Nov. 9, 1954 L. CALDWELL 2,693,800

NASAL CANNULA

Filed April 27, 1951

Fig. 1.

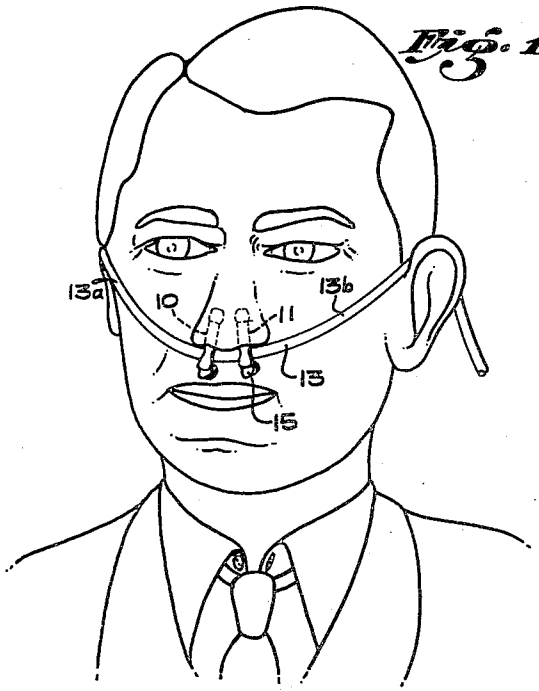


Fig. 2.

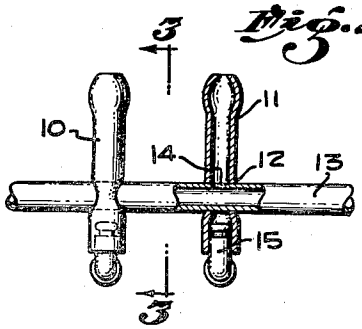


Fig. 3.

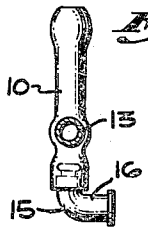


Fig. 4.

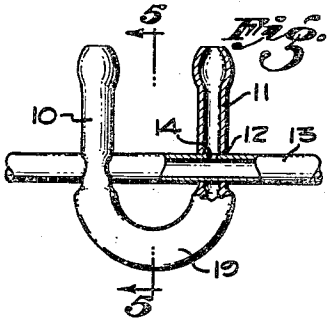


Fig. 5.

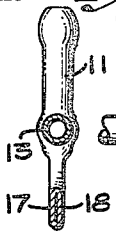


Fig. 6.

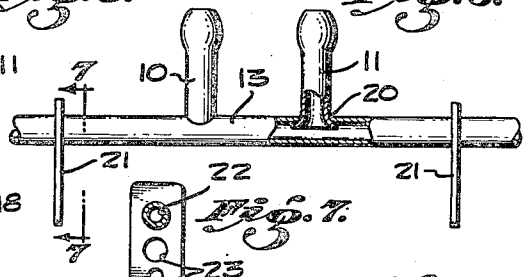


Fig. 7.

Fig. 8.

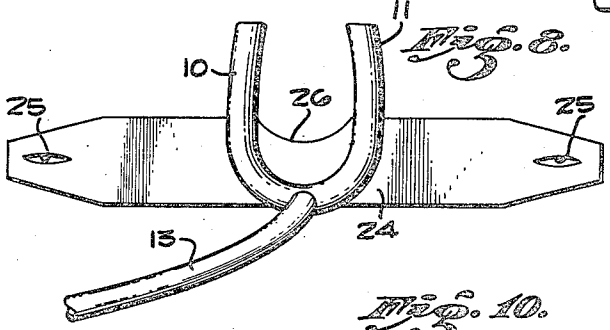


Fig. 9.

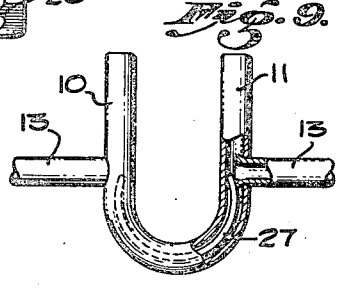
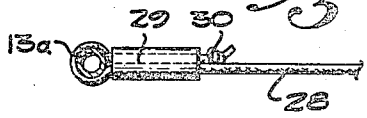


Fig. 10.



