March 5, 1946. J. D. KARLE 2,396,179

SURGICAL STITCHING INSTRUMENT

Filed July 15, 1944

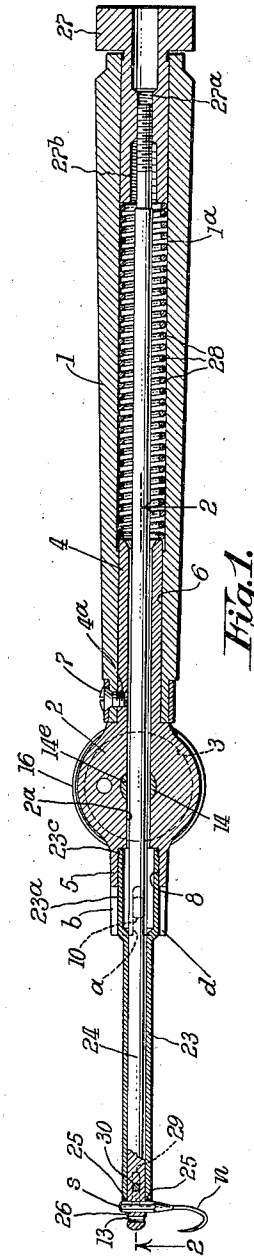


Fig. 1.

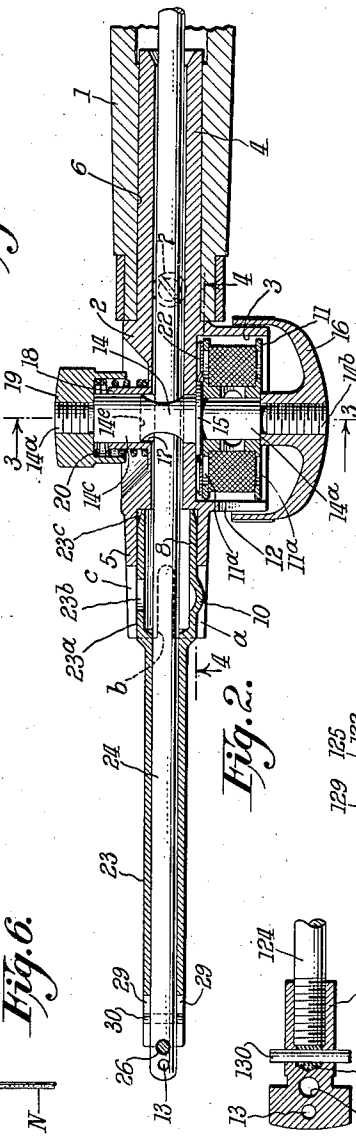


Fig. 2.

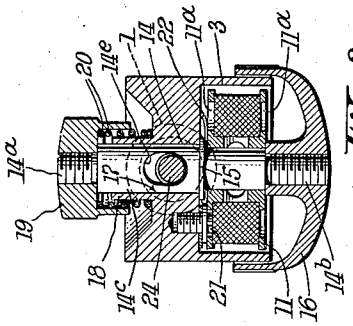


Fig. 3.

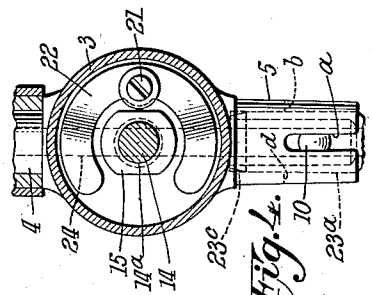


Fig. 4.

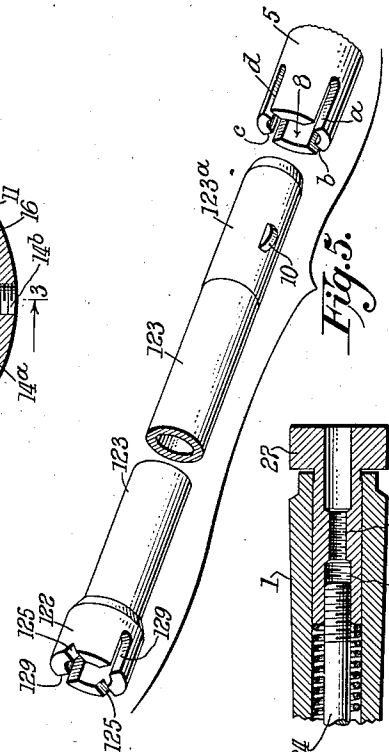


Fig. 5.

