United States Patent [19]

Curtiss et al.

[11] **3,828,790**

[45] **Aug. 13, 1974**

[54] **SURGICAL SNARE**

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[22] Filed: **Feb. 28, 1973**

[21] Appl. No.: **336,631**

[52] **U.S. Cl.**..... **128/320**, 30/116, 128/303.14

[51] **Int. Cl.**..... **A61b 17/00**

[58] **Field of Search** 128/320, 319, 305, 306, 128/307, 308, 309, 303.14, 303.16, 317; 30/116, 140

[56] **References Cited**

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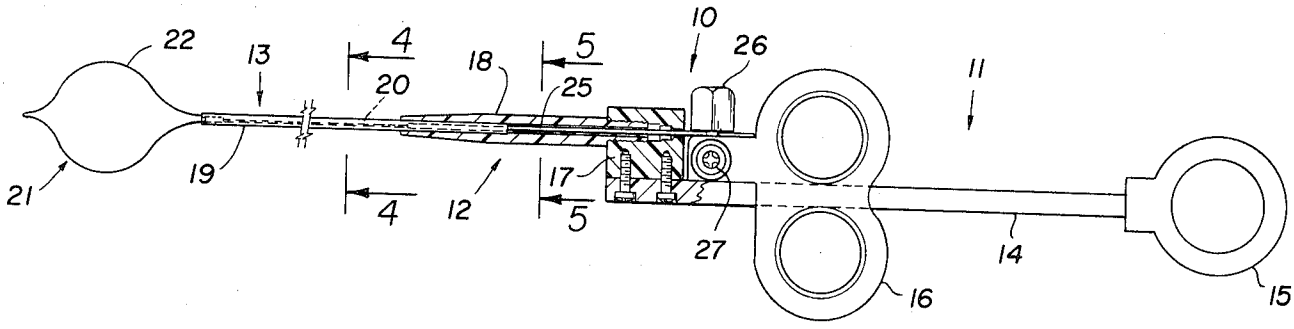
[57] **ABSTRACT**

Surgical snare has an operating loop formed with a resilient spiral sleeve through which a core member extends. The core member is flat and resilient, forming a spring which has greater flexibility in the direction parallel to the rest plane of the operating loop than normal thereto, thereby providing a surgical snare with a loop which, though having the thickness of the spiral sleeve, has substantially the flexibility of the much thinner core member in the directon parallel to the plane of the loop.

