Sept. 22, 1959 P. HILZINGER III 2,905,178

SURGICAL CONTROL DEVICE FOR CONTROLLING OPERATING MEANS INSERTED INTO A BODY CAVITY

Filed Dec. 19, 1956

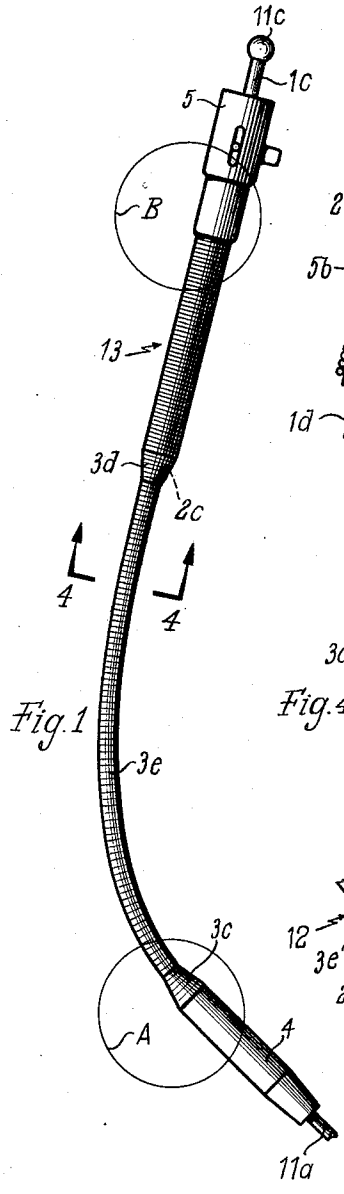

Fig. 1

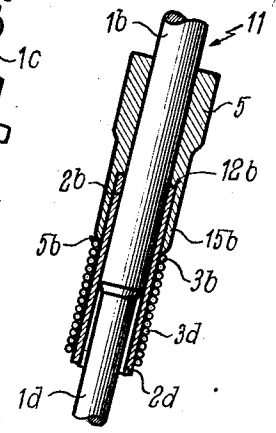

Fig. 3

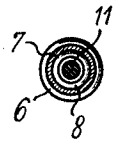

Fig. 6

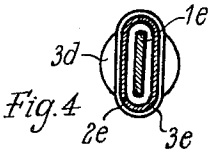

Fig. 4

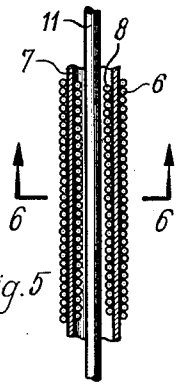

Fig. 5

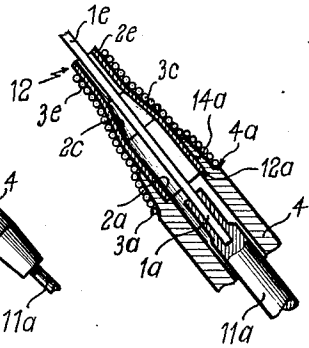

Fig. 2

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SURGICAL CONTROL DEVICE FOR CONTROLLING OPERATING MEANS INSERTED INTO A BODY CAVITY

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8 Claims. (Cl. 128—303)

The present invention relates to a surgical control device which permits operating means inserted into a body cavity to be controlled by the surgeon's manipulation of hand controls located outside the body cavity.

In practice, such control devices must be curved to follow body passages. Guides for surgical control devices according to the prior art either are rigid or they are insufficiently durable to permit repeated bending thereof between a plurality of desired curved positions.

It is an object of the present invention to avoid the disadvantages inherent in surgical control devices according to the prior art.

It is a further object of the present invention to provide for a surgical control device a tubular guide which permits of repeated bending to desired curved positions without damage.

It is another object of the present invention to prevent folding or breaking of the tubular guide for the surgical control device by repeated bending to different shapes.

Another object of the present invention is to provide a surgical control device which is bendable yet durable and which can be safely inserted in a body cavity in contact with body tissue.

A further object of the present invention is to provide bendable guide means for a surgical control device which can be manufactured at reasonable cost and which can be assembled and easily maintained in good operating condition.

