June 2, 1959 H. W. SEIGER 2,888,928

COAGULATING SURGICAL INSTRUMENT

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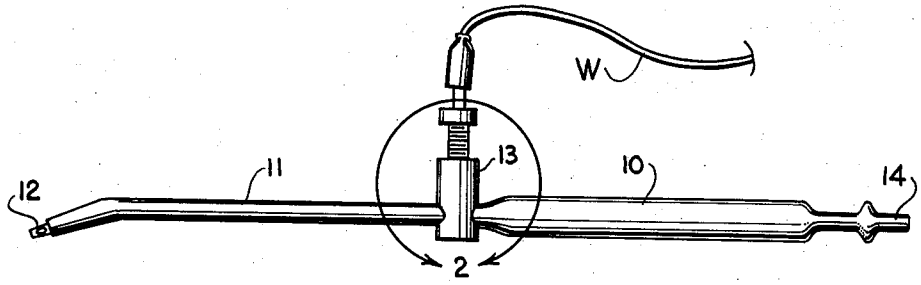

FIG. 1

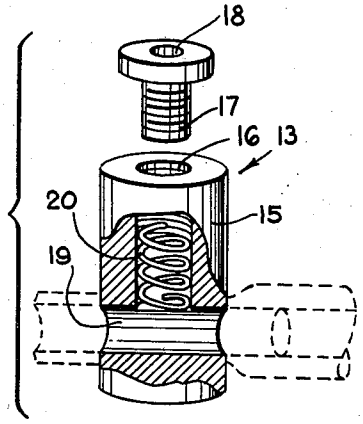

FIG. 2

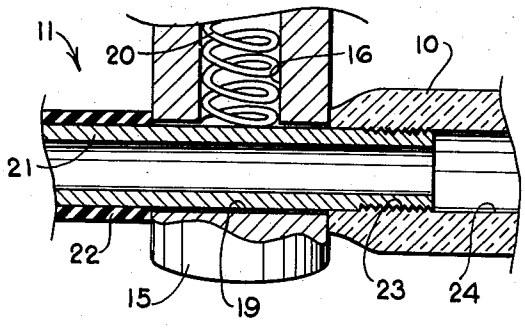

FIG. 3

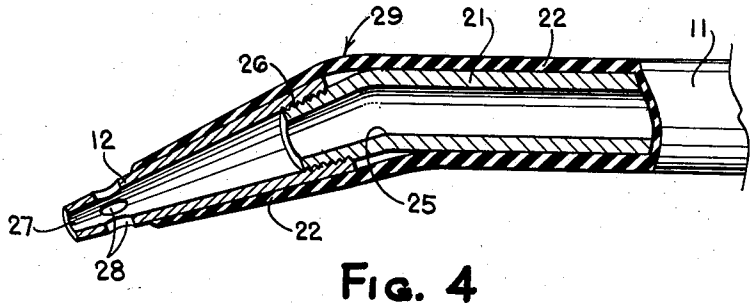

FIG. 4

INVENTOR.
HARRY WRIGHT SEIGER
BY Elliott & Pastoriza
ATTORNEYS

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COAGULATING SURGICAL INSTRUMENT

Harry Wright Seiger, Santa Monica, Calif.

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2 Claims. (Cl. 128—303.17)

This invention relates generally to surgical instruments and more particularly to an improved combination coagulating and sucking instrument.

It is becoming common practice to stem bleeding as a result of surgical operations or even natural causes by coagulating at the affected area rather than resorting to sutures, clamps, or tying off of vessels. By coagulation, no foreign body is introduced and there is less deformation of the tissues, which deformation usually occurs when sutures or clamps are used. Coagulation is best accomplished by a localized controlled heating of the bleeding tissue area, preferably by means of high frequency electrical energy. The advantages of electrical energy for providing the required degree of heat resides in the ability of the operator to control the electrical energy level and to pinpoint the area to be treated.

