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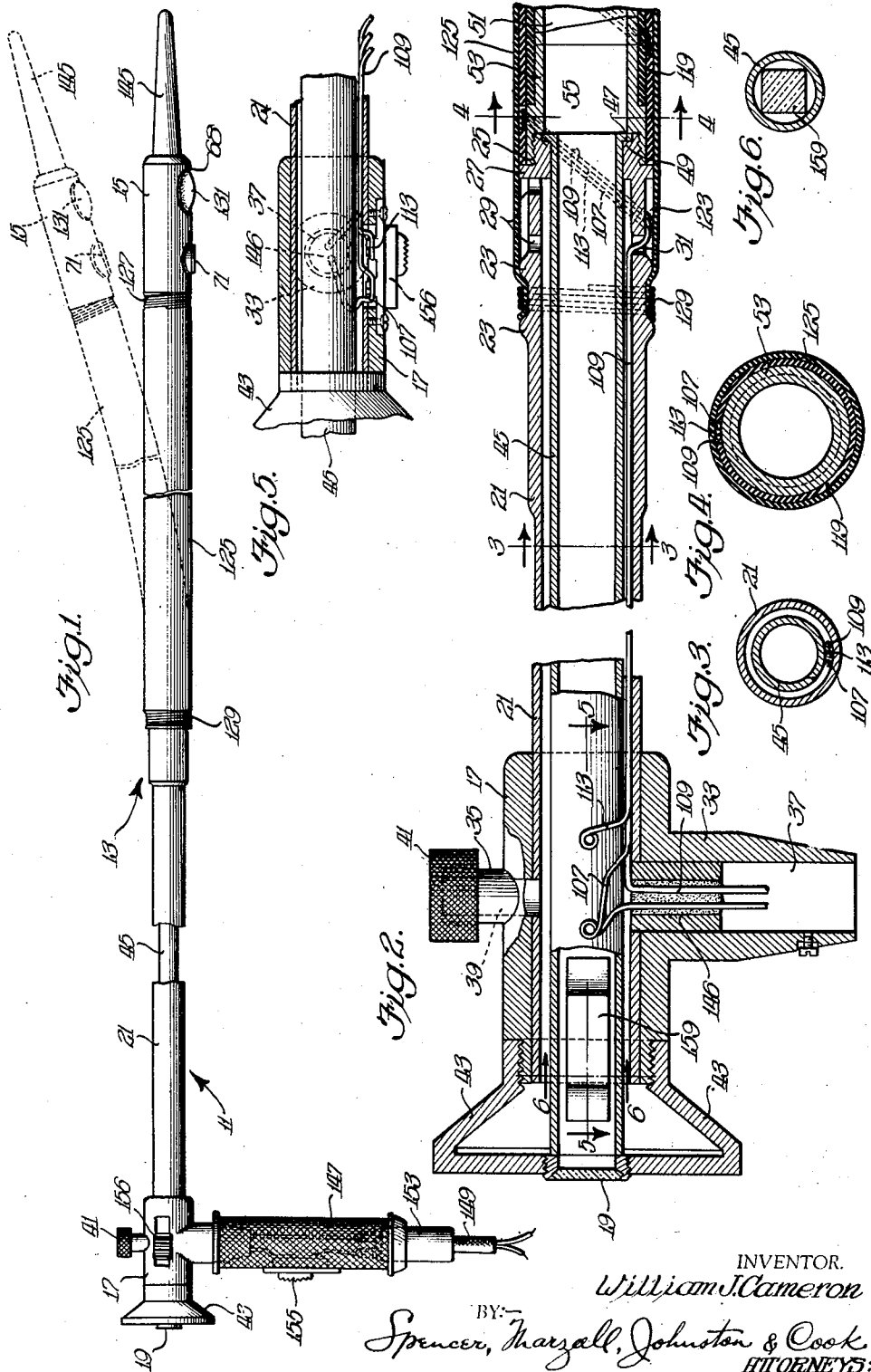
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2,325,831

