

[54] **STERILE ANESTHETIC INSTRUMENTS**

[76] Inventor: **Irvin D. Tice**, 192 East State St.,
Salem, Ohio 44460

[22] Filed: **Sept. 28, 1972**

[21] Appl. No.: **292,942**

[52] **U.S. Cl.**..... **128/172.1**, 128/409

[51] **Int. Cl.**..... **A61m 35/00**

[58] **Field of Search**..... 128/172.1, 399-409,
128/303.1, 24.1, 417, 172, 269; 401/199

[56] **References Cited**

UNITED STATES PATENTS

569,380	10/1896	Hollingsworth.....	128/409
866,180	9/1907	Ball.....	128/408
1,076,210	10/1913	Kerr et al.....	128/172.1
2,055,540	9/1936	Karnofsky.....	128/409
3,089,182	5/1963	Lofgren.....	401/199
3,107,672	10/1963	Hofmann.....	128/405
3,292,620	12/1966	Mahler.....	128/409
3,716,054	2/1973	Porter et al.....	128/172.1

FOREIGN PATENTS OR APPLICATIONS

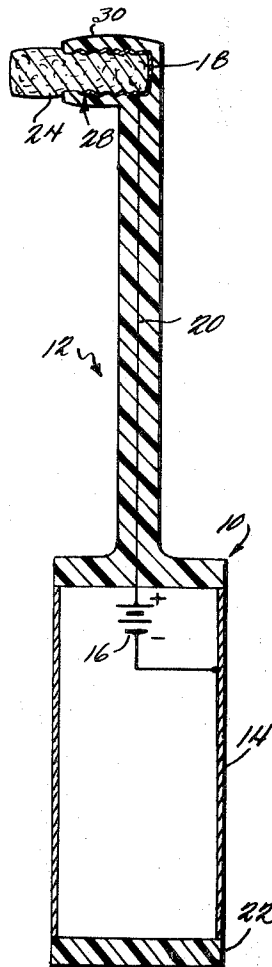
730,652	8/1932	France.....	128/409
376,028	10/1939	Italy.....	128/409
966,559	10/1950	France.....	128/269

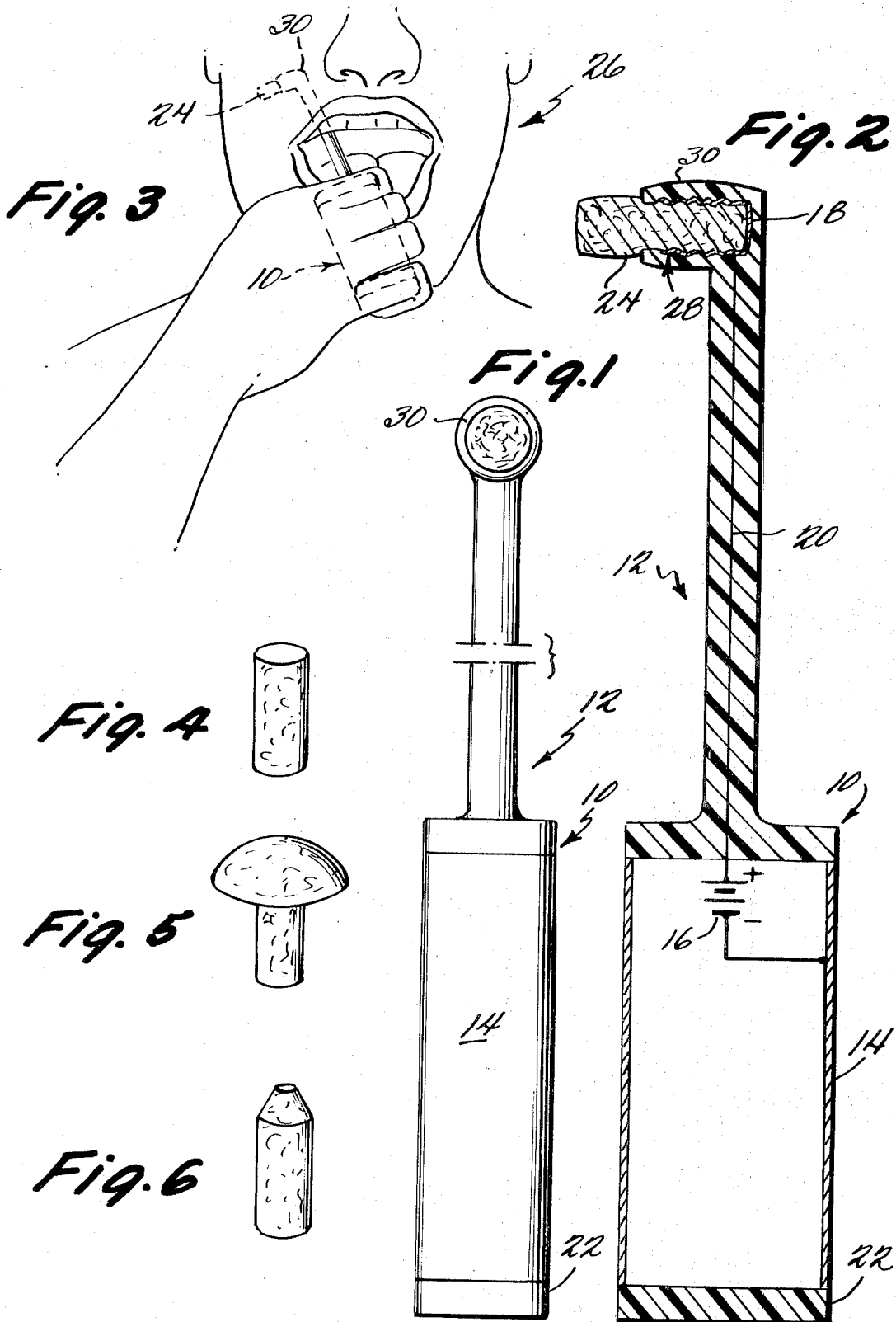
Primary Examiner—Richard A. Gaudet
Assistant Examiner—Lee S. Cohen
Attorney, Agent, or Firm—Cushman, Darby & Cushman

