

- [54] **SURGICAL TOOL**
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- [51] Int. Cl. **A61b 17/22, A61m 29/00**
- [58] Field of Search **128/2 B, 242, 243, 244, 128/311, 321, 341, 343, 352, 356; 294/99 R, 116**

[56] **References Cited**

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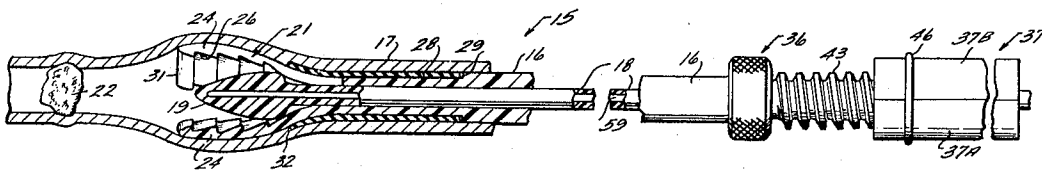
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[57] **ABSTRACT**

A surgical tool which includes a first elongated tubular member of flexible material and a second elongated member slidably mounted therein. Lengthwise extending circumferentially spaced slits are provided in a head end portion of the first elongated member dividing the head end portion into a plurality of jaws. A head on the second elongated member can be retracted between the jaws to cause the jaws to diverge. A resilient band surrounds portions of the jaws remote from the head end of the first elongated member so that when the head is further retracted until the head is inboard of a head end of the resilient band, the resilient band causes the jaws to close.