One of the more troublesome aspects of coagulating tissues is the blocking of visibility by tissue fluids, particularly blood and the resultant smoke and steam, rendering it difficult to see the operating area clearly. It has been the practice in some instances, therefore, to employ a suction tube while coagulating the tissues with conventional type electrodes, in order to clear the area and maintain visibility during the coagulation procedure. Oftentimes, however, there is not sufficient room without undue distorting of the tissues to provide both a suction tube and a coagulating instrument, and further, it is not an easy matter to position the suction tube such as to clear the area of blood and smoke at the exact point at which it is desired to coagulate the tissue.

Bearing the above in mind, it is a primary object of the present invention to provide a vastly improved coagulating instrument constituting a combined electrical heating and suction means such that the operation of coagulating bleeding tissues may be effected far more simply than has been possible heretofore.

More particularly, it is an object to provide an improved surgical instrument employing a single common shaft for effecting both suction and coagulation whereby these combined functions may be effected simultaneously without any increase in the actual size of the coagulating instrument.

Still another object is to provide an instrument of the above type which may be readily manually manipulated without interference from the electrical energy source connected to the instrument for providing heat at its tip.

Another important object is to provide an instrument of the above type employing an improved coagulating tip portion which may be readily removed and replaced for cleaning purposes, and which is so designed that the exact area to be coagulated is simultaneously subject to the suction feature whereby the tissue treated is at all times visible to the operator notwithstanding emission of smoke, steam, blood and other tissue fluids during the coagulating operation.

These and other objects and advantages of the present invention are attained, briefly, by providing a narrow elongated hollow shaft terminating at one end in an open tip communicating with the hollow interior of the shaft and having its other end adapted to be connected to a source of suction. Electrode means are provided and connected to the exterior of the shaft at a point intermediate to its ends. The portion of the shaft between the tip and the electrode means comprises an electrically conductive material so that the shaft not only serves as a fluid conduit for the suctioning apparatus but also as an electrical conductor for passing high frequency electrical energy from the electrode to the tip of the instrument.

The tip itself comprises a conically shaped member having an axial opening at its apex and a threaded base adapted to be received on the shaft whereby it is readily removable for cleaning. Preferably, the apex portion of the conically shaped tip is quite small so that the heating effect of the high frequency electrical energy is concentrated, essentially in a very small area, to facilitate coagulation of only the desired area. In order to insure effective suctioning, however, the tip is also provided with a series of lateral openings through its conical surface adjacent the apex so that fluids may pass through these lateral openings as well as the end axial opening to insure complete drainage during the operation. The handle of the instrument is suitably insulated and there is also provided an insulated sleeve about the shaft portion between the electrode and the tip such that the high frequency electrical energy cannot be dissipated to ground except at the tip portion of the instrument where its effects are desired.

A better understanding of the invention will be had by referring to a preferred embodiment thereof as illustrated in the accompanying drawings, in which:

Figure 1 is a perspective view of the entire instrument of this invention;

Figure 2 is an enlarged perspective exploded view of the electrode portion of the instrument enclosed within the circular arrow **2** of Figure 1;

Figure 3 is an enlarged cross section illustrating the connection of a portion of the electrode to the instrument shaft; and,

Figure 4 is an enlarged cross section of the tip portion of the instrument.

Referring to Figure 1, the instrument comprises a hollow handle **10** secured to a shaft portion **11** terminating at one end in a tip **12**. Intermediate the ends of the instrument there is provided an electrode means **13** adapted to connect a source of high frequency electrical energy from a wire W to the shaft which in turn serves to conduct this energy to the tip **12**. The far end of the handle **10** terminates in a nipple structure **14** adapted to be connected to a suction apparatus.