[57] **ABSTRACT**

A self contained cataphoric device which may be conveniently hand held by or attached to the patient for locally anesthetizing an area of tissue. The device includes a central body portion containing a battery having one terminal connected to an electrically conducting outer surface. Connected to one end of this central body is a rigid arm having an electrical contact socket connected to the remaining battery terminal and located at the opposite end of the rigid arm for receiving an absorbent pledget made of material such as compressed felt. The absorbent material is saturated with a conventional anesthetizing agent. Typically, the patient will hand hold the central body portion thus automatically making electrical contact with one terminal of the battery through the outer conducting surface. The saturated pledget will then be applied to the area where anesthesia is desired thus completing an electrical circuit through the body such that significant amounts of the anesthetizing agent are physically transported by the electrical current below the skin surface in the desired local area to achieve anesthesia.

3 Claims, 6 Drawing Figures





STERILE ANESTHETIC INSTRUMENTS

This invention relates generally to the art of cataphoresis wherein electrical current through human or animal tissues is utilized for transporting conventional anesthetic agents into the tissue material. More specifically, the invention relates to a cataphoric device for simply, quickly and effectively pre-anesthetizing a tissue area prior to an injection. In the case of dentistry, the injection which is given after such preanesthesia may itself be an anesthetizing agent destined for more remotely located tissues. However, because of the pre-anesthetic effect in the local surface area achieved through cataphoresis with this invention, the actual penetration of the needle into the more remote tissues will not be felt by the patient or animal involved.

The basic concepts of cataphoresis are well known in the art. Such prior art U.S. Pat. Nos. as 569,380 - Hollingsworth; 591,160 - Dow; 865,330 - Clymer et al; 868,123 - Randall; and 1,076,210 - Kerr et al. each teach various prior art types of cataphoric apparatus. In spite of several far reaching statements in such prior art patents, it has been discovered that the physical transport of medicinal materials such as anesthetizing agents does not actually result in deep penetration within tissue material. Rather, actual tissue penetration due to the cataphoric effect is rather shallow. However, even shallow penetration of strong anesthetic agents results in significant local anesthesia which is very useful in many dental, medicinal and/or veterinary practices such as the previously mentioned pre-anesthesia of a local area before actually penetrating that area with an injection needle.

In spite of the rather early discovery of the basic cataphoric phenomena, not much practical use has been made of it in recent times due to the cumbersome and complicated designs of conventional cataphoric devices. These devices relied on heavy costly batteries and complex control circuit designs that often required a very skilled operator. High levels of electrical currents were utilized which, together with the complex control circuits often resulted in electrical shocks, burns and/or frightening sensations of electrical current by the patient involved. Many of these earlier devices also relied upon unwieldy clamps, springs, forceps, and/or other mechanical contrivances as a part of the electrode in contact with patient's body. Besides conveying a disturbing psychological impression to the patient, such an unwieldy conglomeration of springs, clamps, wires, etc. often actually interfered with medical procedures. For instance, in dentistry such an unwieldy electrode design prevents the patient from easily expectorating or expelling excess saliva. Furthermore, such designs are inherently unsanitary for use as a medical tool successively used by different patients.