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NASAL CANNULA

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7 Claims. (Cl. 128—206)

The present invention relates generally to therapeutic devices; and is more particularly concerned with a nasal cannula of novel construction for the nasal feeding or administering of a gas, such as oxygen, through the nose of a patient.

That part of the human nose between the nostril openings contains relatively tender tissues, whereas the outside of the nostril openings is less tender. Having this in mind, the present invention contemplates a therapeutic device in the form of a nasal cannula which is so constructed that a minimum of pressure will be applied on the tender tissues in the nostrils, and the pressure resulting from supporting the device will be applied to the less tender portions of the nostril openings and so distributed as to eliminate pressure on those portions of the nostril opening which result in discomfort to the patient.

A further object is to provide in a device of the hereindescribed type, nasal tubes which are constructed of a relatively soft material, which may be of an elastomeric type of material, so as to minimize the possibility of injury to the nostrils by any movement of the unit which might be caused by the patient rolling over, etc., and yet has sufficient rigidity and sufficient diameter to prevent a tickling sensation in the nostril which might cause sneezing.

A still further object is to provide a nasal cannula in which the nostril tubes are retained by novel means against outward tipping from the face, or displacement from the nostrils.

Further objects of the invention will be brought out in the following part of the specification, wherein detailed description is for the purpose of fully disclosing several embodiments of the invention without placing limitations thereon.

Referring to the accompanying drawings, which are for illustrative purposes only:

Fig. 1 is a view illustrating the manner in which a nasal cannula embodying the features of the present invention is applied to the patient;

Fig. 2 is an enlarged view of one construction of the present invention, portions being cut away and sectioned to disclose certain features of construction;

Fig. 3 is a sectional view of the same, taken substantially on line 3—3 of Fig. 2;

Fig. 4 is an elevational view of a modified construction;

Fig. 5 is a transverse sectional view of the same, taken substantially on line 5—5 of Fig. 4;

Fig. 6 is an elevational view of another modified construction, including adjustable means for positioning the nostril tubes and retaining them against tilting movement;

Fig. 7 is a transverse section, taken substantially on line 7—7 of Fig. 6, showing details of the adjustable arm piece;

Fig. 8 is an elevational view of yet another modified construction;

Fig. 9 is an elevational view of still another modification; and

Fig. 10 is a view showing details of an adjustable securing strap as utilized in the invention.

Proceeding now with a more detailed description of the invention, as shown in Fig. 1, the nasal cannula of the present invention broadly comprises a pair of nostril tubes **10** and **11** which are adapted to be inserted in a patient's nostrils and retained in operative position by suitable anchor means.

A variety of materials are suitable for constructing the

nostril tubes as utilized in the nasal cannula of this invention, and for such purpose the material may consist of a flexible elastomeric material such as rubber or of a plastic such as highly plasticised polyvinyl chloride-acetate.

The type of material used will determine somewhat the dimensions of the tube. It is necessary that the nostril tubes be of sufficient size, i. e. at least ⅛ inch outside diameter or more and of sufficient wall thickness to give to such soft flexible material enough body so that movement of the face in talking, eating, etc., will not move these small nasal tubes around readily in the nostrils and create a tickling sensation. For example, a polyvinyl chloride-acetate elastomeric tube of approximately 3/16 inch O. D. and ⅛ inch I. D. is of suitable size for the purpose.

In utilizing soft rubber, such a tube should, for example, be about the same 3/16 inch O. D. with approximately 1/16 inch I. D.

Other plastic materials could be employed in place of the vinyl copolymer, but such material should be of the "non-rigid" or "elastomeric type." One advantage in the use of plastic material over rubber is that a visual examination of the unit will at all times show whether any dirt or obstruction exists to the flow of gas. The length of the nostril tubes depends on the person using the device, but in general these tubes should be in the range between ¼ inch and 1 inch long with about 7/16 inch as the average length most desirable.

