Sept. 18, 1956 I. A. ELLMAN 2,763,263

ANALGESIC APPARATUS

Filed June 30, 1953

FIG. 1

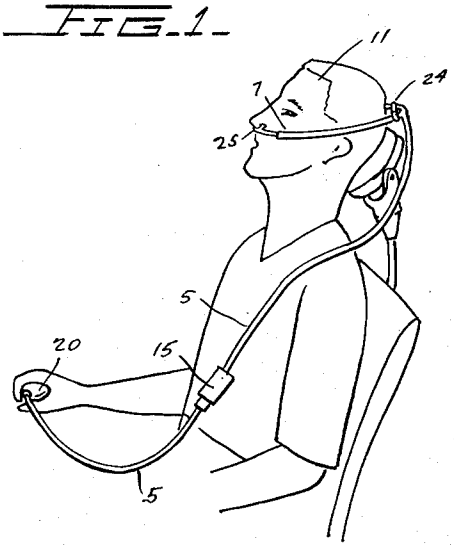

FIG. 2

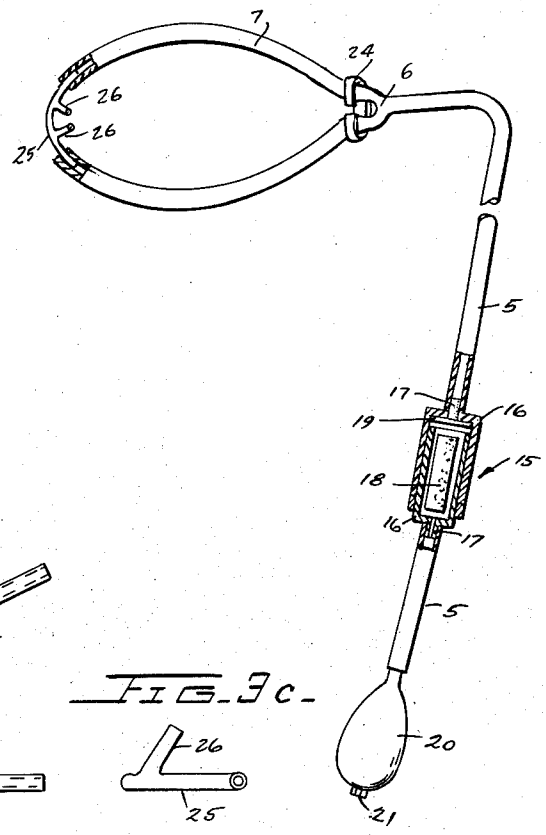

FIG. 3a

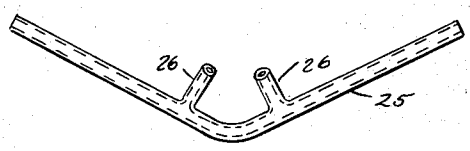

FIG. 3b

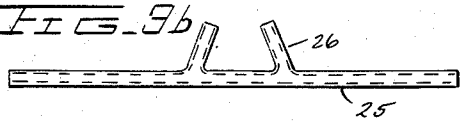

FIG. 3c

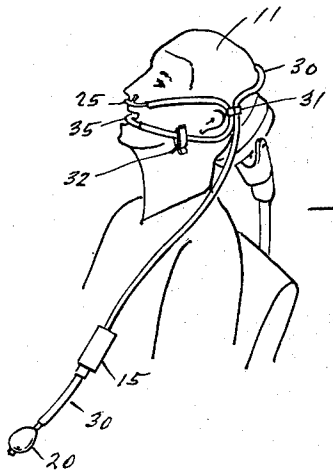

FIG. 4

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ANALGESIC APPARATUS

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3 Claims. (Cl. 128—198)

This invention relates to an apparatus for administering anesthetic gases to a patient to produce a condition known as analgesia. More particularly, this invention relates to a forced-feed apparatus for administering anesthetic gases over which the patient has complete control at all time.

Painless dentistry has been a goal sought after for many years by the dental profession. Recently, a great deal of effort has been expended in the direction of analgesic apparatus as the solution to this vexing problem. Analgesia is a plane of anesthesia under which the patient is insensible to pain in most parts of his body. It is a condition of semi-consciousness which is ideally suited for the dental profession because it is rapidly induced by a relatively small number of inhalations of the anesthetic gas; it is easily maintained by intermittent administration of the gas; and it is easily terminated in a relatively short time without any annoying or uncomfortable after-effects. Under analgesia, a patient can be treated for dental work such as cavity preparations, extractions, bridge fittings, crowns and inlays, incisions and drainage of abscesses, and the like, without suffering the slightest amount of pain. Analgesia, therefore, is rapidly becoming an important adjunct of modern painless dentistry.