Referring to Figure 2, the electrode means **13** is illustrated in greater detail and as shown, comprises a cylindrical element **15** provided with an axial opening **16** at its upper end adapted to threadedly receive a screw **17** for securing a wire or the like within a socket **18** from a source of high frequency electrical energy. The lower end portion of the element **15** is in turn provided with a transverse bore **19** diametrically passing through the element **15**. The dimensioning of the bore **19** is such as to receive the conducting portion of the shaft. As shown in Figure 2, the bore **16** in the cylindrical element **15** includes a biasing spring **20** adapted to bear against the top of the shaft when the shaft is positioned in the transverse bore **19**. By adjusting the inward extent of screw **17**, the biasing pressure of spring **20** may be adjusted.

The connection of the electrode to the shaft will be better understood by referring to Figure 3 wherein the shaft **11** is illustrated as comprising a metallic tubular conducting material **21** provided with an insulating sleeve

22 terminating at one end adjacent the cylindrical element 15. As shown, the tubular shaft 21 passes through the transverse bore 19 terminating in threads 23 at its protruding end. The threads 23 are adapted to be threadedly coupled to interior threads in the hollow handle 10. As indicated by the drawing, the handle 10 is made of an insulative material and includes a hollow passage 24 communicating with the end opening nipple portion 14 of Figure 1 for connection to a suction machine. The portion of the metallic shaft 21 between the insulated sleeve 22 and handle 10 is exposed to make direct electrical contact with the sides of the transverse bore 19 of the cylindrical element 15. It will be clear from Figure 3, that the biasing spring 20 within the bore opening 16 is biased into contact with the outer surface of this portion of the shaft tube 21 so that a positive electrical connection between the element 15 and tube is always maintained. Further, it will be evident that the element 15 is free to revolve about the tube 21 as an axis so that any wire such as the wire W of Figure 1 connected to the upper end of the cylindrical electrode element 15 will not tend to be wrapped about the instrument should the instrument be axially rotated during an operation.

Referring now to Figure 4, it will be noted that the insulated sleeve 22 terminates just short of the extreme tip portion of the tip 12. The end portion of the tube 21 is bent as at 25 and is provided with suitable exterior threads 26 for receiving the tip 12. The tip 12 itself is generally of a conical shape having interior threads about its base for connection to the threads 26. Alternatively, the threads may be reversed so that the interior end of the tube 21 is threaded and the exterior of the tip 12 threaded without change in function. It will be evident that by unthreading the threaded connection at 26, the tip 12 may be readily removed for cleaning or for replacement by another tip of different dimensions depending upon the particular operation for which the instrument is to be used.

The tip 12 terminates at its apex in an axial opening 27. Necessarily, this opening 27 is small in order to enable the operator to concentrate the heating area as a result of the high frequency energy passed through the tubular shaft 21 and tip 12. Therefore, the tip 12 is also provided with a series of lateral openings 28 through its conical surface adjacent the apex to provide a greater ingress area for tissue fluids such as blood to increase the efficacy of the sucking operation.

To facilitate the unthreading of the tip 12, the portion of the insulating sleeve 22 covering the conical tip up to the opening 28 may first be slid back along the tube; alternatively, this insulative sleeve may be terminated adjacent the threaded portion 26 as at 29 and a separate insulated sleeve provided for the upper portion of the conical tip. This separate sleeve may be permanently affixed to the tip and extend from the point 29 up to the openings 28 whereby the tip with its affixed insulation may be readily removed for easy cleaning.

The overall operation of the instrument will be evident from the above description. In effecting a coagulation of a local tissue area, a suitable source of high frequency electrical energy is connected to the electrode 13 and this electrical energy is conducted by the metallic shaft tube 21 to the tip 12. A suction source is also connected to the far end of the handle as at 14 whereby suction through the hollow interior of the shaft 11 and handle 10 is continuously maintained. In treating the affected area, the high frequency electrical energy will be concentrated at the tip adjacent the tip opening 27 where it will ground to the tissues. As a result of the resistance to this electrical flow between the contact of the tip of the conically shaped portion 12 with the tissue, sufficient heat will be generated to coagulate the tissue. Because of the relatively small area of the metallic portion exposed adjacent the tip opening 27, the area coagulated may be very precisely controlled. Further, as a result of the continuous suction, the fluids and smoke in the immediate area will be drawn through the axial opening 27 and lateral openings 28 up through the conical tip portions 12 and shaft and subsequently through the handle 10.