In the construction shown in Figs. 2 and 3, the nostril tubes are provided with transverse passages **12** in each case intermediate the tube ends. A gas supply tube **13** is passed through the passages **12**, and the engaged wall surfaces of the nostril tubes and gas supply tube are bonded so as to hold the nostril tubes in spaced apart parallel relation with the nostril entering ends above the gas supply tube and the opposite ends projecting below the gas supply tube. Communicating ports **14** are provided in the gas supply tube to form a flow connection in each case with the upper end of each nostril tube.

Ordinarily the lower projecting ends of the nasal cannula as thus far described above will hold the nostril tubes against tilting. It may be desirable in some cases because of unusual facial characteristics to provide additional means to prevent tilting movements of the nostril tubes, when the device is in a position of use as shown in Fig. 1 with portions **13***a* and **13***b* of the gas supply tube being carried back over the ears of the patient. For such purpose, the lowermost ends of the nostril tubes are each provided with an end plug **15** which may or may not have a right-angled deflected end portion **16** which is adapted to bear against the adjacent face portion of the patient lying below the nose, so as to assist positioning and retaining the associated nostril tube in a position of use.

The arrangement shown in Figs. 4 and 5 is in general similar to the arrangement of Figs. 2 and 3, except that the nostril tubes **10** and **11** are constructed as a part of a U-shaped integral assembly in which the bridging portion is flattened to bring opposite sides **17** and **18** together so as to form a rigid bridging portion **19**. This bridging portion is disposed on the opposite side of the gas supply tube **13** from the nostril tubes, and serves to more rigidly retain the nostril tubes in position. The bridging portion **19** also serves to prevent tilting of the nostril tubes much in the same manner as the previously described plusg **15**.

In the arrangement shown in Fig. 6, the nostril tubes, instead of extending on both sides of the gas supply tube **13** are set into an opening **20** in each case in the gas supply tube and bonded around its periphery to the gas supply tube wall. In this construction, the nostril tubes provide parallel extension projections or nipples which extend from one side only of the gas supply tube. In this construction, it will be noted that there is no tube portion extending on the opposite side of the gas supply tube for retaining the nostril tubes against tilting movement. In order to provide for adjustable positioning of the nostril tubes, small arm pieces **21**—**21** are positioned on opposite sides of the nostril tubes, these arm pieces having in each case an opening **22** for receiving the

gas supply tube therethrough. The arm piece may, with this connection, be circumferentially shifted about the gas supply tube so as to accommodate and retain the nostril tubes against tilting movement. The arm pieces may, if desired, be lightened by providing additional openings **23** therein. The arm pieces may also be adjusted lengthwise of the gas supply tube with which it is associated, thus enabling positioning of these arm pieces at different locations so that the device may be confortably adapted to different persons.

Another construction which may be utilized in practising the present invention is shown in Fig. 8, wherein a single length of tubing is deformed into a U-shaped piece in which the end portions are utilized for the nostril tubes. Since the piece of tubing is of flexible nature, the tubing is retained in deformed U-shaped position by means of an elongate strip **24** of flexible material, this strip having end slits **25—25** for the affixing of a suitable cord or retaining band which may be passed around the patient's head. In this arrangement, instead of utilizing the gas supply tube **13** as securing means for the nasal cannula, the gas supply tube **13** is in this case connetcted directly into the bridging portion of the U-shaped assembly so as to feed directly into the nostril tubes. Between the nostril tubes, the strip **24** may be provided with an edge notch **26** for accommodating the associated portions of the patient's nose and to enable insertion of the nostril tubes the desired distance into the patient's nostrils.

Another arrangement utilizing a single deformed tube to provide the U-shaped assembly having nostril tube end portions is shown in Fig. 9. In this arrangement, however, instead of utilizing external means for holding the deformed tube in its U-shaped position, an internal member **27** is placed in the bridging portion. This member may be a curved length of wire or other means which has sufficient rigidity to retain the deformed tube in its U-shape. By utilizing a material of a malleable characteristic such as aluminum, the wire may be bent to adjust the spacing between the nostril tubes. In this case, instead of connecting the gas supply tube **13** into the bridging portion as in the case of Fig. 8, the gas supply tube is severed and the respective ends connected into the leg portions of the U-shaped tube assembly, the connected ends being bonded to prevent leakage.

