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F. C. WAPPLER

1,930,214

SURGICAL ELECTRODE

Filed March 23, 1931

Fig. 1

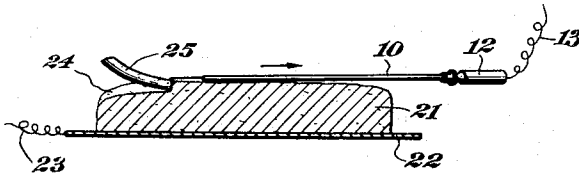


Fig. 2

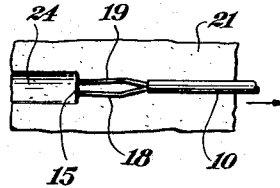


Fig. 3



Fig. 4

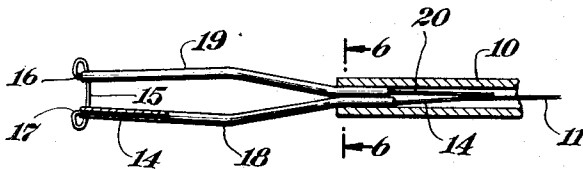


Fig. 5

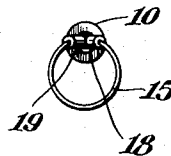
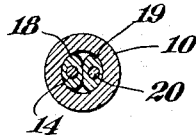


Fig. 6



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UNITED STATES PATENT OFFICE

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SURGICAL ELECTRODE

Frederick Charles Wappler, New York, N. Y.

Application March 23, 1931. Serial No. 524,500

5 Claims. (Cl. 174—89)

My present invention relates generally to surgical electrodes, and has particular reference to cutting electrodes adapted to function with electrical current of high frequency.

5 The so-called "bloodless surgery" is being more and more widely used of late; and, as is known to those skilled in the art, it consists essentially in harnessing to surgical cutting purposes the peculiar characteristics and capabilities of an alternating electrical current of very high frequency and relatively low voltage. Usually, the patient is caused to be electrically connected with one source of high-frequency current, as, for example, by being rested upon a table or the like which serves as an indifferent electrode; and a suitable tool or active electrode is connected to the opposite terminal of such source of high-frequency current and is adapted to induce a bloodless cutting operation when its contact with the patient closes the electrical circuit through the body of the patient. The phenomenon is not clearly understood, but is probably some sort of heat phenomenon, since the movements of the active electrode are accompanied by a slight sizzling and by a considerable evolution of localized heat which does not burn the tissues but which apparently sears them slightly to an extent sufficient to prevent bleeding.

My present invention relates to an electrode adapted to be used for the foregoing purpose, and, more particularly, to a loop-type electrode whose passage through a portion of the body, in a direction transverse to the plane of the loop, results in resecting a channel.

One of the main objects of my present invention is to provide an improved type of electrode which embodies features of simplicity, lightness, flexibility, and compactness hitherto unattained, to my knowledge.

The general advantages of my present invention will be obvious when it is borne in mind that electrodes of the foregoing character are usually caused to function in the interior of a body cavity or the like, the employment of such electrodes being usually accompanied and facilitated by the use of an endoscopic tube, illuminating means, and a telescope.

One of the main objects of my invention is to provide an electrode whose visibility is greatly enhanced, especially from the rear thereof, and, more particularly, from a point of view obliquely rearward from the electrode, such as that which might be afforded by a surgical telescope arranged alongside of the electrode.

One of the main features of my invention lies

in providing an elongated handle member with a loop electrode at its forward end, the forward end of the handle being bifurcated in a novel manner which permits the electrode to be better observed.

Another feature of my invention lies in providing the bifurcation in a novel and highly expeditious and extremely simple manner, and, more particularly, by the arrangement of a pair of forwardly diverging conducting wires arranged at the forward end of the elongated handle. The arrangement of such wires in spaced, substantially parallel and forwardly diverging relationship requires that they be insulated, so that the action of the electrode tool will be restricted to the operative loop at the forward end; and it is a particular feature of my present invention to provide insulation of an improved and novel character which contributes toward the general objectives of my present invention.

