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Matsuo

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[54] **STILET FOR ENDOSCOPES**

[75] Inventor: **Kazumasa Matsuo,** Tokyo, Japan

[73] Assignee: **Olympus Optical Co., Ltd.,** Tokyo, Japan

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[52] **U.S. Cl.** **128/8**

[51] **Int. Cl.** **A61b 1/06,** A61b 1/26

[58] **Field of Search** 128/8, 6, 4, 5

[56] **References Cited**

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Primary Examiner—Lucie H. Laudenslager

Attorney, Agent, or Firm—Flynn & Frishauf

[57] **ABSTRACT**

A stilet for endoscopes includes an elongated coil spring to be inserted in the flexible tube of the endoscope. The coil spring may be compressed or extended by operating a mechanism outside of the human body so that the flexibilility of the coil spring and thus the flexible tube may be adjusted.

9 Claims, 3 Drawing Figures

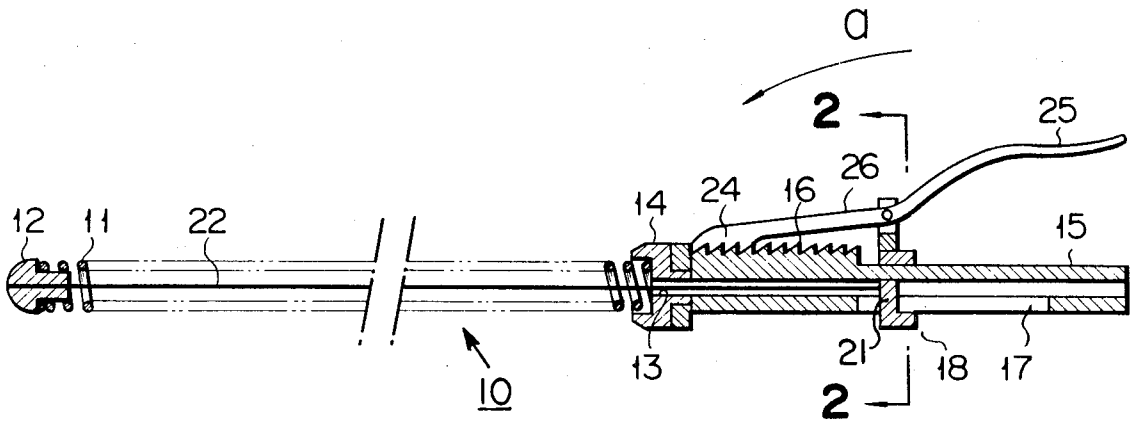


FIG. 1

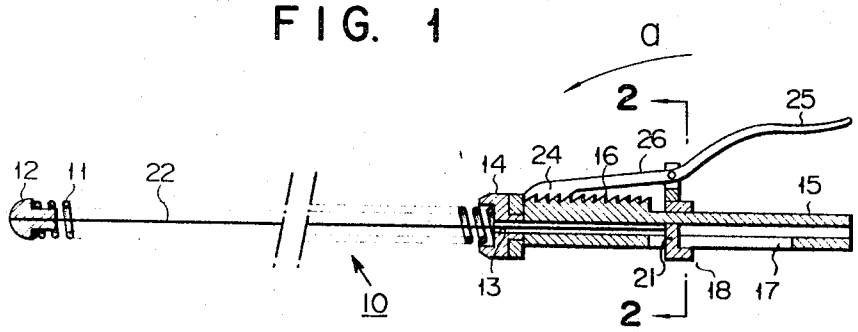


FIG. 2

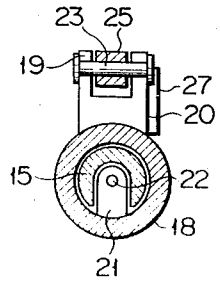
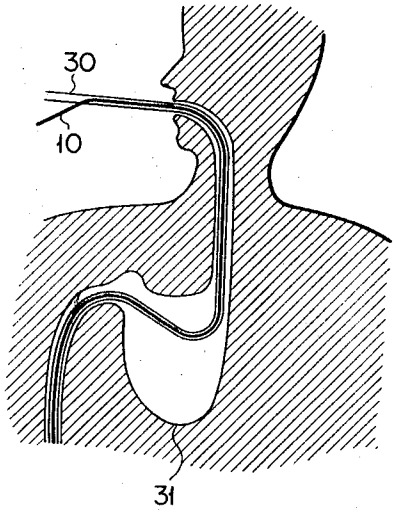


FIG. 3



STILET FOR ENDOSCOPES

BACKGROUND OF THE INVENTION

This invention relates to a stilet to be inserted in an endoscope for adjusting the flexibility of the endoscope to assist in smooth insertion of the scopé into the cavity of a human body.

