

- [54] **SURGICAL INSTRUMENTS**
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- [52] U.S. Cl. .... **128/321, 128/2 R**
- [51] Int. Cl. .... **A61b 17/00**
- [58] Field of Search ..... **128/321, 2**

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*Attorney, Agent, or Firm*—Richards & Geir

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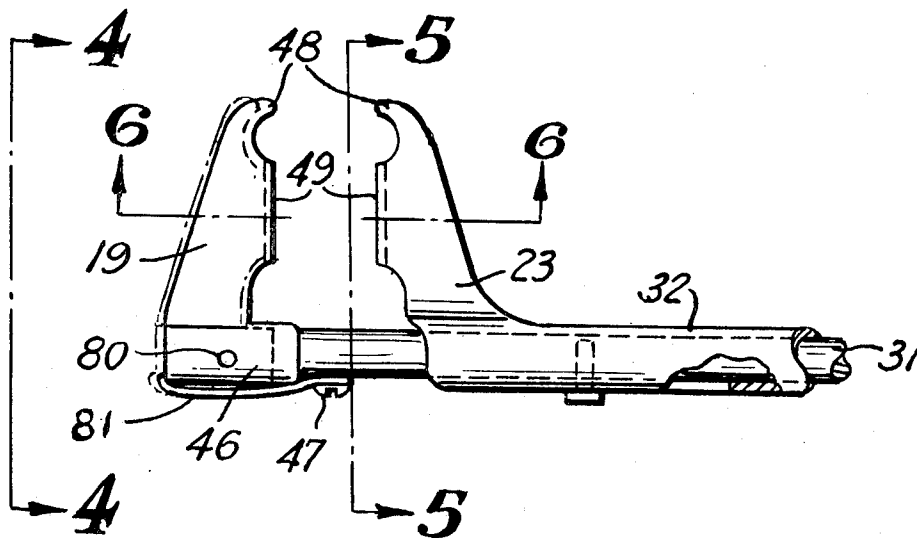
[57] **ABSTRACT**

Surgical instruments, particularly rectal hemo-clip applicators have a handle consisting of two parts which are interconnected pivotally and resiliently. The two handle parts are connected to two elongated members located one within the other and movable relatively to each other when the handle is actuated. The outer ends of the two members have jaws which are movable toward and away from each other to carry out surgical operations.

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**1 Claim, 13 Drawing Figures**



