

Oct. 27, 1953

F. C. EASTMAN

2,656,804

SHOE SEWING MACHINE NEEDLE

Filed Nov. 17, 1950

Fig. 1

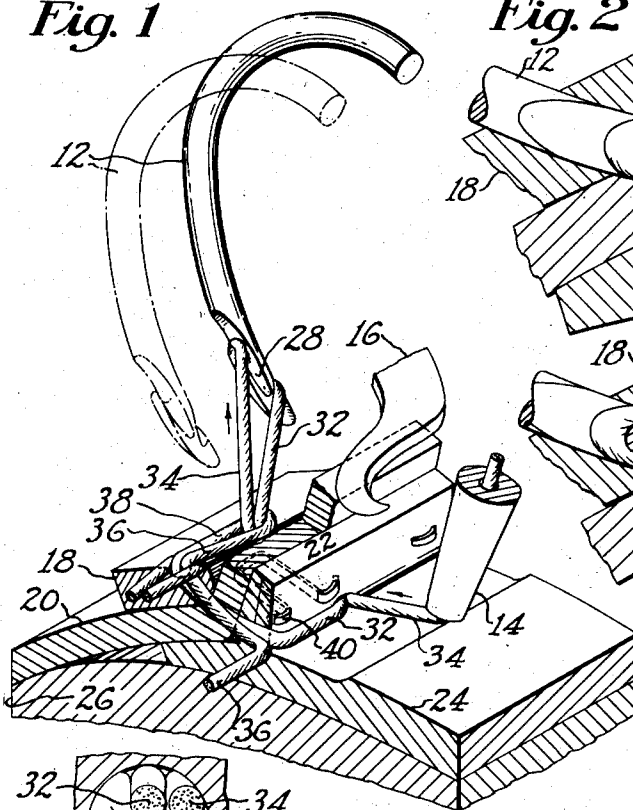


Fig. 2

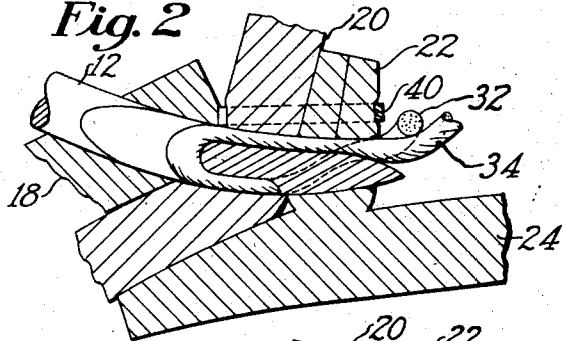


Fig. 3

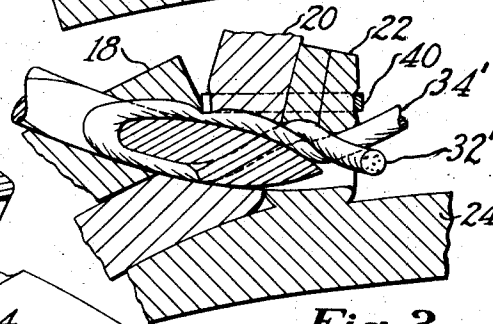


Fig. 4

Fig. 5

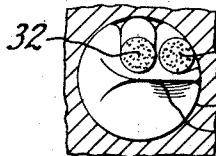
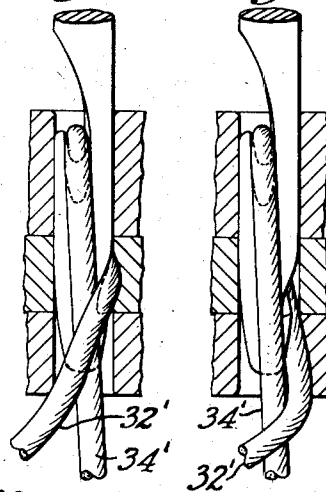