4 Claims, 9 Drawing Figures



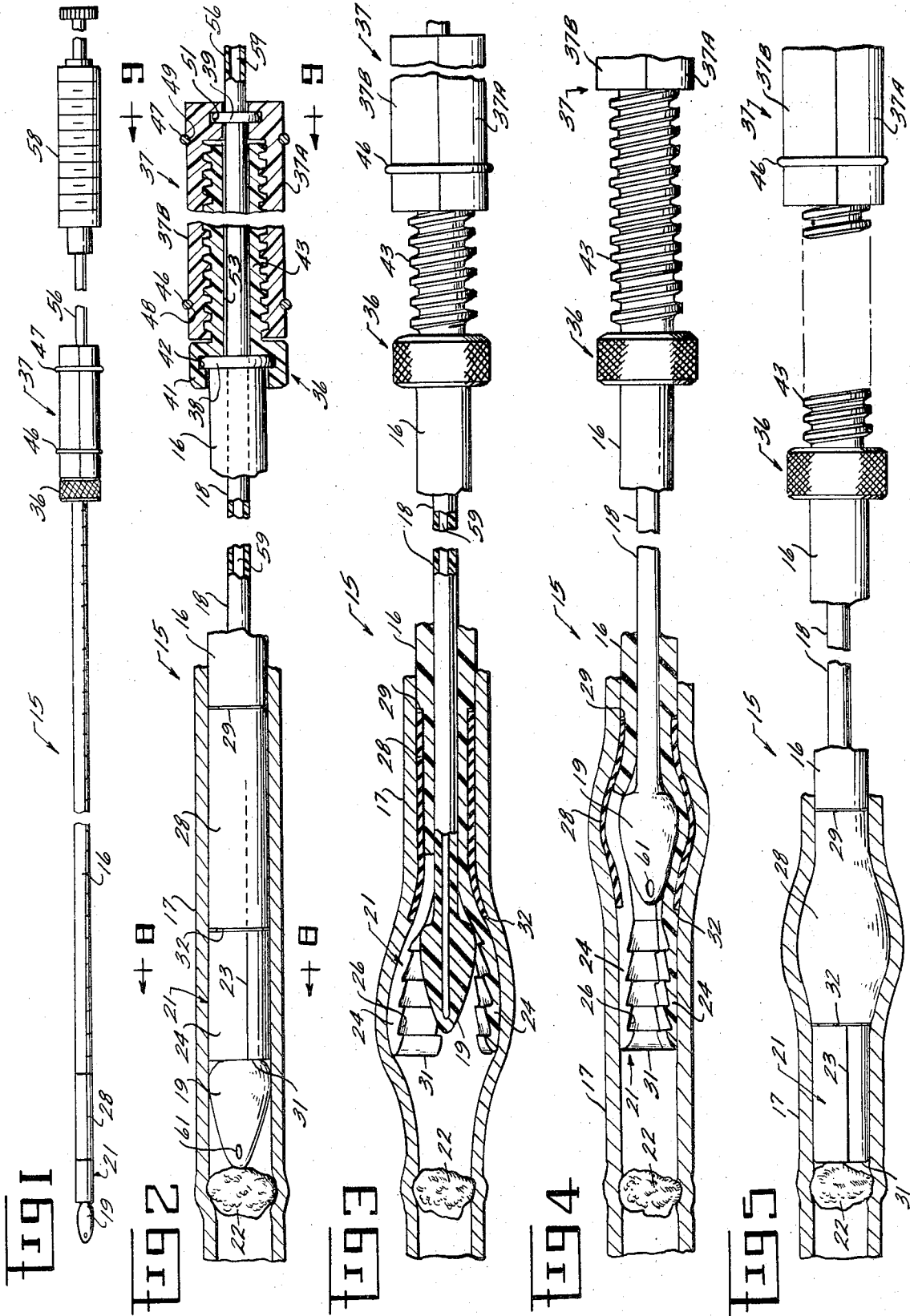


FIG 6

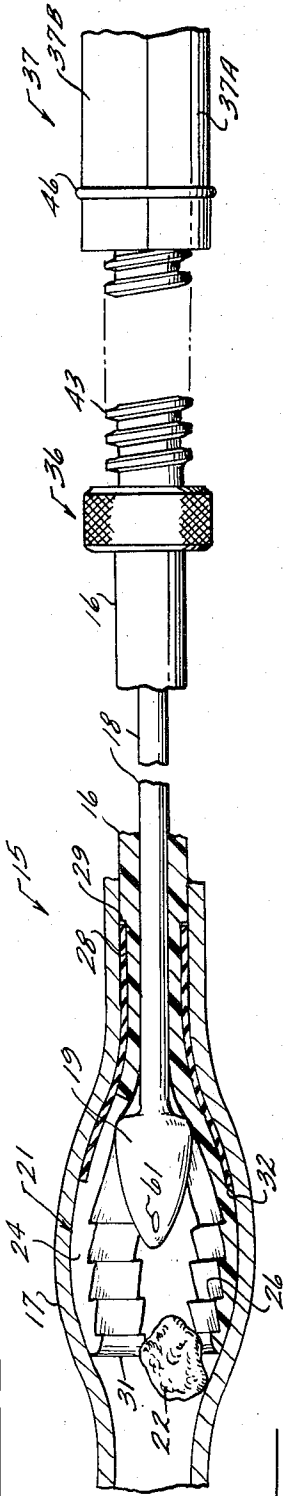


FIG 7

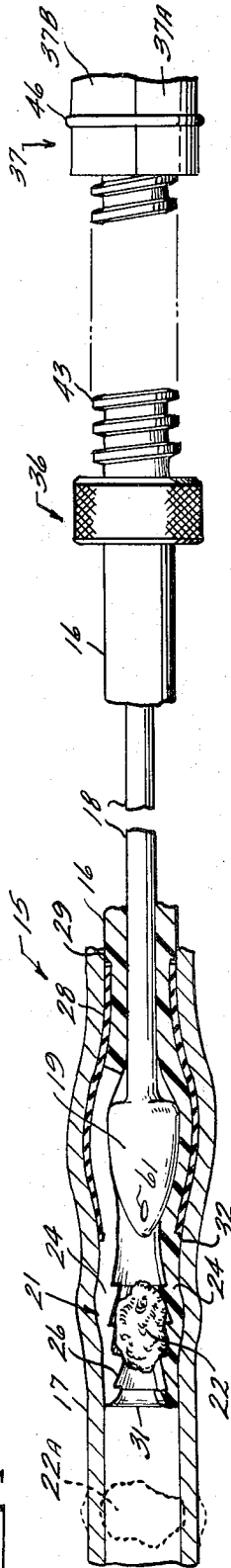
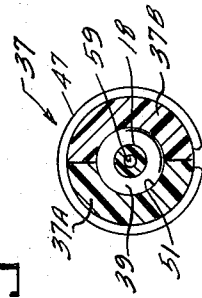


FIG 8



FIG 9



SURGICAL TOOL

This invention relates to surgical tools. More particularly, this invention relates to a surgical tool which can be inserted into a body tube to remove a stone or the like which obstructs the body tube.

