

July 21, 1953

B. S. PRIESTLEY
MECHANICAL SUTURING DEVICE

2,646,045

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2 Sheets-Sheet 1

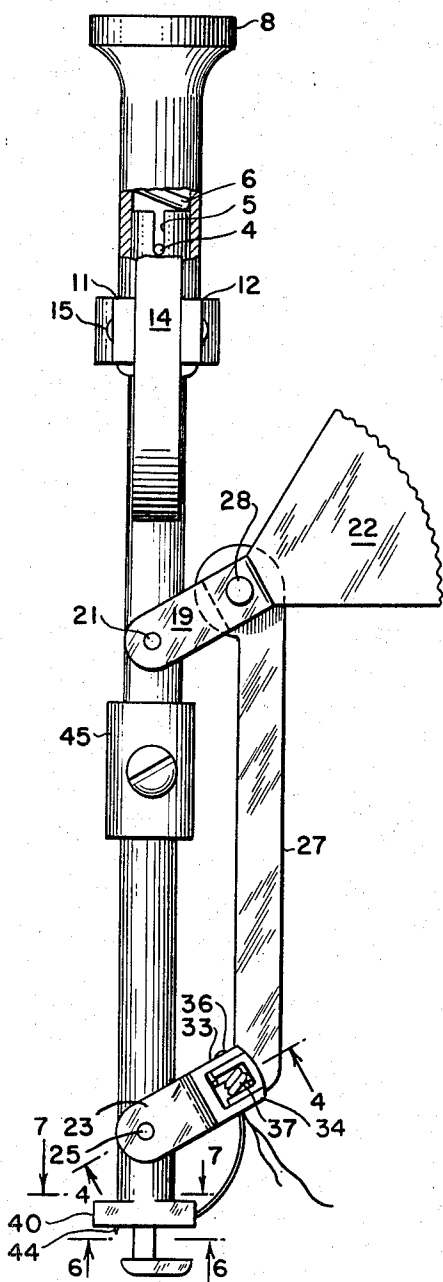


FIG. 1

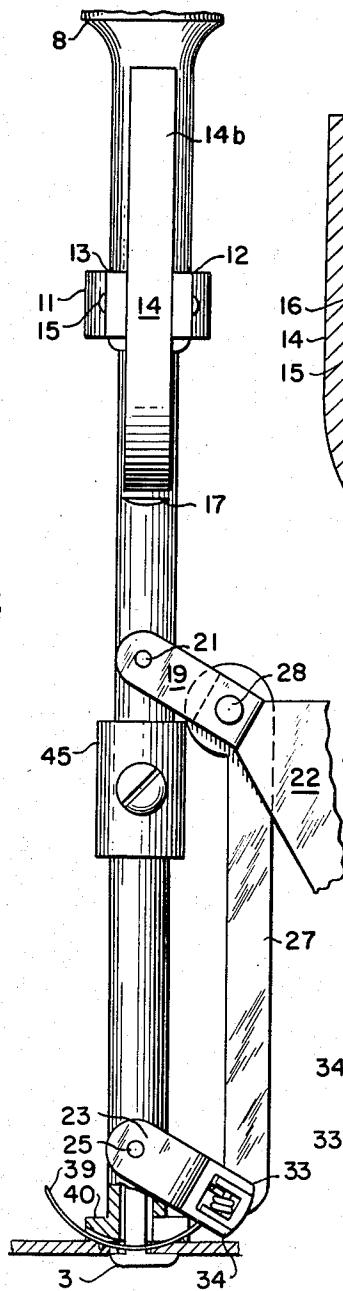


FIG. 3

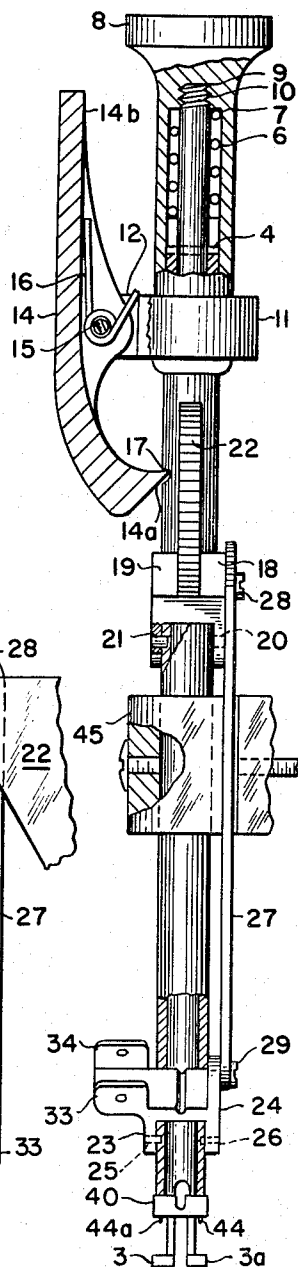


FIG. 2

INVENTOR.