8 Claims, 6 Drawing Figures



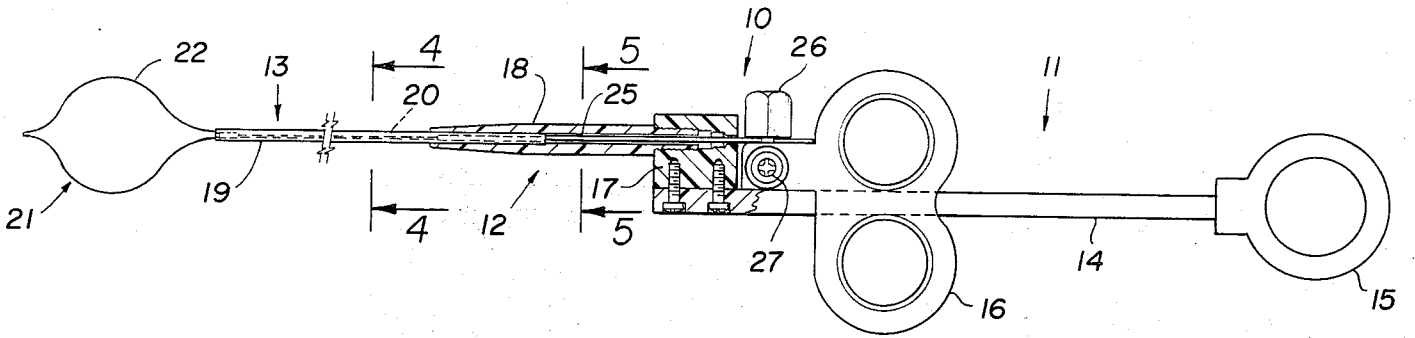


FIG.1

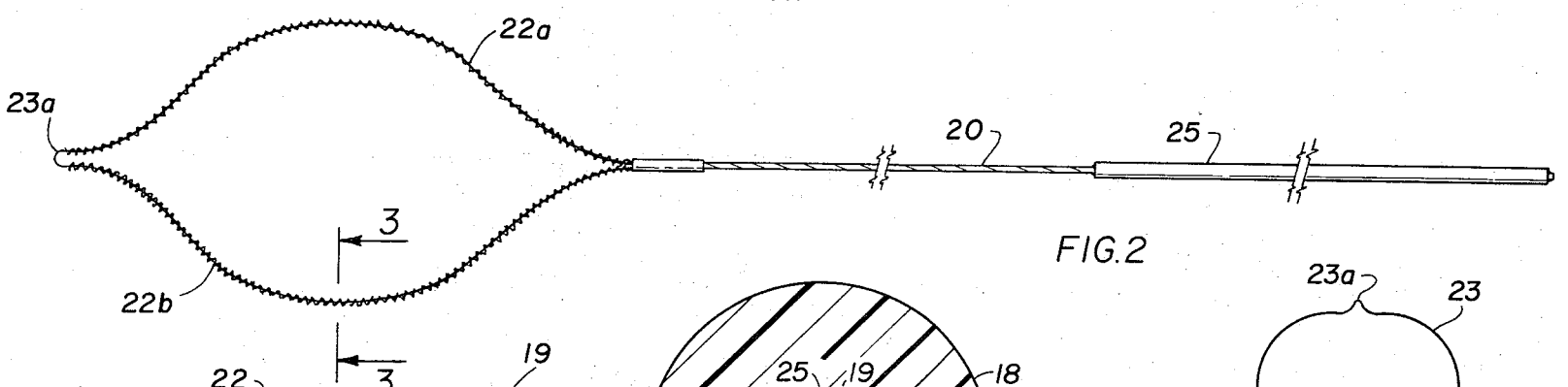


FIG.2

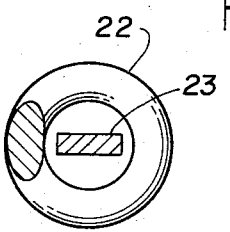


FIG.3

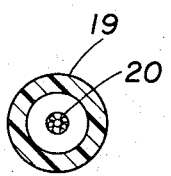


FIG.4

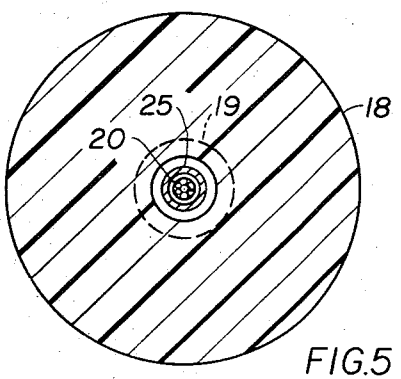


FIG.5

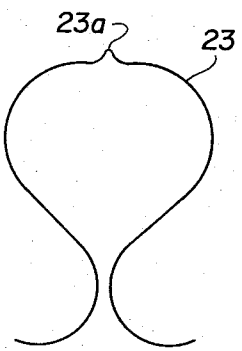


FIG.6

SURGICAL SNARE

BACKGROUND OF THE INVENTION

This invention relates to a surgical instrument and, more particularly, to a surgical snare suitable for use in carrying out polypectomy procedures.

Surgical snares suitable for use in removing polyps, such as those which are formed in the colon of a patient, have been in use for many years. Though such instruments have been used with success, they have left much to be desired. Surgical snares hitherto have comprised an elongated flexible sheath connected at its proximal end to an operating handle. Extending through the sheath is an elongated flexible cable, the proximal-end portion of which is connected to a movable portion of the operating handle so that the cable can be retracted and protracted by the surgeon relative to the sheath. An operating loop is connected to the distal-end portion of the cable which is opened and closed by the surgeon to the extent that he shifts the movable portion of the operating handle to protract or retract the cable. When the cable is in its protracted or forward position, the operating loop is outside the sheath and in its fully extended position. As the cable is retracted, the loop is drawn into the sheath and closed.