CAVITY INSPECTION DEVICE

Filed Dec. 11, 1941

2 Sheets-Sheet 1



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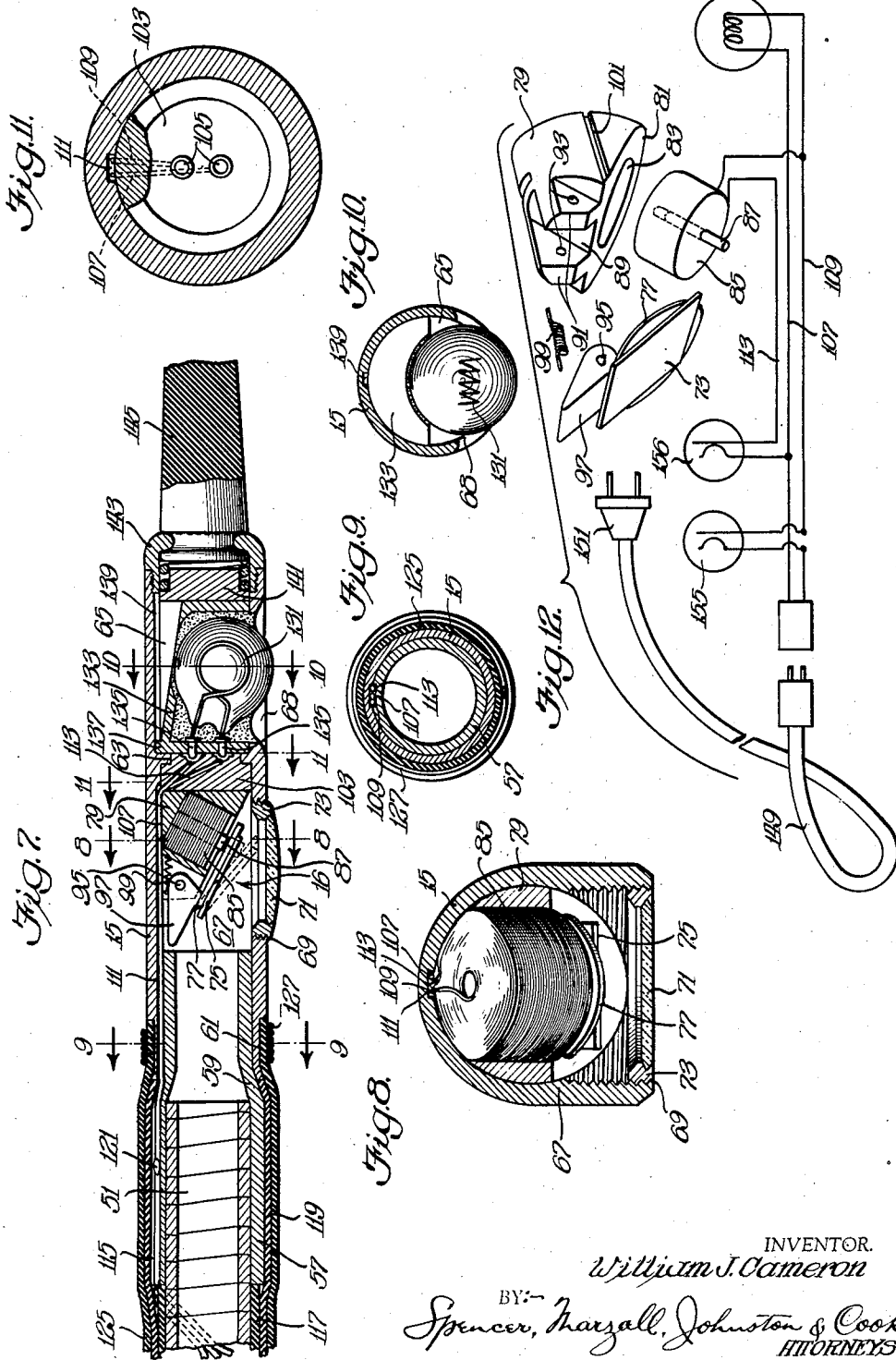
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2 Sheets-Sheet 2



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UNITED STATES PATENT OFFICE

2,325,831

CAVITY INSPECTION DEVICE

William J. Cameron, Chicago, Ill.

Application December 11, 1941, Serial No. 422,532

11 Claims. (Cl. 128—7)

My present invention relates in general to instruments for internal inspection of inaccessible cavities, such as the stomach and other body cavities, and has more particular reference to instruments generally classified as scopes, including gastroscopes, cystoscopes, thorascopes, peritoneoscopes, endoscopes, and like instruments comprising tubular means usually formed with a flexible portion for insertion in a cavity to be inspected, as through a restricted, frequently tortuous channel leading to the cavity, the inspection tube having usually a lamp and a view transmitter at the insertion end of the instrument, view transmitting lenses within and spaced along the tube, and an ocular or eye piece at the other end, whereby the interior of the cavity being inspected may be illuminated and a view thereof transmitted through the tube of the scope for inspection at the ocular end of the device outwardly of the cavity.

