Dec. 13, 1955 F. L. TABRAH 2,726,657

X-JOINT FOR SURGICAL INSTRUMENTS

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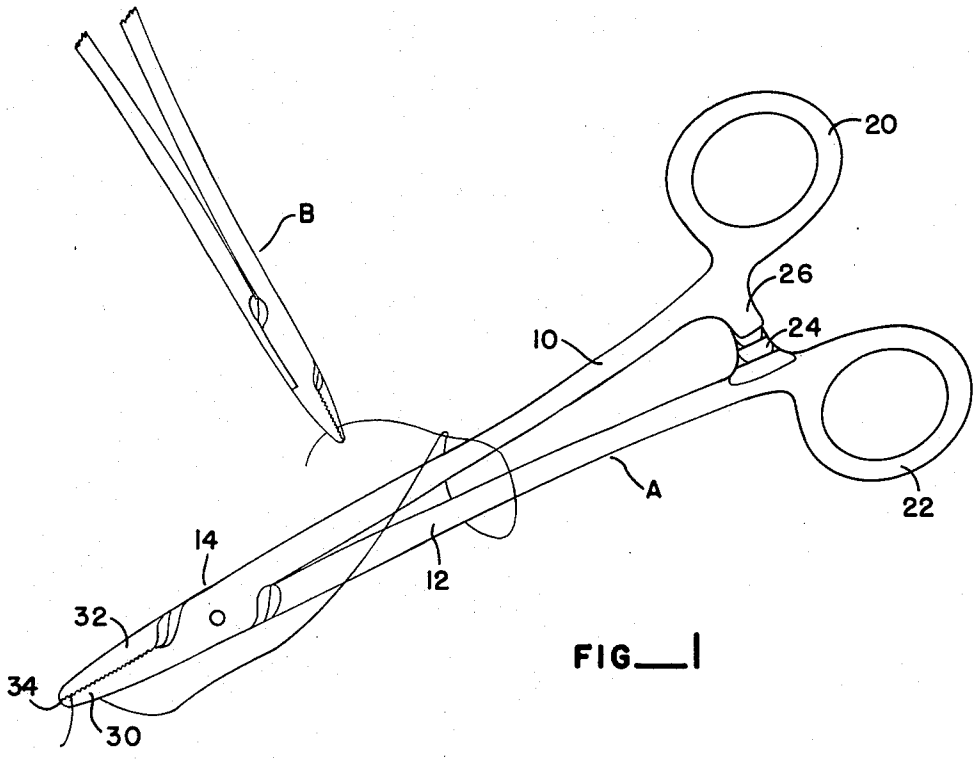