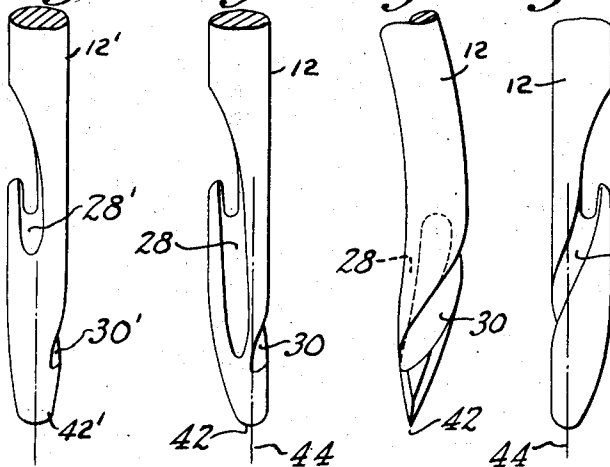
Fig. 10

Fig. 6

Fig. 7

Fig. 8

Fig. 9



Inventor

Fred C. Eastman

By His Attorney

Wm. C. Eastman

UNITED STATES PATENT OFFICE

2,656,804

SHOE SEWING MACHINE NEEDLE

Fred C. Eastman, Marblehead, Mass., assignor to
United Shoe Machinery Corporation, Flemington,
N. J., a corporation of New Jersey

Application November 17, 1950, Serial No. 196,162

3 Claims. (Cl. 112-222)

1

The present invention relates to curved hook shoe sewing machine needles for inserting chain stitch means and is hereinafter illustrated in the type of needle employed with shoe in-seam sewing machines.

The needle in a shoe in-seam sewing machine not only acts to draw loops of sewing thread through the work but also to perform the principal function in enchaining each loop with a successive loop of thread in each stitch and an important function in tightening and setting each stitch in the substance of the work. The work pieces operated upon by a shoe in-seam sewing machine needle are composed of relatively heavy leather temporarily held together by metallic staples inserted slightly above the line along which the in-seam is to be sewed. In performing its functions the needle frequently contacts a staple and is subject to sudden strains which are alternately reversed along the length of the needle. The effects of these strains and reversals are to impart shock loads to a degree which often causes failure from fatigue in the needle itself. Such failure may result in breakage or in permanent deformation of the needle to such an extent that stitches will be formed and set improperly and the thread broken. Slight deformation of the needle may not readily be perceived by an operator who may be led by thread breakage to attempt various readjustments in the machine so as to bring the machine into a condition of serious maladjustment. In some instances, needles with poorly constructed thread engaging surfaces may cause the same results which a machine operator may fail to recognize without the use of specially designed gages.

The objects of the invention are to provide a chain stitch shoe sewing machine needle with a configuration in its thread engaging surfaces which will eliminate many of the conditions above noted, both from use and in the original construction of such needle and to provide a needle of the type referred to which will have many times the durability of prior needles of similar nature and which will be uniformly effective in forming seams with heavier tensions and with less likelihood of damage to the thread employed.

The curved hook, chain stitch shoe in-seam sewing machine needle of the present invention comprises a stem of uniform circular cross-section, the hook of which opens into the stem at that side of a plane defined by the needle curvature away from which the work operated upon is to be fed, a sharpened point centered about the solid section of the stem of the needle opposite

2

the hook and two thread guiding grooves between the hook and the point, the grooves being cut to uniform depths throughout their lengths within the confines of the projected circular surface of the needle stem. These grooves are identified as a curved side groove and a straight inner groove, the latter being formed within the curvature of the needle and the former extending from outside the needle curvature to the inside thereof.

In the needle of the invention, uniform depth of thread grooves throughout their lengths within the confines of the projected area of the circular needle stem section has been rendered possible only by the use of a point centered about the reduced solid section of the stem opposite the needle hook. When the point is centered about the stem of the needle as a whole rather than about the reduced solid section, tapering the needle towards the point causes removal of material at that side of the needle opposite the hook, the curved thread guiding groove being cut along said side of the needle. In order to form the curved side groove with a uniform effective depth in prior needles, to receive the full diameter of thread intended to be employed with the needle the outlet of the curved groove is directed toward the thread running from the straight inner groove so that it brings the outside thread extending through the curved side groove into interference with the thread running from the straight inner groove. By centering the point about the reduced section of the stem opposite the hook, material is provided at the point of the needle for giving the curved side groove a uniform depth throughout its length while at the same time it is possible to form the outlet of the curved groove clear of the thread running through the straight groove. A structural advantage in the way of increased strength also is obtained in bringing the needle point into the line with the reduced section of the stem opposite the hook. In this way, the force of penetrating the work operated upon subjects the reduced section of the needle to more nearly pure compression rather than to excessive bending force about the reduced section as in prior needles. The use of the curved groove of uniform depth throughout its length is of further assistance in forming each stitch in that it insures retaining each loop on the needle after the needle is retracted from the work and in that it renders certain the proper enchainment of that loop with the succeeding one when the needle again penetrates the work.