Apparatus for administering anesthetic gases to produce analgesia in a patient have been available for some time; however, they all fail in one or more particulars to meet the stringent requirements imposed thereon by the practicing dentist thereby limiting the wide application to which the technique of analgesia is entitled by reason of its advantageous properties. The most important requirements, from the practicing dentist's point of view, which have not been fulfilled by any of the known apparatus, are that the apparatus should be simple, light-weight, easily operated by the patient himself, and fool-proof in that operation. These are important since, in the last analysis, it is the dentist himself who must convince a usually reluctant patient of the effectiveness and harmlessness of the apparatus. Consequently, all complicated, heavy or bulky equipment is ruled out. The apparatus should be simple and uncomplicated, so as to reassure completely the patient of its usefulness and induce complete confidence in the dentist. Furthermore, from the psychological point of view, the apparatus should be adapted so that the administration of the anesthetic gases remains entirely in the hands of the patient. That is to say, the patient alone should determine how little or how much gas is necessary to induce a state of analgesia, and the patient should be able to discontinue its use at any time. In short, the patient should be able to feel that he dominates and controls the apparatus, and not vice versa. Most known apparatus falls short when it comes to meeting this requirement because the entire nasal organ or nostrils of the patient are usually sealed off by a mask through which the gas is inhaled, and the patient has a feeling of constriction accompanied by fear connected with the fact that he must and, as a matter of fact, can only, inhale through the mask and thereby is denied access to the outside air.

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Another requirement is that the apparatus should leave the mouth area of the patient completely free of obstructions so that the patient's teeth are readily accessible to the dentist. Further, the apparatus should be designed to prevent administration of the anesthetic gas in quantities in excess of that required to produce the condition of analgesia. That is to say, the apparatus should be free from a construction under which gas may continue to be administered even after the state of analgesia has been produced in the patient. In addition, the parts of the apparatus that come into contact with the mouth or nasal organs of the patient should be capable of being sterilized by boiling, without damage to the apparatus and without requiring excessive dismantling thereof. And, finally, the apparatus should be economical, both as to its own cost, and in the expense involved in its efficient use of anesthetic gases.

Accordingly, one object of the present invention is to provide a simple, light-weight and reliable apparatus for administering anesthetic gases to a patient to induce a state of analgesia therein.

A further object of the invention is to provide an apparatus for administering anesthetic gases to a patient in which the nasal organ or nostrils are not sealed off from the outside air, but are free from impediments which deny access to the air.

Another object of the invention is to provide an apparatus for administering anesthetic gases to a patient which does not depend on inhalation by the patient to receive the gases from the apparatus.

A still further object of the invention is to provide an apparatus for administering anesthetic gases to a patient in which the parts which come into contact with the nasal or mouth organs of the patient are easily sterilized by boiling in water for future use.

The invention will now be described with reference to the accompanying drawing in which:

Fig. 1 shows one embodiment of the apparatus according to the invention in position on the head of a patient;

Fig. 2 is a plan and partially cross-sectional view of the apparatus of the invention shown in Fig. 1;

Figs. 3*a*, 3*b* and 3*c* are plan, elevational and side views, respectively, of the detachable nozzle shown in Figs. 1, 2 and 4 in detached position; and

Fig. 4 is a perspective view of another form of apparatus according to the invention in position on the head of a patient.

Referring now to Figs. 1 and 2 of the drawing, the forced-feed analgesic apparatus of the invention comprises a flexible tube or hose **5** connected by means of a Y-connector member **6** to a looped tube portion **7** which is supported in position on the head of a patient **11**. The tube **5** is preferably light-weight and small in diameter to impart the least amount of discomfort to the patient. Any light-weight flexible material is suitable for this purpose, such as rubber or plastic material, the only restriction being that the anesthetic gas employed does not act as a solvent for the material.

A cartridge holder **15** is connected to the tube **5** and functions as the source of the anesthetic vapors. The holder **15** comprises a pair of hollow cylindrical telescoped members **16** each having a hose connector **17** at one end. Inside the holder **15** is disposed a wick **18** saturated with a liquid anesthetic agent. The wick **18** may be constituted by a cotton roll, such as is commonly found in dentist's offices, or any other substance capable of absorbing an anesthetic liquid. A filter member **19**, for example,

felt, may be disposed at the exit port of the holder **15** to assure that only vapors are carried into the tube **5**. Alternatively, the cartridge holder **15** may consist of a tubular member having an open end which is detachably sealed by a threaded nut. At the end of the tube **5** is connected means **20** for compressing air and forcing it through the holder **15** and the tube **5**. In the embodiment shown, the compressing means **20** comprise a conventional hand rubber bulb adapted, upon pressing, to force air under pressure through the hose **5**. The end **21** of the bulb **20** is fitted with a conventional one-way valve which permits air only to enter the bulb when it is released, but not to be expelled therefrom when the bulb is pressed. The bulb **20** is held in the hand of the patient, as shown, the holder **15** resting in an upright position on the breast of the patient.