Yet another object of the present invention is to provide a surgical control device which makes efficient and economical use of the very expensive materials required for such devices.

Another object of the present invention is to provide a surgical control device which can be connected interchangeably with any number of different operating means and control handles.

Yet another object of the present invention is to provide a surgical control device which meets the aseptic requirements for use in living beings.

Another object of the present invention is to provide a surgical control device, such as a valvulotome, which is certain and reliable in operation and which is especially suitable for delicate heart operations.

Another object of the present invention is to provide a surgical control device which permits the surgeon to control pressure of the operating means during movement into the body cavity and also during movement outward from the body cavity.

With the above objects in view the present invention mainly consists in a surgical control device comprising a bendable tubular guide means, an elongated instrument control means passing through the tubular guide means and being movable relative thereto, and at least one coil spring means tightly engaging the tubular guide means along the length thereof whereby the bendable guide means can be repeatedly bent between different desired curved positions without being damaged.

The word "bendable" as used herein refers to a type

of flexibility which permits bending from one position to another desired position along the length of the guide means and which permits retention of said guide means in a desired bent position during use of the device for operating in a body cavity, or at least until the surgeon again bends or varies the curvature thereof during use or otherwise.

The novel features which are considered as characteristic for the invention are set forth in particular in the appended claims. The invention itself, however, both as to its construction and its method of operation, together with additional objects and advantages thereof, will be best understood from the following description of specific embodiments when read in connection with the accompanying drawings, in which:

Fig. 1 is a side view of one embodiment of the present invention;

Fig. 2 is a fragmentary side view partly in section of the area "A" in Fig. 1;

Fig. 3 is a fragmentary side view partly in section of the area "B" on Fig. 1;

Fig. 4 is a sectional view taken along the line 4—4 of Fig. 1;

Fig. 5 is a fragmentary side view partly in section of a modified form of the embodiment of Figs. 1–4; and

Fig. 6 is a sectional view taken along the line 6—6 of Fig. 5.

With reference to the drawings, Figs. 1–4 show a thin-walled tubular guide means indicated generally by the numeral 12 and having a pair of spaced end portions 2*a* and 2*b* and intermediate portions 2*c*, 2*d* and 2*e*. The end portions 2*a* and 2*b* and the portion 2*d* are cylindrical, the portion 2*e* is flattened, as can be seen particularly in Fig. 4, and the portions 2*c* are tapered and interconnect the flattened portions 2*e* with the adjacent portions 2*a* and 2*d*. At least the portion 2*e* of guide means 12 is composed of material having a flexibility which permits the user to bend this portion 2*e* and to use the device with the portion 2*e* retaining or maintaining this bent condition. The material permits, also, that the portion 2*e* can be repeatedly bent between different desired curved positions. The guide means 12 has a pair of end faces 12*a* and 12*b* shown respectively in Figs. 2 and 3.

An elongated instrument control means indicated generally by the numeral 11 passes through the tubular guide means 13 and is movable relative thereto. The control means 11 includes a first end portion 1*a*, shown in Fig. 2, which is threaded and adapted to be threadedly connected to operating means, such as operating means 11*a* fragmentarily shown in Fig. 2. The control means 11 has also a second end portion 1*c*, shown in Fig. 1 as including ball joint means 11*c* for connecting the control means 11 with manually operable means (not shown) for controlling the operating means 11*a*. The end portions 1*a* and 1*c* connect the control means 11 interchangeably with a variety of operating means or instruments and with operable means or control handles.

The control means 11 includes a portion 1*e*, shown in Fig. 4, which has a cross-section corresponding in shape with the flattened portion 2*e* of the guide means 12, a cylindrical portion 1*d* located adjacent the portion 1*e*, and a cylindrical portion 1*b* which is thicker than the remainder of the control means 11 and is located between the portions 1*d* and 1*c* and opposite the end portion 2*b* of the guide means 12.

A coil spring means, indicated generally by the numeral 13 and composed of non-magnetizable material, tightly engages the tubular guide means 12 along the length thereof to prevent damage thereto during repeated bending. The spring means 13 has ends 3*a* and 3*b* which may be connected to the guide means 12 at the end portions 2*a* and 2*b* respectively.