By employing only a single tubular arrangement such as comprised of the conically shaped tip 12 and shaft 21 for both conducting the high frequency electrical energy to the area to be treated and for carrying away tissue fluids and smoke in such area, not only is the particular area being treated always rendered visible as a result of the removal of the fluid and smoke at the exact point of operation, but the overall size of the instrument is not unduly increased and precise areas may be treated without undue distortion of adjacent tissues or organs. Further, by providing the bend at 25 whereby the axis of the cone is inclined with respect to the axis of the shaft, the point being treated by the extreme end of the tip 12 is not obscured from view by the remaining portions of the shaft. In the event the tip 12 should become clogged, it may be readily removed and suitably cleaned and then replaced. Alternatively, and as mentioned heretofore, different shaped tips may be substituted for the tip 12 depending upon the particular operation being performed.

Finally, any axial rotation of the instrument during an operation will not tangle the wire leading to the electrode 13 inasmuch as the shaft may rotate within the electrode and the electrode maintain a relatively constant position.

The present invention thus provides a greatly improved combination coagulating and suction instrument employing a minimum number of parts wherein a single elongated tubular means provides the dual function of providing a suction passage and conducting high frequency electrical energy to the immediate area to be treated. Various modifications falling within the scope and spirit of the present invention, however, will occur to those skilled in the art. The coagulating instrument of this invention is, therefore, not to be thought of as limited to the specific embodiment set forth for illustrative purposes.

What is claimed is:

1. A surgical instrument comprising: a hollow shaft having one end terminating in an open tip communicating with the hollow interior of said shaft and its other end adapted to be connected to a source of suction; an electrode means including a cylindrical element having a threaded axial opening in one end and a threaded screw receivable in said opening for securing a wire to said cylindrical element, said cylindrical element having a transverse diametric bore adjacent its other end for receiving said shaft; and spring biasing means within said cylindrical element biasing said shaft against the inner walls of said transverse bore so that said cylindrical element is free to revolve about the axis of said shaft while continuously maintaining electrical contact with said shaft, the portion of said shaft between said tip and said cylindrical element comprising electrically conductive material whereby high frequency electrical energy may be passed from said electrode means to said tip.

2. A surgical instrument comprising, in combination: a hollow electrically conductive shaft having one end terminating in a threaded opening; a hollow electrically conductive tip member having a tapered exterior, the larger end thereof being threadedly engageable with said threaded opening, and the smaller end thereof terminating in at least one opening adjacent its apex communicating through the hollow interior of said tip member with the interior of said shaft, the other end of said shaft terminating in a nipple portion for connection to a source of suction; an electrode means including a cylindrical element having a threaded axial opening in one end and a threaded screw receivable in said opening for securing a wire to said cylindrical element, said cylindrical element having a transverse diametric bore adjacent its

other end for receiving said shaft; spring biasing means within said cylindrical element biasing said shaft against the inner walls of said transverse bore so that said cylindrical element is free to revolve about the axis of said shaft while continuously maintaining electrical contact with said shaft so that high frequency electrical energy may be passed from said electrode means to the tip portion of said tip member; and an insulating sleeve surrounding said shaft between said electrode and said opening adjacent said apex of said tip member, whereby said energy is concentrated at said tip portion of said

tip member to coagulate tissue, tissue fluids being sucked through said opening to pass through said shaft, said threaded engagement enabling manual removal of said tip member for cleaning and replacement during and between operations.

References Cited in the file of this patent

UNITED STATES PATENTS

2,030,285	Dinyer	Feb. 11, 1936
2,808,833	August	Oct. 8, 1957