FIG. 1

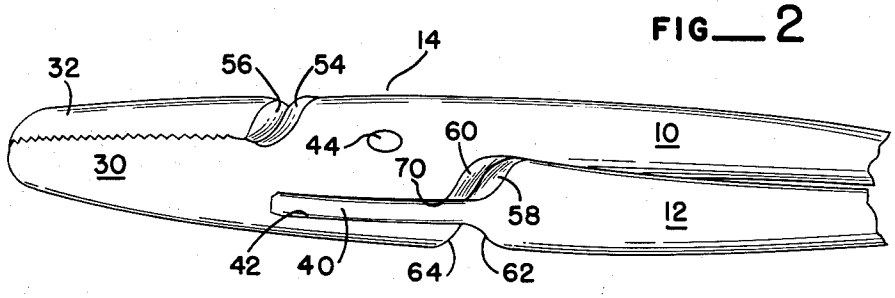


FIG. 2

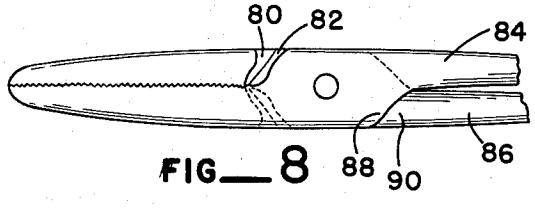


FIG. 8

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FIG. 3

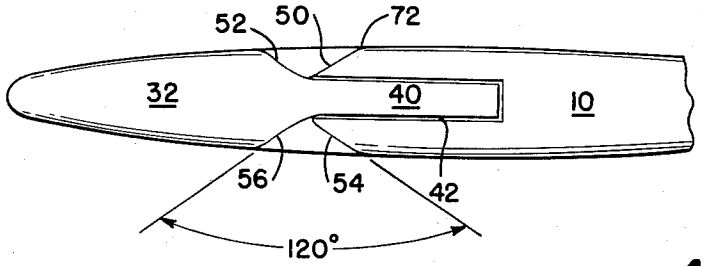


FIG. 4

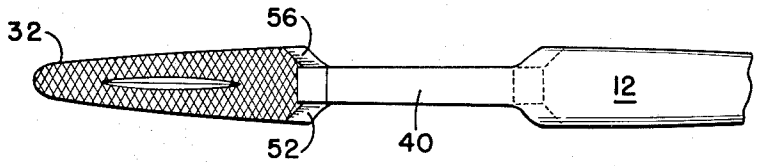


FIG. 5

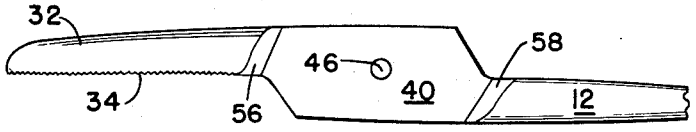


FIG. 6

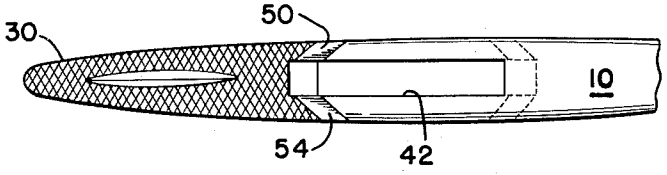
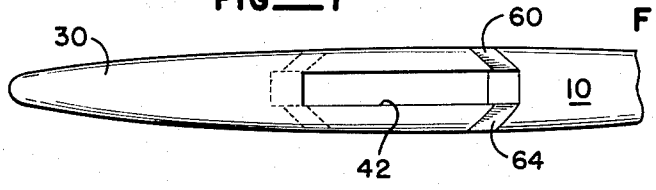


FIG. 7



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X-JOINT FOR SURGICAL INSTRUMENTS

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Application February 8, 1954, Serial No. 408,633

2 Claims. (Cl. 128—321)

My invention relates to surgical instruments, and more particularly, to an improved X-joint for surgical instruments. Briefly, the invention includes beveling and rounding the opposed surfaces forming cracks at the X-joint so that sutures and ligatures will not catch on the joint when the instrument is in use.

In surgery, there are frequent operations involving the use of surgical forceps, hemostats, ligators, and needle holders wherein a suture or a ligature is looped around the instrument and slid down the same to form a knot, or in which the instrument is passed through an already formed loop, in either direction, relative to the longitudinal axis of the instrument. Considerable trouble has been caused in the past by the X-joint catching the suture or ligature. This either may be troublesome to free or may actually break the thread. It will be evident that it is desirable to avoid this because of the loss of precious time, or weakening of the suture especially in difficult operations. The X-joint in such tools may be of various types such as a mortise-tenon type or a scarf type; but in each case there are exposed cracks to cause the trouble. The problem is not solved by merely having close tolerances at these joints because in time the instruments inevitably become worn or corroded at the joints due to frequent sterilization and previous attempts at solutions have not provided for "snagproofing" the instrument when the suture slides along it in either direction relative to its longitudinal axis.

The objects of my invention include: to provide an X-joint in a surgical instrument which will not snag by a shoulder or crevice any thread-like member used in an operation, such as a ligature. When closing an instrument with its X-joint lying flat on gauze sponges in the operative field the gauze strands sometime inadvertently become caught in the closing shoulders of conventional instruments, preventing further manipulation of the instrument until it is freed and it is an objective of my invention to prevent this trouble. It is a further object to devise such a joint which will be economical to manufacture, which will not snag despite deterioration from wear and corrosion, which will be easier to clean and sterilize and keep rust-free, and which will be operative over the life of the instrument.

My invention will be best understood, together with additional objectives and advantages thereof, from a reading of the following description, read with reference to the drawings, in which:

Figure 1 is a perspective view showing a pair of surgical instruments embodying my invention in the act of tying a ligature;

Figure 2 is an enlarged, perspective view of the X-joint portion of such instrument;

Figure 3 is an enlarged side view of the structure shown in Figure 2;

Figure 4 is a fragmentary side view of a first of the leverage members forming the X-joint;

Figure 5 is a plan view of said first leverage member;

Figure 6 is a fragmentary side view of the second leverage member;

Figure 7 is a view similar to Figure 6 except taken on the opposite side; and

Figure 8 is a face view of forceps with a scarf type X-joint.

It will be understood that surgical instruments used in forming sutures and ligatures may be of various types, depending upon the particular operation involved, and the application of the present invention will be similar in each case. Such instruments include ligators, forceps, needle holders, and hemostats and all have X-joints, formed in some way. In the drawings, I have shown principally what may be termed a mortise-tenon type of X-joint but it will be apparent that the improvement can be applied to a scarf type of X-joint, as shown in Figure 8. Figure 1 shows a pair of instruments "A" and "B" in the operation of tying the suture. A loop has been formed in suture material around the handle portion of instrument "A" in Figure 1; and instrument "B" is being used to slide the loop down the leverage members **10** and **12** of instrument "A" past the X-joint **14** to make the tie. This is typical of various steps in making instrument ties in surgery in which there is likelihood of a ligature or surface catching in an X-joint of conventional construction.

