

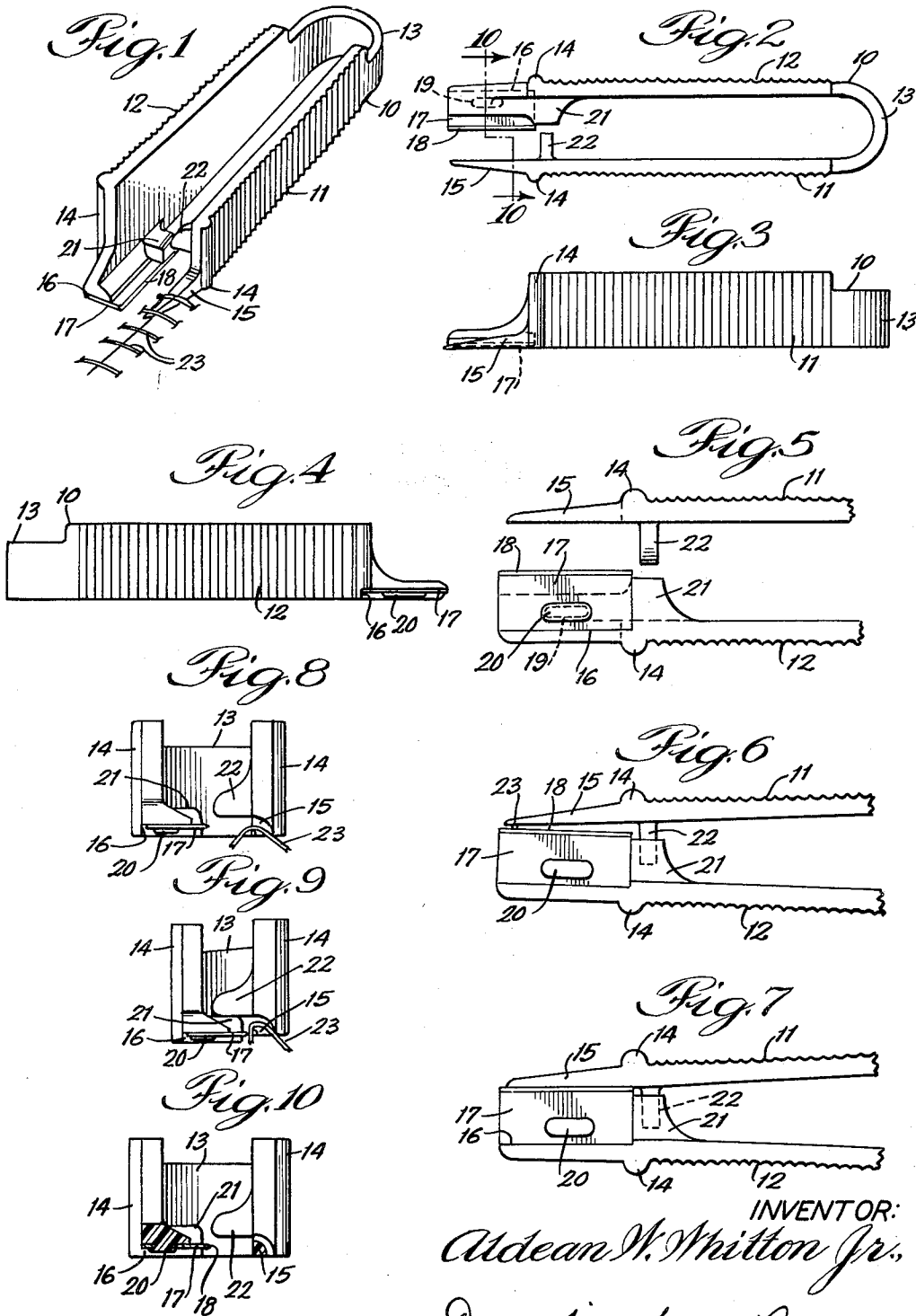
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SUTURE CUTTER

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SUTURE CUTTER

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This invention relates to a suture cutting device, and more specifically, to an instrument particularly adapted for lifting and cutting surgical sutures when they are to be removed from the skin of a patient.

Ordinarily, sharply pointed scissors are used to cut surgical sutures when such sutures are to be removed from a patient. However, scissors are generally unsatisfactory for this purpose for a number of reasons. For one thing, precise control of the cutting points of the scissors may be difficult because of the distance between those cutting points and the operator's hand. Any unsteadiness of the hand therefore tends to be magnified at the cutting points. Also, the fact that both blades of the scissors are usually pointed requires extreme care in their operation, especially in attempting to get under and cut embedded sutures. Furthermore, scissors are useful household items and, when used in hospital wards where constant control may be difficult to administer, they are frequently lost or pilfered. In many hospitals, the frequent loss of scissors to be used for this purpose has provided considerable annoyance and an unnecessary expense.

