

[54] **SUTURE APPLICATOR**

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 [58] **Field of Search**..... 128/334 R, 326, 340

[57] **ABSTRACT**

The disclosure is of a suturing clamp in which the jaws are moved toward each other to a pre-set position wherein the flesh is firmly, but not too tightly clamped. A bifurcated needle is moveably carried on one of the jaws and a length of suture is extended from a bobbin on the clamp to a grip at the end of the jaw. After the pre-set clamping position is reached, further operation drives the needle across the space between the jaws to carry a length of suture with it.

[56] **References Cited**

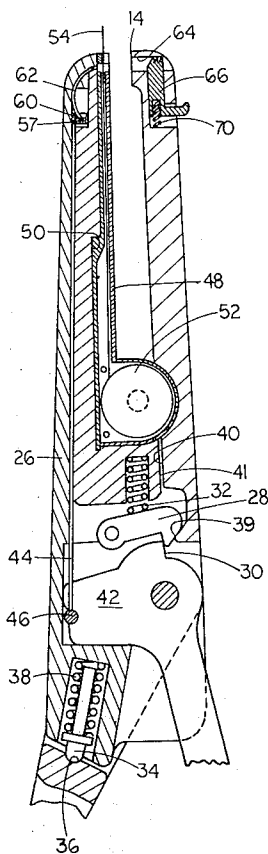
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10 Claims, 8 Drawing Figures



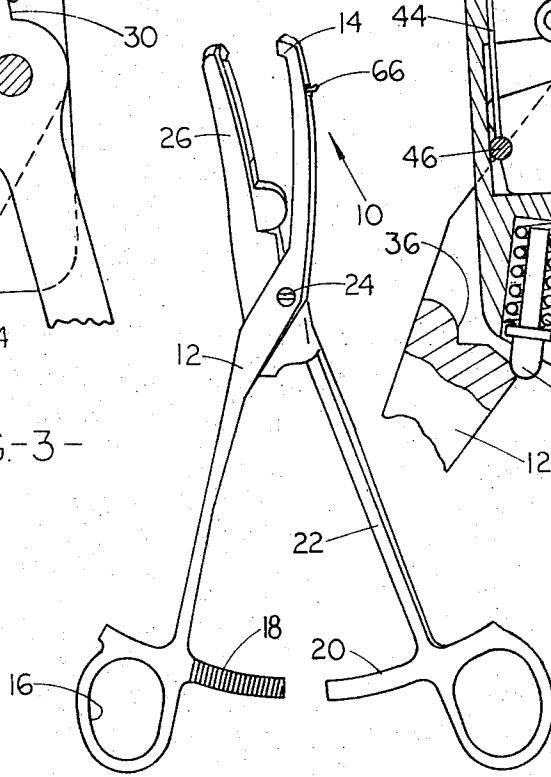
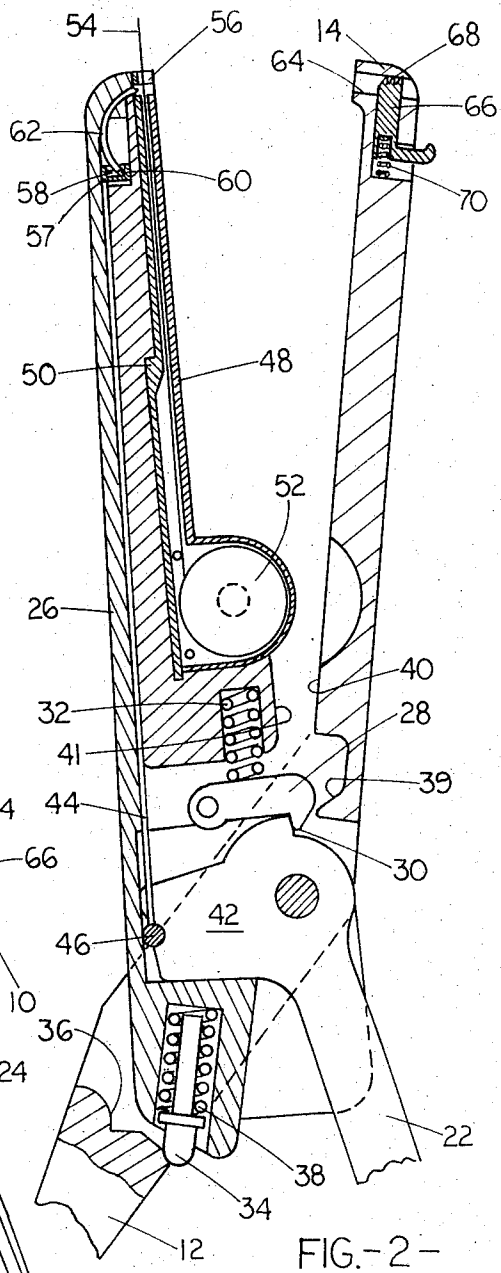
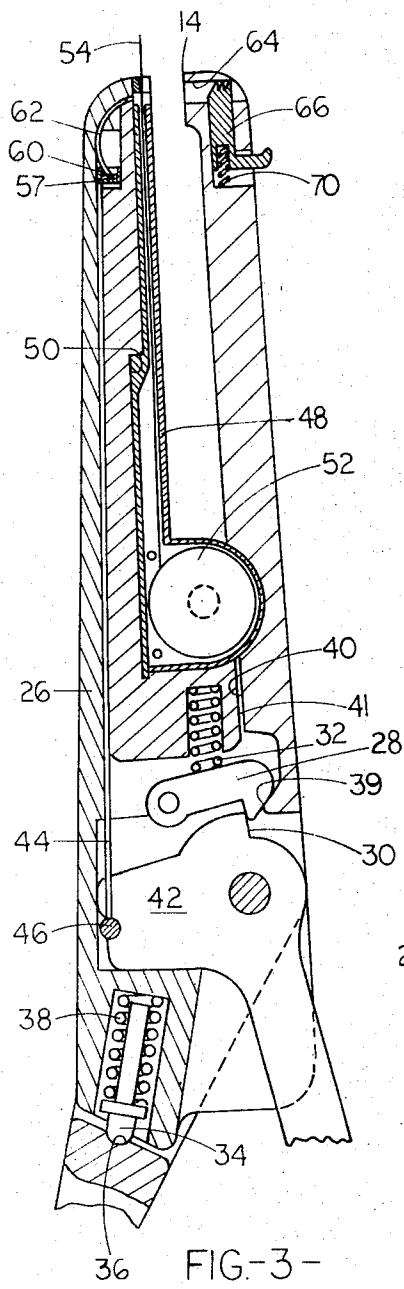