The hose **5** is connected by means of the Y-connector **6** to the end **17** of the holder **15**. The looped portion of the hose **7** passes over the ears of the patient, across the cheekbones, and terminates under the nostrils, the loop being secured in that position by a slideable clamp **24** which is lightly tightened against the rear of the head of the patient. Completing the loop by being detachably secured thereto is a hollow, bent, bifurcated member **25** which rests lightly on the upper lip of the patient and comprises a pair of short, thin nozzles **26** (Figs. 3*a*, 3*b* and 3*c*) protruding therefrom which are partially inserted into the two nostril openings of the patient. This nozzle member **25** may be constituted, for example, of rigid metal, or of a flexible plastic material, and is detachably secured by a tight fit to the ends of the hose **7**. The nozzles **26** are relatively short and have a relatively small diameter, much smaller than the nostril openings; consequently, the nostrils are only partially occupied by the nozzles and are in no way obstructed or denied access to the outside air.

The apparatus illustrated in Figs. 1 and 2 operates in the following manner. The apparatus is placed in position on the head of the patient, the clamp **24** tightened, and the bulb **20** placed in the patient's hand. The telescoped cartridge holder **15** is opened, the cotton roll **18** withdrawn, inserted into a suitable liquid anesthetic agent, and reinserted back into the holder which is then closed. In normal use, about 3 cc. of liquid is sufficient to saturate a roll 1½ inches x ⅜ inch, and this relatively small amount will supply vapor for about 2 hours under normal usage. However, if larger doses are required, it is a simple matter to provide a cotton roll having a greater length and thereby able to hold greater amounts of the anesthetic liquid; for example, a roll of 3 inches x ⅜ inch will hold about 6 cc. of liquid. The longer roll can be inserted into and enclosed by the holder **15** by simply not telescoping the two sections **16** together as much as for the smaller roll. In other words, the holder **15** is equipped to supply larger or smaller quantities of the anesthetic vapors by disposing larger or smaller wicks **18** therein, depending upon the patient's requirements.

The bulb is then pressed by the patient. Air under compression is forced through the holder **15** into the tube on the other side carrying along concentrated vapors of the anesthetic gas which have been produced by evaporation from the wick **18** in the holder **15**. The mixture of concentrated vapor and air is forced through the tube **5** and loop **7** by the air pressure and blown into the nostrils of the patient through the nozzles **26**. By simply breathing in, the patient inhales both the concentrated vapors and air present in his nostrils and air from the outside, which serves to further dilute the vapors to a proper concentration to induce the state of analgesia in the patient. About six to nine inhalations are sufficient to induce a state of analgesia in the patient, accompanied by about three or four squeezes of the bulb per inhalation by the patient. Once the state of analgesia has been attained, the patient loses control over his muscular functions and is therefore unable to press the bulb any further thereby preventing any further vapors from entering his nostrils. The nostrils of the patient being unimpeded by the nozzles **26** and accessible to the outside air, he is able to inhale pure air and exhale expired air at will and without any difficulty whatsoever while remaining in the state of analgesia. As long as the bulb **20** remains unpressed, no vapors can be inhaled by the patient. Consequently, planes of anesthesia beyond the state of analgesia can not be maintained. When the effect of the vapors is terminated, the patient regains control over his muscular functions and can once again administer to himself another dose of vapors whenever desired. After treatment of the patient is completed, the apparatus is removed from the patient's head, the detachable nozzle member **25** detached from the tube **7** by simply pulling the two apart, and the nozzle **25** readily sterilized by boiling in any conventional sterilizing apparatus. The closed cartridge holder **15** prevents the vapors therein from escaping to the atmosphere so that one charge of the cotton roll **18** is more than adequate for one patient and can be recharged by redipping in the anesthetic liquid without loss thereof; consequently, the amounts of liquid anesthetic agent employed is extremely small.

The apparatus of the invention offers the advantages of simplicity and light-weight. The patient is not appalled by a complicated and bulky device; he readily understands its simple operation, and is completely reassured when confronted thereby. The mouth of the patient is completely free from obstructions and readily accessible for treatment by the dentist. There is no discomfort to the patient because the apparatus is extremely light-weight and the nozzles **26** fit loosely and comfortably within the nostrils. The nose of the patient is not sealed up by the nozzle but remains exposed to the outside air, and the patient is thus able freely to inhale pure air and exhale expired air through the unimpeded nostrils at all times. The anesthetic vapors are force-fed by the compressed air of the bulb **20** directly into the nostrils of the patient, and inhalation on his part to transfer the vapors from the nostrils to the respiratory system requires very little effort. Normal breathing by the patient through the nose is adequate for this purpose. The apparatus is economical in its efficient use of the anesthetic liquid, 3 cc. being adequate for the average patient. Furthermore, various sizes of the nozzle member **25** can be employed for use with larger or smaller adults, or for children.

