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CAUTERY INSTRUMENT FOR USE IN NASAL SURGERY

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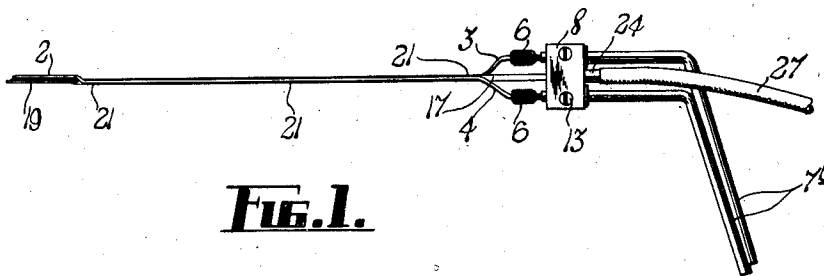


FIG. 1.

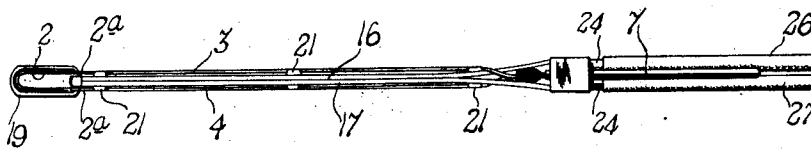


FIG. 2.

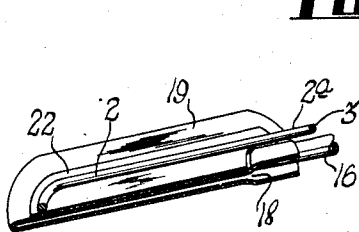


FIG. 3.

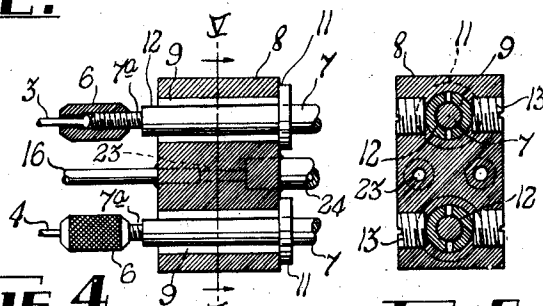


FIG. 4.

FIG. 5.

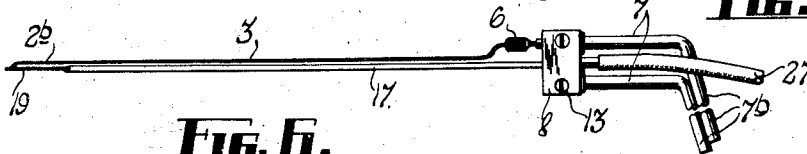


FIG. 6.

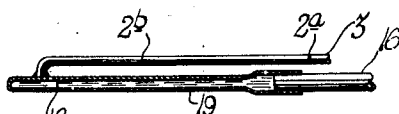


FIG. 7.

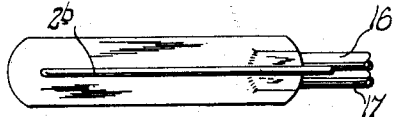


FIG. 8.

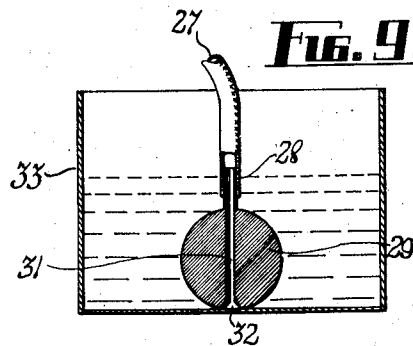


FIG. 9.

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UNITED STATES PATENT OFFICE

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CAUTERY INSTRUMENT FOR USE IN NASAL SURGERY

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6 Claims. (Cl. 219—31)

This invention relates to cautery instruments as used in nasal surgery for treating the turbinal bone or cartilage.

Such operations are carried out with the aid of an instrument, sometimes known as a cautery needle or cautery point, which is inserted into the nasal passage whereupon electric current is supplied to a high resistance wire at the top of the instrument so that the resistance wire becomes incandescent and effects the cautery treatment.

