Aug. 22, 1939. E. J. OVINGTON 2,170,693

SEAMED ARTICLE AND PROCESS FOR MAKING IT

Filed July 30, 1937

Fig. 1.

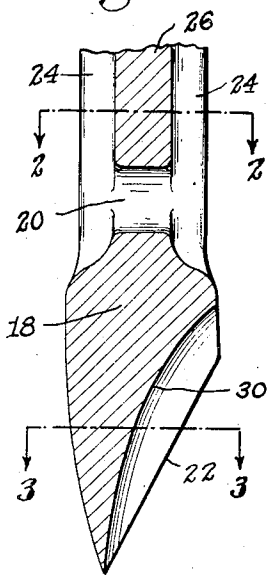


Fig. 2.

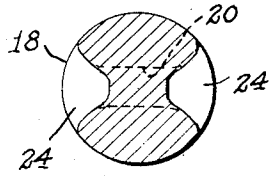


Fig. 3.

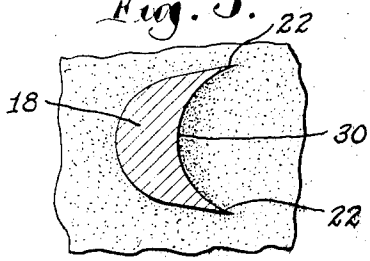


Fig. 4.

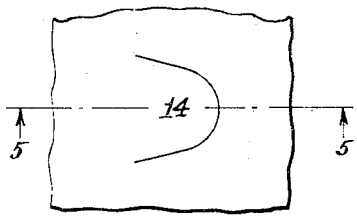


Fig. 5.

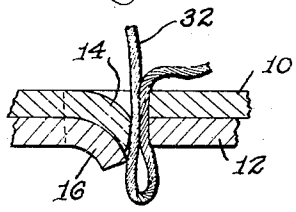
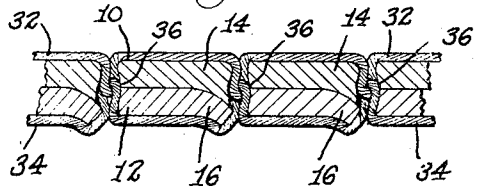


Fig. 6.



Inventor
EDWARD J. OVINGTON
by Everett Kent
Attorney

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UNITED STATES PATENT OFFICE

2,170,693

SEAMED ARTICLE AND PROCESS FOR MAKING IT

Edward J. Ovington, Newton Highlands, Mass.

Application July 30, 1937, Serial No. 156,447

4 Claims. (Cl. 112—262)

This invention relates to improvements in seamed articles and process of making them.

More especially it provides an improved seam which is particularly advantageous in the sewing of leather and of living tissue, but which has utility as well when applied to other materials. As the sewing of leather is illustrative of the manner in which the invention functions when applied to other materials, the characteristics of the invention will be described herein with reference to the sewing of leather, and also with some reference to surgery; but it will be understood that the utility and the advantages are not limited to the materials named, or the particular uses described.

This application is a continuation in part of my application, Serial No. 728,103, filed May 29, 1934, which has matured into Patent No. 2,092,929, of September 14, 1937, wherein I have disclosed and claimed a penetrative implement the essential features of which may be employed in practicing the invention as herein disclosed.

The invention utilizes a small flap of material, preferably of tongue shape, for pinching that short length of thread which stands within the plane of the material; and this pinching of the thread occurs as the flap is drawn back or forced back toward its initial position after having been cut and displaced therefrom by the needle. The needle or awl may have a cutting portion which is crescent shape in cross-section, tapering to the extreme point of the needle, as described and claimed in my said application Serial No. 728,103; but in the present case the eye of the needle will be near the point, a little back of the tapering cutting portion. If the material be leather, the displacing of the flap takes the form of a bending of the flap out of its original position in the plane of the material, and then the walls, of the hole thus made, are in part a surface cleanly cut by the needle, as distinguished from being torn, and are in part an inbent surface which was initially an exterior surface of the material. If the material be living tissue, the displacing takes the form of a compressing and a lateral flow of surrounding tissue. In both cases ragged edges and torn tissues are avoided, which is a matter of human consequence, if the use happens to be surgical, as well as one which in any case affects the strength and durability of the sewing.