An important object of the invention is to provide inspection means, in a scope of the character mentioned, affording a relatively wide inspection field; a further object being to provide adjustable inspection means enabling cavity inspection in a plurality of directions without moving the scope from an adjusted position within the cavity being inspected.

Another important object is to provide a scope of the character mentioned having an adjustable view transmitting member in combination with means for shifting the view transmitting member in order to allow the device to transmit different views or aspects of the cavity being examined without altering the position of the instrument within the cavity; a further object being to utilize a tiltable mirror for thus transmitting a plurality of views; a still further object being to employ a solenoid of minute proportions, controllable from the ocular end of the instrument, for adjusting the position of the mirror.

Another important object is to provide a scope having shiftable inspection means, at the distal or insertion end thereof, in combination with a solenoid and a mounting for the solenoid compactly formed for assembly in the extremely restricted space available at the distal end of the instrument; a further object being to mount the solenoid in a frame of magnetic material and to mount the shiftable inspection means on an armature tiltably supported on the solenoid mounting; a further object being to employ a spring normally urging the armature in one direction and to provide means for energizing the solenoid to tilt the armature in the opposite direction for ad-

justing the inspection means; a still further object being to utilize the tubular walls of the instrument as a stop for limiting movement of the armature in one direction, the armature mounting serving to limit armature movement in the opposite direction.

Another object is to provide conductors within and extending along the tubular instrument from between the ocular and insertion ends thereof for actuating the lamp and the solenoid, portions of said conductors extending in longitudinal grooves formed in the tubular member and said conductors being disposed helically at the flexible portions of the instrument; a further object being to arrange the helical conductor portions in a helical groove between abutting edges of an insulation strip forming a part of the instrument at the flexible portions thereof.

Another important object is to form the insertion end of the instrument as a rigid casing secured at the end of a flexible tubular portion of the instrument and to mount the lamp and adjustable inspection means in the rigid casing; a further object being to mount the lamp removably at the end of the casing and to hold the same in place by means of a removable cap, thereby facilitating lamp replacement.

Another important object is to mount the adjustable view transmitting means in the end housing as a unit to facilitate removal thereof for repair and replacement by making the housing removable from the flexible portions of the instrument.

A further object resides in the arrangement of electrical conductors in the end housing in a fashion occupying minimum space therein and facilitating the making of electrical connections with the solenoid and the lamp.

Another important object resides in utilizing three conductors for controlling the lamp and solenoid from the ocular end of the instrument, whereby the lamp may be selectively energized independently of the solenoid.

These and numerous other objects, advantages and inherent functions of the invention will become apparent as the same is more fully understood from the following description which, taken in connection with the accompanying drawings, discloses a preferred embodiment of the invention.

Referring to the drawings:

Figure 1 is a perspective view of a scope embodying my present invention;

Figure 2 is an enlarged sectional view through

the ocular end of the instrument shown in Figure 1;

Figures 3, 4, 5 and 6 are sectional views taken substantially along the lines 3—3, 4—4, 5—5 and 6—6 in Figure 2;

Figure 7 is an enlarged sectional view taken through the insertion end of the instrument shown in Figure 1;

Figures 8, 9, 10 and 11 are sectional views taken substantially along the lines 8—8, 9—9, 10—10 and 11—11 in Figure 7; and

Figure 12 is a diagrammatic view of electrical connections.

To illustrate the invention, I have shown on the drawings a gastroscope 11, which is an instrument particularly designed for the internal inspection of the stomach by insertion through the orifice of the throat. It will be apparent, however, that the invention is not necessarily restricted to the instrument I have shown but may be applied in any scope, including cystoscopes, thorascopes, peritoneoscopes, endoscopes, and like instruments for the inspection of inaccessible cavities, including cavities other than body cavities.

The inspection instrument 11 comprises a tubular structure 13 having a housing 15 at one end, usually referred to as the distal end, adapted for insertion in a cavity to be inspected, and a housing 17 at the other end of the tubular structure, said housing 17 embodying a window or ocular 19 at which the view obtained of the cavity is presented for inspection. The housing 15 contains view transmitting means indicated generally at 16, the same preferably comprising a mirror for reflecting the view longitudinally into the tubular structure 13, which preferably comprises a flexible portion adjacent the housing 15 and a relatively rigid portion adjacent the housing 17. The tubular structure 13 contains suitable lens means disposed at intervals within the flexible portion for directing the view transmitted by the mirror along said flexible portion and through the rigid portion to the ocular end of the instrument, regardless of the flexed position of the instrument.

