Nov. 7, 1939. C. F. LOMBARD 2,178,800

INHALER

Original Filed May 15, 1936

Fig. 1

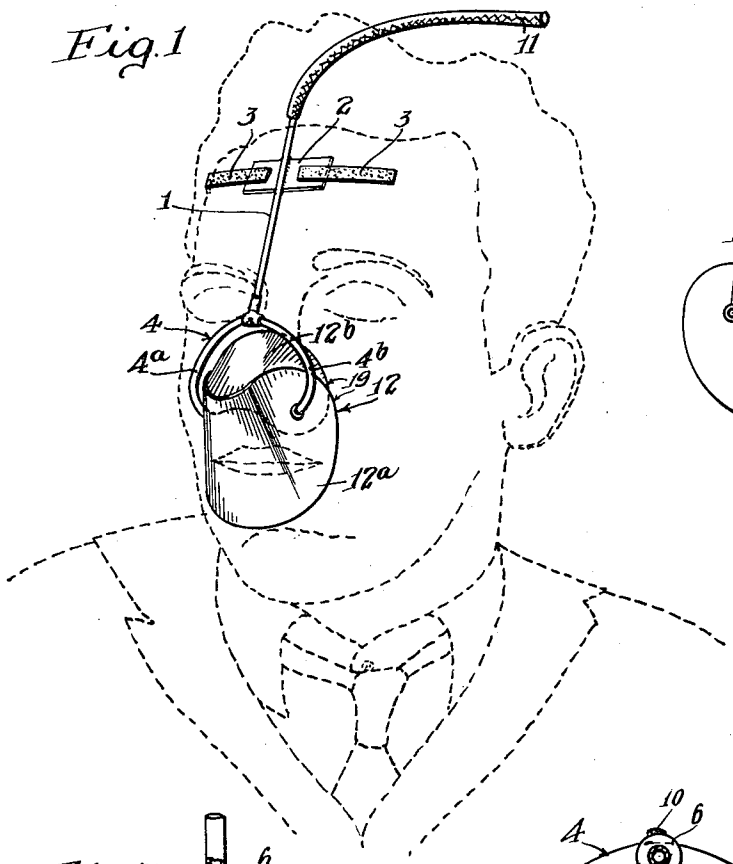



Fig. 2

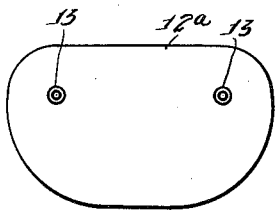



Fig. 3

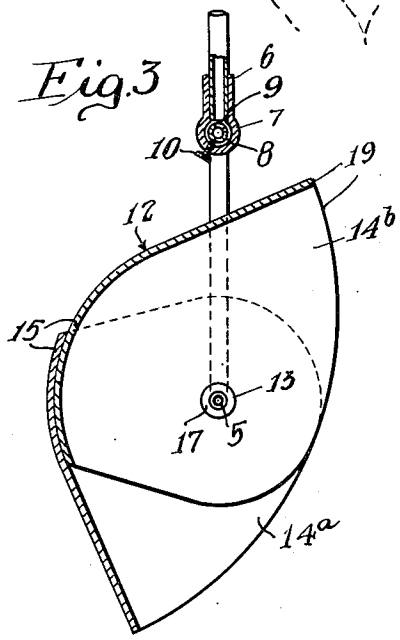
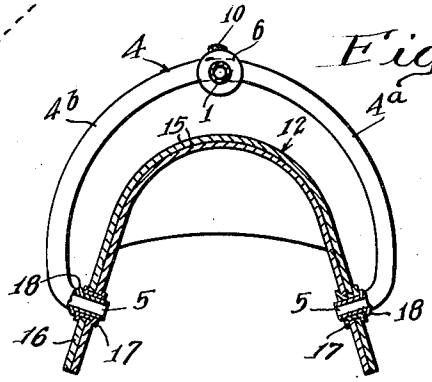



Fig. 4




INVENTOR.

Charles F. Lombard

BY Lyon & Lyon ATTORNEYS

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# UNITED STATES PATENT OFFICE

2,178,800

## INHALER

Charles F. Lombard, Alhambra, Calif.