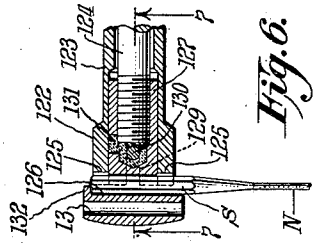


Fig. 6.

Fig. 7.

Fig. 8.

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SURGICAL STITCHING INSTRUMENT

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Application July 15, 1944, Serial No. 545,032

9 Claims. (Cl. 128—340)

This invention relates to surgical stitching instruments and more particularly to improvements in the instrument which forms the subject of my pending United States patent application Serial No. 493,819, filed July 8, 1943.

The primary object of this invention is to provide a surgical stitching instrument which, by the substitution of suitable parts, readily may be adapted to perform various types of suturing operations under dissimilar operating conditions.

When eye, plastic surgery and other delicate suturing operations are to be performed, it is desirable that the suturing instrument be relatively small and of light weight so that it conveniently may be held in and manipulated by the fingers of the surgeon. As such operations are usually performed with relatively small and fine needles it is also desirable that the needle-holding portion of the instrument also be small so as to be easily manipulated and so as not to obstruct the surgeon's vision.

When general suturing is to be performed, in readily accessible places, the instrument may still be relatively small but the needle and that portion of the instrument which holds the needle may, to advantage, be materially larger and heavier than is practical for the more delicate operations.

When performing deep suturing operations as, for example, when operating within the abdominal cavity, it is essential that the instrument be materially longer than is desirable for surface suturing.

This invention therefore has as an object to provide a surgical stitching instrument capable of having secured thereto, selectively, any one of a plurality of needle-supporting bars of various lengths and of various diameters; to provide a plurality of needle-clamp actuating rods also of various lengths and diameters each to cooperate with a complemental one of said needle-supporting bars; and to provide a single manually operatable member to actuate all of said needle-clamp actuating rods.

With the above and other objects in view, as will hereinafter appear, the invention comprises the devices, combinations and arrangements of parts hereinafter set forth and illustrated in the accompanying drawing of a preferred embodiment of the invention, from which the several features of the invention and the advantages attained thereby will be readily understood by those skilled in the art.

In the drawing,

Fig. 1 is an enlarged central longitudinal sectional view of a surgical stitching instrument embodying the present invention, fitted for delicate suturing operations.

Fig. 2 is a sectional view substantially on the line 2—2 of Fig. 1 on a still larger scale.

Fig. 3 is a transverse sectional view substantially on the line 3—3 of Fig. 2.

Fig. 4 is a longitudinal sectional view substantially on the line 4—4 of Fig. 2.

Fig. 5 is a perspective view of one of the larger removable needle-supporting bars and a portion of the instrument into which it is designed to be inserted and frictionally retained, a portion of the bar being shown as broken away.

Fig. 6 is an enlarged detail sectional view of the needle-holding end of the instrument when fitted with one of the larger needle-bars, a larger needle-clamp actuating rod and one of the larger size needles.

Fig. 7 is a sectional view substantially on the line 7—7 of Fig. 6.

Fig. 8 is a longitudinal sectional view of a portion of the handle-end of the instrument showing the needle-clamp actuating nut threaded upon one of the larger size needle-clamp actuating rods.

Referring more specifically to the drawing, the invention is disclosed as embodied in a surgical stitching instrument comprising a handle 1, a spool-holding section 2, having a cup-like spool-receiving portion 3 and oppositely extending tubular portions 4 and 5 of which the former is fitted within one end of a bore 6 formed in the handle 1 and removably held therein by a screw 7 threaded into a hole 4a in the member 4. The opposite portion 5 is formed with a bore 8 adapted to receive the rear or shank end of any one of a plurality of hollow needle-holding bars later to be described. The portion 5 is formed with four slots or notches *a*, *b*, *c* and *d*, spaced ninety degrees apart and which are adapted selectively to receive a positioning tongue 10 punched outwardly from the shank end of each of the needle-bars, to locate the needle-bar, and the needle carried thereby, in any one of four positions about the axis of the instrument.

Suture thread for the needle is wound upon a spool 11 held within the cup-like spool-case 3 of the spool-holding section 2, intermediate the needle-bar and the handle 1. The thread runs from the spool 11 through a slot 12 in the sidewall of the spool-case 3, thence through a thread-guiding aperture 13 in the outer end of the needle-clamp, later to be described, and finally to the eye, or eyes, of the needle. The spool is rotatably journaled on the portion 14a of a spool-supporting

pin, or rod, 14 against a collar 15 formed thereon. The spool-case 3 is closed, to protect the suture thread and to prevent contamination thereof, by a metal cover or cap 16 which is threaded onto the portion 14b of the spool-pin and telescopes with the spool case.