In the case of a sewing of leather this is of particular importance. Leather is inherently resilient; and the little bent flap, upon being displaced from its normal location in the sheet of leather, presses back against the thread which occupies the hole. If it happens that the flap has been put back into the hole, which can be done by the presser foot and the draft of thread in a sewing machine, the flap presses tightly against the intruded thread; it holds the sewing more firmly than if there were merely a hole of the size of thread. In the case of patent leather the invention avoids the striae of cracks and incipient rents which surround stitching holes broken through the leather by ordinary needles.

As applied in surgery, the U-shaped characteristics of the arcuate line of cut prevents accidental trauma. When the arc is extended through so many degrees of curvature that the end portions approach parallelism, accidental pressing of the hand of the surgeon toward either side is a pressing of a flat or broadly rounded surface, instead of a lateral pressing of a cutting edge, and so does not extend the cut sidewise, and make the hole unnecessary large. This shape of needle hole also makes the needle wound of such a form as to have the best conditions for healing quickly and of leaving the least scar. The tissue on the concave side of the needle is under compression,—parallel to the surface in all directions from the concave face of the needle. The tissue is by nature resilient; and this compression extends to that part of the tissue which is about to be cut. The presence of a state of compression there, as contrasted with the presence of a state of tension and stretch, tends to prevent tearing of the tissue at the points which are about to be cut.

Other advantages result from or are found in the construction and mode of operation hereinafter described. The particular embodiment of the invention herein described is illustrative, and the invention may be applied in other ways without departing from the spirit and the scope of the invention. It is intended that the patent shall cover, by suitable expression in the appended claims, whatever features of patentable novelty exist in the invention disclosed.

In the accompanying drawing:

Figure 1 is an elevation, in medial vertical section, many times enlarged, of the lower end portion of a sewing machine needle suitable for use in practicing the invention;

Figure 2 is a plan in section on 2—2 of Figure 1;

Figure 3 is a plan in section on 3—3 of Figure 1, and showing the effect when penetrating live tissue;

Figure 4 is a plan of a fragment of material

having a flap cut therein, as by the needle of Figures 1–3, shown many times enlarged;

Figure 5 is an elevation of a double thickness of leather, in section on a plane comparable in position to that indicated by the line 5—5 of Figure 4, and showing a thread pinched by the flap; and

Figure 6 is an elevation in section of a seam embodying features of the invention.

According to the invention the sewing is accomplished by the awl and/or needle displacing minute tongue-shaped flaps of the leather, tissue, etc. when the thread for each stitch passes through the material, so that the flap can spring back, or be drawn or forced back, to pinch the thread. Figure 5 represents a loop of thread, which may be the spool thread of a sewing machine, thrust through two thicknesses 10, 12 of material with a bending of the superimposed flaps 14, 16 out of the plane of the material, and showing the thread left there by the needle. This figure shows how the flaps 14, 16 tend by resilience to press the thread as they tend to return to their natural positions. The thread is thus more tightly gripped than if there were a mere open hole for the thread. And when the flaps have been pulled back, as they may be by friction and thread tension, upon withdrawal of the needle, to the positions of the flaps in Figure 6, the pressure of the flaps upon the thread in the plane of the material is manifest.

A needle such as is illustrated in Figures 1–3 may be employed for cutting the minute tongue-shaped flaps. For this purpose the portion 18 of the needle, being the part in advance of the eye 20, may have the tapering form which in cross-section is crescent-shaped, as disclosed and claimed in my said application Serial No. 728,103, with the cutting edges 22 at the horns of the crescent extending along the taper to the extreme point of the needle. In the drawing, the needle is shown greatly enlarged. Actually it may be the size of an ordinary sewing machine needle. And an ordinary thread groove 24 may extend along one or both sides of the shank 26 to the eye 20.

In sewing, the portion 18 of the needle pierces the leather or tissue with a two-edged curved cutting action which is initiated the instant the penetration commences. The convex exterior surface of tapering portion 18 puts the material under slight tension so that the cutting edges 22, 22 cut cleanly a tongue-shaped flap 14, or superimposed flaps 14, 16. Figure 4 illustrates in plan at 14 a shape of flap which may be made in this manner. As the needle progresses in penetration through the material, the growing thickness of needle behind the concave surface 30 and the frictional drag of that surface, force the flaps each gradually out of the plane of its sheet, so that the spool thread 32 may be drawn through the hole thus made. The bobbin thread 34 which is carried by the shuttle of the machine, on the under side of the sheets, is passed through the loop of thread 32 while the needle is in its penetrated position. Then, as the thread 32 is drawn up with the needle, it pulls a loop of the thread 34 with it, until the interlocked portion 36 of the two threads is within the thickness of the material. Simultaneously with the upward travel of the needle and the drawing upward of the threads, the flaps 14, 16 are drawn back by the friction and tension of the threads so that each approaches the plane of its sheet. Because the interlocked threads have been intruded, the flaps exert pinching pressure on the threads, which makes the stitches and the seam as a whole more secure than those made in conventional manner.