Accordingly, it is an object of the present invention to provide an inexpensive and highly effective device which is particularly suited for lifting and cutting surgical sutures. Another object is to provide a compact instrument which may be easily manipulated by a user and which provides greater control in the lifting and cutting of sutures than conventional instruments. More specifically, it is an object to provide a device having a rounded probe for lifting sutures without the possibility of harming the patient, the device being constructed so that such sutures may be easily and safely lifted prior to the actual cutting operation. A still further object is to provide a suture cutting device which may be inexpensively manufactured so as to be disposable after use, thereby eliminating the usual hospital expenses arising from the cleaning, autoclaving and handling of suture cutting instruments, and from the frequent loss of such instruments.

Other objects will appear from the specification and drawings in which:

FIGURE 1 is a perspective view of a suture cutting device embodying the present invention, the device being illustrated in the operation of lifting sutures prior to actual cutting;

FIGURE 2 is a top plan view of the suture cutting device;

FIGURE 3 is a side elevational view of the device;

FIGURE 4 is another side elevational view showing the opposite side of the structure;

FIGURE 5 is an enlarged and broken bottom plan view showing the suture cutting device in open condition;

FIGURE 6 is an enlarged and broken bottom plan view similar to FIGURE 5 but showing the device in partially closed condition during a suture cutting operation;

FIGURE 7 is another enlarged and broken bottom plan view similar to FIGURES 5 and 6 but showing the edge of the cutting blade in full contact with the probe;

FIGURE 8 is an enlarged front elevation of the device in open condition;

FIGURE 9 is an enlarged front elevation showing the suture cutter in partially closed condition;

FIGURE 10 is an enlarged vertical sectional view of the device taken along line 10—10 of FIGURE 2.

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The suture lifting and cutting device of the present invention essentially comprises a U-shaped body 10 having elongated straight arm portions 11 and 12 and having an integral curved intermediate portion 13. The body is formed of a flexible but relatively stiff material which permits spring action of the arm portions toward and away from each other. While any suitable spring metal might be used, I prefer to form the body from a single piece of relatively hard, flexible plastic material such as, for example, polystyrene. By using such a plastic material, the device may be very inexpensively manufactured, thereby making disposal after use economically practical. Also, plastic construction has the further advantage that the device feels warm when brought into contact with a patient's skin.

It will be noted that the arm portions 11 and 12 have a width or height substantially greater than their thickness. As a result, the arms may be readily moved or flexed towards and away from each other, but resist forces tending to urge them out of horizontal alignment. The outer surfaces of the arms may be ribbed or knurled to facilitate gripping and operation of the device, the ribs terminating near the ends of the arms in enlarged vertical shoulders 14 which serve to prevent a user from placing his fingers too close to the free ends of the arms.

As shown in FIGURES 3, 4 and 8, the lower surfaces of the spaced arms are straight and normally lie along the same horizontal plane. At the free end of arm 11 is a tapered probe portion 15 which has its lower surface in substantially alignment with the undersurface of the arm and which has its inner surface extending along the same plane as the remainder of the arm's inner surface (FIGURE 2).

The opposing arm 12 is undercut at 16 to provide a flat undersurface adjacent its free end which is disposed above the plane defined by the remainder of the instrument's lower surface. A blade 17 is secured to the undercut horizontal surface and has a straight cutting edge 18 spaced inwardly from the inner surface of arm 12 and extending along a line parallel with that surface. The blade may be secured to the arm by any suitable means. In the illustration given, blade 17 is provided with an opening 19 through which a projection 20 of the plastic material of arm 12 extends. In the manufacturing operation, blade 17 is first fitted into place upon the projection and the plastic projection is then softened and flattened into the condition illustrated in FIGURES 5 and 10 to firmly lock the blade upon the arm. It will be understood, of course that the blade may be detachably mounted upon arm 12 so that it may be removed for sharpening or replacement and, in the case where this device is made of metal, the blade may, if desired, be formed integrally with body 10.

Projecting inwardly from the inner lower surface of arm 12 behind blade 18 is an integral shoulder 21. The opposite arm 11 is also provided with an integral and inwardly projecting portion 22 in opposing relation with shoulder 21. Normally, the shoulder 21 and projection 22 are spaced apart, as shown in FIGURES 2, 5 and 8, with the horizontal undersurface of the projection disposed below the horizontal top surface of the shoulder (FIGURE 8). Therefore, when the arms are urged towards each other, projection 22 engages shoulder 21 to restrain further inward movement of the arms without the application of additional force. However, since the abutting edge portions of the projection and shoulder are curved or rounded, a slight increase in the closing force applied to the arms results in a camming action wherein arm 11 is displaced or flexed upwardly with reference to arm 12 (FIGURE 9). Upon continued application of the closing force, the undersurface of the projection slides horizontally over the top surface of the

shoulder until blade 17 contacts the inner surface of the probe.

