

Feb. 13, 1968

A. BÖTTCHER
ENDOSCOPE DEVICE

3,368,552

Filed Nov. 26, 1965

2 Sheets-Sheet 1

FIG. 1

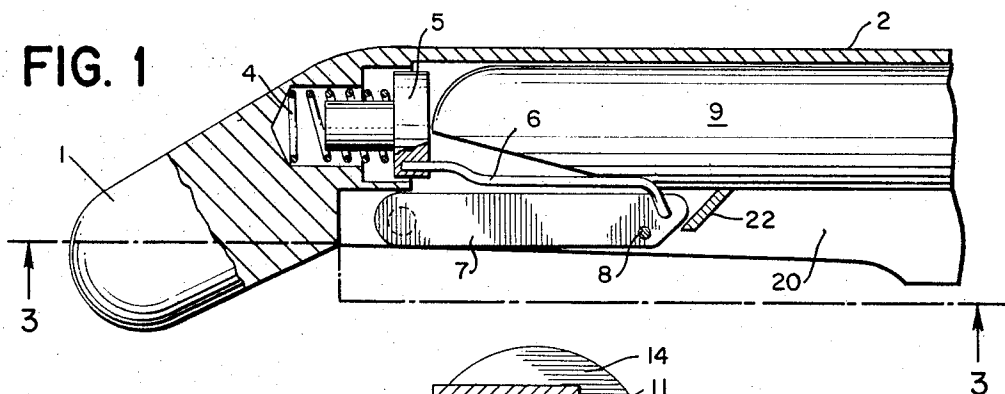


FIG. 2

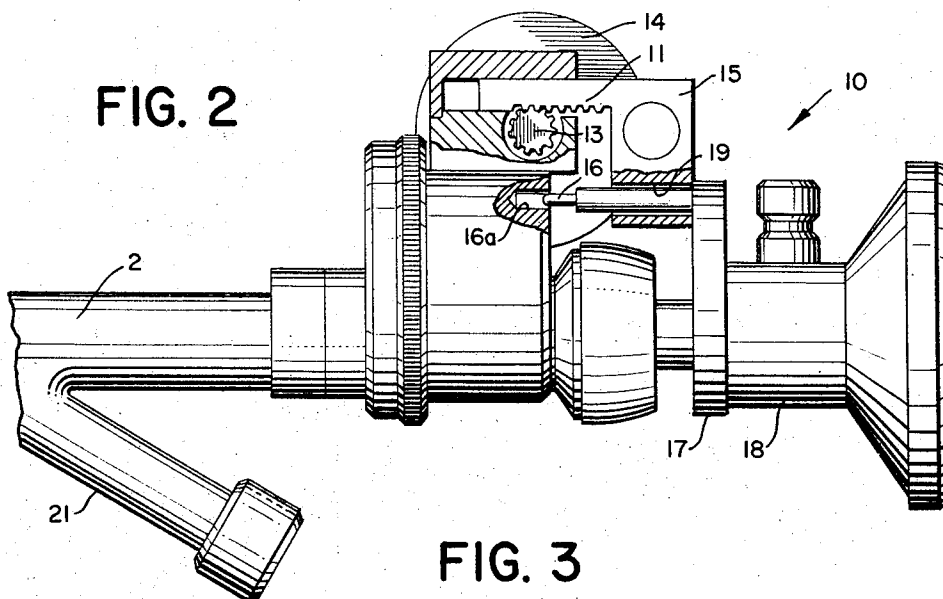


FIG. 3

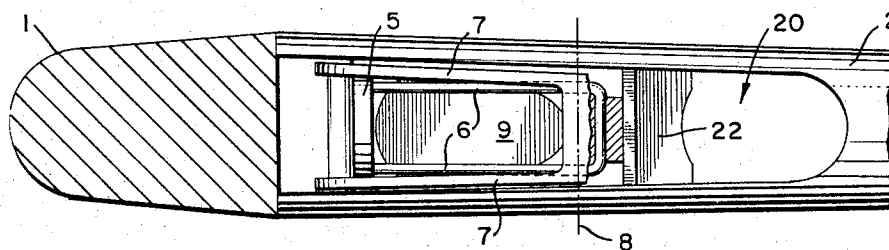
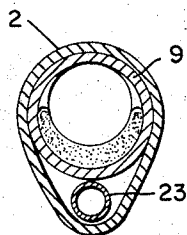