A material such as live tissue of man, or of animals, is resiliently mobile in high degree. Around an incision into which needle and thread have been introduced, it can undergo compression; and the tissue transmits pressure in all directions somewhat as a fluid does. Therefore the tissue at both sides of each cutting edge 22, 22 in Figure 3 is in a state of compression from the gradual thickening of the intruded concavo-convex body 18 of the needle. By its native resiliency it can then tend strongly to return to its former position upon the withdrawal of the needle; and it will then remain in compression owing to the presence of the thread which remains as an intruded body.

In entering, the face of needle which is concave exerts less of a material-stretching or spreading strain than would an ordinary blade whose cutting edges are backed by a wedge form the sides of which are plane or convex. Unlike a needle which merely makes a straight cut and then bulges the material, or one which radially enlarges a small hole made by the very point of the needle, both of which tear the tissue more or less in their enlarging of the hole, the needle here represented makes the hole by cutting a flap and pressing aside the flap as the cutting progresses. Thus the walls surrounding the hole are cleanly cut; and hence are relatively smooth, firm and regular; and, as they automatically tend to close together, both in the case of leather and of living tissue, the thread is firmly held; the article thus sewn has its material in a state of resilient compression against intruded thread; and the continuity of the cut walls makes the frictional holding secure and very strong. The part of thread which is compressed within the thickness of the material holds the outer parts of the thread close, and continues to hold the two sheets of material together, in the case of leather, even after the outside portions of the thread have been worn away.

When the needle's cut through the material is clean, as represented in Figure 4, and the ends of the cut approach a parallelism of direction, as there indicated, the walls of each hole are in condition to resist strongly a seam tension without tendency of the holes to become enlarged by extension of incipient radial rents, such as might have been already started if an ordinary needle had been used.

I claim as my invention:

1. A process of sewing comprising the forming of holes, for the passing of thread through the material which is to be sewn, by the cutting of U-shaped flaps of that material of which the convexity of one flap faces the base of an adjacent flap, pressing the flaps out of their natural positions in that material, passing thread through the holes left by the bending out of the U-flaps, with the thread extending from one to another of said holes in direction from crest to crest of the flaps, and letting the material of the flaps return toward its original positions in the material.

2. A seam in an article, comprising a row of U-shaped holes having cut-surfaced walls along the curve of the U, and having a bent flap of the material surfacing the wall along that side of the hole which is opposite said curve, said row of holes being organized with the curve of each U-hole toward the base of the bent flaps in a next adjacent hole; along which row of holes there

are loops of thread within the holes between said flap surfaces and said cut surfaces thereof and frictionally engaged between said surfaces by resilience of the material of the article, the thread of said loops extending integrally from one said hole to another in direction from crest to crest of the flaps in said holes.

3. A process of sewing for securing together two mutually overlapping sheets of material, comprising the cutting of overlying U-shaped flaps of the sheets and simultaneously pressing these U-flaps out of their natural positions in their respective sheets to open a hole for a thread fed from one side of the sheets, and carrying a loop of that thread through the hole; passing another thread on the other side of the sheets through the said loop of thread, thereby to provide a lock stitch; drawing the interlocked portions of threads into the said hole; and simultaneously drawing the U-flaps toward their said natural positions in the planes of their respective sheets, for resiliently pinching the intruded threads.

4. A process of sewing for securing together two mutually overlapping sheets of material, comprising the cutting of mutually overlying U-shaped flaps of the two sheets and pressing these mutually overlying U-flaps out of their natural positions in their respective sheets to open a hole for a thread fed from one side of the two sheets, and carrying that thread through the hole, and then drawing the U-flaps toward their said natural positions in the planes of their respective sheets, for resiliently pinching the intruded thread.

EDWARD J. OVINGTON.