At the side of the collar 15 remote from the portion 14a on which the spool is mounted, the spool-pin has an enlarged portion 14c which is slidingly mounted in a transverse bore 17 formed in the section 2 and in a boss 18 projecting therefrom. A cup-nut 19, which also serves as a thumb-button, is threaded upon the end 14a of the spool-pin and serves as means to shift the pin axially, in one direction, in opposition to a coil spring 20 surrounding the boss 18 intermediate the member 2 and the nut 19.

Provision is made for locking the spool against rotation except when it is desired to draw suture thread therefrom. To that end, each flange of the spool 11 is formed with a series of apertures 11a adapted to receive the head of a screw 21, located within the spool-case 3, to prevent rotation of the spool. The screw 21 also serves to hold, within the spool-case, a light C-shaped flat metal friction spring 22, adapted to bear upon the innermost flange of the spool to prevent overrunning of the spool when it is released from the screw 21, as will now be described.

When it is desired to unlock the spool from the screw 21 so that the spool will be free to rotate to permit suture thread to be withdrawn from the spool, the user presses on the thumb-button 19 thereby shifting the rod 14, and the spool carried thereby, axially away from the screw 21, thus releasing the spool. Upon release of the pressure upon the thumb-nut the spring 20 shifts the parts in the opposite direction again to bring one of the holes 11a in the spool 11, into locking engagement with the head of the screw 21.

As in my above mentioned application, the suture spool and its locking and unlocking means are located on the longitudinal axis of the instrument so as to be equally accessible to the thumb of either hand. When so located, the axis of the spool pin 14 intersects the axis of a needle-clamp actuating rod later to be described. To permit the parts to have this desirable location and yet to avoid interference between the spool-pin and the needle-clamp actuating rod I have so formed the parts that one may pass transversely through the other. Preferably the portion 14c of the spool-pin 14 is formed with a transverse clearance aperture 14e which is of sufficient width to permit the needle-clamp actuating rod to pass therethrough, as shown in Figs. 1, 2 and 3. Also, the aperture 14e is sufficiently long to permit the spool-pin to be shifted lengthwise, under thumb-pressure applied to the thumb-button 19 or by the spring 20, to cause the spool to be released from or locked to the screw 21, as hereinbefore described.

Figs. 1 and 2 show the instrument fitted with a needle-supporting bar 23, a needle-clamp actuating rod 24 and a small needle *n*, all of the type used when performing delicate suturing operations in readily accessible places such, for example, as in eye and plastic surgery. At its inner end the bar 23 is formed with an enlarged cylindrical shank portion 23a adapted to fit within the bore 8 in the tubular portion 5 of the spool-holding section 2. The portion 23a carries the positioning tongue 10, hereinbefore mentioned, which is designed to be fitted into any one of the slots *a*, *b*, *c*, or *d* in the portion 5. The tongue is formed by being pressed outwardly from the shank portion 23a by means of a suitable tool projected through an aperture 23b in the diametrically opposite side of the shank.

The outside diameter of the shank portion 23a of the needle-supporting bar corresponds to the inside diameter of the tubular portion 5 but the latter is slightly resilient and is constricted at its outer end to cause it to grip the shank of the needle-supporting bar and hold it against accidental outward movement. The shank 23a is formed with a tapered end 23c to facilitate insertion of the shank into the bore in the portion 5. In its outer end the bar 23 is formed with two aligned V-shaped notches 25 the walls of which afford fixed jaws of a clamp for the shank *s* of the needle *n*. Cooperating with the fixed jaws in gripping the needle is a movable jaw 26 provided by the wall of an aperture extending through the needle-clamp actuating rod 24. The rod 24 extends through the bore in the bar 23, through a bore 2a in the spool-holding section 2, through the transverse clearance aperture 14e in the spool-pin 14 and is screwed into the smaller threaded bore 27a in a nut 27 journaled in the remote end of the handle 1. The nut 27 also contains a larger threaded bore 27b for a larger clamp-actuating rod, as later will be described.

The shank of the needle is preferably of octagonal shape in cross-section and therefore the needle may be clamped in any one of eight predetermined angular positions.

A coil spring 28, located in a bore 1a in the handle 1, has one end in engagement with the tubular portion 4 of the spool-holding section and its other end in contact with the inner end of the nut 27. This spring normally urges the nut 27 and rod 24 to the right, as seen in Fig. 1, thereby yieldingly gripping the needle between the jaws 25 and 26. When the needle is impositively held by the clamp jaws the needle may be rotated to any desired position without dropping from the needle-clamp. This grip on the needle may be made positive by rotating the nut 27. Initial turning of the nut causes it to engage the end of the handle after which a further turn of the nut will cause the rod 24 and the clamp-jaw 26 carried thereby to be urged to the right, thereby positively locking the shank of the needle between the jaws 25 and 26.