An object of this invention is to provide a surgical tool which can be inserted into the ureter to grasp a stone therein.

A further object of this invention is to provide such a device which is of small diameter as it is advanced along the ureter but which includes jaws which can be opened to surround and grasp the stone.

A further object of this invention is to provide such a device through which a liquid can be injected into the ureter.

Briefly, this invention provides a surgical tool which includes an elongated outer tubular sheath which can be inserted into the ureter and an elongated inner tubular member which can slide inside the sheath. A head end portion of the sheath is provided with lengthwise spaced slits which divide the end portion into a plurality of jaws. A head on the elongated member includes a thick portion of greater diameter than the inner diameter of the sheath so that, when the head is retracted into the head end portion of the sheath, the jaws are caused to open. A resilient band surrounds a portion of the slits spaced from the head end of the sheath so that, when the thick portion of the head of the inner tube member is opposite the resilient band but inboard of a portion thereof adjacent the head end, the resilient band causes the jaws to close. Means is provided on the end portions of the sheath and of the elongated member remote from the head ends for causing relative movement thereof. Means is provided for projecting liquid through the elongated member to be discharged through an opening in the head thereof.

The above and other objects and features of the invention will be apparent to those skilled in the art to which this invention pertains from the following detailed description and the drawings, in which:

FIG. 1 is a view in side elevation of a surgical tool constructed in accordance with an embodiment of this invention;

FIG. 2 is a view partly in side elevation and partly in lengthwise section of the device shown in FIG. 1, the device being shown inserted in a ureter, the ureter being shown in section, the device being shown in a first position;

FIG. 3 is a view partly in side elevation and partly in lengthwise section of the device in a second position in the ureter;

FIG. 4 is a view partly in side elevation and partly in lengthwise section of the device in a third position in the ureter;

FIG. 5 is a view partly in side elevation and partly in lengthwise section of the device in a fourth position in the ureter;

FIG. 6 is a view partly in side elevation and partly in lengthwise section showing the device in a fifth position in the ureter;

FIG. 7 is a view partly in side elevation and partly in lengthwise section showing the device in a sixth position in the ureter;

FIG. 8 is a view in section taken on the line 8—8 in FIG. 2; and

FIG. 9 is a view in section taken on the line 9—9 in FIG. 2.

In the following detailed description and the drawings, like reference characters indicate like parts.

In FIGS. 1 and 2 is shown a surgical tool 15 constructed in accordance with an embodiment of this invention. The surgical tool 15 includes an elongated tubular outer member or sheath 16 which can be inserted into a body tube such as a ureter 17, only a section of which is shown in FIG. 2. A second or inner elongated tubular member 18 is slidable lengthwise of and inside the outer tubular member 16. A generally conical tip or head 19 is mounted on a head end of the inner tubular member 18. The base diameter of the head 19 is substantially equal to the outer diameter of the outer tubular member 16 so that, when the tubular members are in the position shown in FIG. 2 with the head 19 of the inner tubular member 18 in front of a head end portion 21 of the outer tubular member 16, the head 19 forms a guide for inserting the tubular members into the ureter 17 so that the tubular members 16 and 18 can be advanced along the ureter until the head 19 is adjacent an obstruction such as a stone 22 in the ureter 17.

The head end portion 21 of the outer tubular member 16 is provided with lengthwise extending slits 23 which divide the head end portion 21 into a plurality of jaws 24 as shown in FIGS. 3 and 8. The inner faces of the jaws 24 are provided with arcuate grooves 26 forming gripping teeth on the interior of the jaws 24. The outer tubular member 16 is formed of flexible material, such as that commonly used in forming catheters and the like, so that, when the head 19 is retracted into the head end portion 21 of the outer tubular member 16, the jaws 24 are caused to diverge as shown in FIG. 3.