Now, however, the invention described herein has been discovered to provide a unique and highly desirable structure for a cataphoric device which overcomes the defects associated with such conventional devices. This new cataphoric device will fill urgent requirements in dentistry, medicine, and veterinary practice for such procedures as pre-anesthesia of an area prior to an injection. It is simply constructed using conventional transistor radio batteries as a power source and with conventional anesthetizing agents such as mepivocaine (Carbocaine) or other conventional anesthetizing agents as will be apparent to those in the art.

The cataphoric device of this invention is extremely compact and lightweight (the exemplary embodiment to be described below weighs only approximately 5 ozs.) while being completely portable and hand held for applications to the human body. Of course, in veterinary medicine, the device must be strapped or otherwise attached to animal tissues as will be explained in more detail below. Since there are no external wires to the unit of any kind, the patient is never really aware of the fact that electrical currents are being employed with the device. Accordingly, there is no psychological hesitation to utilize the device since there is also no unpleasant sensation of any current flow nor risk of electrical shocks, burns, etc. to the patient.

Besides eliminating any external electrical wires, there are absolutely no required control adjustments of any kind in the nature of switches, reostats, meters, dials or any other kind of controls such that absolutely no special skill of any kind is required for using this cataphoric device. Once the active end of the device is properly positioned on the area for which local anesthesia is desired, the patient may himself hold the device in place with no further surveillance.

With respect to dental use for pre-anesthetizing an area later to receive some form of injection by needle, the cataphoric device of this invention provides extreme versatility in that virtually any part of the mouth may be conveniently pre-anesthetized including the upper hard palate as well as the hard to reach buccal folds and tissues at the rear of the mouth. Sufficient local anesthesia is achieved very quickly (within four to six minutes using the exemplary embodiment) and the device may be easily applied and removed by the patient during this period for such purposes as expelling excess saliva, etc.

Of course, the same basic design will also serve for local anesthesia of the eye, ear, nose, and/or other skin areas of the patient as will become apparent to those in the art.

While many applications of the device will use liquid anesthetizing agents, it has been discovered that equally good results may be obtained when the anesthetizing agent is in the form of a gell or salve. In fact, in some applications, it is virtually imperative that the anesthetizing agent be in such a form. For instance, it has been discovered that a gell form of anesthetizing agent may be introduced into the urethra and then activated by the cataphoric device of this invention to provide anesthesia of the urethra prior to catheterization.

Of course, since the entire device of this invention is completely self contained and encapsulated, its cleanliness may be assured by rinsing or emersing the entire unit in a sterilizing solution after each use. As will be explained in detail below, several types of shapes or configurations may be utilized for the felt tips or pledgets of this device depending upon the desired utilization of the device.

A more complete understanding of the invention can be obtained by reading the following detailed description in conjunction with the accompanying drawings, of which:

FIG. 1 is a front view of an exemplary embodiment of the cataphoric device of this invention;

FIG. 2 is a cross-section of a side view of the cataphoric device shown in FIG. 1;

FIG. 3 is a pictorial view showing an exemplary use of the FIG. 1 device in the practice of dentistry; and

FIGS. 4, 5 and 6 are pictorial drawings of exemplary pledget structures for use with the exemplary cataphoric device shown in FIGS. 1 and 2.

Referring to FIG. 1, an exemplary embodiment of the cataphoric device of this invention is shown in front view. There is a central body portion 10 and an upper rigid arm portion 12 attached thereto. In the exemplary embodiment, the central body portion 10 has a rectangular cross-section conforming generally to the rectangular cross-section of conventional transistor radio batteries. A portion 14 of the outer surface area of the central body 10 is formed of an electrically conducting material such as, for instance, zinc, copper, aluminum, etc.