I achieve the foregoing advantages and objects, and such other advantages and objects as may hereinafter appear or be pointed out, in the manner illustratively exemplified in the accompanying drawing, wherein—

Figure 1 is a cross-sectional view through a body of meat or the like, showing the general manner in which my present electrode functions;

Figure 2 is an enlarged plan view of a portion of Figure 1;

Figure 3 is an enlarged perspective view of the forward end of my improved electrode tool;

Figure 4 is an enlarged plan view of the forward end, shown partly in section;

Figure 5 is a front end view of the device; and

Figure 6 is an enlarged cross-sectional view taken substantially along the line 6—6 of Figure 4.

In the drawing, I have shown a high-frequency cutting electrode embodying the features of my present invention, and composed of a hollow, elongated handle member 10 which is preferably of insulating material. The member 10 is substantially stiff and rigid, although it is resiliently flexible to an extent which permits it to be bent by slight degrees along gentle curvatures. It may be of any convenient length, as, for example, nine to twelve inches, and is preferably of conveniently small cross-section. Thus, a tube of this character having an exterior diameter of approximately one-eighth of an inch has proven satisfactory.

Arranged within the tube 10 is a conducting member 11 which I have shown in the form of an uninsulated wire of any suitable metal. This

member extends rearwardly through the handle 10 and is suitably connected at the rear end 12 of the handle to a terminal or binding post of any desired character, whereby an electrical connection may be made, as at 13, to this conducting member.

Emanating out of the interior of the forward end of the handle 10 are a pair of conducting wires 14 and 20 arranged in substantially parallel and spaced relationship, as shown most clearly in Figures 3 and 4, the rear ends of these wires converging rearwardly into the interior of the handle 10 and being electrically connected therein with the conducting member 11. In the illustrated embodiment, the conducting wire 14 is formed as an integral continuation of the member 11.

At the forward ends of the two conducting wires referred to an operative loop 15 is arranged, preferably of U-shape and arranged in a plane substantially transverse to the axis of the handle 10. This loop is of any suitable material adapted to conduct high-frequency alternating current and may, for example, be of platinum or its equivalent. It extends between the forward ends 16 and 17 of the two spaced wires 20 and 14, respectively. A sheath of insulation is arranged around each of the spaced conducting wires 14 and 20, the wire 14, for example, being enclosed within a sheath of insulation tubing 18 and the corresponding opposite wire 20 being enclosed within a similar sheath 19. Each of these sheaths terminates at its forward end at the operative loop 15, and extends rearwardly to an extent sufficient to dispose the rear ends of both insulation sheaths in snug relationship, side by side, within the forward end of the handle 10.

In accordance with my invention, each of the sheaths 18 and 19 has an exterior diameter substantially less than that of the handle 10, and, in fact, the exterior diameters are so small that both sheaths are adapted to be snugly positioned within the handle 10, as shown most clearly in Figure 6. These sheaths may, for example, be of thin treated fabric of the character which is customarily used for catheters, and the exterior diameter of each sheath is of the order of one-thirty-second of an inch.

The rear end of the wire 20 within the sheath 19 may, if desired, be entwined or similarly associated with the conducting member 11, although I prefer to avoid this arrangement for the sake of simplicity of manufacture; and in the illustrated embodiment, this rear end lies adjacent to the member 11 and terminates within the forward portion of the handle 10.

The use of the device is illustratively exemplified in Figures 1 and 2, wherein a piece of meat 21 or the like serves as the equivalent of a portion of the human body upon which a cutting operation is to be performed. I have shown the body 21 resting upon an indifferent electrode or plate 22 which is connected by a lead 23 to the opposite terminal of the source of alternating current to which the lead 13 is connected. It will be understood, however, that in actual surgery, the portion of the body to be operated upon is in all probability within the interior of a body cavity, and the entire patient is caused to lie upon an indifferent electrode.

When the handle 10 is drawn rearwardly in the manner shown in Figures 1 and 2, the operative loop 15 serves to cut a channel 24 in the body 21, thereby cutting out or resecting a rod-shaped piece 25 which lies within the confines of the

loop 15. The alternating current which is customarily employed is of such a character that hardly any pressure is necessary upon the handle 10, the loop 15 working its way through the material 21 with great facility at a rate of approximately one inch per second.