In practice it is often found that tissues opposite or adjacent the area to be treated are also cauterized simultaneously with the result that during subsequent healing, the opposite or adjacent tissues knit together or adhere to each other and thus defeat the primary purpose of the operation or, at least, prevent it from being entirely successful.

With a view to overcoming such surplus or undesired cauterizing it has been proposed to insert a pad of heat insulating material adjacent the resistance wire so that the cautery treatment will be localized to the particular area that has been selected, while the opposite or adjacent areas will be insulated from the heat of the resistance wire. Such proposal has not however, been found effective for the reason that in order to provide a sufficient degree of heat insulation, the pad or like member would have to be of such thickness as would interfere with proper insertion and manipulation of the instrument.

The present invention provides a simple, effective and practical solution of the problem and with this object in view it contemplates associating with a resistance wire or like electric cautery element a circulatory cooling system involving the use of a liquid or fluid coolant which by its circulation carries surplus heat away from the incandescent wire and thus prevent areas or tissues other than those in contact with the wire from being cauterized.

It is believed that by the invention operations of the kind in question can be successfully carried out without involving any change in technique, and in a manner that will prove most satisfactory to the surgeon and to the patient.

The above and various other objects and features of the invention will however be more readily apparent from the following description, aided by reference to the drawing in which—

Figure 1 is a side elevation of an instrument according to one form of the invention.

Figure 2 is a plan of Figure 1.

Figure 3 is an enlarged part section and part

perspective view of the heat insulating chamber and associated parts.

Figure 4 is a sectional elevation of a junction member.

Figure 5 is a cross section on line V—V of Figure 4.

Figure 6 is a side elevation of an instrument according to a modified form of the invention.

Figure 7 is an enlarged sectional elevation of the heat insulation chamber of the instrument seen in Figure 6.

Figure 8 is a plan of Figure 7.

Figure 9 illustrates an accessory for the instrument.

Referring more especially to Figures 1 to 5 the resistance or cautery wire 2 is of substantially U shape and has its opposite ends silver soldered or otherwise suitably connected at or about points 2a to a pair of insulated wires 3, 4, which may extend side by side and be connected at their outer or distant ends to screwed ferrules 6 adjustably applied to screwed shanks 7a of terminal pins 7 which extend through a junction member or block 8 and have down-turned legs 7b for insertion into an apertured or slotted member (not shown) which forms a holder for the device. The holder may have terminals for connection with an electric cable for supplying current to the pins, the insulated wires 3, 4 and the resistance wire 2.

Where the pins 7 extend through the block they may be closely encircled by longitudinally split shanks 9 of bushes having enlarged heads 11 bearing against one end face of block 8. The pins 7 may be coated with insulating material 12 within the bushes, the split shanks of which are held in gripping engagement with the pins by set screws 13.

The circulatory cooling system may include a pair of tubes 16, 17, which extend from the aforesaid block 8 and communicate at their outer end with a chamber 18 (Figure 3) formed by a casing 19 which is preferably flat and has an area which may slightly overlap the area defined by the resistance wire 2.

To increase stability, the insulated wires 3, 4, may be bound to the coolant tubes 16, 17 by clips 21 or by windings of silk or other suitable yarn or thread.

Bearing in mind the nature of the instrument, the casing 19 and its chamber require to be relatively small and delicate. For example it may be formed of sheet copper of say 3 thousandths of an inch in thickness, while the depth of the chamber (i. e. the distance between its opposed faces) may be of the order of 10 thousandths of

an inch. These dimensions are given not in any limiting sense but merely as a general indication of the nature of the casing and chamber.

In any event the casing extends contiguously with the resistance wire 2, but should be separated and electrically insulated therefrom by a thin layer 22 of mica or other appropriate material.

The aforesaid block 3 may be provided, in continuation of the cooling system tubes, with a pair of passages 23 terminating in longitudinally outstanding nipples 24 forming an inlet and an outlet for the coolant which may consist, for instance, of water, although other suitable liquid or vapour or gas or a mixture thereof can be employed. The coolant may be led to the inlet and led away from the outlet by rubber or other flexible tubes 26, 27, which may be detachably applied so that whenever desired ready access may be had to the passages and tubes for clearing, cleansing or other purposes.