Some patients, though otherwise cooperative, tend to breathe through the mouth when the realization occurs that continued nasal inhalation of the gases will result in their losing their consciousness. As a result, the state of analgesia can not be maintained.

According to a further feature of the invention, means are provided for effecting administration of the anesthetic vapors both orally as well as nasally when the patient exhibits the aforementioned tendency. This embodiment is illustrated in Fig. 4, in which a hose **30** is constituted by a continuous member passing from the bulb **20**, through the holder **15**, through clamping means **31**, over one ear and through the detachable nozzle member **25** and nozzles **26**, back over the other ear and through the clamping means **31**, and then downward through a hand-operated valve or clamp **32**, and finally terminates at another detachable nozzle **35** which is held in position in the side of the patient's mouth.

The apparatus illustrated in Fig. 4 operates in a similar manner to that shown in Figs. 1 and 2 when the clamp or valve **32** is closed, the anesthetic vapors being administered through the patient's nose. However, administration of the vapors orally, as well as nasally, can be simply accomplished by opening the valve **32**, thereby completing a path for the vapors both to the nose and to the mouth. Consequently, inhalation by the patient, either orally or nasally, will result in introduction of the anesthetic vapors to the respiratory system of the patient. The rela-

tive nozzle openings **26**, **35** may be adjusted so that the anesthetic vapors are apportioned therebetween in the desired manner.

To illustrate the smallness and light-weight of the apparatus illustrated in Figs. 1 and 2, there now follows a detailed description of one form of apparatus successfully employed to induce a state of analgesia in a large number of patients. The tube **5** was composed of a polyethylene plastic material having an O. D. of ¼ inch and an I. D. of ⅛ inch. The cartridge holder **15** was a brass cylinder four inches long compressed and five and one-half inches extended, and three-quarter inch in diameter. The cotton roll **18** was one and one-half inches long and three-eighths inch in diameter. The nozzle member **25** was brass tubing with an O. D. of one-eighth inch. The nozzles **26** were seven-sixteenths inch long and had an O. D. of one-eighth inch. The complete apparatus weighed only about four and one-half ounces.

Anesthetic agents suitable for application in the apparatus of the invention are any of the well-known liquid anesthetic agents, for example, ether, ethyl chloride, chloroform, vinylether, etc. Particularly good results were obtained with a commercial preparation consisting of trichloroethylene.

While I have thus described my invention with specific examples and embodiments thereof, I do not wish to be limited thereto inasmuch as other embodiments will appear obvious to those skilled in the art without departing from the spirit and scope of the invention as defined in the appended claims.

What I claim is:

1. A forced-feed apparatus for administering an anesthetic gas to a patient to induce a state of analgesia therein, comprising a flexible continuous tube including a looped portion adapted to be supported around the head of the patient under his nostrils, compressed air means coupled to one end of said tube for forcing air under pressure through said tube, a detachable nozzle member coupled to said looped portion of said tube at a position adjacent the nostrils of the patient for introducing a mixture of air and concentrated anesthetic vapors into the nostrils, said nozzle member comprising at least one short thin nozzle having a diameter enabling outside air to be admitted to the patient, a cartridge holder coupled to said tube between said compression means and said nozzle member, a wick disposed in said holder and adapted to hold a quantity of a liquid anesthetic agent, a nozzle connected to the other end of said tube, and a valve coupled to said tube at a position between the last-named nozzle and the looped portion of the tube.

2. A forced-feed apparatus as claimed in claim 1 in which the compressed air means comprises a hand rubber bulb, and means are provided for tightening the looped portion of the tube against the patient's head.

3. A forced-feed apparatus for administering an anesthetic gas to a patient to induce a state of analgesia therein, comprising a flexible continuous tube including a looped portion adapted to be supported around the head of the patient, clamping means for tightening the looped portion against the patient's head, a hand bulb coupled to one end of said tube for forcing air under pressure through said tube, a detachable bifurcated nozzle member comprising short thin nozzles each having a diameter enabling outside air to be admitted to the patient, said nozzle member being coupled to said looped portion of said tube at a position adjacent the nostrils of the patient, a cartridge holder comprising a pair of telescoped open-ended hollow cylindrical bodies coupled to said tube between said compression means and said looped portion, a wick of absorbent material disposed in said holder and adapted to hold a quantity of a liquid anesthetic agent, a nozzle connected to the other end of said tube, and a valve coupled to said tube at a position between the last-named nozzle and the looped portion of the tube.

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