Application May 15, 1936, Serial No. 79,894
Renewed March 4, 1939

6 Claims. (Cl. 128—195)

This invention relates to an inhaler to facilitate the administering of gas to patients. Although the invention may be employed for administering gas of any kind to patients, it is intended particularly to be employed for administering oxygen.

Apparatus for this purpose has been suggested, employing a small nasal hood into which the gas was delivered through a single tube, but with such apparatus, due to the velocity of flow into the hood, there is a tendency for much of the gas to escape into the atmosphere. An inhaler has also been in use that employs two tubes projecting directly into the nostrils. It is not a satisfactory method to deliver the gas within the nostrils through an inserted tube, as it then becomes difficult to regulate the strength of the oxygen.

The general object of this invention is to provide simple means for delivering the gas adjacent the patient's nostrils so that the velocity of flow of the gas is eliminated; in other words, so as to present a quantity of gas in a static condition, ready to be drawn into the patient's lungs by his act of inhaling.

It is the present practice in hospitals in administering oxygen to a patient, to place the patient in an oxygen tent. These tents are relatively expensive, and one of the objects of the present invention is to enable oxygen to be administered to a patient without necessitating the use of such a tent.

A further object of the invention is to construct the device so that it can be readily adjusted to admit more or less atmospheric air to the patient with the oxygen supply. In using such a device on a hospital patient, it is very desirable that the patient's mouth should be accessible when necessary, to enable the patient to take food, or expectorate. In its preferred construction the device comprises two articulated parts, one of which covers the patient's mouth; and one of the objects of the invention is to construct the device so that the part covering the mouth can be set when desired, in an open position.

A further object of the invention is to provide a construction for the device, which will enable its parts to be readily packed into a compact bundle or package for shipment.

Further objects of the invention will appear hereinafter.

The invention consists in the novel parts and combination of parts to be described hereinafter, all of which contribute to produce an efficient inhaler.

In the drawing:

Figure 1 is a perspective of the device, and illustrates by dotted lines the manner in which it is applied to a patient.

Fig. 2 is a plan of one of the parts that forms the hood over the patient's nose, and representing the same in a flat condition ready for packing.

Fig. 3 is a section taken through the inner end of the apparatus, and further illustrating details of the device; in this view a portion of the tube is represented in elevation and broken away.

Fig. 4 is a section through the hood taken about in the plane of the yoke that supplies the gas to the inside of the hood, and this view shows the inner ends of the forks of the yoke broken away, and in section.

Before proceeding to a more detailed description of the invention, it should be stated that in practicing the invention, I provide a tube, which is constructed so as to facilitate its attachment to the patient's head and preferably to his forehead, so that the tube projects down to a point near the patient's nose. At this point the device includes a yoke preferably of tubular form, and including two forks which, at their lower ends converge toward each other so as to present opposed outlets for the gas. As the two currents from these outlets meet each other their velocities are eliminated, leaving the gas in a substantially static condition. I prefer to employ a hood that covers the patient's nose and excludes the atmospheric air to a considerable extent. The hood is preferably constructed of two hood sections formed from a sheet of Celluloid or similar material. The hood is preferably constructed so that it can be adjusted to regulate the admission of air. In the present instance the two sections are movable relatively to each other, and by reason of this movement one of the hood sections can be tilted more or less so as to admit more or less air under the hood. In this way the degree of concentration of the oxygen that the patient is breathing may be regulated. The device is composed of small parts, which can be readily taken apart if desired, for packing. In the preferred embodiment of the device the hood is formed of sheet Celluloid, which is a resilient and stiff material; that is to say, not flimsy, and a material that will not stretch substantially; and by their own resiliency the two sections tend to expand and maintain themselves pressed into engagement with the forks adjacent their tips, said forks forming the yoke that supplies the gas to the hood. By reason of this construction the hood sections will maintain themselves yieldingly in any position in which they are left. When these hood sections are disengaged from the forks, they will

assume the form of a flat sheet facilitating their shipment. In another embodiment of the device, the hood sections are also made of sheet material such as Celluloid, but are formed by molding so that they are of shell-form; and these hood sections are formed with overlapping walls which are struck on substantially the same radius from the axis of rotation of the hood sections on the ends of the forks, thereby insuring a closer contact between the hood sections and reducing the loss of oxygen from under the hood.