In any event the coolant flows under a suitable degree of pressure, furnished for instance by a small pump (not shown), through one of the flexible tubes and one of the rigid tubes into the insulating chamber 18 and then out of the chamber and through the other rigid tube, in such a manner that a continuous circulation of the coolant may be maintained while the cautery operation is being performed.

In this way surplus heat from the resistance wire 2 is continuously being carried away by the circulatory coolant so that that face of the heating insulating casing 19 remote from the resistance wire 2 is kept cool or, at least, maintained at moderate temperature which will not bring about any cauterizing of tissues with which it is in contact.

According to the modification, illustrated in Figures 6, 7 and 8 a single or straight resistance wire 2b is employed in place of the U shape wire as before mentioned, thus making possible a substantial reduction in the size or bulk of the instrument, and enabling the surgeon to perform satisfactory operations even in difficult cases, for instance where it is desired to carry out several cautery treatments over different areas without withdrawing the instrument.

For this purpose the single resistance wire 2b may be welded or otherwise suitably secured at its outer end to the exterior of the heat insulating casing which therefore constitutes an electrode. In this case only that terminal pin 7 connected with the single insulated wire 3 has to be insulated from the aforesaid block 8. The other pin 7 has mechanical and electrical connection with the block, resulting in the current passing through the insulated pin 7 to the resistance wire 2b and returning through the heating insulating casing and the coolant tubes, 16, 17 to the block 8 and thence to the un-insulated terminal 7.

It may be mentioned that manipulation and control of the instrument is in no way impeded by the application thereto of the circulatory cooling system, as the rubber hose or like connections between the coolant source and the instrument may be of substantial length and thus will not offer any obstruction to the surgeon performing the operation.

As a further convenience, the outlet end of the return or exhaust hose 27 (Figure 9) may be connected to a nipple 28 outstanding from a ball or like member 29 having a through passage 31

terminating in a recess 32. This ball is placed within a tank 33 and, by its weight, anchors the hose 27 and ensures that the returning coolant will be discharged into the tank.

Having now described my invention what I claim as new and desire to secure by Letters Patent is:

1. In a cautery instrument for nasal surgery, the combination with an electric cautery element, of a cooling system providing for the circulation of a coolant adjacent one side of the cautery element so as to carry away surplus heat while the cautery treatment is in progress and thus prevent flesh or tissue at the said side of the element from being cauterized.

2. In a cautery instrument for nasal surgery, the combination with an electric cautery element of a heat insulating casing located adjacent one side of said element and providing a chamber for the passage of a coolant so that circulation of coolant may be maintained through said chamber while cautery operations are in progress in order to carry away surplus heat and to prevent flesh or tissue at said side of the element from being cauterized.

3. In a cautery instrument for nasal surgery, the combination with an electric cautery element in the form of a high resistance wire, of a hollow casing extending adjacent one side of said element and providing a chamber, and tubes opening into said chamber so as to provide for circulation of a coolant through the chamber while cautery operations are in progress as to prevent flesh or tissue at said side of the element from being cauterized.

4. In a cautery instrument for nasal surgery, a combination as claimed in claim 2, wherein said cautery element consists of high resistance wire of substantially U shape and extends contiguous one surface of said casing, a layer of electric insulating material intervening between said surface and said element, and two tubes opening into the chamber of said casing to provide for the inlet and outlet of a fluid coolant so that a continuous circulation of coolant through said chamber may be maintained while cautery operations are in progress.

5. In a cautery instrument for nasal surgery, a combination as claimed in claim 3, and including a junction block, electrical terminals carried by said block, conductors extending between said terminals and said electrical cautery element, means for connecting said coolant tubes to said block, and supply and return tubes for the coolant connected at the block with the first mentioned tubes.

6. In a cautery instrument for nasal surgery, a combination as claimed in claim 2, wherein said cautery element is united at one of its ends to a surface of said casing so that the latter forms part of the electric circuit, for the cautery element, a junction block, electric terminals carried by said block, one of said terminals being electrically insulated from the block and the other terminal being electrically connected to the block, a conductor leading from said insulated terminal to the other end of said cautery element, and coolant supply and return tubes extending from said block to openings in said casing, said tubes or either of them also serving to form an electric current path between said casing and the non-insulated terminal.

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