These and other features and advantages of

the invention as hereinafter described and claimed are particularly applicable to shoe in-seam sewing machine needles having flat or duck bill type points and will be apparent from the following detailed specification of a preferred form of needle and of its manner of use in such machine, taken in connection with the accompanying drawings, in which:

Fig. 1 is a perspective view on an enlarged scale showing some of the parts of a chain stitch shoe sewing machine in its usual manner of operation on a section of a Goodyear welt shoe;

Fig. 2 is a sectional view of a shoe and a novel form of needle constructed according to the present invention, on a somewhat further enlarged scale, showing the position of the needle while its threaded hook is being retracted from the shoe;

Fig. 3 is a similar sectional view of a shoe with a prior needle;

Fig. 4 is a plan view of the hooked end of a prior needle showing one manner in which the threads may lie while being retracted from the work;

Fig. 5 is a similar plan of a prior needle showing another manner in which the threads may lie;

Fig. 6 is a detail plan as viewed from within its curvature of a prior needle hooked end;

Fig. 7 is a similar plan of the improved needle of the present invention;

Fig. 8 is a view of the improved needle showing its right side;

Fig. 9 is a bottom plan of the needle looking from outside its curvature; and

Fig. 10 is a sectional end view of the improved needle on a still further enlarged scale taken as the threaded hook is being retracted from the work.

The operating devices of the shoe in-seam sewing machine illustrated in the drawings are a curved hook needle 12, a needle looper 14 and a thread finger 16 arranged and actuated in the usual manner to form a chain stitch in-seam for securing together a welt 18, a lasted upper 20 and the upstanding rib 22 of an insole 24, the shoe parts being mounted upon a supporting last 26. The illustrated needle has a stem of uniform circular cross-section and is curved in the arc of a circle along its length with a hook opening at one side of the plane defined by the needle curvature. To insert the in-seam the needle 12 pierces the shoe parts, entering and emerging without engaging the supporting last 26 and with the chain of the seam engaging the welt. After penetrating the shoe parts the sewing thread is laid in the hook of the needle by movement of the looper 14 about the projecting end of the needle in a clockwise direction, facing the needle point. To provide thread for the needle, as the needle retracts from the work with the thread, the thread is first engaged with the thread finger 16 before the looping operation. The thread finger then holds aside a measured length of thread between the last formed stitch and the looper and the measured length is given up as the threaded needle hook retracts through the work.

Before entry of the thread into the needle hook the thread actually is first engaged with the needle stem somewhat above the hook from outside the needle curvature and then is wrapped upwardly, first entering the outer side of the hook, which hook is disposed on the left-hand side of the needle stem, with the completed stitches of a seam. The opening into the hook faces that side

of the needle away from which the work operated upon is to be fed. As the needle begins to retract from the work the thread carried by its hook is engaged by the outer surfaces of the work around the needle opening. The portion of thread first engaged by the needle is then pushed toward the point of the needle and the length of thread running to the looper from inside the hook moves toward a position of parallel relation along the needle inside its curvature. When the threaded hook has entered the work the thread engaged thereby begins to form a loop, the inside length of which lies along a short straight inner guiding groove 28, running from the hook toward the point along the inside of the needle curvature. Outside the curvature of the needle the thread portion first engaged by the needle forms the outside length and enters a curved outside thread guiding groove 30 extending substantially 180 degrees around the stem of the needle from the outside of the hook toward the point in a counterclockwise direction facing the needle point. The purpose of the curved side groove is to bring the outside thread length eventually from the hook outside the needle curvature around the right side of the needle and over the point of the needle into a position inside and across the needle point, as illustrated in Fig. 1.

In Fig. 1 the threaded needle is illustrated as being fully retracted from the work in the dot-dash position. The full line position illustrates the relationship of the two thread lengths of a needle loop more clearly, the outside length 32 of the loop being connected with the previously formed stitch and the inside length 34 running from the inside of the needle hook to the supply through the looper 14. In the previously formed stitch, the illustration of which enables a better understanding of the relationship of these thread lengths, the outside length 36 extends to the previously formed stitch and corresponds to the length 34 in the stitch being formed, while the inside length 38 did extend to the supply before the loop 32, 34 was formed. It will thus be seen that with the loops of thread lying snugly against the welt 18 the inherent nature of a chain stitch seam causes a 90° twist to be imparted to the threads inside the material of the work, the threads on the chain side being located naturally in side-by-side relationship crosswise of the seam and the threads along the channel between the rib 22 and the insole 24 being located in side-by-side relationship along the seam. It is this 90° twist in the threads together with unavoidable inaccuracies in control of the thread by the stitch forming devices which frequently causes irregularities in formation of stitches and in the resulting seam.