The rod 24 is provided in its outer end portion with the thread-guiding aperture 13, hereinbefore mentioned, through which the suture thread passes in its travel from the spool to the eye, or eyes, of the needle. To prevent rotating of the rod 24 in the bar 23, while permitting relative endwise movement therebetween, the outer end of the bar is provided with aligned slots 29 within which are slidingly mounted the outer ends of a pin 30 fastened in the rod.

When it is desired to use the instrument for heavier suturing the needle-supporting bar 23 and the clamp-actuating rod 24 are removed and replaced by the needle-supporting bar 123 and the clamp-actuating bar 124, shown in Figs. 5, 6, 7 and 8 and a larger and heavier needle N, having an octagonal shank S, is secured in the needle-clamp. The shank portion 123a of the bar 123 corresponds in size and shape to the shank portion 23a of the bar 23 and is adapted to be frictionally held within the slotted end portion 5 of the spool-holding section 2, with the tongue 10 in a selected one of the slots *a*, *b*, *c*, or *d*. The outer end of the bar 123 is formed with a head

122 provided with aligned V-shaped notches 125, which correspond to the notches 25 in the bar 23, and the walls of which comprise the fixed jaws of a needle-clamp. The cooperating movable jaws of the needle clamp are afforded by the surface 126 of a bore formed in a clamp-block 127 secured upon the outer end of the clamp-actuating rod 124. The opposite end of the rod 124 is threaded into the larger threaded bore 27b in the nut 27, as shown in Fig. 8. The head 122 of the bar 123 is formed with aligned slots 129, which correspond to the slots 29 in the bar 23, and which slidingly receive a cross-pin 130 secured in the clamp block 127, as for example, by solder 131.

As shown most clearly in Fig. 7 the clamp-block 127 is provided with a thread-guiding aperture 13, parallel with the surface 126 of the movable clamp-jaw, and a portion 132 which overlies the shank of the needle and forms a stop therefor.

When deep suturing is to be performed, as for example within the abdominal cavity, a needle-supporting bar and needle-clamp actuating rod similar to those shown in Figs. 5, 6, 7 and 8 but of greater length are inserted into the instrument to materially increase the length of the instrument. Inasmuch as the longer needle-supporting bar and its complemental longer clamp-actuating bar differ from those shown in Figs. 5, 6, 7 and 8 only in length, illustration thereof is deemed unnecessary.

From the foregoing it will be perceived that this invention has provided an all-purpose surgical stitching instrument which, by a simple and convenient interchange of certain parts thereof is adapted to afford all the advantages of a plurality of single purpose instruments in the performing of a considerable number of unlike suturing operations in relatively accessible and inaccessible parts of the human body.

Having thus set forth the nature of the invention, what I claim herein is:

1. A surgical stitching instrument comprising a handle; a spool-holding section having oppositely projecting tubular portions one of which is secured to said handle, the other of said tubular portions being slotted; a needle-supporting bar having one end secured in said slotted tubular portion of said spool-holding section and having a radially projecting portion entering a slot therein to prevent relative rotation between the section and the needle-supporting bar; a fixed needle-clamping jaw formed at the outer end of said needle-supporting bar; a needle-clamp actuating rod slidingly mounted in said bar, section and handle and carrying a needle-clamping jaw adapted to cooperate with said fixed jaw to clamp a needle; and means associated with said rod and handle for shifting said rod axially to effect clamping of a needle between said jaws.

2. A surgical stitching instrument comprising a handle; a spool-holding section having oppositely projecting tubular portions one of which is secured to said handle, the other of said tubular portions having therein a plurality of circumferentially spaced open-ended slots and being slightly constricted at its outer end; a needle-supporting bar having one end frictionally secured in said slotted tubular portion of said spool-holding section and having an outwardly pressed tongue adapted to be inserted into any one of the slots therein to locate the needle-supporting bar in various angular positions relative to said spool-holding section and to prevent relative rotation between the section and the bar; a fixed needle-clamping jaw formed at the outer end of said needle-supporting bar; a needle-clamp actuating rod slidingly mounted in said bar, section and handle and carrying a needle-clamping jaw adapted to cooperate with said fixed jaw to clamp a needle; and means associated with said rod and handle for shifting said rod axially to effect clamping of a needle between said jaws.