Referring more particularly to the parts, 1 indicates a tubular member, which is preferably provided with simple means to facilitate its being attached to the patient's face. In the present instance, this means consists of a forehead plate 2, which is rigid with the tube, and which may be attached to the patient's forehead by means of small pieces of adhesive tape 3, preferably as illustrated in Fig. 1.

At its inner or lower end the device includes a yoke 4 formed of a bent tube presenting two forks 4*a* and 4*b*. This yoke is preferably of curved form as shown, and the ends of the forks are formed with converging tips 5 (see Fig. 4). These operate as inlets for admitting gas to the inhaler hood 12, and will be described hereinafter. The yoke 4 is movably attached on the tube 1, through a flexible joint, and for this purpose I prefer to provide the lower end of the tube with a head 6 having a transverse sleeve 7 in which the wrist portion 8 of the yoke is rotatably mounted. The wrist portion 8 is provided with a port 9 within the sleeve 7, which enables gas coming down the tube to flow into the yoke.

Suitable means is provided for holding the yoke 4 in any adjusted position. In the present instance this means consists of a small set screw 10 (see Fig. 3), that clamps against the wrist.

The upper end of the tube 1 is attached to a hose 11 that supplies the oxygen or other gas, and this gas flows down the tube through the yoke 4, and is delivered through the tips 5 of the forks under the hood 12 that is positioned over the patient's nose. This hood is preferably constructed of two sections 12*a* and 12*b*. These hood sections are preferably pivotally connected together, and may be formed of two flat sheets of Celluloid (see Fig. 2), which illustrates one of these sheets before being bent up to the shell-form which it has when forming a part of the hood. The hood section 12*a* and 12*b* is provided with sockets 13 preferably in the form of metal eyelets, which are adapted to fit over the tips of the forks in the manner illustrated in Fig. 4. When the hood 12 is constructed as illustrated in Fig. 1, the hood sections will have overlapping walls, the side portions of which press themselves by their own resilience against the forks 4*a* and 4*b* adjacent the tips 5, but these walls are not struck on a radius from the axis of rotation of the hood members, and hence there is not very perfect contact between the overlapping walls. However, if desired, the hood sections may be constructed as illustrated in Figs. 3 and 4. In this case the hood sections are not made of flat sheet material, but are molded into shell-form so that the hood sections 14*a* and 14*b* present overlapping walls 15 which are struck on substantially the same radius from the axis of rotation of the hood sections on the tips 5.

In either form of the hood the side walls of the hood, tend by the resiliency of the material to move outwardly, and this facilitates the attachment of the hood sections to the tips 5. In attaching them the hood sections should be held with their converging walls 16 pressed slightly toward each other. They should then be slipped into place between the tips so that the sockets or eyelets 17 (see Fig. 4) can slip over the tips 5. By reason of this resiliency of the material, it is unnecessary to provide any means for holding the walls 16 of the hood on the tips 5. This facilitates dismounting of the hood when desired, as this can be accomplished by pressing the walls 16 toward each other, and slipping the eyelets off of the tip.

In order to limit the spreading movement of the walls 16 when they are put in place on the tips 5, it is preferable to provide the tips 5 with annular shoulders 18 at their junction points with the forks. These shoulders form an annular seat for the ends of the eyelets.

In using this device it will be evident that the hood sections can be moved relatively to each other. This enables the lower section 12*a* or 14*a* to be tipped up or down more or less to bring its lower edge nearer to, or further from, the patient's chin. This enables the admission of atmospheric air with the oxygen to be regulated more or less.

In hospitals, it is sometimes necessary to administer oxygen continuously to a patient for several days. In other words, when a hood is employed to cover the patient's nose, it may remain in place almost continuously. The present device is particularly useful on such occasions, because by reason of the fact that the lower section 12*a* of the hood is movable, this section can be raised from time to time to enable the patient to take food, or expectorate. The construction of this device is also advantageous, in that the hood covers the mouth as well as the nose of the patient, and hence even if the patient does not breathe through his nose, he will inhale the oxygen through his mouth.

Referring to Fig. 4, it will be seen that the axes of the inlets 5, although in a position to direct the oxygen currents so that they oppose each other, these inlets are actually slightly converged with respect to each other in the direction of the patient's nose, the effect of which is that while the velocities of the inflowing gas through the two inlets are substantially eliminated, there will be a slight resultant from the directions of inlet, tending to move the gas in the direction of the patient's nose, and this makes for effective operation of the inhaler.