FIG. 4



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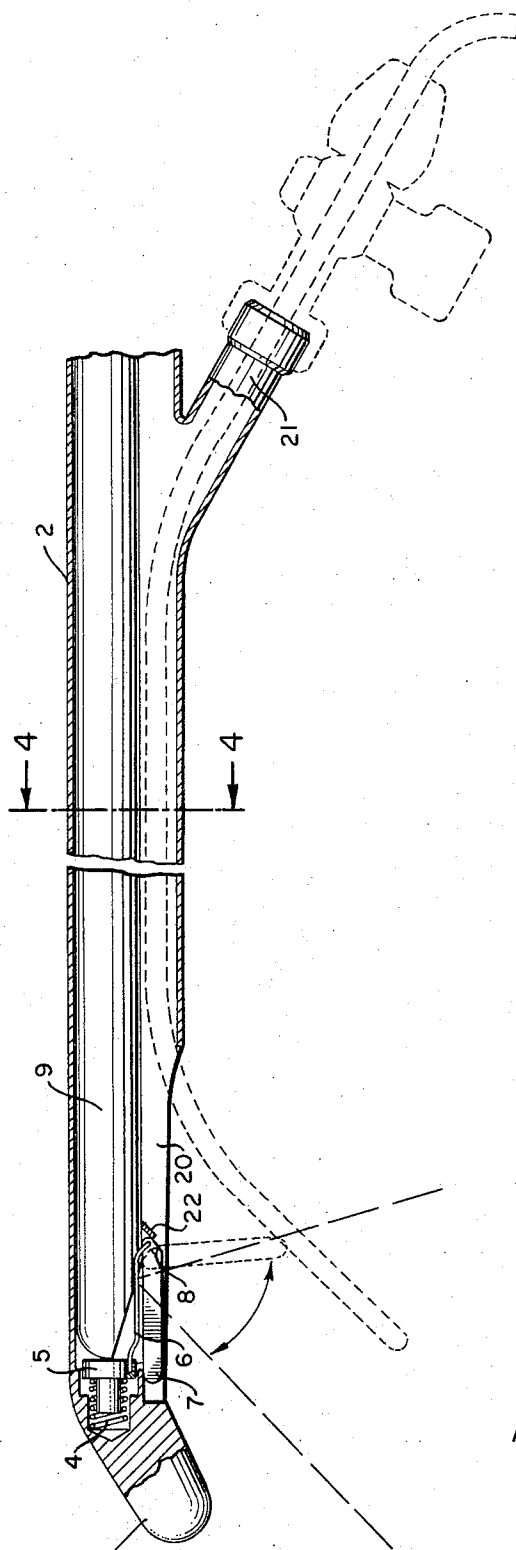
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FIG. 5



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8 Claims. (Cl. 128—4)

The invention relates to an endoscope device in which a lever is arranged for controlling the manipulation of ureteral catheters or flexible instruments used in surgical operations.

An endoscope is known in which the control lever is disposed in a portion thereof closer to the objective of the device and pivotably arranged on a fork-shaped taut wire. Both end portions of the taut wire are secured to a toothed segment which in turn is engaged by a pinion having hand wheels operatively associated therewith. The segment experiences axial displacement upon rotation of the hand wheels resulting in subsequent swiveling of the control lever. The taut wire, in this known endoscope, is guided in conduits disposed within the instrument shaft. The guiding conduits are secured to the inner wall portion of the shaft or to a shaft attachment serving to receive the optical means or directly to the optical conduit itself.

It has been proposed in connection with endoscope devices to replace the guiding conduits by a T-shaped member having a pair of channels therein. The T-shaped member becomes secured, at the wider side thereof, to the shaft in a fashion resulting in a path for the taut wire which runs parallel to the lateral axis of the instrument.

In another known endoscope a wedge-shaped intermediate chamber is formed in a side portion of the shaft, which comprises a pair of integrally connected conduits for receiving the optical means and the operating instruments therein, and a rod connected with the control lever. The rod is manipulated over a toothed segment by means of a spring loaded lever arranged on a portion of the endoscope near the ocular.

The known endoscopes, particularly the ones discussed above, exhibit a disadvantage in that the lever rod, the taut wires and the guiding conduits require extra space in addition to the one assigned to receive the optical means and the operating instrument. This circumstance is necessarily accompanied by a corresponding increase in the over-all cross-sectional area of the device. Furthermore, if need arises to have the field of view illuminated, especially under circumstances requiring high quality illumination and subsequent picture transmission, this illumination can be attained only by improved illuminating devices, such as a glass optical fibre bundle type device, which requires more space than conventional illuminating equipment, while at the same time requiring an additional duct of appropriate size to be left available for other purposes. These requirements will, of necessity, lead to an increase of the cross-sectional area of the device. Serious technical problems must also be solved in connection with the parallel arrangement of the wire guiding conduits on the inner wall of the optical conduit.