Bruno S. Priestley
BY

L. G. Cox

ATTORNEY

July 21, 1953

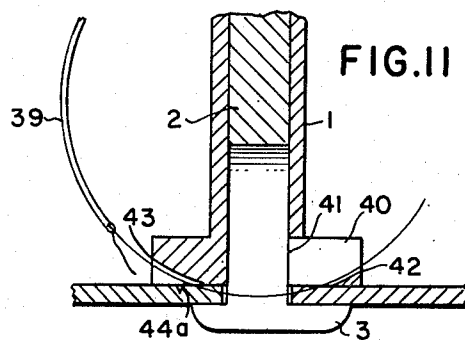
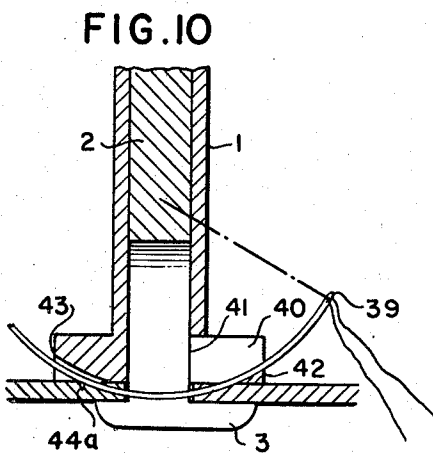
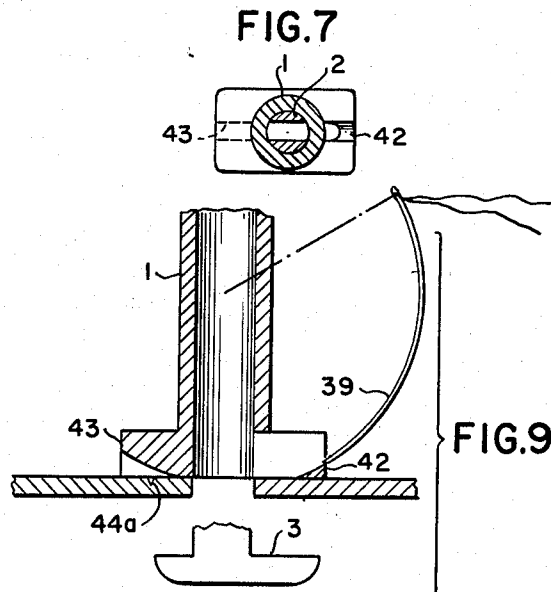
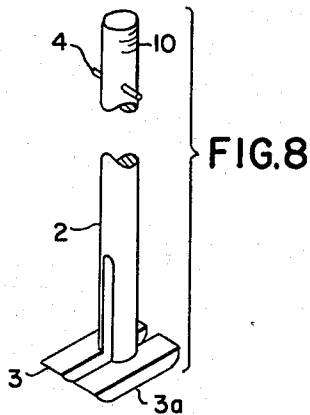
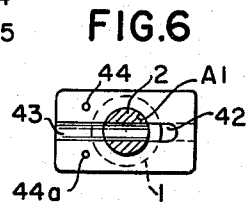
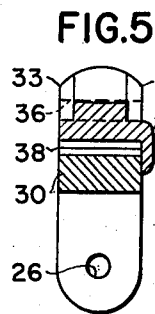
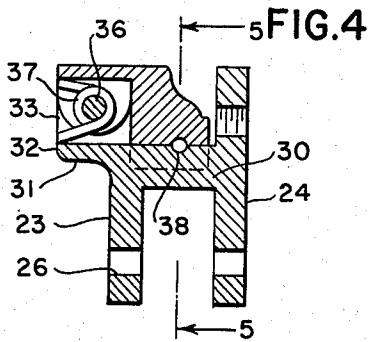
B. S. PRIESTLEY

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INVENTOR.
Bruno S. Priestley
BY

[Signature]

ATTORNEY

UNITED STATES PATENT OFFICE

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MECHANICAL SUTURING DEVICE

Bruno S. Priestley, New York, N. Y.

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9 Claims. (Cl. 128—340)

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My invention relates to a mechanical device for the insertion of sutures and more particularly for the insertion of corneoscleral sutures. It may, however, be used for analagous operations on other parts of the body to which it is adapted or adaptable.

Prior to my invention the usual method of binding tissue together by sutures was with the use of a curved needle and forceps. This is an extremely difficult and time consuming procedure especially when relatively tough tissue is encountered such as is present when corneal tissue is involved.

One of the objects of my invention is to hold opposing tissue surfaces in rigid and exact opposition throughout the suturing operation.