The electrical battery 16 housed within the central body portion 10 has one terminal (the negative terminal for most anesthetizing agents having positive radicals as will be appreciated) which is electrically connected to the outer conducting area 14 as shown in FIG. 2. As will be appreciated, it would be possible to even utilize the outer container of some batteries as the surface 14 since such outer surfaces normally constitute the negative battery terminal. The other terminal of battery 16 is connected through arm 12 to an electrically conducting contact or socket 18 having retaining ridges disposed within the upper end of the arm 12. This connection may be in the form of a wire 20 extending through the center of the arm 12 or it may, in fact, be an integral part of the arm 12 such as, for instance, if the arm were formed of a copper tube coated with some insulating material. Preferably, the arm 12 as well as the encapsulating portion of the central body portion 10 is comprised of a unitary epoxy or plastic structure. The battery 16 is shown schematically in FIG. 2 with a bottom encapsulating portion 22 of the central body 10 also comprising an epoxy of plastic substance for hermetically sealing the battery 16 within the central body 10. As will be appreciated, in actual practice the battery 16 would be hermetically sealed within a unitary encapsulation structure having the outer conducting surface 14 and the upwardly extending arm 12.

A pledget 24 is inserted in the electrical contact socket 18 and held in place by the retaining ridges. In use, the pledget 24 should be saturated with any desired conventional anesthetizing agent as will be apparent to those in the art.

As shown in FIG. 3, a typical application in the field of dentistry would involve a patient 26 holding onto the central body 10 of the device and thus automatically making electrical contact with the outer surface 14 thereof. The rigid arm 12 would then be inserted within the mouth of the patient and the pledget (saturated with a desired anesthetizing agent) would be held against the desired portion of the mouth. Thus, an electrical circuit would be completed through the patient's body to permit the cataphoric effect to transport the anesthetizing agent below the surface of the skin at the desired area within the patient's mouth, thus locally anesthetizing this area and numbing it sufficiently to prevent feeling a later inserted injection needle in that area.

Although each person's body will vary somewhat, it may be generally said that the human body presents approximately 1,000 ohms of electrical resistance as will

be appreciated by those in the art. Using the cataphoric device of this invention, it has been discovered that approximately 9 to 12 volts (from conventional batteries normally used in transistor radio circuits) is sufficient electrical voltage for the battery 16. Of course, since the body's resistance is approximately 1,000 ohms, this means that approximately 9 to 12 milliamps of electrical current are involved in the electrical circuit completed through the patient's body. As will be appreciated by those in the art, this is not generally sufficient current to cause the patient to feel a sensation of electrical current passing through his body.

It has been discovered that using the standard 9 volt transistor battery 16 will result in sufficient local anesthesia within four to six minutes to permit a painless needle injection. By increasing the voltage to 12 volts and hence the electrical current to 12 milliamps, this time period may be reduced by a factor of approximately two to 2-3 minutes. However, at the upper voltage (i.e., 12 volts) some patients may be able to sense the presence of an electrical current.

The pledget 14 is preferably comprised of compressed felt; however, any form of absorbent material having enough structural rigidity to approximately maintain its shape under slight pressures such as those that may be exerted by the hand-held application shown in FIG. 3 would suffice as should now be apparent.

Different shapes of pledgets will be found to work with different degrees of success or effectiveness depending on the type of application involved. For instance, for the usual type of pre-anesthetizing in dental applications, the pledget of cylindrical shape shown in FIG. 4 and/or the pledget having the disc-spherical shape shown in FIG. 5 have been found most effective. The disc-sphere shape shown in FIG. 5 would be used for the hard upper palate of the mouth while the cylindrical shape shown in FIG. 4 would be used for other areas of the mouth.

The shape shown in FIG. 6 (frusto-conical) has been discovered as being especially advantageous in anesthetizing the urethra prior to catheterization. For instance, a gel formed of a conventional anesthetizing agent is introduced into the urethra and then (with the pledget shape shown in FIG. 6 inserted within the socket 18 of this device), the small frusto-conical end of the pledget is applied to the end of the urethral opening by the patient to cause cataphoric transport of the anesthetic agent into and below the surface of the urethra channel tissues thus permitting subsequently painless catheterization of the patient.

It should be noted that in FIG. 2 that the electrical socket 18 terminates at point 28. That is, the socket 18 is recessed within the insulating material 30 forming the outside of the rigid arm assembly 12. This prevents the patient's skin from actually coming into direct contact with the electrical conductor 18 and thus prevents electrical burns which would otherwise result from such direct contact. Of course, there is no danger of electrical burns from the surface area 14 being in direct contact with the user's skin since there is a much larger surface area of skin involved.