The cooperative action of the shoulder 21 and projection 22 performs at least two important functions. First, it constitutes a simple and highly effective means for accomplishing precise alignment of the blade and probe during a cutting operation. As the arms are urged towards each other, projection 22 slides up and over shoulder 21 and thereby flexes the arms in opposite vertical directions. The natural resiliency or flexibility of the plastic or other material from which the body is formed exerts an opposing force at 90 degrees to the squeezing plane in an effort to return the arms into horizontal alignment, and this force thereby urges the contacting surfaces of the projection and shoulder firmly together to provide exact alignment of the blade and probe. Secondly, the rounded upper and lower edges of the shoulder and projection, respectively, are brought into contact soon after a squeezing force is applied to the arms and, in order to produce the camming action described above, an appreciable increase in the squeezing force is necessary. The resistance to closure arising from abutment of the shoulder and projection serves a protective purpose since it tends to prevent complete closure which might otherwise inadvertently occur while the probe is being used to lift sutures prior to cutting.

In the operation of the device, a user first urges probe 15 beneath the sutures or stitches 23 (FIGURE 1) and, as the tapered probe is advanced, the sutures are lifted upwardly into cutting positions. The squeezing force applied to arms 11 and 12 is then increased so as to bring the blade into contact with the sutures looped over the probe.

Unlike scissors which utilizes a shearing action, the structure of the present invention produces a slicing action in the cutting of sutures. As pressure is increased on the arms of the instrument after initial contact between the blade and probe, there is a slight but effective longitudinal relative movement between the blade and probe. Thus, as indicated in FIGURES 6 and 7, the blade initially contacts the probe at its tip only, but as pressure is increased the arms begin to flex or bow slightly so that the blade then slides into full contact with the probe. This cutting action causes the blade to slice through the suture cleanly without fraying the cut ends.

While in the foregoing I have disclosed an embodiment of the invention in considerable detail for purposes of illustration, it will be understood by those skilled in the art that many of these details may be varied without departing from the spirit and scope of the invention.

I claim:

1. A suture cutting device comprising a U-shaped body of hard flexible material having a pair of elongated and normally spaced flexible arms, one of said arms being provided with a tapered probe extending longitudinally from the free end thereof for lifting sutures, a blade fixed to the other of said arms adjacent the free end thereof and having a straight cutting edge normally spaced from said probe but movable into abutting engagement with the probe along substantially the entire length of said cutting edge when said arms are urged towards each other, and mutually engageable projections provided by both of said arms for displacing said arms in directions at right angles to the direction of inward and outward movement thereof and for aligning said blade and probe when said arms are squeezed together.

2. A suture cutting device comprising a body of relatively hard flexible material having a pair of elongated and spaced flexible arms connected to each other at one end of the body, one of said arms being provided with a tapered probe extending longitudinally from the free

end thereof, said probe having a substantially flat undersurface, a blade fixed to the other of said arms adjacent the free end thereof and having a straight cutting edge normally spaced from said probe but movable into abutting engagement therewith when said arms are urged towards each other, said blade extending along a generally horizontal plane substantially above the plane defined by the undersurface of said probe, one of said arms being provided with an inwardly extending shoulder and the other of said arms having an inwardly directed projection engageable with said shoulder when said arms are urged together, said shoulder and said projection having rounded bearing surfaces for flexing said arms in a direction substantially 90 degrees to the plane of inward movement thereof to bring said blade closer to the plane of said undersurface and to orient said straight cutting edge and probe for mutual abutting engagement.

3. A suture cutter having a pair of normally spaced horizontal and flexible arms joined at one end thereof by an integral intermediate portion, said arms each having vertical dimensions substantially greater than the width thereof and having flat bottom surfaces, one of said arms being provided with a tapered probe extending longitudinally from the free end thereof and having an undersurface in substantial alignment with the bottom surface of said arm, a cutting blade fixed to the other of said arms adjacent the free end thereof and having a straight cutting edge normally spaced from said probe but movable into engagement therewith when said arms are urged towards each other, said probe having a flat inner bearing surface adapted to abut the straight cutting edge of said blade when said arms are urged towards each other and are displaced vertically, and means provided by said arms for vertically displacing the same to guide said probe and blade into alignment and abutting contact when said arms are urged together.

4. The structure of claim 3 in which said displacing means comprises inwardly projecting portions provided by said arms, said portions being engageable when said arms are urged together for displacing the same in opposite vertical directions.

5. A suture cutter comprising a U-shaped body having a pair of elongated and spaced flexible arms, one of said arms being provided with a tapered probe extending longitudinally from the free end thereof and having an undersurface in substantial alignment with the bottom surface of said arm, a cutting blade fixed to the other of said arms adjacent the free end thereof and having a straight cutting edge normally spaced from said probe but movable into abutting engagement therewith along a line of contact extending longitudinally along said probe when said arms are urged towards each other, said line of contact being substantially parallel with but spaced below the normal plane of said blade when said arms are spread apart and unflexed, said arms each being provided with mutually engageable portions for flexing said arms to guide said blade into abutting contact with said probe along said line of contact as said arms are squeezed together.

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