3. A surgical stitching instrument comprising a handle; a spool-holding section having oppositely projecting tubular portions one of which is secured to said handle, the other of said tubular portions being slotted; a needle-supporting bar having one end secured in said slotted tubular portion of said spool-holding section and having an outwardly projecting portion entering a slot therein to prevent relative rotation between the section and the needle-supporting bar; a fixed needle-clamping jaw formed at the outer end of said needle-supporting bar; a needle-clamp actuating rod slidingly mounted in said bar, section and handle and carrying a needle-clamping jaw adapted to cooperate with said fixed jaw to clamp the shank of a needle, said needle-clamp actuating rod also affording a thread-guide arranged substantially parallel to the shank of the needle; and a clamp nut threaded on said rod and engaging said handle for shifting said rod axially to effect clamping of a needle between said jaw.

4. A surgical stitching instrument comprising a handle; a spool-holding section having oppositely projecting tubular portions one of which is secured in said handle, the other of said tubular portions being slotted and slightly constricted at its outer end; a needle-supporting bar having one end frictionally secured in said slotted tubular portion of said spool-holding section and having an outwardly projecting portion entering a slot therein to prevent relative rotation between the section and the needle-supporting bar; a fixed needle-clamping jaw formed at the outer end of said needle-supporting bar; a needle-clamp actuating rod slidingly mounted in said bar, section and handle and carrying a needle clamping jaw adapted to cooperate with said fixed jaw to clamp a needle; means including a pin-and-slot connection between said needle-supporting bar and said needle-clamp actuating rod to prevent relative rotation therebetween; and means associated with said rod and handle for shifting said rod axially to effect clamping of a needle between said jaws.

5. A surgical stitching instrument comprising a handle; a spool-holding section having oppositely projecting tubular portions one of which is secured in said handle; a tubular needle-supporting bar having at one end an enlarged shank portion secured in the other tubular portion of said spool-holding section and at its other end a pair of spaced and aligned fixed needle-clamping jaws; a rod slidingly mounted in said bar, section and handle and carrying at its outer end a needle-clamping jaw adapted to cooperate with said fixed jaws to clamp a needle; and means associated with said rod and handle for shifting said rod axially to effect clamping of a needle between said jaws.

6. A surgical stitching instrument as set forth in claim 5 in which the overall diameter of the instrument in the region of the needle-clamp is not greater than the diameter of the tubular needle-supporting bar.

7. A surgical stitching instrument comprising a handle; a spool-holding section having oppositely projecting tubular portions one of which is

secured in said handle; a tubular needle-supporting bar having at one end an enlarged shank portion secured in the other tubular portion of said spool-holding section and at its other end a pair of spaced and fixed needle-clamping jaws; a rod slidingly mounted in said bar, section and handle and carrying a movable needle-clamping jaw located between said fixed jaws and adapted to cooperate therewith to clamp a needle; and a nut threaded on said rod and adapted to engage said handle for shifting said rod axially to effect clamping of a needle between said jaws.

8. A surgical stitching instrument comprising a handle; a spool-holding section having two oppositely projecting tubular portions of which the first is secured in said handle and of which the second is adapted to receive the shank portion of any one of a plurality of needle-supporting bars of different lengths and of different diameters but each having a shank portion adapted to fit within said second tubular portion and each having at its outer end a fixed needle-clamping jaw; a clamp-nut rotatably mounted in the free end of said handle, said nut having a plurality of aligned threaded bores of different diameters each adapted to receive the threaded end of one of a plurality of different size clamp-actuating rods each associated with one of said needle-supporting bars, each of said rods carrying a movable clamp-jaw adapted to cooperate with one of said fixed jaws to clamp a needle.

9. A surgical stitching instrument comprising a handle; a spool-holding section having oppositely projecting tubular portions one of which is secured in said handle and the other of which is slotted and has its outer end slightly constricted, said slotted portion being adapted to receive the shank portion of any one of a plurality of needle-supporting bars of different lengths and of different diameters but each having a shank portion adapted to fit within said slotted tubular portion and having a tongue adapted to fit within a slot in said slotted portion to prevent relative rotation between said section and the bar, each of said bars having at its outer end a fixed needle-clamping jaw; a clamp-nut rotatably mounted in the free end of said handle, said nut having a plurality of aligned threaded bores each adapted to receive the threaded end of one of a plurality of clamp-actuating rods of different diameters each associated with one of said needle-supporting bars, each of said rods carrying a clamp-jaw adapted, by endwise movement of the rod, to cooperate with one of said fixed jaws to clamp a needle.

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