FIG. 1-

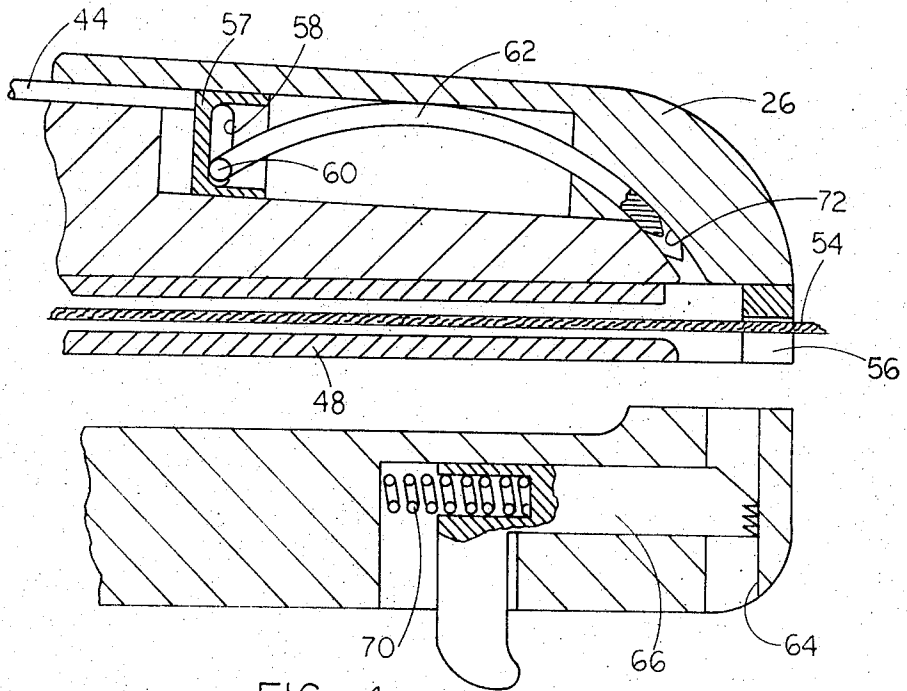


FIG-4-

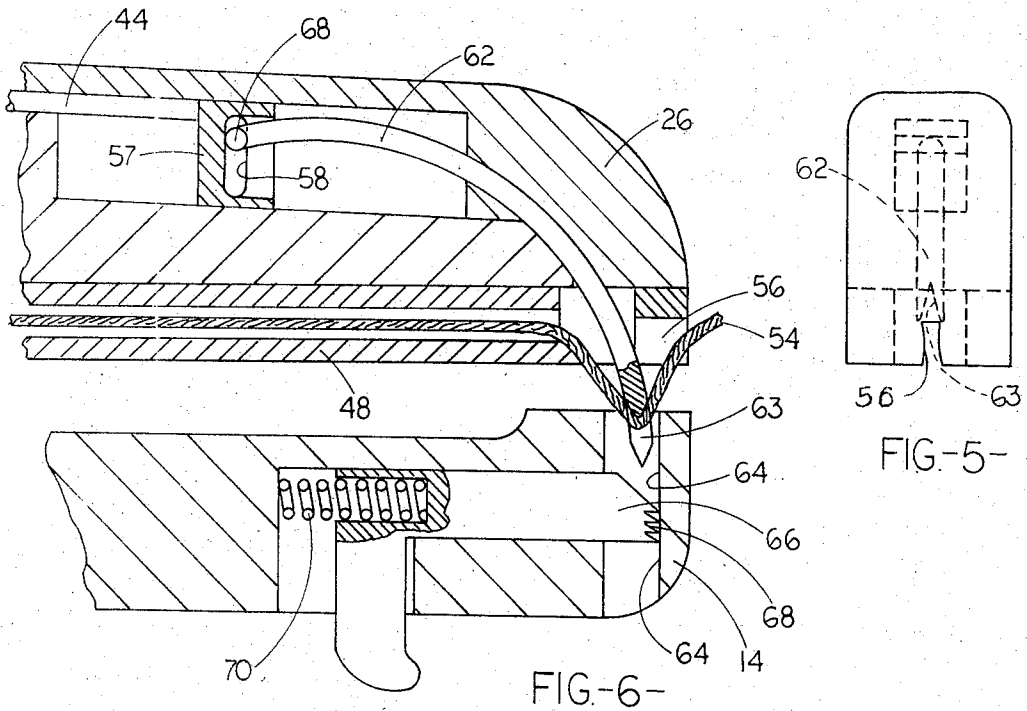


FIG-5-

FIG-6-

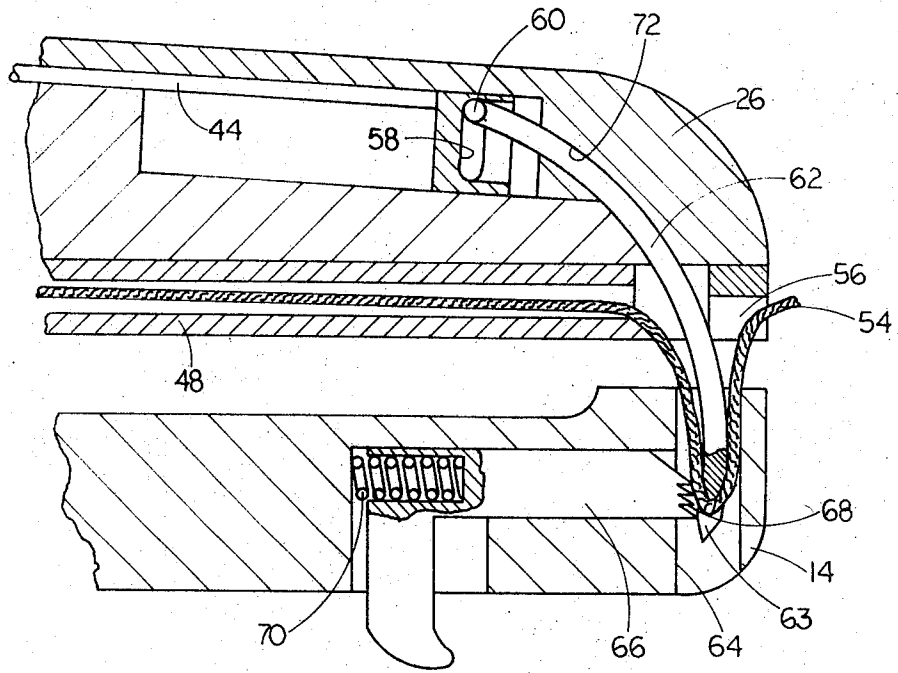


FIG-7-

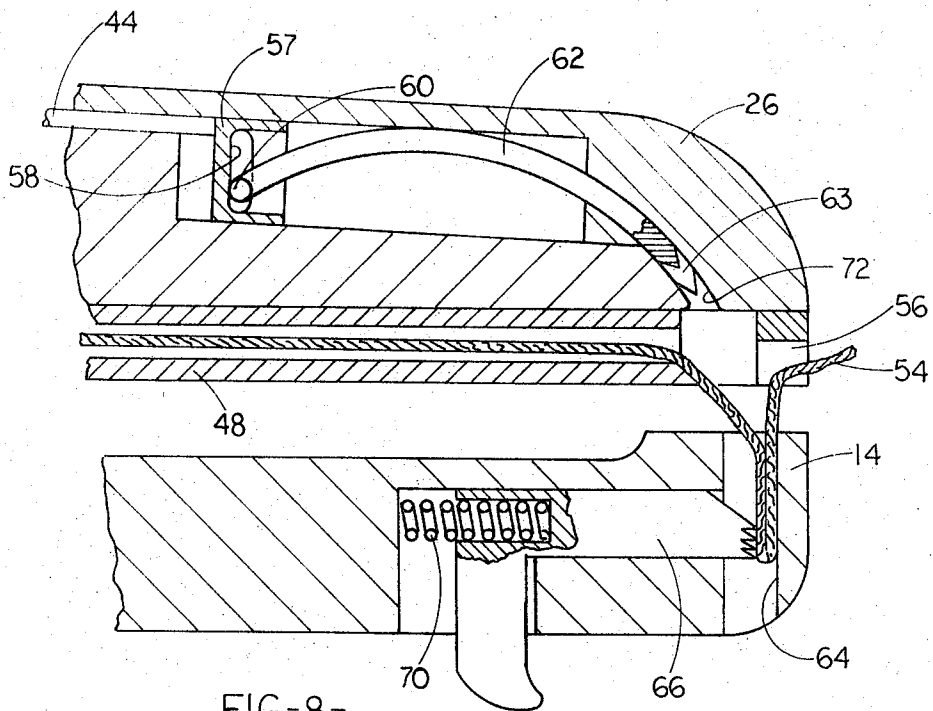


FIG-8-

SUTURE APPLICATOR

BACKGROUND OF THE INVENTION

Suturing clamps presently available carry a length of suture with needles at one or both ends thereof. The clamps are tightened on the flesh; the needles are driven through; the needles are cut away; and the suture is tied off. Hence, for each stitch the suturing clamp must be loaded, operated and replaced.

OBJECTS OF THE INVENTION

It is an object of this invention to provide a surgical suture applicator which may be operated repeatedly for placement of a plurality of stitches.

It is a further object of this invention to provide a surgical suture applicator wherein the needles are not attached to the suture.

It is a further object of this invention to provide a surgical suture applicator wherein it is not necessary to cut needles from the suture after the suture is driven through the flesh.

It is a further object of this invention to provide a surgical suture applicator wherein more than one stitch may be placed without reloading.

It is a further object of this invention to provide a surgical suture applicator which clamps the flesh to a pre-set, limited degree and then drives a length of suture through the flesh to permit a stitch to be tied without removing a needle from the suture.

It is a further object of this invention to provide a surgical suture applicator wherein a needle drives a length of suture through the flesh and then is withdrawn while the suture is held in place.

Other objects and advantages of this invention will become apparent from the description to follow when read in conjunction with the accompanying drawings.