In recent years, the development of an endoscope has been remarkable in permitting the device to be inserted through the mouth as far as the stomach, duodenum and the small intestine, and through the anus as far as the rectum, sigmoid colon, descending colon, transverse colon and the ascending colon, for medical observation of these organs.

It is required than an endoscope operative for deep observation be sufficiently flexible and bendable so that the forward end thereof may smoothly reach a position of predetermined depth. It has heretofore been difficult to insert the device deeply because of the fact that it tends to be unnecessarily bent concentratedly at a relatively shallow portion of the human body such as the stomach to disturb advancement of the forward end of the device or because of its insufficient overall available length.

In an attempt to obviate this defect, a device has been proposed in which the flexibility of the flexible tube of the endoscope is progressively varied in such a manner that the tube is made relatively soft at its forward end and is made gradually harder at portions closer to the operation section. The endoscope of the arrangement in which the rigidity or flexibility of the tube is predetermined does not assist to positively solve the above problem. The defect may be eliminated if the flexibility of the flexible tube is made adjustable, but with the prior art device, the construction of the tube to make it adjustable becomes complex, thereby resulting in a tube of an inconveniently increased diameter.

SUMMARY OF THE INVENTION

Accordingly the object of the invention is to provide a stilet of simple construction and capable of being externally operated to optionally adjust the flexibility of a flexible tube of an endoscope by being inserted into the endoscope prior to the insertion of the device into the cavity of a human body.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a cross sectional elevation of a stilet embodying this invention;

FIG. **2** is a cross section taken along the line **2—2** in FIG. **1**; and

FIG. **3** is a schematic view illustrating an endoscope employing the stilet of FIG. **1** as being in an operative inserted position.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS OF THE INVENTION

There will now be described a stilet according to the embodiment of the present invention with reference to the drawings.

In FIG. **1**, the stilet **10** includes an elongated coil spring **11** with a small pitch or shot clearance between the adjacent turns, one end of which is attached to the rear end of small diameter of a guide member **12** whose forward end has a semispherical surface. The other end of the spring **11** is received and connected to the forward end of a connecting ring **14** with a central through

bore **13**. The connecting ring **14** is attached to an adjusting cylinder **15** at its rear end so that the central bore **13** of the former is coaxially connected to the central bore of the latter. On the upper side of the front half portion of the adjusting cylinder **15** there is formed a row of triangular teeth **16** along the longitudinal direction thereof. On the lower side of the rear half portion of the adjusting cylinder **15** there is perforated a long slit **17** extending along the longitudinal direction and communicating with the central bore thereof. The triangular teeth **16** each may be in the shape of a right-angled triangle with the hypotenuse and vertical side respectively corresponding to the front and rear sides of the tooth. A sliding ring **18** is fitted on the periphery of the adjusting cylinder **15** so as to slide along the rear half portion thereof. From the upper outer side of the ring **18** there is radially extended a projection **20** with its forked top portion forming a bearing **19**. On the lower inner side of the ring **18** there is fixed a supporting plate **21** (see FIG. **2**) extending into the central bore through the slit **17** of the adjusting cylinder **15**. By means of this supporting plate **21**, the sliding ring **18** may be supported on the adjusting cylinder to be slidable therealong without rotation of the sliding ring **18**. A retracting wire **22** is inserted through the central bores of the coil spring **11**, connecting member **14** and adjusting ring which are arranged in a coaxial relationship. The wire **22** is connected to the rear end of the guide member **12** and the forward side of the supporting plate **21** at its both ends to be stretched therebetween.

A lever **26** is rockably supported on the bearing **19** of the projection **20** by means of a pin **23**. On the forward lower side of the lever **26** there are formed a plurality of teeth **24** engageable with the teeth **16** of the adjusting cylinder **15**. The rear portion of the lever constitutes a handle **25**. Between the sliding ring **18** and lever **26** there is connected a wire spring **27** so that, in the normal condition, the lever **26** is urged in the rotating direction of an arrow *a* to allow the teeth of the lever **26** to engage the teeth of the adjusting cylinder **15** thereby preventing the sliding of the sliding ring **18** in the backward direction by the coil spring **11**.