A resilient band 28 surrounds a section of the head end portion 21 of the outer tubular member 16. A circumferential slot 29 in the outer tubular member 16 spaced from a tip or head end 31 of the jaws thereof receives the resilient band 28. The resilient band 28 overlies portions of the slits 23 remote from the head end 31 so that, as the head 19 of the inner tubular member 18 is further withdrawn to the FIG. 4 position at which the base of the head 19 is inboard of a head end 32 of the resilient band 28, the jaws 24 are closed by action of the resilient band 28. The resilient band 28 can be formed of rubber or other rubber-like material which resiliently urges the jaws 24 to closed position.

When the jaws 24 have been closed, the tubular members 16 and 18 can be further advanced to the FIG. 5 position to bring the tip end 31 of the jaws 24 adjacent the stone 22. Then the jaws 24 can be opened again by returning the head 19 of the inner tubular member 18 to the FIG. 6 position as the jaws 24 are maneuvered around the stone 22. The jaws 24 distend the ureter 17 sufficiently to permit the stone 22 to enter the jaws 24. Then the head 19 is retracted to the FIG. 7 position at which the base of the head 19 is opposite a portion of the resilient band 28 to permit the resilient band 28 to cause the jaws 24 to close around the stone 22. Then the tubular members 16 and 18 can be withdrawn from the ureter with the stone 22 being held in the jaws 24. In FIG. 7 the position of the stone before removal is indicated in dashed lines at 22A.

End portions of the tubular members 16 and 18 remote from the head end portions are coupled by cou-

pling members 36 and 37 (FIGS. 1 and 2). The remote or distal end portions of the tubular members 16 and 18 are provided with outwardly extending annular flanges 38 and 39 (FIG. 2), respectively. The coupling member 36 includes a head 41 provided with a slot 42 in which the flange 38 is received. The coupling member 36 can be formed of material which is sufficiently resilient to permit the flange 38 to snap into the slot 42. A shank 43 of the coupling member 36 is provided with external threads. The coupling member 37 can be formed of a pair of coupling halves 37A and 37B having internal threads which engage the threads of the shank 43. The coupling halves 37A and 37B are held together in assembled relation by C-shaped spring clips 46 and 47 which are received in circumferential slots 48 and 49, respectively, in the coupling halves 37A and 37B. An annular slot 51 in the coupling halves 37A and 37B receives the annular flange 39 of the inner tubular member 18. The coupling member 36 has a central bore 53 in which a portion of the tubular member 18 is received. An end portion 56 of the tubular member 18 extends beyond the flange 39 and can be attached to a syringe 58 (FIG. 1) from which liquid can be injected along a central bore 59 (FIG. 2) of the inner tubular member 18 to be discharged through an opening 61 in the head 19 into the interior of the ureter 17 adjacent the stone 22. The liquid can be of the type used to assist in X-ray examination or for other purposes or to provide irrigation during stone manipulation.

The coupling members 36 and 37 are rotatably mounted on the outer tubular member 16 and on the inner tubular member 18, respectively. As the coupling members 36 and 37 are turned with relation to each other, the inner tubular member 18 is advanced inside the outer tubular member 16 between the FIG. 2 and FIG. 4 positions.

The surgical tool illustrated in the drawings and described above is subject to structural modification without departing from the spirit and scope of the appended claims.

Having described my invention, what I claim as new and desire to secure by letters patent is:

1. A surgical tool which comprises an elongated tubular sheath of flexible material, an elongated member slidably mounted inside the sheath, there being lengthwise extending circumferentially spaced slits in a head end portion of the sheath extending from a head end of the sheath and dividing the head end portion into a plurality of jaws, a head on the elongated member having a thick portion of greater diameter than the inner diameter of the sheath so that, when the head of the elongated member is retracted between the jaws, the jaws are caused to diverge, and a resilient band surrounding portions of the jaws remote from the head end of the sheath so that, when the head is further retracted until the thick portion of the head is inboard of a head end of the resilient band, the resilient band causes the jaws to close.

2. A surgical tool as in claim 1 wherein there are teeth on the interior faces of the jaws.

3. A surgical tool as in claim 1 wherein there are coupling members rotatably mounted on the sheath and on the elongated member and the coupling members are in threaded relation so that the elongated member is caused to advance along the sheath when the coupling members are relatively rotated.

4. A surgical tool as in claim 1 wherein the elongated member is tubular, there is a discharge opening in the head in communication with the hollow interior of the elongated member, and means is provided for projecting liquid along the interior of the elongated member.

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