In carrying out a polypectomy procedure, after the instrument has been inserted and positioned in the usual way in the patient, the surgeon must manipulate it so as to bring the loop over the head of the polyp so that it can be tightened around the polyp stalk. Such instruments are usually provided with an electrical socket so that when connected to an appropriate power supply, the surgeon may apply a cauterizing current as the polyp is removed. If no electrical current is to be applied, then, by partially closing the loop, the stalk of the polyp is held constricted long enough so that no bleeding will result when the loop is fully closed to remove the head of the polyp.

To facilitate manipulation of the operating loop by the surgeon, it should be sufficiently flexible and resilient so that it can be readily brought over the head of a polyp to engage the stalk. However, in practice, improved flexibility was achieved by reducing the thickness or diameter of the operating loop; but when made thin enough to provide sufficient flexibility to prevent deformation during use, it became extremely difficult for the surgeon to avoid cutting through the stalk of the polyp when all that was wanted was to constrict it. When such premature cutting occurred, it was no longer possible to effect cauterization, and there was a resultant risk of excessive bleeding and infection. When the cutting loop wire was increased in thickness to minimize the risk of premature cutting of the polyp, an expensive hinge was required at the distal end of the snare loop, and the loop, because of its thickness, had a tendency to become deformed in use so that reshaping was necessary. In addition, the reduction in flexibility tended to increase the surgeon's difficulty in manipulating the instrument.

SUMMARY OF THE INVENTION

It is, therefore, a principal object of this invention to provide an improved surgical snare of the type especially well suited for removing polyps formed in the colon of a patient and characterized by an improved

flexibility, which can be more readily manipulated by the surgeon and yet which, in use, is less likely to result in premature cutting of polyps and which is less likely to be deformed.

In accordance with this invention, a surgical snare is provided having a flexible sheath, preferably formed of a material which has good insulative properties, connected adjacent to its proximal end to one portion of an operating handle. A flexible, conductive lead, fixed to a second portion of the operating handle that is movable with respect to the first, extends through the sheath to adjacent the distal end thereof. Connected to the lead adjacent to its distal end is a snare operating loop made up of a resilient core member which has a high degree of flexibility in a plane parallel to the rest plane of the loop, while being relatively rigid normal to the loop, and is enclosed in a resilient spiral sleeve which is also highly flexible. The apparent diameter of the composite loop thus formed is that of the outer spiral sleeve. The core member preferably has a thickness significantly less than that of its width and is oriented with its shorter dimension extending substantially parallel to the plane of the operating loop when the latter is in its rest position. The opposite ends of both the inner and outer members are preferably brought together and joined to the distal-end portion of the lead. The dimensions of the parts are such that when the lead is fully retracted, the operating loop freely enters and is enclosed in the flexible sheath.

DESCRIPTION OF THE DRAWING

Further objects and advantages of the present invention will be apparent from the following description of a preferred embodiment thereof and the accompanying drawing in which

FIG. 1 is a plan view, partially in section, of a surgical snare constructed in accordance with the present invention and showing the snare assembly in its protracted position;

FIG. 2 is a plan view of the snare lead and loop assembly removed from the grip assembly;

FIG. 3 is an enlarged cross-sectional view of the snare loop taken along the line 3—3 of FIG. 2;

FIGS. 4 and 5 are enlarged cross-sectional views taken respectively along the lines 4—4 and 5—5 of FIG. 1; and