Accordingly, an object of the invention is to provide an improved endoscope which eliminates the shortcomings associated with known endoscopes.

A further object of the invention is to provide improved operating means for the control lever of an endoscope device such that a decrease in the operational diameter of the device can be achieved.

In accordance with the invention, an endoscope device comprises an elongated housing, a control lever pivotable between a rest position within said housing and operating positions over an angular distance of at least 90°, such operating positions being located outward of said hous-

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ing, resilient means disposed at one end of the housing, means operatively connecting said resilient means to the control lever, and optical means movably disposed in the housing and abutting with one end thereof against the resilient means. The arrangement is such that optical means when advanced against the force of the resilient means effect rotation of the control lever to one of the operating positions of the control lever.

The resilient means, preferably comprises a compression spring cooperating with a clamping bolt, the control lever being operatively connected to the clamping bolt preferably by a fork-shaped taut wire, such that displacement of the clamping bolt by the advancing optical means causes the control lever to be pivoted to the above mentioned operating positions thereof.

The compression spring is disposed in a stepped recess provided in the front end portion of the endoscope device for laterally guiding the clamping bolt loaded by the spring upon advancement of the optical means abutting the clamping bolt.

In the arrangement in accordance with the invention, a pivoting of the control lever in a direction outward the housing, i.e. toward the operating positions thereof, will impart tension to the taut wire, whereas a pivoting of the control lever back to its rest position is effected by a return of the taut wire from a tension state to a compression state, such return being effected by the compression spring and the associated clamping bolt to which the taut wire is connected.

A pivoting action, as described, is effected by an operating hand wheel which imparts a displacement to the optical means, whereupon the abutting relationship of the optical means and the clamping bolt causes the control lever, upon advancement of the optical means, to follow up by gradual pivoting movement and attain a desired operating position, or gradually return same to its rest position upon a retreat of the optical means followed by the clamping bolt under the effect of the compression spring. Such controlled movement of the lever adapts it for use in the sensitive manipulation of an operating instrument which is guided by the endoscope device.

A device is attached to the ocular end of the housing, for manually effecting an axial displacement of the associated optical means, particularly the objective. The operating device comprises a toothed rack which, through a pinion is coupled to a handwheel and upon rotation of the hand wheel engages a member which in turn is coupled with a catch provided on the optical means. The operating device further comprises a threaded sleeve adjoining the housing and which upon rotation of the hand wheel experiences axial movement and causes the optical means to advance or retreat.

It is to be noted that other arrangements are possible for effecting axial displacement of the objective.

The invention will become more readily apparent from the following description of a preferred embodiment thereof shown, by way of example, in the accompanying drawings, in which:

FIG. 1 is a view, partly in section, showing the front, or objective, end portion of the endoscope device in accordance with the invention, with the control lever in the rest position;

FIG. 2 is a side view of the back, or ocular, end portion of the endoscope device in accordance with the invention, partly in section;

FIG. 3 is a plan view in accordance with FIG. 1, partly in section;

FIG. 4 is a cross-section taken along line 4—4 in FIG. 5; and

FIG. 5 is a view similar to FIG. 3, further illustrating

an inserted catheter and showing the control lever in an operating position.

It is seen in FIGS. 1 and 2 that front portion 1 of the elongated endoscope housing of shaft member 2 has a recess formed therein which serves for the receiving of a compression spring 4 and for the lateral guiding of a clamping bolt 5. A fork-shaped taut wire 6 has both ends thereof secured to the clamping bolt 5, while a middle portion of taut wire 6 is coupled to a control lever 7. Control lever 7 is pivotably supported about an axle 8 which is secured, preferably, by soldering, to wall portions of the endoscope housing or shaft.

At a portion of the endoscope shaft nearest to the end supporting the ocular, there is provided an operating device 10 for effecting axial displacement of objective 9. A pinion 13, coupled to a hand wheel 14, engages through a toothed rack 11, a member 15 which has a bore 19 provided therein. A limiting stud 16 secured, in the preferred embodiment, to a supporting ring 17, cooperates with a recess 16a to limit axial movement of the optic.

Supporting ring 17 is threadably secured to the end portion 18 of the ocular, and passes through a bore 19 of member 15.

