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A. B. FLAGG ET AL
SURGICAL NEEDLE OR THE LIKE

2,240,330

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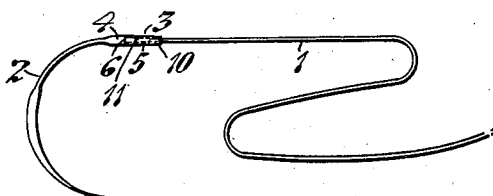


Fig. 1.



Fig. 2.

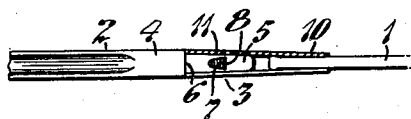


Fig. 4.

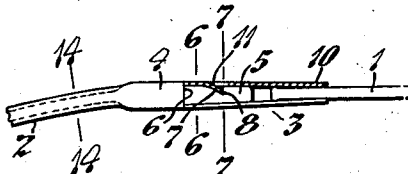


Fig. 3.

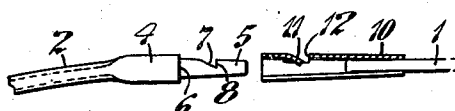


Fig. 5.



Fig. 6.



Fig. 7.

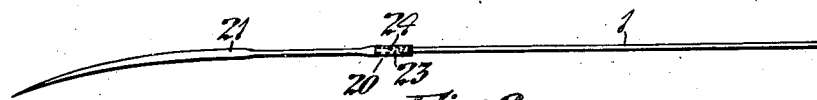


Fig. 8.

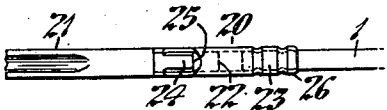


Fig. 9.

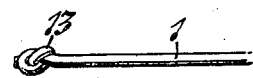


Fig. 12.

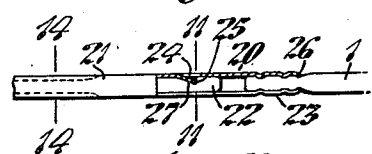


Fig. 10.



Fig. 11.



Fig. 13.



Fig. 14.

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SURGICAL NEEDLE OR THE LIKE

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5 Claims. (Cl. 128—339)

The present invention relates to improvements in surgical needles and more particularly to a means for attaching sutures to such needles with convenience and facility.

The surgical needles now commonly used are provided with eyes through which the sutures are threaded. With such a needle the suture often slips through the eye during use and the doubled suture adjacent the needle causes the tissue to be unduly torn and injured as it is drawn there-through. Although the faults of such needles are well known, no other satisfactory needle has been available prior to the present invention.

It has heretofore been proposed to provide needles with single length sutures permanently attached thereto, but such needles are discarded after one use. Such use of needles is expensive and wasteful and necessarily tends to cheapen the quality of the needles supplied. It has also been proposed to provide a needle having a hollow end into which the suture is drawn through a slot at one side. Such constructions have been found unsatisfactory in use as they cannot be depended upon to hold the suture. It even has been proposed to provide a fitting at the end of the suture having screw threads thereon to adapt it to be screwed onto the threaded end of a needle. Such constructions are expensive to manufacture and are also unsatisfactory in use because of the small dimensions of the parts and the difficulty in properly aligning them to adapt them to be screwed one onto the other. It will be apparent that during a surgical operation no time can be wasted in screwing the end of a needle into a tapped fitting.

One object of the present invention is to provide a construction and arrangement of elements whereby a suture may be securely attached to a needle by the simple operation of telescoping two relatively movable parts, one into the other.

Another object of the invention is to provide a shank on the needle and a tubular fitting on the end of a suture with latching means automatically engageable during relative axial sliding movement of the parts.

Another object of the invention is to provide a connecting means of the type indicated wherein the fitting at the end of the suture forms a continuation of the needle without enlargement thereof.