The tubular structure 13 comprises a preferably rigid jacketing tube 21 formed with spaced annular ridges 23 near one end of the tube, said end being threaded as at 25 and formed with a flange 27 and having perforations 29 and 31 there-through adjacent the flange 27. The other end of the tube 21 carries, sealed thereto, a sleeve-like fitting forming the housing 17, said fitting having radial nipples 33 and 35 formed, respectively, with channels 37 and 39 communicating with the interior of the tube 21, the nipple 35 being normally sealed by means of a removable cap 41. The ocular end of the housing 17 carries a cap 43 threadedly secured thereto, said cap carrying the ocular window 19 in axial alignment with the end of the tube 21. Centrally within the tube 21 is disposed an inner tube 45. This tube has an end abutting the cap 43 around the window 19, which is thus mounted at said end of and in alignment with the inner tube 45. The opposite end of the tube 45 is secured in coaxial alignment with the outer tube 21 by means of a flange 47 on the tube 45 which engages an annular seat 49 in the threaded end of the tube 21.

The tubular structure 13 comprises a flexible portion 51 which may conveniently be formed of a helically wound strip of spring metal adapted to bend with relative ease, yet normally biased to maintain itself in straight condition by the in-

herent resilience of the material. One end of the flexible tube 51 is secured, as by soldering or brazing, to one end of a ferrule 53, the opposite end of which is threaded for coupling with the threaded end 25 of the tube 21, the ferrule 53 having an annular shoulder 55 adapted to overlie the flange 47 of the inner tube 45 in order to securely hold the same in place on the seat 49. The other end of the flexible tube 51 is secured, as by brazing, soldering or otherwise, in a ferrule 57 which carries the housing 15 at the distal end of the instrument. The housing 15, as shown in Figure 7 of the drawings, is preferably cylindrical and is formed preferably in one piece, although, of course, it may be fabricated in sections for convenient assembly. The housing, at one end, is formed to fit snugly upon the ferrule 57, the ferrule having a shoulder 59 for determining the mounted position of the housing thereon. The housing also, at its ferrule receiving end, is provided with an annular groove 61.

The housing 15 preferably has an internal annular flange 63 defining a lamp chamber 65 and an inspection chamber 67 within the housing on opposite sides of the flange 63, the inspection chamber 67 being at the ferrule mounted end of the housing, the lamp chamber 65 opening at the ferrule remote end of the housing. The sides of the housing are formed with a lamp opening 68 and a window opening 69 formed, respectively, in the walls defining the chambers 65 and 67. The window opening 69 is fitted with a transparent window-pane 71 which may be mounted in a collar 73 having threaded engagement in the window opening 69, although the window-pane 71, of course, may be fitted and secured in the opening 69 in any suitable or preferred fashion.

Within the chamber 67 is mounted adjustable view transmitting means which, as shown, comprises a mirror 75 which is supported on an armature 77, the armature, in turn, being pivotally mounted in a support frame or mounting 79. The mounting 79 comprises a block of magnetic material formed to fit snugly within the chamber 67 and, to that end, has cylindrical surfaces in conformity with the cylindrical walls of the chamber 67. The mounting 79 is formed with an inclined surface 81 facing toward the window 71 and has a cylindrical cavity 83 opening on said surface for the reception of a solenoid 85. The solenoid 85 comprises wire of extremely fine gauge wound in a coil forming a central cylindrical opening adapted to receive a solenoid stem 87. The coil and stem are mounted in the cavity 83 with one end of the solenoid coil 85 substantially flush with the inclined surface 81. The mounting 79 is cut away to form a notch 89 between spaced ears 91 in which pintles 93 are set in alignment on the opposite sides of the notch 89. The facing ends of the pintles 93 are formed with bearing sockets in position to receive bearing pins 95 extending oppositely from an armature head 97. When mounted, the head 97 extends between the ears 91, with the pins 95 received in the bearing sockets formed at the facing ends of the pintles 93. When so mounted, the armature 77 overlies the mounting surface 81, covers the end of the solenoid and carries the mirror 75 in position facing toward the window 71. The armature 77 is normally urged in its bearings toward the surface 81 of the mounting by a spring 99, one end of which is secured, as by soldering, upon the mounting 79, the other end of the spring being attached to the armature head 97 in any suitable fashion, as by anchoring

it on a pin in the head or by soldering. The mirror thus is normally presented at an inclination, as shown in solid lines in Figure 7, under the influence of the spring 99. By energizing the solenoid, however, the stem 87 may be projected from within the coil 85 in a direction to shift the mirror from its normal position to a tilted position shown in dotted lines in Figure 7, the tilted dotted line position being determined by the engagement of the armature head 97 with the walls of the housing 15.