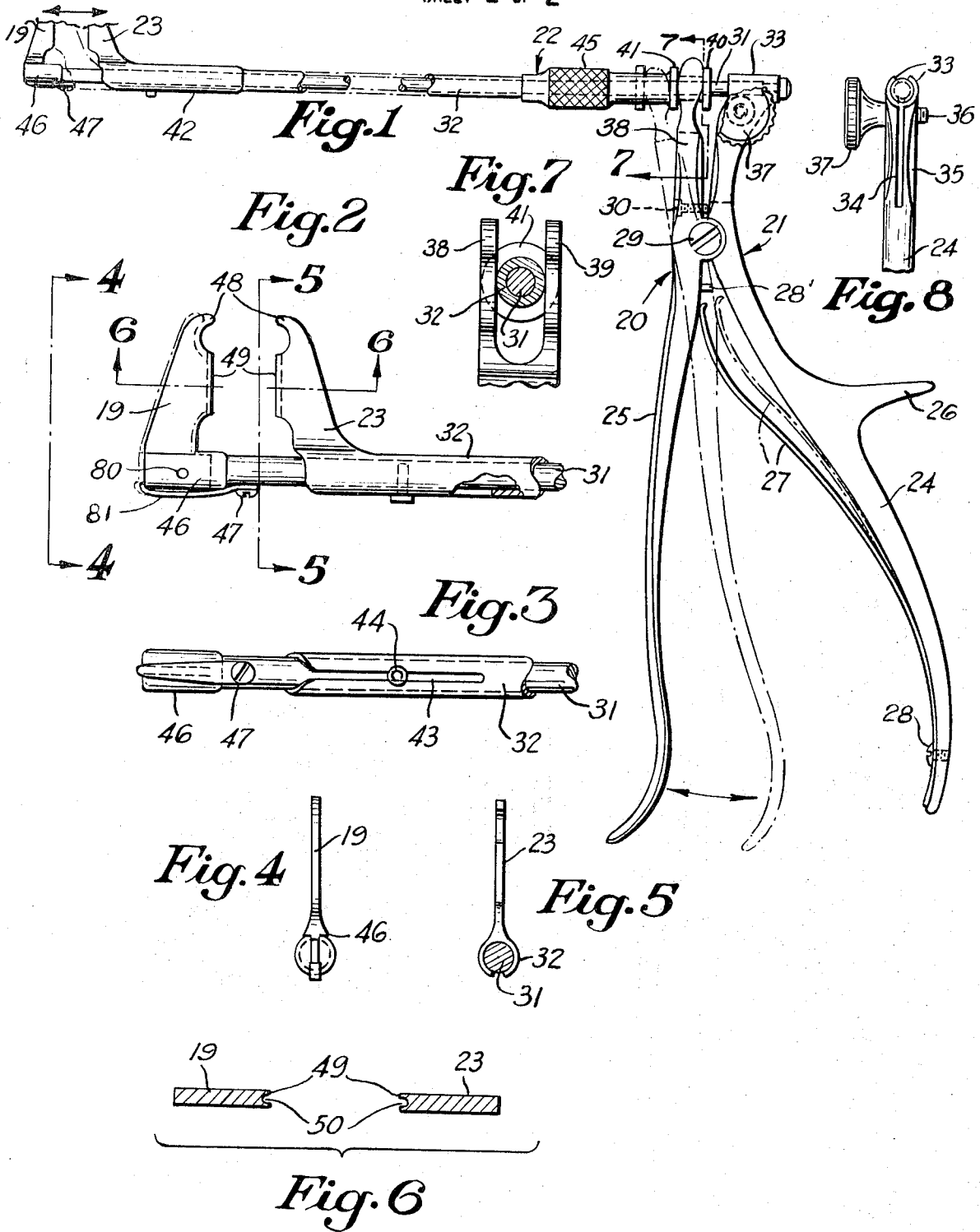


Fig. 9

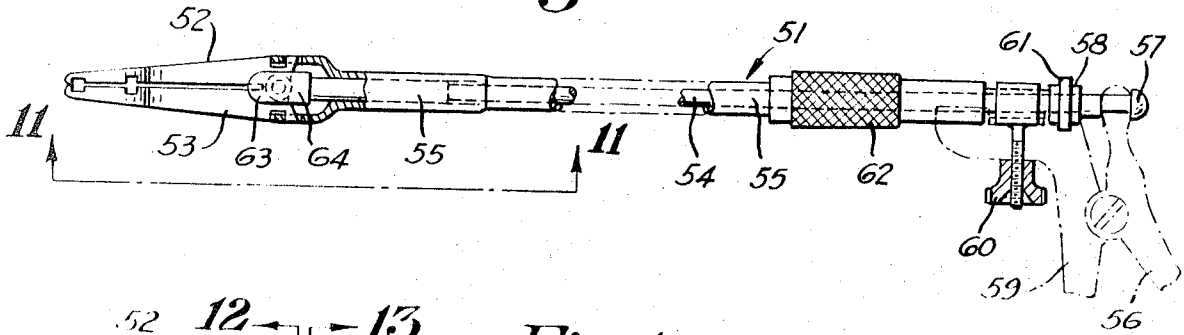


Fig. 10

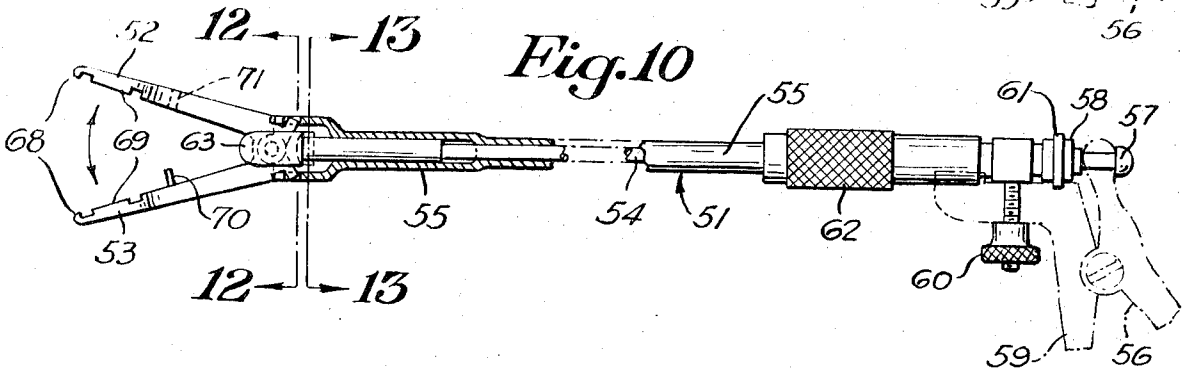


Fig. 11

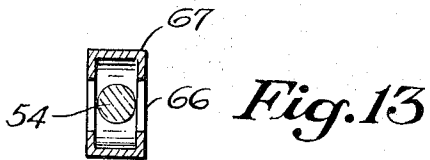
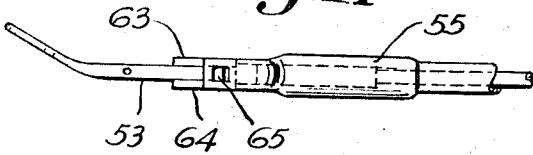
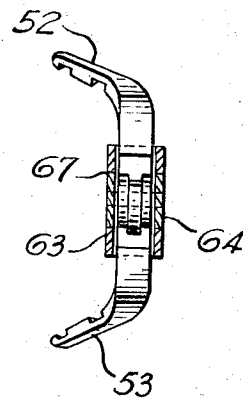