A prior art needle, such as shown at 12' in Figs. 4, 5 and 6 for sewing shoe in-seams is formed with a so called "duck bill" point in which a chisel shape is provided, the widest dimension along the cutting edge of which extends along the line of the seam to be inserted. However, to provide good penetration of the needle the "duck bill" tapers toward its cutting edge, the side edges being inclined together toward the point with the result that the curved side groove 30' connecting the outside of the needle hook is of such reduced depth at its outlet where it intersects the relatively flat inside surface of the duck bill point that there is insufficient ability to hold the thread reliably in place in the straight groove 28'. An attempt to increase the depth of the

5

curved groove outlet will not improve the conditions since the thread will not be pressed into it by engagement with the work sufficiently for reliable results and if the groove is increased in depth it will promote a further difficulty through interference with the thread length 34'. If the outlet of the curved groove 30' is deepened or the outside length 32' of thread (see Fig. 4) is held in place from other cause it may be led to emerge from the outlet of the curved groove 30' at the inside duck bill surface too close to the inside length 34' and the outside length 32' may overlie the inside length 34' as illustrated in Fig. 4. When this occurs the cross-over between the threads bulges and compresses the thread fibers sufficiently to impede retraction of the needle. To reduce these conditions the inside groove 28' has always been terminated between the hook and the outlet of the curved groove 30', thus increasing the pressure of the work on the thread length 34' so that it will be held in line with a certain degree of flexibility opposite the outlet of the curved groove 30'.

Frequently when the upper and the insole rib of a shoe are temporarily attached by means of metallic staples, as illustrated at 40, the prior art needle may come so close to a staple that the outside thread 32' is frayed or severed at the cross-over along the inside surface of the duck bill while the needle is being retracted, as indicated in Fig. 3, the already compressed outside thread length 32' being jammed with heavy pressure beneath the corner of the staple.

If the threads do not cross over on the inside surface of the duck bill ahead of the needle point they may be pressed into a side-by-side relationship during their passage through the material of the work. In such case the inside length 34' may press the outside length 32' out of the outlet to the curved side groove 30', as shown in Fig. 5. If this occurs the outside length 32' of the thread may slip outwardly past the needle point, indicated at 42', as the point is being retracted. In this case, when the work is fed relatively to the needle 12', from the position indicated by the dot-dash outline in Fig. 1 to that indicated in solid lines the thread will not be retained in the curved side groove 30'. As a result, the loop will be freed from the needle hook during the succeeding work penetrating stroke and will not be enchain with the succeeding needle loop.

To avoid both the possibility of causing the lengths of each needle loop from crossing over each other as in Fig. 4 or the inside length 34' from pressing the outside length 32' out of the outlet of the side groove 30' as in Fig. 5 and to insure that both lengths of thread in each needle loop will lie uniformly in side-by-side relationship under all conditions along the inner surface of a duck billed needle point, according to a feature of the present invention, the right side of the improved needle 12 opposite the opening in the hook or that side facing the direction toward which the work is fed forms a continuation of the needle stem surface substantially to the point of the needle with a dimension corresponding to the full diameter of the needle stem sectional area, there being no perceptible set-back along the edge of the duck bill point 42 at this side of the needle. To insure proper penetration of the needle point, however, the opposite edge of the duck bill point below the hook of the needle is formed with a gradual setback from a location about halfway between the hook and the extreme tip of the point. The curved side groove 30 is

6

formed with a uniformly ample sectional area and depth required for the full diameter of the largest thread intended to be employed from the opening of the hook outside the curvature of the needle throughout its length to its outlet at the surface of the duck bill point inside the needle curvature. The result is that the right side of the needle from the stem to the duck bill point lies tangent to a single plane. When the threaded needle hook is withdrawn from the work the outside thread length 32 is forced positively below the surface of the needle by the inner wall of the perforation in the work into engagement with the curved side groove 30 and is retained in this groove during retracting movement through the work by the close fitting inner wall of the perforation. With the prior needle 12' formed with a setback right edge along its point to provide a taper in the usual way, the pressure of the work inside the perforation on the outlet of the curved groove 30' is relieved as the point retracts so that there is no positive holding power to retain the thread in the outlet of the groove 30' in case it is pressed outwardly by the thread length 34' inside the needle point, as shown in Fig. 5.

A further advantage of the described needle construction results from the location of the outlet of the curved side groove 30; out of line with the natural path of the thread length 34 along the inside of the needle point. Accordingly, the inside thread length 34 always will lie in side by side relation with the outside thread length 32 without opportunity for crossing it or pressing it out of the outlet of the curved groove 30 (see Figs. 2 and 10).