The rectangular shape of the central body portion 10 which corresponds roughly with the size and dimensions of the usual conventional rectangular 9 to 12 volt transistor radio battery is especially convenient for a hand-held instrument such as the exemplary embodi-

ment shown in FIGS. 1 and 2. Furthermore, the angular position of the pledget 24 and the socket 18 for receiving the pledget with respect to the arm 12 is especially advantageous for reaching all areas of the mouth and/or other parts of the body. That is, with the axis of the socket 18 situated at approximately 90° with respect to the axis of the arm 12, it is very convenient for the patient to hand-hold the device as shown in FIG. 3 and apply the active end of the pledget 24 to any desired area of the inside mouth surfaces. Of course, other than 90° angles might be used if desired as will now be appreciated.

For applications in veterinary medicine, the device of this invention is physically strapped or otherwise affixed to the body or limbs of the animal patient by a piece of tape or elastic wrap, etc. Of course, the same concept could be used for human bodies if desired thus permitting the human or animal complete freedom of movement while the pre-anesthesia effect is taking place. For this application, the axis of the pledget 24 and socket 18 should preferably be rotated by 90° from the positioning shown in FIGS. 1 and 2. That is, the axis of the pledget 24 should preferably be perpendicular to the larger surface of the rectangular body 10. Thus, when the rectangular body 10 is elastically or otherwise strapped to the limb or body of the patient or animal, the pledget 24 would be more stable and thus more likely to be maintained in contact with the desired surface area as should now be apparent.

Furthermore, while the rectangular cross-section is shown in FIGS. 1 and 2 is preferable for such reasons as the procedures described in the just preceding paragraph, different shapes could also be utilized for certain applications as should now be appreciated. For instance, in the hand-held application for the field of dentistry, as shown, for example, in FIG. 3, a round battery structure and/or round body 10 might be utilized instead of the rectangular shape as should now be appreciated. Of course, other shapes might also be used if desired.

It should now be appreciated that the cataphoric device just described provides an extremely lightweight self-contained device without any external electrical wires, switches, meters, reostats, controls, dials, etc. It provides for a unique inclusion of the user's body in the electrical circuit required for the cataphoric effect while yet offering complete freedom of movement on the user's part and complete freedom from surveillance during use. Absolutely no skill is required on the operator's part and it provides for quick application and removal of the device which is of great importance in dental use, for instance, where the patient must frequently expectorate. The recessed electrical socket 18 makes the device completely safe from electrically burning the patient while the angle relationship between the axis of the pledget and the rigid slender arm of the device facilitates easy application to any desired area of the human or animal body. The pre-formed felt tips of various shapes may, of course, be pre-packaged and saturated with a desired anesthetizing agent and

the entire device is completely hermetically sealed and immersible to provide a sanitary one-piece design.

While only a few exemplary embodiments of this invention have been described in detail above, those in the art will readily appreciate that many obvious modifications may be made in the exemplary embodiments without in any way departing from the spirit or teachings of this invention. Accordingly, all such modifications are intended to be included within the scope of this invention.

What is claimed is:

1. A sterile anesthetic instrument for producing local anesthesia through cataphoric transport of anesthetic agents, said instrument comprising:

15 a bottom encapsulating portion;

a central body having first and second ends and hermetically sealed at the first end to said bottom encapsulating portion, said central body having a longitudinal axis and having a rectangular cross-section perpendicular to said longitudinal axis, said central body also comprising a self-contained battery and an electrically conducting outer surface area electrically connected to one terminal of said battery;

25 a rigid arm having a longitudinal axis and an electrically insulated outer surface hermetically sealed at one end to said second end of said central body portion and having the opposite end of said rigid arm extending away from said central body portion along the longitudinal axis of said rigid arm, wherein said battery is hermetically sealed between said bottom encapsulating portion and said extending arm;

an absorbent structure means for absorbing and storing a quantity of said anesthetic agent;

an electrically conducting socket receiving said absorbent structure and positively retaining said absorbent structure therein, said socket being disposed on said opposite end of said rigid arm and electrically connected to the remaining terminal of said battery through said rigid arm;

said socket also being recessed within an insulating material to prevent direct contact with a user's skin surface,

45 said socket having a central axis disposed at a right angle with respect to the longitudinal axis of said rigid arm; and

the central axis of said socket being disposed at a predetermined angular relationship with respect to the longer dimension of said rectangular cross section of said central body.

2. A sterile anesthetic instrument as in claim 1 wherein said electrically conducting socket includes retaining ridges therein circumferentially disposed about said absorbent structure.

3. A sterile anesthetic instrument as in claim 2 wherein said absorbent structure is anesthesia saturated and has a disc-sphere shaped end projecting away from said socket.

* * * * *