The mounting 79, carrying the solenoid and armature, may be assembled in the chamber 67 before the housing 15 is mounted on the ferrule 57 by inserting the mounting endwise into the chamber 67 through the open end of the housing. In order to orient the mounting in the housing, the mounting may be provided with a longitudinal groove 101 to slidably receive a pin set in the wall of the chamber 67, and the mounting 79 may be held in place by any suitable fastening means as, for example, a screw extending through the wall of the housing and taking into the mounting. The back of the mounting 79 is supported by the flange 63 and may rest against a connection disk 103 held in the chamber 67 upon the flange 63 by the mounting 79. This connection panel preferably comprises a non-conducting material and carries a pair of contacts 105 at the surface thereof facing into the lamp chamber 56 through the opening defined by the annular flange 63. The contacts 105 are connected with conductors 107 and 109 which extend through the disk 103 and into a groove 111 formed in the inner walls of the chamber 67 and extending to the open ferrule supported end of the housing. The solenoid coil is connected at one end to the conductor 109 and at the other with a conductor 113 which extends in the groove 111 together with the conductors 107 and 109.

After the disk 103 and mounting 79, with solenoid and armature assembled thereon, have been positioned and secured in the chamber 67, with the conductors 107, 109 and 113 lying in the groove 111, the housing may be inserted upon the end of the ferrule 57. The ferrule and housing may be formed with co-operating tongue and slot to determine the relative angular position of the housing on the ferrule, and the ferrule also, outwardly of the housing, may be formed with a groove 115 in its outer surfaces for the reception of the electrical conductors.

The flexible portion 51 of the tubular structure between the ferrules 53 and 57 is preferably enclosed in a rubber sheath 117 which embraces the member 51 between the ferrules. Outwardly of the rubber sheath 117 is applied a strip of rubber-like material 119 which is wound in helical turns upon the flexible portion of the tube structure, the opposite ends of the strip 119 being wrapped upon the ferrules 53 and 57 and secured thereto, as by means of rubber cement. The abutting edges of the helically wrapped strip 119 are separated sufficiently to provide space for three electrical conductor wires which extend in the groove 115 at one end of the flexible tube structure and are connected, respectively, with the conductors 107, 109 and 113, as at 121, preferably in the groove 115. At the other end of the flexible tube structure, the conductors are connected, as at 123, with corresponding conductors which extend through the opening 31 and into the tube 21, passing thence into the housing 17 at the ocular end of the instrument. The flexible layer comprising the helically wound strip

119 and the conductors applied between abutting edges thereof may be given a coating of rubber cement, and an elastic outer sheath of rubber 125 is applied upon the flexible portion of the tube structure. One end of this sheath or casing 125 extends in the groove 61 of the housing 15 and may be secured and sealingly connected on the housing by binding the same in place with a suitable fastening filament 127. The other end of the sheath 125 extends around the end of the tube 21 and may be sealingly secured thereto between the spaced ridges 23 by means of a filamentary binding 129.

The lamp chamber 65 opens at the end of the housing 15 and is adapted to receive a lamp 131 which may be supported in the chamber in any suitable or preferred fashion. As shown, the lamp 131 is mounted in a holder or frame 133, which supports a pair of terminals 135 in position to engage the contacts 105 when the holder and the lamp are positioned in the chamber 65. The opposite ends of the filament of the lamp are electrically connected with the terminals 135, whereby the filament is connected between the conductors 107 and 109 when the lamp is mounted in the chamber 65.