As a further improvement rendered possible by this construction the inside groove 28 of the improved needle is lengthened from the needle hook to bring it to a location substantially opposite the outlet of the curved groove 30 (Fig. 7) without intersecting the outlet. Lengthening the inside groove 28 enables this groove also, which has heretofore been formed with an extremely shallow dimension of insufficient depth required for the full diameter of the thread employed with a given needle, now to be cut with a uniformly ample sectional area and depth throughout its length for the full diameter of thread employed between the bottom of the groove and the confines of the projected cylindrical surface of the stem so that during retraction of the threaded needle from the work the inside length 34 of the loop will be protected by the upstanding sides of the inside groove from abrasive contact with staples or other interferences. The effect of a full depth groove 28 to prevent abrasive contact of the thread lengths 32 or 34 with staples is clearly illustrated in Fig. 10.

From the above described construction it is apparent that an advantageous chain stitch shoe sewing machine curved hook needle is provided, having thread guiding grooves extending from its hook toward its point with uniformly full sectional areas and depths throughout their lengths between the bottoms of the grooves and the projected surfaces of the needle stem but that the point itself is located to impart the greatest possible strength to the needle. Referring more particularly to Fig. 7 the point 42 is centered about the dot-dash line 44 which represents the center of the solid needle section opposite the opening of the hook. Accordingly, during penetration of the work the forces reacting on the needle will be centered about this line. For this

reason no substantial bending forces are imparted to the needle at the hook, this section being the weakest part of the needle. Also, during retraction of the needle the thread lengths 32 and 34 are located positively inside the needle point, as illustrated in Fig. 10, so that the tension on the thread is exerted more nearly in line with the center 44 of the solid needle section along its weakest area opposite the hook.

The nature and scope of the invention having been indicated what is claimed is:

1. A chain stitch shoe sewing machine needle comprising a stem of uniform circular cross section curved in the arc of a circle and provided with a hook opening to one side of a plane defined by the needle curvature, the opening in which faces the completed stitches in the seam inserted thereby, the stem having straight and curved thread guiding grooves extending from opposite sides of the opening in the hook and along the stem to direct the two thread lengths running from a loop carried by the needle into side-by-side relation within the confines of the projected surface of the stem and a point sharpened to a duck bill with the widest dimension extending along the line of the seam inserted thereby and centered about the section of the needle stem opposite the hook, the curved groove intersecting the surface of the duck bill along the widest dimension to form an outlet of ample sectional area required for the full diameter of thread employed with the needle and the straight groove extending toward the point of the needle to a location opposite the outlet of the curved groove without intersecting said outlet.

2. A chain stitch shoe sewing machine needle comprising a stem of uniform circular cross section curved in the arc of a circle and provided with a hook opening to one side of a plane defined by the needle curvature and facing the completed stitches in a seam inserted by the needle, said stem having straight and curved thread guiding grooves extending from the needle hook inside and outside of the needle curvature to direct both thread lengths extending from a loop while engaging the needle into side by side rela-

tion inside the curvature of the needle and a sharpened point centered about the solid section of the needle stem opposite the hook, said curved groove extending from the hook opening outside the curvature of the needle to an outlet inside the needle curvature and being of a uniformly ample sectional area and depth throughout its length required for the full diameter of thread employed with the needle.

3. A chain stitch shoe sewing machine needle comprising a stem of uniform circular cross section curved in the arc of a circle and provided with a hook opening to one side of a plane defined by the needle curvature and facing the completed stitches in a seam inserted by the needle, said stem having thread guiding grooves located to direct both thread lengths extending from a loop while engaging the needle into side by side relation inside the curvature of the needle and a point sharpened to a duck bill with the widest dimension extending along the line of the seam inserted and centered about that section of the needle opposite the opening in the hook, the thread guiding grooves extending from opposite sides of the needle hook and one of the grooves extending from the outside of the hook around the needle to a point of intersection with the inner surface of the duck bill to form an outlet of ample sectional area and depth required for the full diameter of thread employed with the needle, the outlet for said last-mentioned groove being located along the length of the needle opposite the other thread guiding groove without intersecting said other thread guiding groove.

FRED C. EASTMAN.

References Cited in the file of this patent

UNITED STATES PATENTS

Number	Name	Date
211,242	Lascell	Jan. 7, 1879
947,485	French	Jan. 25, 1910
2,097,495	Lineham et al.	Nov. 2, 1937

FOREIGN PATENTS

Number	Country	Date
15,659	Great Britain	Nov. 2, 1916