Fig. 12



## SURGICAL INSTRUMENTS

This invention relates to surgical instruments, more particularly hemostatic clip applicators used for strangulation of blood vessels. However, the instruments of the present invention are capable of general uses as surgical forceps or clamps, suturing clip inserters and ligators.

An object of the present invention is the provision of surgical instruments of this type which can be easily and efficiently operated without inconveniencing the operating surgeon and without causing any unnecessary pain to the patient.

Other objects will become apparent in the course of the following specification.

In the accomplishment of the objectives of the present invention it was found desirable to provide a surgical instrument the handle of which consists of two pivotally interconnected parts. A spring located between the parts maintains them in a predetermined relative position. One of the handle parts is connected to one end of a long tube while the other handle part is connected to an end of a long rod located within the tube. The opposite ends of the tube and rod carry the jaws used for surgical purposes.

According to one embodiment of the present invention one jaw is carried by the tube while the other jaw is carried by the rod. The two jaws are located in alignment. A relative movement of the handle parts will move the two jaws toward or away from each other.

According to another embodiment of the present invention the two jaws are arranged scissor-like upon the end of the rod. A movement of the rod relatively to the tube will cause the jaws to open and close like scissors.

The invention will appear more clearly from the following detailed description when taken in connection with the accompanying drawings showing by way of example only, preferred embodiments of the inventive idea.

In the drawings:

FIG. 1 is a side view of a surgical instrument constructed in accordance with the principles of the present invention.

FIG. 2 is an enlarged side view of the part of the instrument carrying the jaws.

FIG. 3 is a bottom view of the part shown in FIG. 2.

FIG. 4 is an end view looking in the direction of the line 4 — 4 of FIG. 2.

FIG. 5 is a section along the line 5 — 5 of FIG. 2.

FIG. 6 is an enlarged section along the line 6 — 6 of FIG. 2.

FIG. 7 is a section along the line 7 — 7 of FIG. 1.

FIG. 8 is an end view of the top part of the instrument shown in FIG. 1.

FIG. 9 is a partial side and sectional view illustrating another instrument of the present invention with jaws in the closed position.

FIG. 10 is similar to FIG. 3 but shows the jaws in the open position.

FIG. 11 is a bottom view along the line 11 — 11 of FIG. 9.

FIG. 12 is an enlarged section along the line 12 — 12 of FIG. 10.

FIG. 13 is an enlarged section along the line 13 — 13 of FIG. 10.

The surgical instrument 20 shown in FIGS. 1 to 8 includes a handle portion 21, a carrier portion 22 and jaws 19 and 23.

The carrier portion 22 in both directions provides the desired position of the jaws.

As best shown in FIGS. 1, 7 and 8 the handle portion 21 has two handle parts 24 and 25 which are suitably curved so that they can be grasped conveniently by the user. For that purpose the outer handle part 24 has an outer projection 26 which may be engaged by a finger. The two parts 24 and 25 are interengaged by a curved spring 27 the width of which is somewhat narrower than that of the handle parts. One end of the spring 27 is firmly attached to the inner bottom end of the handle part 24 by a screw 28. The opposite end of the spring 27 is slightly curved and is freely slidable upon an inner surface of the inner handle part 25.

Thus the spring 27 maintains the handle parts 24 and 25 in an outer position shown in full lines in FIG. 1. However, the user can move the handle part 25 toward the handle part 24 by compressing the spring 27, as indicated by broken lines in FIG. 1. The handle part 25 carries a small pin 28' used as a stop for this inward movement.

The two handle parts 24 and 25 are joined by a large screw pivot 29 extending through curved interengaging portions of both parts. Above the pivot 29 the inner handle part 25 carries a small screw 30 which also serves as a stop and also regulates the size of the opening of the jaws 19 and 23 to correspond with the size and curvature of the hemostatic clips.