The frame 133, at one end, may be formed to fit snugly within the chamber 65 and may have a lug 137 adapted for sliding reception in a groove 139 formed in the walls of the chamber 65 to orient and guide the lamp support within the chamber 65 in order to assure registration of the terminals 135 with the contacts 105. The lamp 131 may be secured in the frame 133 by setting the lamp in a bed of plaster of Paris, or other suitable material, in the frame. The frame and lamp may be held rigidly in the chamber 65 by means of a plate 141 yieldingly secured in a cover cap 143 formed for threaded engagement with the end of the casing. The cap 143 carries a finger 145 of soft, flexible rubber for aiding in guiding the instrument into a cavity to be examined. This finger has a base clampingly received in an opening in the cover cap and is thus held in place in axial alignment on the end of the instrument. When mounted, the lamp 131 extends in the opening 68, and the edges of the opening around the lamp are preferably sealed with plaster of Paris, or other cementitious material, to render the opening liquid-tight. In order to facilitate the insertion and removal of the lamp, the frame 133 may be formed to permit the same to be tilted within the chamber 65 in order to allow the lamp to project substantially into the opening 68 and to permit removal of the lamp from such projected position through the opening at the end of the chamber 65 upon removal of the cover cap 143.

In order to control the operation of the lamp 131 and of the solenoid 85 at the ocular end of the instrument, the conductors pass from the housing 17 through the channel 37 of the nipple 33, which is preferably hermetically sealed around the conductors, as at 146. The conductors pass from the nipple into a handle 147, which is secured at one end on said nipple. The other end of the handle provides a socket for an electric cable 149 embodying two conductors for supplying electrical energy to the instrument. This cable 149 may be provided at one end with a connector 151 for connecting the cable to a suitable source of electrical power, such as the outlet socket of a house wiring system. The other end of the cable may be fitted with a connector 153 to enable the same to be connected in the socket

of the handle and thus electrically connected with the conductors 107 and 109 leading through the instrument from the ocular end thereof to the lamp 131. The handle 147 carries a switch 155 conveniently located thereon for operation, and this switch, as shown in Figure 11, may be connected in the conductor 109 and thus control the lamp and the solenoid, the lamp being energized whenever the switch 155 is closed.

For the control of the solenoid, a switch 155 may be connected between the conductors 107 and 113, and the switch 156 preferably is mounted on the housing 17 in position for convenient operation. The solenoid may comprise varnished copper wire, as the potential between adjacent turns of the coil is relatively small. The conductors for supplying energy to the solenoid and lamp preferably comprise copper wire insulated by a thin sheath of silk and varnish of sufficient dielectric strength to insulate the conductors one from the other and from the metal portions of the instrument.

It will be noted that the capped nipple 35 communicates through the interior of the tube 21 with the interior of the expansible sheath 125 through the openings 29. By applying a pressure device to the nipple 35, the expansible sheath 125 may be inflated around the flexible portions of the tube structure to facilitate the insertion and removal of the instrument through restricted channels, such as the esophagus. After the device has been inserted into a cavity to be inspected, the lamp 131 may be energized by closing the switch 155. Thereupon, inspection of a portion of the cavity may be accomplished by looking through the window 19 with the mirror in the position shown in solid lines in Figure 7. In such position, a view may be had of a localized section within the cavity being examined. By closing the switch 155, the solenoid 85 may be energized to throw the mirror into the shifted position illustrated in dotted lines in Figure 7, in which position a view of a different portion of the cavity being examined may be had. The displacement of the mirror may be made such that immediately adjacent areas may be viewed at the window 19 by operating the switch 156 and without shifting the position of the instrument in the cavity being examined.

The view transmitted by the reflecting mirror 75 will be inverted, and in order to rectify the inversion, I mount a rectifying lens 159 in the ocular end of the tube 45 adjacent the window 19.

It is thought that the invention and its numerous attendant advantages will be fully understood from the foregoing description, and it is obvious that numerous changes may be made in the form, construction and arrangement of the several parts without departing from the spirit or scope of the invention, or sacrificing any of its attendant advantages, the form herein disclosed being a preferred embodiment for the purpose of illustrating the invention.

The invention is hereby claimed as follows:

1. An instrument for cavity inspection, comprising tubular means having a flexible portion, a distal end comprising a housing for placement in a cavity to be inspected, and an ocular end having an eye-piece, a view transmitting member in said housing in position to receive a view within a field radially of the housing and to transmit the view longitudinally of the instrument to said eye-piece, and operable means for shifting the said transmitting member in said housing where-

by to alter the field of view of the transmitting member.

