

[54] **FORCEPS MEANS FOR REMOVING
CELLULAR TISSUE FROM THE BODY
CAVITIES**

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[51] Int. Cl.² **A61B 17/36**

[58] Field of Search..... 128/303.15, 303.16, 320

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[57] ABSTRACT

A surgical instrument means for removing cellular tissue from the body cavities arranged to shape a loop easily by using a wire having at least two bent portions formed by plastic deformation.

2 Claims, 7 Drawing Figures

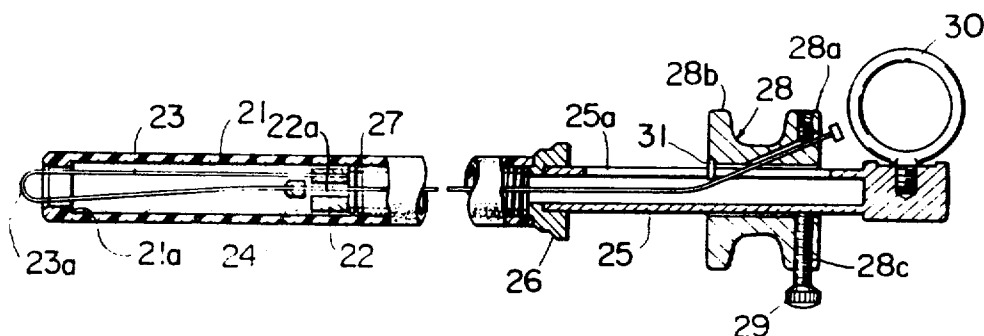


FIG. 1

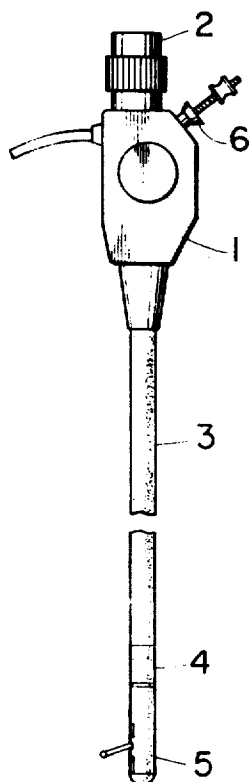


FIG. 2

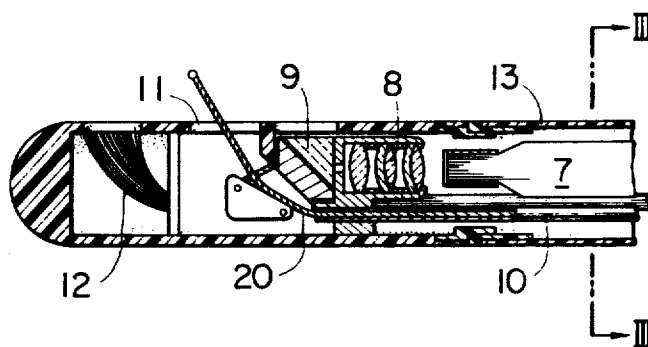


FIG. 3

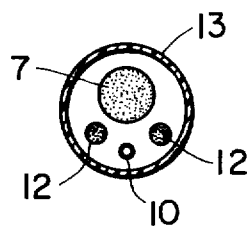


FIG. 4a

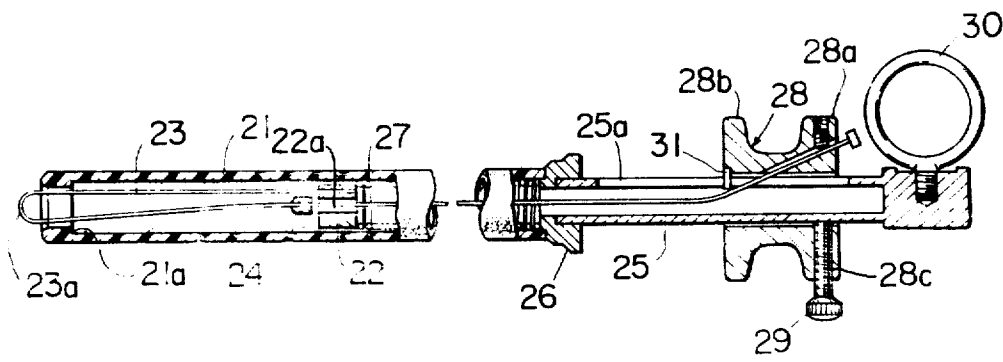


FIG. 4b

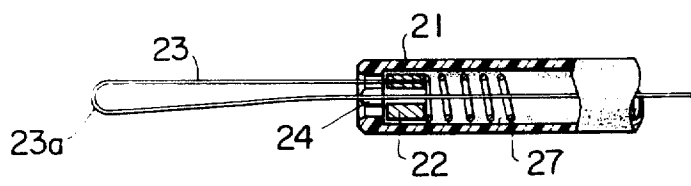


FIG. 4c

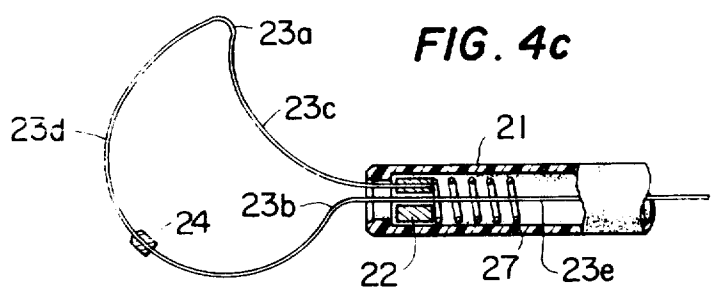
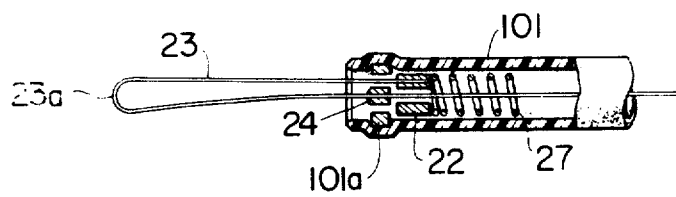


FIG. 5



FORCEPS MEANS FOR REMOVING CELLULAR TISSUE FROM THE BODY CAVITIES

BACKGROUND OF THE INVENTION

a. Field of the Invention

The present invention relates to a surgical instrument means for removing cellular tissue such as a polyp from the body cavities.

b. Description of the Prior Art

When removing cellular tissue from the body cavities, for example when removing a polyp or the like caused on the mucous membrane of the stomach, a removing means is usually inserted into the body cavity, for example into the stomach, together with an endoscope and the polyp or the like is removed by observing that removing means and polyp or the like to be removed.

As the removing means for such purposes, those incorporating scissors or cup forceps are known widely. As for those removing means incorporating scissors, it is necessary to cut into the base of, for example, the polyp repeatedly because said scissors are small and, therefore, the operation is complicated. When using the removing means incorporating cup forceps, the tissue is removed by pinching it out little by little and, therefore, it takes a long time.

SUMMARY OF THE INVENTION