During operation of the endoscope device, if it is desired to pivot control lever 7 to an operating position, as shown in FIG. 5, in order to manipulate a catheter 23 guided in conduit 21 and protruding with its front end through a window 20 in the housing, hand wheel 14 should be rotated to impart axial displacement to objective 9.

It is seen in FIG. 5, that during the surgical operation it might be necessary that the catheter or other instrument 23, or any other instrument such as boiling electrodes, cutting hooks, flexible hypodermic needles, looping catheters or different forceps, such as foreign substance forceps, or sampling forceps, should be introduced into conduit 21 of the endoscope shaft which is adapted to be sealed by cock plugs. Such instruments are slid over the optic through conduit 21 within the endoscope shaft.

The catheter 23 assumes, during its protrusion through the shaft window, the position shown in dashed lines in FIG. 5, whereas during normal position, i.e., during a rest position of the control lever 7, the end will be slightly displaced from an axial direction due to its abutment on a deflector 22.

The rotational movement of hand wheel 14 via pinion 13 and member 15, causes the latter to effect axial displacement of objective 9. The objective 9 is forced against clamping bolt 5 which in turn retracts the taut wire 6 toward front portion 1. As a result, control lever 7 coupled to the taut wire 6 will be rotated to the position shown in dashed lines in FIG. 5.

When control lever 7 is pivoted to its operating position, as shown in FIG. 5, it will carry therewith the front portion of catheter 23, or the particular instrument which protrudes from the shaft window 20, to a desired working position. The pivot range of the control lever 7 is such that the front end of catheter 23 appears in the center of the field of view of the optic. Within the pivot range, the control lever may remain in any desired intermediate position without being affected by the pressure exerted thereon by the possible stiffness of the instrument being used, either when such instrument is advanced or being retracted. The force exerted by the optic on the clamping bolt 5 will be released only by turning the hand wheel 14 in the opposite direction than during advancing of the optic, thus permitting the optic 9 to retreat. Compression spring 4, biasing the clamping bolt 5, will be released.

Clamping bolt 5 follows the retracting optic and thereby exerts compression on taut wire 6. Thus the control lever 7, which is connected to the taut wire 6, is pivoted back into its rest position.

Although the invention has been described with respect to a preferred embodiment thereof, it is, however, not

intended that the invention should be limited to such embodiment only, but it should be defined by the scope of the appended claims.

What is claimed is:

1. An endoscope device comprising; an elongated housing having a front portion and a back portion, optical means comprising objective means disposed in said housing and extending substantially to said front portion, ocular means operable with said objective means and being disposed in said back portion, resilient means disposed in said front portion in cooperating relationship with said objective means, means for effecting displacement of said objective means axially of said housing, lever means disposed adjacent said objective means, means for operatively coupling said lever means to said resilient means, said lever means being adapted to be pivoted about an axis from a rest position in said housing to an operating position over a predetermined angular range in response to an axial movement of said objective means, the arrangement being such that the free end of said lever means is disposed outwardly of said housing during said operating positions thereof, wherein said housing and said objective means therein define a duct therebetween substantially at one side of said objective means, said duct being adapted to guide therethrough an operating instrument to a position adjacent said lever means.

2. An endoscope device as claimed in claim 1, wherein said front portion has formed therein a recess for receiving therein said resilient means, said resilient means comprising a compression spring.

3. An endoscope device as claimed in claim 2, wherein said coupling means comprises a taut wire and a bolt interposed between said compression spring and said objective means, said taut wire being secured to said lever means and to said bolt.

4. An endoscope device as claimed in claim 3, wherein said taut wire is in compression at said rest position of said lever means and in tension at said operating position of said lever means.

5. An endoscope device as claimed in claim 1, wherein said displacement effecting means are manually operable and are coupled to said optical means at said back portion of said endoscope device.

6. An endoscope device as claimed in claim 5, wherein said displacement effecting means comprise hand wheel means, pinion means rotatably coupled to said hand wheel means, and a member operatively engaging said pinion means and being separably coupled to said optical means for translating the rotary motion of said hand wheel means and said pinion means into displacement of said objective means axially of said housing.

7. An endoscope device as claimed in claim 1, wherein said housing comprises an aperture disposed adjacent said lever means for permitting in and out movement of said lever means from said housing through said aperture.

8. An endoscope device as claimed in claim 7 including an operating instrument inserted into operational position in said duct, the arrangement being such that an end of said operating instrument appears in the center of the field of view of said optical means when adjacent said lever means.

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