Still another object of the invention is to provide a connecting means of the type indicated which is of simple and compact construction adapted for economical manufacture and capable of securely connecting the suture to the needle

while facilitating its attachment thereto and removal therefrom.

Further objects of the invention are set forth in the following specification which describes two forms of attaching means, by way of example, as illustrated by the accompanying drawing.

In the drawing:

Fig. 1 illustrates a suture attached to a surgical needle by the improved connecting means constituting the subject-matter of the present invention;

Fig. 2 is an enlarged plan view of the connecting means showing the tapered fitting at the end of the suture applied to the needle and forming a continuation thereof;

Fig. 3 is a longitudinal sectional view through the connecting means showing the resilient catch on the fitting in engagement with an abutment on the shank of the needle to securely hold the parts connected;

Fig. 4 is a view similar to Fig. 3 showing the fitting turned through an arc of 90° with respect to the shank on the needle to displace the catch with respect to the abutment;

Fig. 5 is a part-sectional longitudinal view of the shank of the needle and the fitting at the end of the suture shown in extended relationship to illustrate the manner in which the parts may be telescoped or slid axially one over the other;

Fig. 6 is a transverse sectional view on line 6—6 of Fig. 3 showing the circular contour of the fitting and shank;

Fig. 7 is a transverse sectional view on line 7—7 of Fig. 3 showing the recess in the reduced shank of the needle and the inclined resilient catch on the fitting;

Fig. 8 is a view similar to Fig. 1 showing a modified form of needle and connecting means;

Fig. 9 is an enlarged plan view of the connecting means illustrated in Fig. 8 showing the fitting at the end of the suture applied to the needle and forming a continuation thereof;

Fig. 10 is a longitudinal section view of the same taken through the connecting means and showing the catch on the fitting in engagement with the abutment on the shank of the needle and the swaged end of the fitting for attaching it to the suture;

Fig. 11 is a transverse sectional view taken on line 11—11 of Fig. 10 showing the oval contour of the shank and fitting;

Fig. 12 illustrates a knot in the end of a suture to form an enlargement for securing the suture in the fitting;

Fig. 13 is a view similar to Fig. 12 showing an

enlarged bead at the end of the suture formed by the action of heat; and

Fig. 14 is a transverse sectional view on line 14-14 of Figs. 3 or 10 showing the concaved form of the shaft portion of the needle to adapt it to be firmly gripped by the jaws of surgical forceps used with the needle.

In the preferred embodiment of the invention illustrated in Figs. 1 to 7, the reference character 1 indicates a suture of gut, silk, wire or the like attached to a surgical needle 2 by the improved connecting means 3 constituting the subject-matter of the present invention. Although the needle 2 may take other forms, a curved type is illustrated in Fig. 1 which is generally tapered from its pointed forward end to its cylindrical rearward end 4. Preferably the opposite sides of the needle 2 adjacent its cylindrical rearward end 4 are concaved as illustrated in Fig. 14 to adapt the needle to be firmly gripped by the jaws of surgical forceps used to force the needle through the tissue to be sewed. Projecting rearwardly from the cylindrical portion 4 of the needle is a reduced shank 5 of tapered or frusto-conical form, the largest diameter of the shank being less than the diameter of the cylindrical portion to provide an annular shoulder 6 therebetween. The reduced shank 5 is notched rearwardly on its outer side with respect to the curvature of the needle 2 to provide a recess 7 and a transverse shoulder or abutment 8 at the rearward end of the recess.