It is, therefore, the principal object of the present invention to provide a surgical instrument means for removing cellular tissue from the body cavities arranged to easily form a loop, when inserted into a body cavity, being operated from outside and to remove the polyp or the like by said loop with high reliability and by very simple operation.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 through FIG. 3 show an example of endoscope for using the surgical instrument means for removing cellular tissue from the body cavities according to the present invention by inserting said surgical instrument means into said endoscope;

FIG. 4a through FIG. 4c show sectional views of an embodiment of the surgical instrument means for removing cellular tissue from the body cavities according to the present invention; and

FIG. 5 shows another embodiment of the surgical instrument means according to the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

FIG. 1 shows an example of endoscope to be used by mounting the surgical instrument means for removing cellular tissue from the body cavities according to the present invention. Numeral 1 designates a control unit, numeral 2 designates an eye-piece, numeral 3 designates a flexible tube, numeral 4 designates the bending section and numeral 5 designates the distal end. Numeral 6 designates the surgical instrument opening through which the below-mentioned surgical instrument means for removing cellular tissue from the body cavities according to the present invention is to be inserted and led through the surgical instrument channel provided in the endoscope and the end of said surgical instrument means is to be projected through the surgical instrument outlet. FIG. 2 shows an enlarged view of the distal end of said endoscope. In this figure, numeral

7 designates an image guide comprising optical fiber, numeral 8 designates an objective and numeral 9 designates a prism. Numeral 10 designates the surgical instrument channel through which the surgical instrument means for removing cellular tissue from the body cavities 20 according to the present invention is to be passed as described in the above, and the end of said surgical instrument means 20 is to be projected through the surgical instrument outlet 11. Numeral 12 designates a light guide comprising optical fiber for lighting the object such as the inside of the stomach. FIG. 3 shows a sectional view along the line III—III in FIG. 2. The above-mentioned image guide 7, surgical instrument channel 10 and light guide 12 are arranged in the tube 13 as shown in FIG. 3.