BRIEF SUMMARY OF THE INVENTION

In carrying out this invention, there is provided a suturing clamp having a one piece jaw and handle to which are pivoted separable jaw and handle elements. The separable jaw and handle are latched together so that they move as a unit until a pre-set limited clamping position is reached. At that point, the separable jaw is unlatched from its handle and latched to the one piece jaw and handle. Further movement of the separable handle will produce no further movement of the jaw but, instead, drives a pusher rod to force a needle from the separable jaw into the other jaw. A length of suture is extended from a spool and held across the space between the jaws whereby the needle, having a bifurcated end, will carry the suture with it through the flesh and into the other jaw where it is secured by a slidable clamp. Then, the clamp may be released and the length of the suture cut off and tied.

BRIEF DESCRIPTION OF THE DRAWINGS

In the drawings:

FIG. 1 is an isometric view of a suturing clamp embodying features of this invention;

FIG. 2 is a section view of the suturing clamp prior to operation;

FIG. 3 is a section view of the suturing clamp in relatively closed position;

FIG. 4 is an enlarged partial section view of the jaw end of the clamp in relatively closed position but prior to the suturing operation;

FIG. 5 is an end view of the upper jaw component; and

FIG. 6 to 8, inclusive, are enlarged partial section views in various stages of the suturing operation.

DESCRIPTION OF A PREFERRED EMBODIMENT

Referring now to FIGS. 1 to 3 with greater particularly, the suturing clamp 10 of this invention includes a first lever 12 having a lower jaw element 14 integral therewith and a thumb engaging loop 16 for manual operation thereof. An arcuate ratchet member 18 extended from the one-piece lever 12 engages with a complementary arcuate ratchet member 20 on an actuator lever 22 to hold the clamps 10 in relatively closed position as in conventional forceps design.

The actuator lever member 22 is pivoted to the first lever member 12 on a pivot pin 24 on which is also pivotally mounted the upper jaw element 26. As shown in FIGS. 2 and 3, the upper jaw element 26 is normally secured to the actuator lever member 22 by engagement of a pawl or latch 28 thereon on a complementary surface 30 on the actuator lever member, the latch being urged into engaging position by means of a spring 32 carried on the upper jaw element. When the jaw elements 14 and 26 move to a pre-set relatively clamped position shown in FIG. 3, a detent 34 carried on the upper jaw element 26 engages in a recess 36 on the one-piece first lever member 12 effectively to interlock the jaw elements 14 and 26 together under the force of compression spring 38 biasing the detent 34. At the same instant, the latch 28 engages a camming surface 39 on the lower jaw element which forces the latch out of engagement with the surface 30 to free the actuator lever 22 from driving engagement with the upper jaw 26 and allows it to pivot relative thereto.

With the separable upper jaw 26 secured to the lower jaw by means of the detent 34 and further clamping movement also precluded by engagement of stop surfaces 40 and 41 and the upper and lower jaws 26 and 14, further pivotal movement of the lever 22 will swing the arm 42 carried thereon to push the rod 44 lengthwise of the upper jaw element 26. The rod 44 may be secured to the arm 42 as by engagement of an enlargement 46 thereon in a complementary recess on the arm 42.

A cartridge 48 of plastic or the like is snapped in place in a recess 50 in the upper jaw element 26 to be carried thereby. A bobbin 52 rotatably carried in the cartridge carries a supply of suture 54 from which a length of suture may be pulled and retained in a gripping slot 56 (FIG. 5) at the end of the cartridge 48.

Carried on the end of the pusher rod 44 in the separable upper jaw 26 is a slide block 57, having a transverse slot 58 therein in which is slidably and pivotally carried a pin 60 on an arcuate needle 62. As shown in FIG. 5 the end of the needle is bifurcated with a V-notch 63 in the end thereof to grasp the length of suture 54 as the needle emerges from the upper jaw. A passageway 64 in the end of the lower jaw is adapted to receive the end of the needle 62, and a slidable clamp 66 having a serrated forward edge 68 is spring biased into engagement with the wall of the passageway 64 to grip a length of suture therein under the force of the spring 70.