The carrier portion 22 includes an inner rod 31 and an outer tube 32 enclosing the rod 31. One end of the rod 31 extending outside the tube is connected to the upper end of the outer handle part 24. As best shown in FIG. 8 this connection includes curved clamps 33 embracing the end of the rod 31 from opposite sides. The upper end of the handle part 24 is divided into two parallel extensions 34 and 35 terminating in the clamps 33. A screw 36 having a round head 37 extends through these extensions 34 and 35 and presses the two clamps 33 against the rod 31.

Due to the provision of the screw head 37 the user can conveniently adjust the position of the rod 31 by rotating the rod 31 to any desired position.

The tube 32 has an end connected with the handle part 25. As shown in FIGS. 1 and 7 to provide this connection the upper end of the handle part 25 has two parallel extensions 38 and 39. The tube 32 has two integral flanges 40 and 41. The flange 40 constitutes the end of the tube 32 and it engages the extensions 38 and 39 from one side. The flange 41 engages the extensions 38 and 39 from the opposite side. Thus the flanges 40 and 41 hold the tube 32 upon the handle part 25.

The tube 32 has a slightly enlarged outer end portion 42 integral with the jaw 23. The bottom of this end portion has an elongated slit 43. A screw 44 extends through this slit and into the rod 31. Due to this arrangement the tube 32 and the rod 31 can be turned jointly. Also this arrangement assures that jaws 19 and 23 will remain in alignment. To facilitate this turning the tube 32 carries a sleeve 45 provided with a roughened outer surface.

The jaw 19 is mounted upon sleeve 46 and is secured thereto by a pivot pin 80. An inner spring 81 engages the jaw 19. The jaw 19 is swingable about the pivot pin 80.

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The two jaws 19 and 23 face each other. Each of the jaws has a hooked end 48 which serve to secure the hemostatic in place until applied and a flat portion 49 provided with a recess 50 which serves to receive hemostatic clip and secure it in place until applied.

The spring and the pivot pin serve to facilitate the entry of the hemostatic clip into the opening between the two jaws and then to secure the hemostatic clip in place until it is applied. For this purpose and by reason of the spring and pivot pin, jaw 19 is movable.

It is apparent that the described surgical instrument can be used most effectively as a hemostatic clip applicator and also for a variety of other surgical needs.

The surgical instrument 51 shown in FIGS. 9 to 13 differs from the one described essentially by the arrangement and actuation of the two jaws 52 and 53. The instrument also includes an inner rod 54 enclosed by an outer tube 55. The inner end of the rod 54 is fixed to the handle portion 56 by a curved end part 57 and a sleeve 58. The inner end of the tube 55 is fixed to the handle portion 59 by a screw 60 extending through a recess provided in the side of the handle portion 59 and also by a sleeve 61 extending into a recess provided in the top of the handle portion. A sleeve 62 having a roughened outer surface is used for turning the tube.

The handle portion 56 carries a screw 82 serving the same purpose as the screw 30.

As shown in FIGS. 9 and 10 the jaws 52 and 53 operate like scissors swinging toward and away from each other when the rod 54 is actuated. For that purpose the end of the rod 54 has a widened portion consisting of two plates 63 and 64. The ends of the jaws 52 and 53 extend between these plates and are pivotally attached to them. These ends have projections 65 fitting into openings 66 provided on the sides of a U-shaped extension 67 constituting a part of the tube 55. This extension 67 is adapted to receive end portions of the plates 63 and 64.

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The jaws 52 and 53 are maintained in their open positions by their projections 65 engaging the sides of the extension 67. When the rod 54 is removed rearwardly, the projections 65 will move into the openings 66 and thus will swing the clips toward each other to maintain them in a closed position.

The shape of the jaws 52 and 53 is substantially similar to that of the above-described jaws 19 and 23, namely, each of the jaws 52 and 53 has a hooked end 68 and a flat portion 69 provided with an inner groove. The jaw 53 also carries a small pin 70 adapted to fit into a corresponding hole 71 provided in the clip 52. This arrangement serves to assure that jaws 52 and 53 close directly against each other when applying hemostatic clip; will not allow jaws to waiver from their alignment.

It is apparent that the jaws 52 and 53 adapted to swing like scissors will be also most effective as hemostatic clip applicators and for many other surgical purposes.

I claim:

1. A surgical instrument, comprising a handle having two handle parts, means pivotally interconnecting said handle parts, a rod having an end connected to one handle part, a tube enclosing a major part of said rod and having an end connected to the other handle part, said rod and said tube moving longitudinally relatively to each other when said handle parts are actuated, and two jaws facing each other and extending in alignment, each jaw having a hooked end directed toward the hooked end of the other jaw and a flat portion with an inner groove, one of said jaws having a sleeve fixed to the opposite end of said rod, the other one of said jaws having a sleeve fixed to the opposite end of said tube and having a longitudinal slit and a screw engaging said slit and extending into said rod.

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