Attached to the end of the suture 1 is a hollow tubular fitting 10 of tapered or frusto-conical form into which the reduced shank 5 of the needle 2 is adapted to be telescoped by sliding it axially thereof. The term "tubular" as hereinafter used in the specification and appended claims to define the fitting is intended to include any form of hollow shell, whether frusto-conical, cylindrical or of other shape. The tubular fitting 10 is adapted to closely fit the reduced shank 5 and the thickness of the material thereof is equal to or slightly less than the height of the annular shoulder 6 so that its outer surface provides a gradually tapering continuation of the cylindrical portion 4 of the needle. The fitting 10 is provided with an inwardly-inclined resilient catch or pawl 11 adapted to cooperate with the abutment 8 and, as herein illustrated, is formed by a depending tongue of the material of the fitting. To avoid sharp corners which might catch in the tissue of a patient the edge 12 opposite the end of the catch or pawl 11 is curved or rounded as illustrated in Fig. 2.

It has been found after considerable experimentation that the fitting 10 may be made of spring-tempered carbon steel or chrome nickel steel. When made of carbon steel the fitting is blanked out of flat annealed stock and progressively a U-shaped piece is sheared from the blank to form the catch or pawl 11. The blank is thereafter rolled to its frusto-conical form and the catch 11 depressed therein. The material is then hardened and tempered to set the form of the fitting and render the catch 11 resilient.

The fitting 10 may be attached to the suture 1 either by forming a knot 13 at its end as illustrated in Fig. 12; or by forming a bead 14 on its end, as illustrated in Fig. 13, by the action of heat; or by swaging the outer end of the fitting to indent the suture as illustrated at 26 in Fig. 10. It has been discovered that the end of a gut suture may be heated to cause it to swell and form a bead 14 as illustrated in Fig. 13, the bead

being considerably larger than the tubular end of the fitting. As the suture is pulled rearwardly the enlarged end 13 or 14 engages the tapered side walls of the fitting 10 and prevents its withdrawal therefrom.

The suture 1 is supplied with the fitting 10 attached thereto and to connect the suture to the needle 2 the fitting is telescoped over the reduced shank 5 by merely sliding the two parts axially of each other from the position shown in Fig. 5 to that shown in Fig. 3, the frusto-conical form of the shank and fitting facilitating this operation. When the fitting 10 has been slid onto the reduced shank 5 to the position illustrated in Fig. 3 the end of the fitting abuts the annular shoulder 6 on the needle 2 and its outside surface provides a gradually tapering continuation of the needle. During the relative sliding movement of the shank 5 and fitting 10 the resilient catch or pawl 11 slides over the shank until its end overlies the notched recess 7. The catch 11 then automatically snaps into the recess 7, due to its inherent resiliency, to engage its end with the abutment 8 on the shank. Thus, the fitting 10 is latched to the reduced shank 5 on the needle 2 to securely connect the suture thereto and the fitting is supported through a considerable portion of its length by the shank which closely fits the opening therein. Any accidental turning of the fitting 10 with respect to the shank 5 is prevented by the engagement of the spring pressed catch 11 with the flat side of the notched recess 7 in the shank. The needle may then be used in the same manner as any surgical needle is manipulated without tearing or injuring the tissue through which it passes.

To remove the suture from the needle the shank 5 and fitting 10 are positively turned relatively to each other through an arc of 90° from the position shown in Fig. 3 to that shown in Fig. 4. During this movement the edge at the side of the flatted recess 7 on the reduced shank 5 engages the catch 11 and cams it out of the slot to the position shown in Fig. 4. In this position the end of the catch 11 is released from the shoulder or abutment 8 so that the fitting 10 may be slid rearwardly from the reduced shank 5.

In the modified form of the invention illustrated in Figs. 8 through 11 the connecting means 20 are shown applied to a relatively straight needle 21 having concaved sides adjacent its rearward end as shown in the transverse sectional view, Fig. 14. In this modified form of construction the reduced shank 22 at the end of the needle 21 and the fitting 23 have the same cross-sectional dimensions throughout their length. The fitting may be made of seamless tubing and the catch 24 sheared therefrom with suitable tools, but as herein illustrated it is blanked from sheet-stock and rolled to its final shape. As in the form of the invention illustrated in Figs. 1 to 7 the material of the tubular fitting 23 is of a thickness equal to the difference between the dimensions of the reduced shank 15 and the rearward end of the needle so that the outside surface of the fitting forms a continuation of the needle. In this form of the invention the reduced shank 22 and tubular fitting 23 are oval in cross-section instead of circular, as shown in Fig. 11, which further acts to prevent accidental rotation of the fitting with respect to the needle. The material of the fitting 23, however, is sufficiently flexible to permit relative rotation of the parts to displace the end of the catch 24