2. An instrument for cavity inspection, comprising tubular means having a flexible portion, a distal end comprising a housing for placement in a cavity to be inspected, an ocular end having an eye-piece, a view transmitting member in said housing in position to receive a view within a field radially of the housing and to transmit the view longitudinally of the instrument to said eye-piece, and operable means for shifting the said transmitting member in said housing whereby to alter the field of view of the transmitting member, said operable means comprising an electro-magnetic device and electrical circuit means for controlling the operation thereof, comprising conductors extending in the instrument between its ocular and distal ends and electrically connected with said electro-magnetic means, and switch means at the ocular end of the instrument and electrically connected in said circuit means for controlling the operation of said electro-magnetic means.

3. An instrument for cavity inspection, comprising tubular means having a flexible portion, a distal end comprising a housing for placement in a cavity to be inspected, an ocular end having an eye-piece, a view transmitting member in said housing in position to receive a view within a field radially of the housing and to transmit the view longitudinally of the instrument to said eye-piece, and operable means for shifting the said transmitting member in said housing whereby to alter the field of view of the transmitting member, said housing comprising a sleeve-like member removably mounted at and forming a chamber opening into the end of said tubular means, said chamber having a lateral window opening, said view transmitting member and said operable means forming an assembly unit mounted in said chamber and comprising a mounting forming a solenoid shell having a coil cavity and a face forming an armature seat facing said window opening, a solenoid coil in said cavity, an armature tiltably supported on said mounting in normal position overlying said armature seat and carrying the view transmitting member thereon in position normally to receive a view in a limited field through said window and to transmit the view longitudinally into the end of the tubular means, and means to energize the solenoid coil to tilt the armature from normal to shifted position and thus alter the field of view of the transmitting member.

4. An instrument for cavity inspection, comprising tubular means having a flexible portion, a distal end comprising a housing for placement in a cavity to be inspected, an ocular end having an eye-piece, a view transmitting member in said housing in position to receive a view within a field radially of the housing and to transmit the view longitudinally of the instrument to said eye-piece, and operable means for shifting the said transmitting member in said housing whereby to alter the field of view of the transmitting member, said housing comprising a sleeve-like member removably mounted at and forming a chamber opening into the end of the tubular means, said chamber having a lateral window opening, said operable means and said view transmitting member being mounted in said chamber with the transmitting member in position to receive a view in a limited field through the window and to transmit the view into the end of the tubular means, said housing having lamp mount-

ing means at the end thereof remote from said tubular means and a lamp supported in said lamp mounting in position to illuminate the field of view of said transmitting member, and means to control selectively the operation of the lamp and the operable means at the ocular end of the instrument.

5. An instrument for cavity inspection, comprising tubular means having a flexible portion, a distal end comprising a housing for placement in a cavity to be inspected, an ocular end having an eye-piece, a view transmitting member in said housing in position to receive a view within a field radially of the housing and to transmit the view longitudinally of the instrument to said eye-piece, and operable means for shifting the said transmitting member in said housing whereby to alter the field of view of the transmitting member, said housing comprising a sleeve-like member removably mounted at and forming a chamber opening into the end of the tubular means, said chamber having a lateral window opening, said operable means and said view transmitting member being mounted in said chamber with the transmitting member in position to receive a view in a limited field through the window and to transmit the view into the end of the tubular means, said housing having an extension forming a lamp chamber at the end of the housing remote from the tubular means, said extension being formed with a lateral lamp window opening and a lamp in said lamp chamber in position in said lamp window opening to illuminate the field of view of said transmitting member.

6. An instrument for cavity inspection, comprising tubular means having a flexible portion, a distal end comprising a housing for placement in a cavity to be inspected, an ocular end having an eye-piece, a view transmitting member in said housing in position to receive a view within a field radially of the housing and to transmit the view longitudinally of the instrument to said eye-piece, and operable means for shifting the said transmitting member in said housing whereby to alter the field of view of the transmitting member, said housing comprising a sleeve-like member removably mounted at and forming a chamber opening into the end of the tubular means, said chamber having a lateral window opening, said operable means and said view transmitting member being mounted in said chamber with the transmitting member in position to receive a view in a limited field through the window and to transmit the view into the end of the tubular means, said housing having lamp mounting means at the end thereof remote from said tubular means and a lamp supported in said lamp mounting in position to illuminate the field of view of said transmitting member, and conductor means extending between the ocular and insertion ends of the instrument for energizing the lamp, and operable means including a conductor connected in common to the lamp and the operable means and a pair of conductors, respectively, connected one to the lamp and one to the operable means.