The inner edges 19 of the hood sections have a contour that enables them to lie close against the patient's face.

It is obvious that if desired, a yoke can be employed having only one fork, but in this case the hood sections would have to be secured on the tip, for example, by threading the end of the tip and applying a nut against the outer end of the eyelet.

In packing the device for shipment, the set screw 10 should be loosened, and the yoke rotated into the plane of the tube. These parts can then be packed into a shallow box with the hood sections.

It is to be understood that the embodiment of the invention described herein is only one of the many embodiments this invention may take, and I do not wish to be limited in the practice of the invention, nor in the claims, to the particular embodiment set forth.

What I claim is:

1. In a nasal inhaler for administering gas

to a patient, a tube for conducting the gas, means for attaching the tube to the patient, said tube having a pair of oppositely disposed branches with inwardly projecting tips for delivering the gas at each side of the patient's nose, and a hood fitting over the patient's nose comprising a pair of hood sections pivotally mounted on the tips of said branch pipes and capable of being moved into different positions relative to each other, said sections constructed so as to admit different quantities of atmospheric air in different positions to regulate the degree of concentration of the gas.

2. In an inhaler for administering gas to a patient, the combination of a tube for conducting the gas, means for securing the tube so as to extend down the patient's forehead, a tubular yoke movably attached to the end of the said tube for receiving gas from the tube, said tubular yoke comprising a pair of oppositely disposed forks with their ends projecting toward each other so as to deliver the gas near the patient's nostrils, a hood pivotally mounted on the ends of said forks for covering the patient's nose, and means for securing the yoke in adjusted positions with respect to the tube, said hood comprising a pair of hood sections relatively movable with respect to each other so that their edges can abut against the patient's face adjacent his nose, and enabling the relative positions of the hood sections to be adjusted to regulate the admission of atmospheric air under the hood.

3. In an inhaler for administering gas to a patient, the combination of a tube for carrying the gas, a forehead plate carried by the tube adapted to have adhesive tape secured to the same and to the patient's forehead to secure the tube extending down his forehead, a tubular yoke pivotally attached to the lower end of the tube for receiving gas from the same, means for securing the tubular yoke in different adjusted positions, said tubular yoke comprising a pair of converging forks with ends projecting inwardly to deliver the gas adjacent the patient's nostrils, and a hood composed of two shell-form hood-sections with overlapping walls and pivotally mounted on the ends of said forks, said hood-sections having edges adapted to fit against the patient's face adjacent his nose.

4. In an inhaler for administering gas to a patient, the combination of a tubular yoke comprising a pair of oppositely disposed forks for carrying the gas, said forks having inwardly projecting tips, and a hood to fit over the patient's nose, said hood being of shell-form and having oppositely disposed walls with sockets therein, the resiliency of the material of said hood operating to press the walls outwardly and maintain said sockets in engagement with the ends of the forks.

5. In an inhaler for administering gas to a patient, the combination of a tube for carrying the gas, a forehead plate carried by the tube adapted to have adhesive tape secured to the same and to the patient's forehead to secure the tube extending down his forehead, a tubular yoke pivotally attached to the lower end of the tube for receiving gas from the same, means for securing the tubular yoke in different adjusted positions, said tubular yoke comprising a pair of converging forks with ends projecting inwardly to deliver the gas adjacent the patient's nostrils, and a hood pivotally mounted on the ends of said forks, said hood composed of hood sections having edges to fit against the patient's face and having overlapping walls struck on substantially the same radius from the axis of rotation of the hood sections on the fork ends.

6. In an inhaler for administering gas to a patient, the combination of a tube for conducting the gas, means for securing the tube to the patient's forehead, said tube having a pair of branch pipes connecting therewith and having inwardly turned tips, a hood fitting over the patient's nose and engaging the patient's face adjacent to his nose, said hood comprising a pair of shell-form members pivotally mounted on the said tips and capable of adjustment on the said tips to regulate the degree of opening of said hood to the atmosphere, said nozzles being located in a position opposed to each other and so that the currents of gas flowing from the same, mix and substantially reduce the velocity of flow of the gas in the vicinity of the patient's nose, thereby producing a quantity of substantially motionless gas under the hood.

CHARLES F. LOMBARD.