While a single suture and needle are here shown, it is obvious that multiple spools 52 and a plurality of needles 62 may be employed if it is desired to apply two or more stitches simultaneously.

Referring now to FIGS. 4 to 8, inclusive, there is illustrated the progressive operation of a suturing clamp 10 of this invention. In FIG. 4 the upper and lower jaws 26 and 14 are in the condition illustrated in FIG. 3 wherein they are locked together in relatively closed position. Since the actuator lever 22 is free to pivot relative to the upper jaw 26, the arm 42 thereon commences to push the rod 44 and drive the slide block 57 toward the end of the upper jaw 26, causing the arcuate needle 62 to slide along its complementary, arcuate guideway 72. Then, as shown in FIG. 6, the bifurcated end 63 of the needle (FIG. 5) grips the suture 54 and commences to carry it into the passageway 64 in the lower jaw element 14. Of course, this would carry the suture through flesh that is gripped between the jaws 14 and 26.

In FIG. 7, the needle 62 has moved further into the passageway 64 to cam the slide clamp 66 back against its spring. The serrated end 68 of the clamp grips the length of suture to prevent it from being withdrawn with the needle as it is retracted. Finally, in FIG. 8, the rod 44 has pulled the slide block back to the left to retract the arcuate needle while the length of suture 54 is gripped by the slide clamp 66. To complete the suturing operation, the length of suture is severed from the supply and tied off. Another length may immediately be placed in the grip 56 at the end of the cartridge and the previously described operation repeated.

While this invention has been described in conjunction with a preferred embodiment thereof, it is obvious that modifications and changes therein may be made by those skilled in the art without departing from the spirit and scope of this invention.

What is claimed is:

1. A surgical suture applicator comprising:
 - a first lever including a first jaw arm thereon;
 - a second jaw arm;
 - a pivotal connection between said first lever and said second jaw arm;
 - an actuator lever;
 - means releasably connecting said actuator lever to said second jaw arm to transmit pivotal movement thereto;
 - a needle slidably carried in said second jaw arm from a retracted position within said second jaw arm to a suturing position extended therefrom toward said first jaw arm;
 - a needle-receiving passageway in the end of said first jaw arm;
 - a supply of suture on said second jaw arm;
 - means on the end of said second jaw arm outward of said needle for gripping a length of suture from said supply across the path of said needle;
 - means operable to disengage said releasable connecting means when said jaw arms have pivoted to a relatively closed position; and means then operable to

restrain further relative movement between said jaw arms;
 means responsive to further pivotal movement of said actuator lever toward said first lever for moving said needle into said suturing position; and
 means on the end of said needle for grasping said length of suture during said movement.

2. The surgical suture application defined by claim 1 wherein:

the end of said needle is bifurcated.
 3. The surgical suture applicator defined by claim 1 including:

a reel carrying said supply of suture rotatably carried on said second jaw arm.

4. The surgical suture applicator defined by claim 3 including:

a magazine containing said reel and said suture gripping means releasably carried on said second jaw arm.

5. The surgical suture applicator defined by claim 1 including:

a clamp slidably carried on said first jaw arm;
 spring means normally biasing said clamp across said passageway;

a camming surface on said clamp engageable by said needle moving into said suturing position to retract said clamp against said spring means; and
 a gripping surface on said clamp to prevent withdrawal of a length of suture carried into said passageway by said needle.

6. The surgical suture applicator defined by claim 1 wherein said releasable connecting means comprises:

a latch member carried on said second jaw arm engaging a surface on said actuator lever to form the connection therewith to transmit said pivotal movement through a predetermined angle toward said first jaw arm.

7. The surgical suture applicator defined by claim 1 wherein said needle moving means comprises:

a pusher rod pivotally connected between said actuator lever and said needle and slidable along said second jaw arm.

8. The surgical suture applicator defined by claim 7 wherein:

said needle is of arcuate configuration, and including:

a complementary, arcuate slideway in the end of said second jaw arm opening toward said needle-receiving passageway.

9. The surgical suture applicator defined by claim 1 wherein:

said suture grasping means comprises a bifurcation at the end of said needle.

10. The surgical suture applicator defined by claim 1 wherein:

said suture gripping means comprises a narrow slot at the end of said second jaw arm extending longitudinally thereof.

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