Another object of my invention is to make it possible to insert a suturing needle through tissue so that the depth of needle penetration is exactly gauged and exactly the same on each of the opposing surfaces.

Another object of my invention is to provide a means whereby a needle may be made to penetrate opposing tissue surfaces on an exact line so that when the suture is tied there is no tendency for the tissue to pull out of position or rupture.

Other objects and advantages will be apparent from the following specification and the accompanying drawings in which:

Fig. 1 is a side elevation of the device in non-operating position;

Fig. 2 is a partially broken away front elevation of the device in non-operating position;

Fig. 3 is a side elevation of the device in operating position;

Fig. 4 is a section of the needle clamping jaws taken on line 4—4 of Fig. 1;

Fig. 5 is a section of the needle clamping jaws taken on line 5—5 of Fig. 4;

Fig. 6 is a bottom view of the pedestal of the instrument taken on line 6—6 of Fig. 1;

Fig. 7 is a top view of the pedestal of the instrument taken on line 7—7 of Fig. 1;

Fig. 8 is an isometric view of the tissue clamping foot;

Fig. 9 is a cross section of the pedestal and half of the tissue clamping foot poised for clamping with the needle retracted;

Fig. 10 is a section as shown in Fig. 9 with tissue clamped and needle advanced;

Fig. 11 is a view similar to Figs. 9 and 10 showing the operation of withdrawing needle from the instrument.

Referring to the drawings, 1 is the main body of the instrument made in the form of a hollow shaft through which runs the parallel movement shaft 2 split enlarged and elongated at the lower end to form the clamping foot 3 and 3a and held within the main body 1 at the upper end by a retainer pin 4. The main body is also slit at its upper end at 5 to receive and guide the retainer pin 4 and topped by a spring 6 which surrounds the shaft 2, and bearing at one end on the upper end of the main body 1 and

at the other end on the inside of the cap 8, as shown at 7, the cap being female threaded centrally at 9 to receive the male threads 10 on the ends of the shaft 2, this allows the shaft 2 to telescope within the hollow shaft 1.

The cap 8 at its lower end is formed into a collar 11 having arms 12 and 13 attached thereto to receive the dog lever 14, held in position by a swivel pin 15 which also retains the spring 16, and is so placed as to bear against the cap 8 and the upper portion of the dog lever so that the dog 14a is normally forced against the body 1, with enough force that on compression of the spring 6 the dog 14a latches in the notch 17 and retains the compression of the spring 6 until released by pressure on the lever arm 14b rocking the dog 14a out of the notch 17.

At a convenient point, preferably at a medial distance from the top to the bottom of the device arms 18 and 19 are mounted on swivel pins 20 and 21 attached to the main body 1 in any suitable manner, the arms 18 and 19 terminating in a finger lever 22.

Near the base of the main body 1 is located a second pair of arms 23 and 24 swiveled on the main body by the swivel pins 25 and 26 and connected to the arms 18 and 19 by a parallel bar 27 by swivel pins 28 and 29. The swivels 28 and 29 are placed at exactly the same distance from the swivel pins 20, 21 and 25, 26, respectively, so that movement of the arms 18, 19 produces the exact arcuate movement of the arms 23 and 24, the purpose of which will later be explained.

The arms 23 and 24 are joined together near this outer end by a bridge 30 while the arm 23 is turned outwardly at 31 and upwardly at 32, the upwardly turned portion 32 being split into two sections 33 and 34 to accommodate an L-shaped vise jaw 35 the longer portion of the L lying over the bridge 30 and the shorter portion of the L forming a closure at the rear between 35 and the bridge 30 as shown best in Fig. 5. The jaw 35 is held in embraced position by the sections 33 and 34 by the swivel pin 36 and is held in forced juxtaposition to the bridge 30 by the jaw spring 37 which surrounds the swivel pin 36. Both the longer portion of the L-shaped jaw and the bridge contain indentations which when the two are in juxtaposition form an orifice 38 whose purpose is to receive the shank of a threaded suture needle 39 while the shorter L-shaped portion of the jaw prevents the needle shank from being forced out of the rear of the vise.

Attached to the base of the main body 1 is a pedestal 40 having a control aperture 41 through which the shaft 2 passes, an arced slot guide 42 at the top rear of the pedestal and an arced guide indent 43 on the bottom front of the pedestal whose purpose is to guide the needle and prevent it from becoming misaligned. The pedestal also has at its forward lower portion spikes 44 and 44a for the purpose of holding tissue firmly in position.

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For convenience in handling my instrument I provide mounted on the main body 1 a collar 45 having a male threaded bolt 46 firmly attached to it and a set screw 47 piercing the collar so that the operator may by loosening and tightening the set screw position the collar on the main body 1, the male threaded bolt providing means whereby a handle (not shown) may be readily attached if desired.