In the following, the construction of said surgical instrument means for removing cellular tissue from the body cavities according to the present invention as shown in FIG. 4a through FIG. 4c is described in detail.

In these figures, numeral 21 designates a tube made of a flexible material such as plastics. At the end of said tube, a stepped portion 21a is formed and, therefore, the bore at the stepped portion is smaller than the bore at the other portions. Numeral 22 designates a slider having a small hole 22a at its center which is slidably inserted in the tube 21. Numeral 23 designates a wire made of a resilient material. As shown in FIG. 4c, said wire 23 has two bent portions, i.e., the first and second bent portions 23a and 23b formed by plastic deformation so that said wire 23 forms two circular arcs 23c and 23d and a linear portion 23e. (Plastically deformed bent portions 23a and 23b here mean that said bent portions change their form accordingly when the wire is forced into the tube 21 for example as shown in FIG. 4a, but when the wire is free, said bent portions are put to bent condition again as shown in FIG. 4c. Thus, the projected portion of the wire returns to the semicircular form.) One end of said wire 23 is fixed to the slider 22 at the end of the circular arc 23c and the other end of the wire 23, i.e., the linear portion 23e of the wire 23 is passed through the small hole 22a of the slider 22. Said wire 23 is usually housed in the tube as illustrated in FIG. 4a by the below-mentioned method, and only the first bent portion 23a is slightly projected from the end of the tube 21. Numeral 24 designates a stopper fixed to the circular arc portion 23d of the wire 23 and the outer diameter of said stopper 24 is larger than the small hole 22a of the slider 22. Numeral 25 designates an operating means having a slit 25a. Numeral 26 designates a cylindrical member connecting the tube 21 and operating means 25. Numeral 27 designates a spring provided in the tube 21 between the slider 22 and cylindrical member 26. Numeral 28 designates an operating ring which has two flanges 28a and 28b and is slidably mounted to the operating means 25. To said operating ring 28, the end of the linear portion 23e of the wire 23, which is passed through the tube 21, is fixed so that said end can be moved along the slit 25a provided to the operating means 25, together with the operating ring 28. Numeral 29 designates a fixing screw which is screwed into the tapped hole 28c of the operating ring 28 and which is for fixing the operating ring 28 to the operating means 25. Numeral 30 designates a ring mounted on one end of the operating means 25. Numeral 31 designates a protuberance fixed to the operating ring 28 and is inserted in the slit 25a provided to the operating means 25 in order to guide the operat-

ing ring 28 so that it can slide along the operating means 25 without rotating.

The surgical instrument means for removing cellular tissue from the body cavities according to the present invention is arranged as described in the above. Therefore, when the thumb of one hand is inserted into the ring 30 holding the operating ring 28 by the forefinger and middle finger of the same hand, the fixing screw 29 is loosened by the other hand and the operating ring 28 is moved toward the ring 30, the end of the wire 23 fixed to the operating ring 28 is pulled toward said ring 30. So, the second bent portion 23b and circular arc portion 23d of the approximately semicircular loop shown in FIG. 4c are gradually stretched and become linear, and said loop becomes narrower. When said loop closes as shown in FIG. 4b, the stopper 24 contacts the slider 22 and said slider 22 moves in the tube 21 toward the operating means 25 acting against the spring 27. At that time, said wire 23 is drawn into the tube 21 by leaving its first bent portion 23a at the outermost position and is housed in the tube 21 as shown in FIG. 4a.