7. An instrument for cavity inspection, comprising tubular means having a flexible portion, a distal end comprising a housing for placement in a cavity to be inspected, an ocular end having an eye-piece, a view transmitting member in said housing in position to receive a view within a field radially of the housing and to transmit the view longitudinally of the instrument to said eye-

piece, and operable means for shifting the said transmitting member in said housing whereby to alter the field of view of the transmitting member, said housing comprising a sleeve-like member removably mounted at and forming a chamber opening into the end of the tubular means, said chamber having a lateral window opening, said operable means and said view transmitting member being mounted in said chamber with the transmitting member in position to receive a view in a limited field through the window and to transmit the view into the end of the tubular means, said housing having an integral extension forming a lamp chamber opening at the end of the housing remote from the tubular means and having a lateral lamp window opening, a removable cover cap for said lamp chamber, and a lamp removably secured in the lamp chamber by said cover cap in position in said lamp window opening to illuminate the field of view of said transmitting member.

8. An instrument for cavity inspection, comprising tubular means having a flexible portion, a distal end comprising a housing for placement in a cavity to be inspected, an ocular end having an eye-piece, a view transmitting member in said housing in position to receive a view within a field radially of the housing and to transmit the view longitudinally of the instrument to said eye-piece, and operable means for shifting the said transmitting member in said housing whereby to alter the field of view of the transmitting member, said housing comprising a sleeve-like member removably mounted at and forming a chamber opening into the end of the tubular means, said chamber having a lateral window opening, said operable means and said view transmitting member being mounted in said chamber with the transmitting member in position to receive a view in a limited field through the window and to transmit the view into the end of the tubular means, said housing having lamp mounting means at the end thereof remote from said tubular means and a lamp supported in said lamp mounting in position to illuminate the field of view of said transmitting member, and conductor means extending between the ocular and insertion ends of the instrument for energizing the lamp, a conductor connected in common to the lamp and the operable means, a pair of conductors, respectively, connected one to the lamp and one to the operable means, a switch in one of the lamp connected conductors, and a switch in another of the conductors connected to the operable means whereby to control the operable means independently of the lamp.

9. An instrument for cavity inspection, comprising tubular means having a flexible portion, a distal end comprising a housing for placement in a cavity to be inspected, an ocular end having an eye-piece, a view transmitting member in said housing in position to receive a view within a field radially of the housing and to transmit the view longitudinally of the instrument to said eye-piece, and operable means for shifting the said transmitting member in said housing whereby to alter the field of view of the transmitting member, said housing comprising a sleeve-like member removably mounted at and forming a chamber opening into the end of the tubular means, said chamber having a lateral window opening, said operable means and said view transmitting member being mounted in said chamber with the transmitting member in position to receive a view in a limited field through the window

and to transmit the view into the end of the tubular means, said housing having an extension forming a lamp chamber at the end of the housing remote from the tubular means, said extension being formed with a lateral lamp window opening and a lamp in said lamp chamber in position in said lamp window opening to illuminate the field of view of said transmitting member, and a contact plate in said housing between said chambers and providing lamp contacts and conductors connected with said contacts and with said operable means and extending to the ocular end of the instrument for electrically energizing the lamp and the operable means.

10. An instrument for cavity inspection, comprising tubular means having a flexible portion, a distal end comprising a housing for placement in a cavity to be inspected, and an ocular end having an eye-piece, means for transmitting a view from the distal end of the instrument and presenting the view for inspection at said eye-piece, comprising a view transmitting member in said housing in position to receive a view within a field radially of the housing and to transmit the view longitudinally of the instrument to said eye-piece, said housing having lamp mounting means at the end thereof remote from said tubu-

lar means and a lamp supported in said lamp mounting in position to illuminate the field of view of said transmitting member, and conductor means connected to the lamp and extending in said housing and along said tubular means to the ocular end of the instrument for electrically energizing the lamp, said conductor extending between the mounted end of the housing and a ferrule forming the portion of the tubular means on which the housing is mounted, the co-operating surfaces of the ferrule and of the housing thereon being grooved to receive the conductor means.

11. An instrument for cavity inspection comprising tubular means having a flexible portion, a distal end comprising a housing for placement in a cavity to be inspected, an ocular end having an eye-piece, a mirror mounted in said housing at an angle, with respect to the longitudinal axis of the housing, in position to receive a view within a field radially of the housing and to transmit the view longitudinally of the instrument to said eye-piece, and means operable at the ocular end of the instrument for changing the angle at which the mirror is mounted with respect to the longitudinal axis of the housing.

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