In operation, a curved threaded needle 39 is forced between the jaws 30 and 35 of the vise within the positioning orifice 38. The main body 1 is grasped with the index and middle finger and the thumb pressed on the cap 8. This compresses the spring 6 until the cap is latched by the dog 14a engaging the slot 17. When the cap and the attached rod 2 are forced downwardly the feet 3 and 3a are forced away from the pedestal 40, leaving a space whereby the feet 3 and 3a may be inserted in the incision as shown in Fig. 1. When in position the arm 14b is pressed inward allowing the spring 6 to bring the feet 3 and 3a upwards toward the pedestal thus clamping the tissue to be sutured between the feet 3 and 3a and the pedestal 40. The next step is to press the lever 22 downwardly which causes the needle 39 to pass through the several abutting tissues and, because of the small "L" on the vise jaw 35 closing the aperture 38 at the rear, the needle cannot be forced backwards but remains tightly held and positioned. At the initial point of entry of the needle, as shown schematically in Fig. 9, the tissue first encountered is forced upward by the needle but as shown in Fig. 10 the tendency is for the tissue to be forced away from the needle. This is prevented by the spikes 44 and 44a which grip the tissue firmly and hold it in place. Since the arms 18, 19 and 23, 24 are pinioned at equidistance from the main body and actuated by the lever 22 and parallel arm 27, these arms travel in an arc whose radius is the radius of the needle used in the suturing operation, due to the arm 27 moving parallel to the body of the instrument, thus eliminating any tendency of the needle to make a puncture in the tissue greater than the diameter of the needle.

When the needle has passed through the tissue as shown in Figs. 3 and 10, a pull on the needle point disengages the needle from the vise jaws allowing it to be pulled completely through the tissue at which time the suturing device is removed and since the feet 3 and 3a are separated the interior suture easily passes through the slot opening between them.

It should be mentioned that although I have shown the swivels 28 and 29 as immovable along the arms 19, 20 and 23, 24, respectively, it would be well within the scope of my invention to provide movable pivots whereby varying radii might be expressed to suit varying types of needles.

Various other modifications of the details of construction herein shown and described may be made without departing from the scope of the invention.

What I claim is:

1. In a suturing device of the kind described, a curved needle, a suture engaged by the needle, a needle operating arm in which the shank of the needle is securely but removably held, a shaft on which said arm is pivotally mounted for oscillatory movement, the arc of oscillation of said arm corresponding substantially to the arc of curvature of said needle, a shaft mounted with the first named shaft to move parallel therewith said second named shaft having a divided foot or

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base providing a passage in which the needle moves, a foot or base on the first shaft substantially opposed to the foot of the second and having a needle aperture therein, one of said shafts and its base being mounted to move and to cause its foot to move toward and from the other, means for moving said shaft with respect to the other to grip and release opposing body tissues, means for oscillating said arm and needle held therein to cause the needle to pass through said tissues and means for retaining said movable shaft and arm in different positions in their movements.

2. In a suturing device of the kind described, a curved needle, a suture engaged by the needle distant from the point of said needle, a needle operating arm in which the shank of the needle is securely but removably held, a hollow shaft on which said arm is pivotally mounted for oscillatory movement, the arc of oscillation of said arm corresponding substantially to the arc of curvature of said needle, a split shaft mounted within the first named shaft to move parallel therewith said second named shaft having a divided foot or base providing a passage in which the needle fits snugly and moves, a foot or base on the first shaft substantially opposed to the foot of the second and having a needle aperture therein, one of said shafts and its base being mounted to move and to cause its foot to move toward and from the other, means for moving said shaft with respect to the other to grip and release opposing body tissues, means for oscillating said arm and needle and suture to pass through said tissues and means for retaining said movable shaft and arm in different positions in their movements.

3. In a device as specified in claim 1, the said shafts being in telescopic relation.

4. In a device as specified in claim 1, spring means for constantly urging the movement of the foot of one shaft in the direction of the foot of the other.

5. In a device as specified in claim 1, spring means for constantly urging the movement of the foot of one shaft in the direction of the foot of the other and an automatic spring-actuated latch engaging the shaft with said movable foot and holding said foot in a position separated from the other.

6. In a device as specified in claim 1, tooth-like projections on one of the feet for engaging the tissue between it and the other.

7. In a device as specified in claim 1, the aperture of the divided needle receiving foot of one shaft being contractible on the movement of said foot toward the other and vice versa.

8. In a device as specified in claim 1, the means for moving the arm comprising a hand operable lever pivoted on one of the shafts and a link connecting the outer part of said arm with an intermediate part of said lever.

9. In a device as specified in claim 1, the needle receiving apertures of the feet constructed to receive and hold the curved needle against lateral movement and to guide its movement in a path substantially normal to the tissue clamped between said feet.

BRUNO S. PRIESTLEY.

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