With the stilet constructed above, when the sliding ring **18** is slid against the adjusting cylinder **15**, so that the teeth **24** of the lever **26** pivoted on the sliding ring **18** are engaged with the extremely forward portion of the row of teeth, the retracting wire **22** takes the most loose condition in which the coil spring **11** is most flexible. In this situation, as the sliding ring **18** is moved rearwards along the adjusting cylinder **15**, the clearance between the adjacent turns of coil spring **11** is gradually made shorter, that is the coil spring is compressed to decrease its flexibility. When the desired flexibility is obtained, the ring **18** is stopped, so that its flexibility is maintained due to the engagement of the teeth of the lever **26** and adjusting cylinder **15**. Alternatively, if it is desired to increase the flexibility of the coil spring **11**, the lever **26** is rocked by operating the handle **25** to release the engagement of the teeth **16** and **24** so that the sliding ring **18** may be retracted forwards by the coil spring **11**.

In the using of the stilet, the coil spring of the stilet is inserted into the flexible tube **30** of an endoscope from its forward end, thereby being located in the flexible tube in a substantially coaxial relationship therewith as shown in FIG. **3**. Then, the endoscope is in-

serted into the deep portion of the cavity of the human body while the flexibility of the coil spring and thus the flexible tube **30** is adjusted by operating the lever outside the human body. Accordingly, the insertion of the flexible tube of the endoscope whose flexibility is adjusted as the endoscope is deeply inserted prevents the flexible tube from the unnecessarily concentrated bending in a cavity located on the way to the observed portion.

What is claimed is:

1. A stilet for varying the flexibility of an endoscope comprising:

a coil spring having a central axis, said coil spring being adapted to be inserted in the flexible tube of an endoscope,

a retracting wire inserted through the coil spring substantially along said central axis, one end of the wire being operatively connected to one end of the coil spring, and

adjusting means provided on the other end of the coil spring and coupled to the other end of the wire to selectively tighten said wire relative to the coil spring to compress adjacent turns thereof closer to each other to stiffen the coil spring, or to retract and loosen the wire relative to the coil spring to render the spring more flexible, thereby selectively adjusting the flexibility of the coil spring and of the flexible endoscope tube in which the coil spring is inserted.

2. A stilet according to claim **1** wherein said adjusting means includes a cylindrical adjusting member in which said other end portion of the retracting wire is inserted and which is coaxial with the coil spring, a sliding ring mounted on the periphery of said cylindrical adjusting member so as to be slidable along its longitudinal direction and connected to said other end of the retracting wire, and a keeping mechanism operatively coupled with the sliding ring to maintain the sliding ring at the desired position.

3. A stilet according to claim **2** wherein said cylindrical adjusting member has at one end a connecting member to receive said other end of said coil spring and at one side of the other end a slit extending in a longitudinal direction of the adjusting cylindrical member, and said sliding ring has a guide plate extending to the internal bore of said cylindrical adjusting member through the slit.

4. A stilet according to claim **3** wherein said keeping mechanism includes a row of teeth formed on one side of said cylindrical adjusting member near the connecting ring along the longitudinal direction thereof and a lever pivotally mounted on the sliding ring and having at least one tooth engageable with the teeth of said cylindrical adjusting member.

5. A stillet according to claim **4** wherein said lever has a plurality of teeth thereon which are engageable with the teeth of said cylindrical adjusting member.

6. A stilet according to claim **5** wherein the lever further includes an urging member for urging the lever so that in an normal condition the teeth of the lever engage the teeth of the adjusting cylindrical member, and a handle to release the engagement of the teeth of the lever and adjusting cylindrical member against the operation of the urging member.

7. A stilet according to claim **1** wherein the coil spring includes a guide member coaxially attached to said one end thereof and having a curved surface, said one end of said retracting wire being connected to said guide member.

8. A stilet according to claim **7** wherein said curved surface of said guide member is at the forward edge of said stilet.

9. A stilet according to claim **1** wherein said coil spring is adapted to extend along the whole length of the flexible tube of the endoscope.

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