FIG. 6 is a plan view of the snare loop core member.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Turning now to the drawings in detail, surgical snare **10** comprises a finger grip assembly **11,** a stem assembly **12** which is connected thereto, and a lead and loop assembly **13.** The finger grip assembly may be of conventional construction, as shown, having an elongated stem holder **14** which may be generally rod-shaped with flat sides, to the proximal end of which is connected a thumb grip **15.** A finger grip **16** is slidably mounted on the stem holder **14** for movement between the thumb grip **15** and the proximal end of the stem assembly **12,** the latter being connected to the distal end of the stem holder **14** by means of a spacer block **17.**

Stem assembly **12** comprises an elongated tubular member **18,** the proximal end of which is engaged by the spacer block **17,** and to which is connected the

proximal end of an elongated flexible tube **19.** The stem assembly **12** including the tube **19** are formed of electrically nonconductive material. Tube **19,** which forms the sheath for the lead and loop assembly **13,** is preferably formed of polytetrafluoroethylene and is cemented to tubular member **18.** The length of tube **19** may vary, as desired, to conform with the intended use of the snare **10** and is just enough shorter than the lead and loop assembly **13** so that the latter, in its protracted position, is positioned with its loop extending outside the distal end of tube **19.**

Snare lead and loop assembly **13** comprises an elongated, flexible lead **20,** preferably formed of electrically conductive cable (as shown) or wire, and is substantially circular in cross section so that when the lead is flexed in use, the snare operating loop **21** is not caused to rotate. Operating loop **21** comprises a spiral sleeve **22** through which extends a flat, resilient core **23** forming a spring which, when unconfined, preferably has the shape shown in FIG. **6** and normally urges the operating loop **21** to the shape shown in FIGS. **1** and **2.** As shown, spiral sleeve **22** comprises two spiral members **22a** and **22b** having their distal ends spaced to facilitate flexing of the core **23** at its cusp **23a** when the operating loop **21** is drawn into or extended from the sheath **19.** The proximal ends of the sleeve **22** and the ends of the core spring **23** are connected together and to the distal end of the lead **20.** As shown, the ends of the sleeve **22** and core spring **23** are soldered together and to the end portion of the lead **20.** Spiral members **22***a*, and **22***b* and flat core spring **23** are advantageously formed from austenitic stainless steel. While the dimensions of the sleeve **22** and spring **23** may vary, the flat spring should be thick enough to provide the required strength. For this purpose, steel ribbon about 0.002 to 0.005 in. thick provides good results. The spiral members **22***a* and **22***b* are wound relatively loosely from stainless steel wire with the space between adjacent turns of the helix equal to from about one-sixth to about twice, preferably about one-third, the diameter of the helix wire.

A snare loop which provides excellent characteristics is made from a flat core spring **23** which is about 0.003 in. thick and about 0.009 in. wide. The spiral sleeve **22** was made from wire having a diameter of about 0.006 in. wound to an outer diameter of about 0.023 in. with the spacing between adjacent turns of the helix equal to about 0.002 in. When the ends of the spiral sleeve **22** and the flat core spring **23** are joined together and to the distal end of the lead **20,** care is taken to ensure that the end portions of the core **23** are joined so that its wider surfaces are in face-to-face relation. Thus, when the unconfined loop opens, the wider surfaces of the spring core **23** extend substantially normal to the plane of the loop while the sides or thickness of the core **23** extends substantially parallel thereto. This ensures that the snare loop **21** which has a thickness of about 0.023 in. will substantially have the flexibility of the 0.003 in. thick ribbon in the direction parallel to the plane of the loop while being somewhat stiffer normal to the plane of the loop so as to facilitate manipulation.