To remove, for example, a polyp caused on the mucous membrane of the stomach by using the above-mentioned surgical instrument means for removing cellular tissue from the body cavities according to the present invention, said surgical instrument means is first inserted into the endoscope as shown in FIG. 1 through FIG. 3 through its surgical instrument opening and, then, is inserted into the stomach together with said endoscope. After that, inserting the thumb of one hand into the ring 30 and holding the operating ring 28 by the forefinger and middle finger, the fixing screw 29 is loosened by the other hand. When the gripping force of said operating ring 28 is then gradually released by observing with the endoscope, the slider 22 slides toward the stepped portion 21a of the tube 21 because of the force of the spring 27. At the same time, the wire 23 projects from the tube 21 by keeping its first bent portion 23a at the outermost position and the operating ring 28 slides toward the cylindrical member 26. When said slider 22 stops contacting said stepped portion 21a, one end of the wire 23 also stops together with said slider 22. But, the other end of the wire 23 still moves, and the portion of said wire 23 projected outside the tube 21 shapes a semicircular loop which is pre-determined by plastic deformation. In the present embodiment, it is arranged to shape the semicircular loop by providing two bent portions 23a and 23b. However, it is also possible to make the wire 23 shape the semicircular loop even when the bent portion 23b is not provided. Then, said loop is positioned around the base of the polyp to be removed. When the polyp to be removed comes into the semicircular loop as above, the operating ring 28 is moved toward the ring 30. Consequently, the wire 23 also moves together with the operating ring 28, the portion of the wire 23 projected outside the tube 21 changes its loop form from that shown in FIG. 4c to that shown in FIG. 4b and then to FIG. 4a as already explained in the above, thus the polyp is pinched out. Therefore, when the above-mentioned surgical instrument means for removing cellular tissue from the body cavities is used, the loop can be easily shaped in the body cavities because a pre-determined loop is formed by plastic deformation and, moreover, said loop can be easily led to the portion of the cellular tissue to be removed such as a polyp or the like.

In the following, another embodiment of the present invention is described according to FIG. 5. For this embodiment, the same reference numbers are given respectively to those parts which are same as those in the former embodiment and detailed explanation is omitted.

In this embodiment, the cellular tissue is removed by flowing a high-frequency electric current to the wire which has formed a loop. The tube 101 is made of an electrically insulating material, for example, plastics and a holding ring 101a is fitted in the end portion of said tube 101.

To remove for example a polyp caused on the mucous membrane of the stomach by using this embodiment of the surgical instrument means for removing cellular tissue from the body cavities, the operating ring 28 is locked by the fixing screw 29 in the condition that the wire 23 is housed in the tube 101, that is, the operating ring 28 is moved toward the ring 30. Then, said surgical instrument means is inserted together with the endoscope into the stomach of the patient who is lying by putting on a wide electrode plate closely contacting his back, and the base of the polyp to be removed is pinched by the loop of the wire 23 by the same operation as the case of the former embodiment. When said loop is closed to the pre-determined extent, a high-frequency electric current is applied between said electrode plate and said wire 23. Thus, the polyp is burnt off smoothly by the high-frequency current which flows from the loop to said electrode plate. In addition to advantages of the former embodiment, this embodiment has further advantages that bleeding is not caused when removing the polyp or the like and, therefore, the wound caused by the removing operation heals quickly and, moreover, the removing operation can be performed easily.

As described in detail in the above, the surgical instrument means according to the present invention has a wire arranged, by plastic deformation, to form a pre-determined loop. Therefore, said pre-determined loop can be easily developed in the body cavities and can be easily led to the cellular tissue portion such as the polyp to be removed. Besides, the number of component parts is not increased conspicuously and it is not necessary to use component parts of complicated shapes. Thus, the present invention provides a surgical instrument means of simple construction for removing cellular tissue from the body cavities.

Though the above embodiments are described in relation to application for removing the polyp caused on the mucous membrane in the stomach, it is of course evident that, when removing cellular forceps in a comparatively shallow body cavity such as an oral cavity, the surgical instrument means according to the present invention can be used independently without incorporating an endoscope. In case of such application, it is not necessary to make the tube (21 or 101) flexible.

I claim:

1. A surgical instrument comprising a tube with a stepped portion in the inside at one end of said tube, a slider slidably arranged in said tube and having a center hole, a wire made of a resilient material having at least a bent portion, one end of said wire being fixed to said slider and the other end of said wire being passed through the center hole of said slider and being fixed to an operating ring provided at an end of said tube opposite said one end, and a stopper with an outer diame-

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ter larger than the diameter of the center hole of said slider attached to said wire.

2. A surgical instrument according to the claim 1, further comprising a spring arranged in said tube at a

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position on the operating ring side of said slider and arranged to bias said slider against said stepped portion in the inside at said one end of said tube.

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