in Fig. 1, showing the bottom or tread surface of the outsole and illustrating the appearance of the shoe after the protruding ends of the stitch loops have been softened and flattened in the machine;

Fig. 3 is a view in front sectional elevation, illustrating portions of a fairstitch sewing machine embodying the present invention, with the outsole and the welt shown in operating position as viewed along the line of the seam being sewn by the machine;

Fig. 4 is a view in side elevation of the same portions of the machine illustrated in Fig. 3, with a section of the shoe being operated upon; and

Fig. 5 is a vertical sectional view, on an enlarged scale, of the welt and outsole of a shoe sewn on the machine, the section being taken along the line of the seam and illustrating how the stitches are locked in place.

The machine illustrated in the drawing is adapted to sew an outsole 8 to a shoe of commercial Goodyear welt construction, the shoe, as shown in Fig. 4, comprising an insole 10 having a marginal sewing rib 12, an upper 14 and a welt 16 which are secured to the insole rib by inseam stitches 18, and the usual filler 20 for the bottom cavity bounded by the sewing rib. The outsole 8 is laid, rough-rounded and processed in the usual manner to provide a marginal stitch receiving channel 22 at the tread side of the sole and forming a flap 24 which is subsequently raised to open the channel and left in a raised position until after sewing, as indicated in Fig. 2.

The illustrated machine is a fairstitch sewing machine of the type disclosed, for example, in United States Letters Patent No. 645,424, granted March 13, 1900, upon application of Edwin F. Mower. Portions of such machine are shown in Figs. 3 and 4 of the drawings, the flat-surfaced throat plate or work support being indicated at 26, the presser foot at 28 having a similar work engaging surface, the awl at 30, the hooked needle at 32, the thread carrier at 34, the loop placer at 36, and the thread retainer at 38.

During the operation of the machine, the extension edge portions of the welt and the outsole are supported and compressed somewhat between the work table and the presser foot at the point of operation of the needle, and the shoe parts operated upon are fed step by step as the successive stitch forming operations are performed. The awl, the needle and the other stitch forming devices co-operate to cause the thread 40 leading from a source of supply, not shown, to be drawn downwardly through the welt and the outsole in the form of a long loop, as indicated at 42 in Fig. 3. Thereafter, the loop is drawn upwardly until its bight is drawn against the thread retainer 38, leaving only a small amount of thread in the bight of each loop projecting at the tread side of the outsole, as indicated at 44. Finally, the projecting bight portion of each loop is flattened against the outsole by the pressure of the pressure foot on the work support. Thus, during continued operation of the machine a serially connected line of loops is formed. For an understanding of further particulars in regard to the construction and mode of operation of the machine, reference may be had to the above-identified patent.

In using the above-described machine for securing an outsole to a shoe according to the herein illustrated invention, the machine is supplied with a thread composed, either wholly or in part, of solidified thermoplastic material (thread formed with twisted strands of nylon fibers having been found suitable for this purpose) and the portion of the work support which functions to flatten the projecting end or bight portions of the stitch loops against the outsole is heated, as by means of an electric heading unit 48 (Fig. 3), to insure that the end portions of the loops will be in a soft and pliable condition while being subjected to pressure. Advantageously, also, the presser foot 28 may be formed with an extension 50 acting in conjunction with the heated work support to insure that the ends of the stitch loops will be effectively headed over, flattened and solidified against the work at a position beyond the immediate point at which the needle acts.

In Figs. 1 and 5 of the drawings, the loops of the completed fairstitch seam are indicated at 52. In sewing the seam, as the feed of the work advances the projecting ends or bights of the stitch loops across the flat upper surface of the heated portion of the work support 26, the thermoplastic material of which the loop ends are composed is processed by softening it to a sufficient degree to cause the fibers in the thread to become autogentically bonded by heat and resolved by pressure into a united plastic mass integrally connected with the plastic fibers of the rest of the thread 40. The softened end or bight portions of the stitch loops 52 are thus consolidated, compressed and flattened against the channeled surface of the outsole by the ironing action of the heated work support under the compression of the outsole by the presser foot with the result that, when hardened, rigid flat heads 54 of greater diameter than that of the thread are formed at the lower ends of the stitch loops.

To cause hardening, the heads 54, extending outwardly beyond the edges of the stitch holes, are quickly cooled as they are moved away from the heated work support by the continued feeding of the work. The rigid heads 54 overlap the lower surface of the outsole at the side of the work opposite from that on which the threads between stitches lie and, after they have become hardened, they function as locking members positively to hold or lock the individual stitch loops in place in the outsole while the thread between stitches remains unaffected and flexible. As the hardened heads move away from the area of compression at the sewing point during work feed, the work expands slightly to tighten the stitches with a corresponding increase in tension in the thread.

The closed ends of the stitch loops are also held in place in the stitch holes by means of the latent adhesive property of the nylon thread which causes the softened end portions of the stitch loops to adhere strongly to the outsole as they are allowed to harden. Consequently, even if the loop ends are not flattened, enlarged or headed over so as to overlap the lower face of the sole to any substantial extent, they will nevertheless be held in place by the bonding action of the softened plastic to cause them to adhere to the tread side of the sole. Thus, the stitch loops will be locked as a joint result of heading over the bights in the loops and the autogenic bonding action between the individual fibers of the thread, the adhesive bond being established between the loop ends and the adjacent portions of the outsole material.