The lead **20,** when it is formed of wire cable as shown, is enclosed at its proximal end in a short length of stainless steel tubing **25** which facilitates removably connecting the lead **20** to the finger grip assembly **11** by means of a clamping knob **26** threaded into the finger grip assembly **11** which also is desirably provided with an insulated electrical connector **27** by which cutting and coagulation current is conveniently brought in to the snare lead and loop assembly **13.**

In use, the operating surgeon grasps the thumb and finger grips **15** and **16** bringing them together so that the operating loop **21** is drawn entirely into the sheath **19.** The surgical snare **10** is inserted and operated within a patient using well-known techniques which form no part of the present invention and, thus, need not be discussed further here. However, it should be noted that surgical snare **10** constructed in accordance with the present invention provides a snare loop having a unique combination of flexibility and thickness so as to facilitate manipulation by the surgeon while minimizing the likelihood of premature cutting of the polyp. The relative flexibility of the operating loop **21** in its own plane and its much greater stiffness transverse to its plane simplifies slipping the loop **21** about the stalk of the polyp. The lead and loop assembly **13** is readily disengaged by unscrewing the clamping knob **26** and can be completely withdrawn for straightening or replacement and then reinserted without disturbing the position of the stem assembly **12** and the sheath **19** or the patient. The structure of the operating loop not only minimizes the likelihood of deformation in use, but also, the flat core facilitates reshaping if that should be necessary.

The terms and expressions which have been employed are used as terms of description and not of limitation, and there is no intention in the use of such terms and expressions of excluding any equivalents of the features shown and described or portions thereof, but it is recognized that various modifications are possible within the scope of the invention claimed.

We claim:

1. A surgical snare comprising an elongated flexible sheath, a lead extending in said sheath, operating loop means connected to the distal-end portion of said lead, actuating means connected to the proximal end portion of said lead for shifting the same relative to said sheath between a retracted position in which said operating loop means is nested within said sheath and a protracted position in which said operating loop means extends beyond the distal end of said sheath and is free to open to form a loop, said operating loop means including an elongated flexible spiral sleeve and an elongated resilient core member extending in said spiral sleeve, and said operating loop means having substantially greater flexibility in the direction parallel to its plane when open than normal thereto.

2. A surgical snare as set forth in claim **1** in which said core member has a thickness in the direction parallel to said plane of said operating loop means which is substantially less than its width in the direction normal to said plane.

3. A surgical snare as set forth in claim **2** in which the thickness of said core member is substantially less than the inner diameter of said spiral sleeve.

4. A surgical snare as set forth in claim **3** in which the width of said core member is substantially equal to the inner diameter of said spiral sleeve.

5. A surgical snare as set forth in claim **4** in which said lead is removably connected to said actuating means.

6. A surgical snare lead and loop assembly, comprising an elongated lead, means forming a flexible operat-

ing loop connected to the distal-end portion of said lead and comprising flexible spiral sleeve means and an elongated resilient core member extending in said sleeve means, said core member having a width substantially greater than its thickness extending with its width substantially normal to the plane of said loop, whereby said operating loop has substantially greater resistance of flexure in the direction normal to the plane of said loop than in the direction parallel thereto.

7. Surgical snare lead and loop assembly as set forth in claim **6** in which said spiral sleeve means comprises a pair of spiral members connected adjacent to their proximal ends to the distal end of said lead and extending about said core member with their distal ends in close-spaced relation, and the end portions of said core member are connected to the distal-end portion of said lead.

8. Surgical snare lead and loop assembly as set forth in claim **7** in which said lead, spiral members and said core member are electrically conductive.

* * * * *

UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

Patent No. 3,828,790 Dated August 13, 1974

Inventor(s) Lawrence E. Curtiss and Richard W. Hall

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Front page, Item [75], Inventors' names, for "Lawrence F. Curtiss" read -- Lawrence E. Curtiss -- and Inventors' address, for "New Cannaan" read -- New Canaan --.

Item [73], Assignee, for "Cytoscope" read -- Cystoscope --, and for "Mass." read -- N.Y. --.

Column 5, line 8, in claim 6, for "of" read -- to --.

Column 6, line 9, in claim 8, before "spiral" insert -- said --.

Signed and sealed this 19th day of November 1974.

(SEAL)
Attest:

McCOY M. GIBSON JR.
Attesting Officer

C. MARSHALL DANN
Commissioner of Patents

FORM PO-1050 (10-69)

USCOMM-DC 60376-P69
* U.S. GOVERNMENT PRINTING OFFICE : 1969 O—366-334