with respect to an abutment 25 on the reduced shank 22 of the needle so that the fitting and suture may be removed from the needle. The end of the suture 1 is preferably attached to the fitting 23 by heating it and swaging the end of the fitting to indent the suture in the manner illustrated at 26 in Fig. 10 to firmly grip the suture.

The suture 1 is attached to the needle 21 in this modified form of holding means in the same manner as explained with respect to the form illustrated in Figs. 1 to 7. The tubular fitting 23 is telescoped over the reduced shank 22 of the needle 21 by merely sliding it axially thereof, the resilient catch 24 yielding as the two parts are slid relatively of each other and thereafter snapping into the notched groove 27 to engage its end with the abutment 25. To remove the suture the tubular fitting 23 and reduced shank 22 are rotated through an arc of 90° with respect to each other, thereby displacing the abutment 25 with respect to the end of the catch 24 to permit the fitting to be removed.

It will be observed from the foregoing that the invention provides a novel and ingenious means for positively connecting a suture to a surgical needle by the simple operation of telescoping two parts, one over the other. It will be observed further that the invention provides an improved connecting means which gradually tapers from the diameter of the needle to the diameter of the suture without sharp corners or protruding parts liable to injure the tissues through which the needle passes. Still further it will be observed that the invention provides a simple and compact arrangement of elements which adapts them for economical manufacture.

Various modifications other than described may be made in the arrangement and form of the parts of the device and the use of the connecting means without departing from the spirit or scope of the invention. For example, the connecting means may be used to attach the separable parts of other devices such as fish-hooks to leaders or the like. Therefore, without limiting ourselves to the exact embodiment herein shown and described, we claim:

1. The combination of a surgical needle having a reduced shank at one end slotted intermediate its ends to provide a shoulder, a suture having a tubular fitting attached to its end and

slidable onto the reduced shank at the end of the needle, said fitting having a catch automatically engageable with the shoulder on the shank during the relative axial movement thereof to connect the suture to the needle, and said suture being removable from the needle by relatively turning the shank and fitting to displace the catch with respect to the shoulder.

2. The combination of a surgical needle having a reduced shank at one end of oval form in cross-section with a transverse shoulder intermediate its ends, a suture having a tubular fitting of oval form in cross-section attached to one of its ends, said tubular fitting being slidable onto the reduced shank of the needle and so constructed as to provide a continuation thereof, and interlocking means comprising an abutment on the shank and a detent on the fitting automatically engageable during the relative axial movement thereof to connect the suture to the needle, said fitting being flexible to adapt it to be rotated relatively of the shank of the needle to disengage the interlocking means.

3. A surgical needle pointed at one end and having a reduced shank at its opposite end providing an annular shoulder, said reduced shank being of conical form throughout its length with a locking abutment extending transversely thereof.

4. A suture having an enlarged end, and a frusto-conical fitting on the suture connected thereto by the engagement of its tapered sides with the enlarged end of the suture, and a resilient catch on the fitting.

5. In combination, a suture having a fitting at its end and a surgical needle, said fitting and the end of the needle having male and female parts so constructed and arranged as to telescope one wholly within the other upon relative axial sliding movement to provide a continuation of the needle to the suture and an integral catch on one of the parts and a recess on the other part automatically engageable during axial sliding movement to detachably secure the fitting to the needle, and said fitting being removable from the needle by relatively turning the needle and fitting to displace the catch with respect to the recess.

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