As in most of these instruments, ligator "A" has a pair of handle rings **20**, **22**, formed on leverage members **10** and **12**. Also, in order to secure the instrument automatically in locked position, adjustable catch means are provided by a multi-toothed ratchet **24** and a pawl **26** on leverage members **12** and **10** respectively. The jaws **30**, **32**, formed on leverage members **10** and **12** respectively, have rough faces, as at **34**, providing positive grips.

X-joint **14** has essentially two components: tenon **40** formed on leverage member **12** adjacent jaw **32** and mortise **42** formed on leverage member **10** adjacent jaw **30**. A pivotal connection therebetween is formed by a pin **44** set in leverage member **10** and extending through an opening **46** in tenon **40**.

The X-joint forms a series of pairs of opposed, adjacent surfaces on leverage members **10** and **12** which move relative to each other, as for example surfaces **50**, **52**; **54**, **56**; **58**, **60**; and **62**, **64**. In conventional instruments these surfaces are parallel in each pair and are either spaced apart far enough when manufactured to catch a thread in the formed crevice or later separated by wear. During surgical operations, there is opportunity to snag a suture or ligator by catching in such crevice, particularly if a loop is being formed around and slid along the instrument.

My solution to this problem is to bevel and round these surfaces so that they diverge as they extend outwardly, thus forming V-shaped crevices. This beveling may be in a single plane but it is preferable to round the corners, particularly the outer corner, as at **70** and **72** in Figures 2 and 3 respectively. It will be noted in Figure 3 that the angle formed between these surfaces, as **50**, **52**, is shown as considerably more than a right angle. To avoid such snagging as would hamper sliding a thread or suture along the instrument, the angles shown in the drawings of approximately 120 degrees have been found most workable in easily passing such thread along the instrument. This angle should not be less than approximately 120 degrees. A median plane, bisecting this angle and disposed normal to the central plane in which the leverage members move, includes the apex of the obtuse angle. Each such apex lies at or is located approximately at the joinder of the opposed surfaces forming a bevel and is wholly to one side of said central plane.

By these means no further problem arises with snagging of sutures, or the catching of unwanted materials between the shoulder surfaces. The joint is made easier to clean and maintain. Manufacture is simplified, since close tolerances are not necessary as in the conventional abutting shoulder surfaces of present X-joint instruments. In the scarf type X-joint, shown in Figure 8, there are likewise a plurality of opposed adjacent surfaces, as **80, 82**, on leverage members **86, 84**, respectively which move relative each other with the median plane between the opposed surfaces disposed at right angles to the plane in which the leverage members move. These opposed, adjacent surfaces are relieved in the manner above described with a mortise and tenon type joint. In this type of joint rear surface **88** may be considerably raised from the companion surface **90** and of such contour that there is no necessity for beveling these surfaces.

Having thus described my invention, I claim:

1. The improvement in a surgical instrument such as forceps, hemostats, ligators, and needle holders, comprising: said instrument having a pair of leverage members joined together by a mortise and tenon type pivotal X-joint and forming handles on one side of the pivot and forming jaws on the other side of the pivot, said joint forming four pairs of opposed, adjacent surfaces on the two leverage members which move relative to each other forming exposed V-shaped crevices with the median plane between each pair of opposed surfaces being disposed normal to the central plane in which the leverage members move, each pair of said opposed surfaces being beveled and rounded so that they diverge as they extend outwardly defining an obtuse angle therebetween, the apex of the obtuse angle being located approximately at the joinder of said opposed surfaces, each said crevice including its apex being disposed wholly to one side of the central plane in which the leverage members move.

2. The improvement in a surgical instrument such as forceps, hemostats, ligators, and needle holders, comprising: said instrument having a pair of leverage members joined together by a pivotal X-joint and forming handles on one side of the pivot and forming jaws on the other side of the pivot, said joint forming a plurality of pairs of opposed, adjacent surfaces on the two leverage members which move relative to each other forming exposed V-shaped crevices with the median plane between each pair of opposed surfaces being disposed normal to the central plane in which the leverage members move, each pair of said opposed surfaces being beveled so that they diverge as they extend outwardly defining an obtuse angle therebetween, the apex of the obtuse angle being located approximately at the joinder of said opposed surfaces, each said crevice including its apex being disposed wholly to one side of the central plane in which the leverage members move.

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