In the embodiment illustrated, a pair of end members 4 and 5 are provided as shown in Figs. 1–3, to which the ends 3*a* and 3*b* of the spring means 13 are connected. The end members 4 and 5 have, respectively, radially extending annular stop portions 4*a* and 5*b* to which the ends 3*a* and 3*b* of the spring means 13 are fixedly connected, for example, by welding.

The intermediate portions 3*c*, 3*d* and 3*e* of the coil spring means 13 correspond in shape with the portions 2*c*, 2*d* and 2*e*, respectively, of the guide means 12.

As shown in Figs. 2 and 3, the end members 4 and 5 include, respectively, portions 14*a* and 15*b* which provide for each of these end members 4 and 5 a pair of cylindrical surface portions which engage the walls of the respectively adjacent end portions 2*a* and 2*b* of the guide means 12. The portions 14*a* and 15*b* provide also for each of these end members 4 and 5 a pair of end faces which abut the end faces 12*a* and 12*b* of the respectively adjacent end portions 2*a* and 2*b* of the guide means 12.

One end member or both end members 4 and 5 may be turnable relative the guide means 12. Advantageously, the end member 5 is so turnable.

As shown in Fig. 2, the first end portion 1*a* of the control means or member 11 extends axially beyond the first end portion 2*a* of the guide means or tubular member 12. The second end portion 1*b* of control means 11 extends axially beyond the end member 5, as shown in Fig. 3.

The stop portion 4*a* is located axially beyond the end portion 4 and the stop portion 5*b* is located axially inward of the end face 12*b* as shown in Figs. 2 and 3, respectively. The thicker portion 1*b* of the control means 11 extends to a point axially inward of the stop portion 5*b*.

The outer wall of the thicker portion 1*b* of the control means 11 contacts the inner wall of the end portion 2*b* and the inner wall of the end member 5 so that movement of the control member 11 is guided.

In the modification illustrated in Figs. 5 and 6, the guide means 7 is cylindrical throughout and is not flattened as is the guide means 12. Coil spring means 6 and 8 are provided and tightly engage the inner and outer walls, respectively, of the guide means 7. The control means 11 is as that of the device illustrated in Figs. 1–4 except that it is not flattened but is of cylindrical shape for the whole length thereof within the guide means 7.

At least those portions of the device which enter the body and contact body tissues are made of silver or similar materials which do not adversely affect body tissues and which may even promote healing. The coil spring means 13 is preferably of non-rusting, non-magnetizable material, such as, for example, stainless steel wire.

The end portion 1*a* of the control means 11 can be interchangeably connected with operating means of medical instruments such as, for example, punches, mastoid rongeurs, dilators, forceps, conchotomes, and valvulotomes. The portions 1*c* and 11*c* of the control means 11 connect said means 11 either movably or fixedly with interchangeable handles or control grips.

It will be understood that each of the elements described above, or two or more together, may also find a useful application in other types of manually operated control devices differing from the types described above.

While the invention has been illustrated and described as embodied in a surgical control device having a bendable guide, it is not intended to be limited to the details shown, since various modifications and structural changes may be made without departing in any way from the spirit of the present invention.

Without further analysis, the foregoing will so fully reveal the gist of the present invention that others can by applying current knowledge readily adapt it for various applications without omitting features that, from the standpoint of prior art, fairly constitute essential characteristics of the generic or specific aspects of this invention and, therefore, such adaptations should and are intended to be comprehended within the meaning and range of equivalence of the following claims.

What is claimed as new and desired to be secured by Letters Patent is:

1. In a surgical control device, the combination of a bendable shape retaining non-elastic tubular guide means composed substantially of silver; an elongated instrument control means passing through said tubular guide means and being movable relative thereto; and at least one coil spring means composed of non-magnetizable material tightly engaging said tubular guide means along the length thereof, said coil spring means having the ends thereof respectively connected to the ends of said tubular guide means, whereby said bendable tubular guide means can be repeatedly bent between different desired curved positions without being damaged, to remain relatively rigid in a desired bent condition.

2. In a surgical control device, the combination of a bendable shape retaining tubular guide means of non-elastic material having a pair of opposite ends and an intermediate flattened tubular portion intermediate and spaced from said ends; an elongated instrument control means passing through said tubular guide means and being movable relative thereto; and coil spring means tightly engaging the outer wall of said tubular guide means along the length thereof, whereby said bendable tubular guide means can be repeatedly bent between different desired curved positions without being damaged, while remaining relatively rigid in a desired bent condition.