Since this operation is generally performed with the aid of an endoscopic tube, which, for example, will probably be provided with a fenestra through which the loop 15 extends, and since the operation will most likely be performed under the illuminated vision provided by a suitable surgical telescope, it is highly desirable that the loop 15 be constantly observed to see that it is functioning properly and to facilitate its guidance and manipulation. My present device permits of extremely enhanced visibility of the loop 15, especially from the point of view which a typical surgical telescope would afford, viz, a point of view rearwardly of the loop 15 and alongside of the handle 10, near its forward end. A typical telescope would in all probability have its objective closely adjacent to the forward end of the handle 10 and would command an obliquely forward field of vision; and it will be obvious that a greatly improved visibility is afforded by virtue of the space between the conducting wires 14 and 20.

Furthermore, the wires 14 and 20 serve as a convenient, light and somewhat resilient support for the loop 15, which has proven in practice to be far less cumbersome and much more convenient and facile in operation than any of the analogous types of instrumentality that may have been used heretofore.

It will be understood that the operative loop need not necessarily be at approximately 90° to the axis of the handle, but may be arranged at angles other than 90°, usually between approximately 90° and 135°, depending upon requirements; and that the description contained herein and in the appended claims, with respect to the arrangement of the loop in a plane "substantially transverse" to the axis of the handle, is intended to include any such "substantially transverse" arrangement, not necessarily forming an exact or nearly exact right angle with the handle axis.

In general, it will be obvious that changes in the details herein described and illustrated for the purpose of explaining the nature of my invention may be made by those skilled in the art without departing from the spirit and scope of the invention as expressed in the appended claims. It is therefore intended that these details be interpreted as illustrative, and not in a limiting sense.

Having thus described my invention and illustrated its use, what I claim as new and desire to secure by Letters Patent is—

1. In a high-frequency cutting electrode of the character described, an elongated handle, a pair of conducting wires diverging forwardly from the forward end of said handle, an operative conductive loop contacting with and extending between the forward ends of said wires and arranged in a plane substantially transverse to the axis of said handle, and a sheath of insulation around each of said wires and terminating at said loop, said sheaths of insulation being sufficiently slender to provide for an appreciable space between said divergent wires, affording visibility between said ensheathed wires.

2. In a high-frequency cutting electrode of the character described, an elongated hollow handle, a pair of conducting wires diverging forwardly from the interior of the forward end of said han-

5 dle, an operative conductive loop contacting with and extending between the forward ends of said wires, and a conducting member extending rearwardly through the handle and electrically connected at its forward end to at least one of said wires.

10 3. In a high-frequency cutting electrode of the character described, an elongated hollow handle, a pair of conducting wires diverging forwardly from the interior of the forward end of said handle, an operative U-shaped wire loop connecting the forward ends of said wires and arranged in a plane substantially transverse to the handle axis, and a sheath of insulation around
15 each of said wires and terminating at said loop, the rear ends of said sheaths being snugly arranged side by side within the forward end of said handle.

20 4. A high-frequency cutting electrode of the character described, comprising an elongated handle of insulation having a conducting member extending longitudinally therethrough, a pair of spaced substantially parallel conducting wires extending forwardly out of the forward end of
25 said handle, said wires converging at their rear ends into said handle and being electrically connected at their rear ends with said conducting

member, a sheath of insulation around each of said wires and having an exterior diameter substantially less than that of said handle, and an operative unsheathed conductive U-shaped loop contacting with and extending between the forward ends of said wires and arranged in a plane substantially transverse to the axis of said handle, said spaced wires thereby supporting said loop and affording visibility thereof from the rear through the space between said wires. 80 85

5. A high-frequency cutting electrode of the character described, comprising a slender, hollow, elongated handle of non-conducting material, a single conducting member extending longitudinally through said handle and provided at its forward end with a bifurcated extension projecting forwardly of the handle, the arms of said extension being appreciably spaced to afford visibility between them, a sheath of insulation around each arm of said bifurcated extension, the exterior diameter of each sheath being substantially less than that of said handle, and an operative, un-insulated, cutting loop connecting the forward ends of said arms and arranged in a plane substantially transverse to the axis of the instrument. 90 95 100

FREDERICK CHARLES WAPPLER.

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