In the arrangements such as disclosed in Figs. 2, 4, 6, and 9, it will be observed that the gas supply tube **13** performs a dual function of not only supplying gas to the nostril tubes, but also serves as the retaining medium for holding the device in a position of use. After passing the portions **13***a* and **13***b* of the gas supply tube over the ears of the patient, these portions may be connected back of the patient's head or under the patient's chin by means of an elastic strip **28**, as shown in Fig. 10. The ends of this strip are adjustably connected to the portions **13***a* and **13***b*, respectively. As shown, the end of the elastic strip is passed through a cylindrical member **29**, looped around the associated portion of the gas supply tube and carried back through the cylindrical member, the end being tied with a knot **30** which prevents reversed withdrawal of the free end of the strip back through the cylindrical member. However, by sliding the cylindrical member along the main strand of the elastic strip, the loop may be loosened so as to permit positioning the connection along the associated tube portion **13***a* or **13***b* at any desired location.

Various other modifications may suggest themselves to those skilled in the art without departing from the spirit of my invention, and, hence, I do not wish to be restricted to these specific forms shown or uses mentioned, except to the extent indicated in the appended claims.

I claim:

1. A therapeutic device for feeding a gas into a patient's nostrils, comprising: a pair of flexible nostril tubes, each having a transverse passage between its ends; a gas supply tube extending through the passages of said nostril tubes; means bonding the engaged walls of said tubes with the nostril tubes lying substantially in the same plane in spaced apart relation; flow passages respectively connecting said supply tube with said nostril tubes; and a plug member in a similar end of each nostril tube, having an outer end deflected at an angle to the plane of said nostril tubes.

2. A therapeutic device for feeding a gas into a patient's nostrils, comprising: a pair of flexible nostril tubes, each having a transverse passage between its ends; a one-piece gas supply tube extending through the passages of said nostril tubes; means bonding the engaged walls of said tubes with the nostril tubes lying substantially in the same plane in spaced apart parallel relation and with portions of each nostril tube extending on opposite sides of the gas supply tube; and flow passages respectively connecting said supply tube with said nostril tubes.

3. A therapeutic device for feeding gas into a patient's nostrils, comprising: conduit means of flexible material defining a continuous passage between its ends and including end portions adapted to be carried along the respective sides of the patient's head for connection with a source of gas supply; a pair of nostril tubes of flexible material adapted for insertion into the patient's nostrils, said tubes being integrally bonded to and supported by said conduit means in spaced apart relation to provide a permanently connected assembly in which the conduit forms an interconnecting flexible bridge between the nostril tubes; and flow passages respectively connecting said nostril tubes with said conduit means so as to receive gas therefrom.

4. A therapeutic device for feeding gas into a patient's nostrils, comprising: conduit means of flexible material defining a continuous passage between its ends and including end portions adapted to be carried along the respective sides of the patient's head for connection with a source of gas supply; a pair of spaced nostril tubes of flexible material adapted for insertion in the patient's nostrils, said tubes each being bonded to and supported by said conduit means to form a permanently connected assembly; flow passages respectively connecting said nostril tubes with said conduit means so as to receive gas therefrom; and means projecting from said conduit means in a direction opposite said nostril tubes adapted to engage the adjacent face portion of the patient and oppose tilting movement of said nostril tubes.

5. A therapeutic device according to claim 4 wherein the projecting means is a U-shaped portion extending between the secured ends of said nozzle tubes.

6. A therapeutic device according to claim 4, wherein the projecting means is a U-shaped portion extending between the secured ends of said nozzle tubes, and including an internal stiffening member positioned within the U-shaped portion.

7. A therapeutic device according to claim 4, wherein the projecting means comprises an arm piece carried by said conduit means, and mounted for adjustable positioning circumferentially thereof.

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