3. In a surgical control device, the combination of a bendable shape retaining tubular guide means of non-elastic material having a pair of opposite ends and an intermediate flattened tubular portion intermediate and spaced from said ends; an elongated instrument control means passing through said tubular guide means and being movable relative thereto; and coil spring means tightly engaging the outer wall of said tubular guide means along the length thereof, said coil spring means having the ends thereof respectively connected to said ends of said tubular guide means whereby said bendable tubular guide means can be repeatedly bent between different desired curved positions without being damaged, while remaining relatively rigid in a desired bent condition.

4. In a surgical control device, the combination of a bendable tubular guide means composed substantially of silver and having a pair of opposite ends and an intermediate flattened tubular portion intermediate and spaced from said ends; an elongated instrument control means passing through said tubular guide means and being movable relative thereto, said control means including a flattened portion located adjacent said flattened portion of said guide means; and coil spring means tightly engaging the outer wall of said tubular guide means along the length thereof, said coil spring means having the ends thereof respectively connected to said ends of said tubular guide means, whereby said bendable tubular guide means can be repeatedly bent between different desired curved positions without being damaged.

5. In a surgical control device, the combination of a bendable shape retaining tubular guide means of non-elastic material; an elongated instrument control means passing through said tubular guide means and being movable relative thereto; and a pair of coil spring means, said coil spring means respectively tightly engaging the inner wall and the outer wall of said tubular guide means along the length thereof, whereby said bendable tubular guide means can be repeatedly bent between different desired curved positions without being damaged, while remaining relatively rigid in a desired bent condition.

6. In a surgical control device, the combination of a bendable shape retaining tubular guide means of non-elastic material; an elongated instrument control means

passing through said tubular guide means and being movable relative thereto; and a pair of coil spring means, said coil spring means respectively tightly engaging the inner wall and the outer wall of said tubular guide means along the length thereof, each of said coil spring means having the ends thereof respectively fixedly connected to the ends of said tubular guide means, whereby said bendable tubular guide means can be repeatedly bent between different desired curved positions without being damaged, while remaining relatively rigid in desired bent condition.

7. In a surgical control device, the combination of a bendable shape retaining tubular guide means composed substantially of silver; an elongated instrument control means passing through said tubular guide means and being movable relative thereto, said control means having at one end a threaded portion for interchangeably connecting said control means with operating means and at the opposite end a joint portion for interchangeably connecting said control means with manually operable means for controlling said operating means; and a pair of coil spring means, said coil spring means respectively tightly engaging the inner wall and the outer wall of said tubular guide means along the length thereof, each of said coil spring means having the ends thereof respectively fixedly connected to the ends of said tubular guide means, whereby said bendable tubular guide means can be repeatedly bent between different desired curved positions without being damaged, while remaining relatively rigid in a desired bent condition.

8. In a surgical control device, the combination of elongated guide means including a bendable shape retaining tubular member of non-elastic material having a first cylindrical end portion and a second cylindrical end portion, and a pair of end members respectively adjacent said end portions, each of said end members having a cylindrical surface portion engaging said respectively adjacent end portions circumferentially and an end face abutting respectively the end faces of said respectively adjacent end portions, each of said end members having at least one radially extending stop portion; an elongated instrument control member passing through said guide means and being movable relative thereto, said control member having a first end portion adapted to be connected to operating means and a second end portion adapted to be connected to manually operable means for controlling said operating means, said first end portion of said control member extending axially beyond said first end portion of said tubular member and said second end portion of said control member extending axially beyond the end member adjacent said second end portion of said tubular member, said control member having near said second end portion thereof a thicker cylindrical portion of the outer wall of which contacts the inner wall of said second end portion of said tubular member and the inner wall of the adjacent end member so that movement of said control member is guided; and at least one coil spring having the ends thereof respectively connected to said stop portions of said end members, said coil spring tightly engaging a wall of said tubular member along the length thereof, whereby said bendable tubular member can be repeatedly bent between different desired curved positions without being damaged, while remaining in a desired bent condition.

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