After sewing the seam with the projecting end or bight portions of the stitch loops headed over, the channel flap 24 is laid in the usual manner and serves to cover the locking heads 54 and protect them from wear. The heads 54, being flat and substantially flush with the bottom surface, will not produce ridges or protuberances in the channel flap and, consequently, there will be no necessity of forming the usual groove in the channel for the purpose of receiving the stitches.

The use of a single-thread fairstitch seam in attaching an outsole to a shoe is particularly advantageous in that such a seam facilitates flexing of the outsole, rendering it capable of bending freely with the foot, since there are no strands or rigid portions of the thread connecting the stitch loops at the outer or tread surface of the

outsole to stiffen the sole and resist bending or flexing thereof. Also, the thread between stitches at the welt side of the work will remain in its normal condition, thus avoiding stiffness. The locking effect of the solidified plastic heads formed at the bight ends of the stitch loops causes the stitches of a fairstitch seam to be securely held in place in the work. Thus, the locking action of the solidified heads renders it practicable to employ such a seam in attaching an outsole to a shoe or in securing together layers of other types of stock in the manufacture of articles or products of various sorts in which it is the practice to insert a thread seam.

Having described my invention, what I claim as new and desire to secure by Letters Patent of the United States is:

1. A sewing machine for inserting a thread seam including a plastic material with a latent property for strong adhesion to the work operated upon, having, together with other stitch forming devices, a needle for carrying loops of thread successively into the work, and work compressing means acting at the point of operation of the needle, in combination with means for processing the plastic material while the work is under compression by the compressing means to lock the loops in place.

2. A sewing machine for inserting a seam the thread in which is composed of softenable synthetic plastic fibers, having, together with other stitch forming devices, a needle for carrying loops of thread successively into the work, and compressing means acting at the point of operation of the needle, in combination with plastic activating means for causing the compressing means to form rigid locking heads on the thread at one side of the work integral with the fibers in the thread.

3. A sewing machine for inserting a seam the thread in which is composed of softenable synthetic plastic fibers, having, together with other stitch forming devices, a needle for carrying loops of thread successively into the work, and work compressing means acting at the point of operation of the needle, in combination with plastic activating means for causing the compressing means to form in the threads at one side of the work rigid locking heads, integral with the fibers in the thread, of a diameter which is greater than the diameter of the thread to prevent the heads from being pulled through the work.

4. A sewing machine employing thread composed of thermoplastic material with a latent property for strong adhesion to the work operated upon, having, together with other stitch forming devices, a needle for carrying loops of thread containing the thermoplastic material successively into the work, and work compressing means comprising a work support and a presser foot acting at the point of operation of the needle, in combination with means for heating the plastic material in the stitch loops at the bight portions thereof while the work is under compression of the work support and presser foot to activate said material and cause it to adhere to the work.

5. A shoe outsole sewing machine employing thread composed of thermoplastic material with a latent property for strong adhesion to leather, having, together with other stitch forming devices, a hook needle for carrying loops of thread containing the thermoplastic material successively into an outsole, and outsole compressing means comprising a work support and a presser foot acting at the point of operation of the needle, in combination with means for heating the thermoplastic material while under compression of the work support and presser foot after the needle withdraws each loop of thread to activate the thermoplastic material of the thread and cause it to adhere to the substance of the outsole.

6. A sewing machine employing thread composed of fibers of a softenable synthetic plastic material, having together with other stitch forming devices, a needle for carrying loops of thread containing the plastic material successively into the work, and flat-surfaced work compressing means acting at the point of operation of the needle, in combination with means for softening the plastic material while under compression by the compressing means to bond the fibers of the thread autogenically and to form flattened locking heads from the bonded fibers.

7. A sewing machine employing thread composed of fibers of a softenable synthetic plastic material with latent properties for strong adhesion to the work operated upon, having, together with other stitch forming devices, a needle for carrying loops of thread containing the plastic material successively into the work, and work compressing means acting at the point of operation of the needle, in combination with means for softening the plastic material while under compression by the compressing means to bond the fibers of the thread autogenically and to form rigid locking heads from the fibers and to bond the locking heads adhesively to the work operated upon.

8. A sewing machine employing thread composed of fibers of a softenable synthetic plastic material, having, together with other stitch forming devices, a needle for carrying loops of thread containing the plastic material successively through the work with the bight portions of said loops projecting from the work, and work compressing means acting at the point of operation of the needle, in combination with means for softening the plastic material of the bight portions of said loops while under compression by the compressing means to form rigid locking heads on the loops.

9. A sewing machine for inserting a thread seam including a plastic material with a latent property for strong adhesion to the work operated upon, having, together with other stitch forming devices, a needle for carrying loops of thread successively into the work, work compressing means, and a thread retainer acting within the area of the work compressed by the compressing means to prevent withdrawal of the bight of thread in each loop, in combination with means for processing the plastic material in each bight successively after retraction of the thread retainer from that bight and while the work is under compression by the compressing means to lock in place the loop forming the bight.

KARL A. STRITTER.