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NASAL CANNULA

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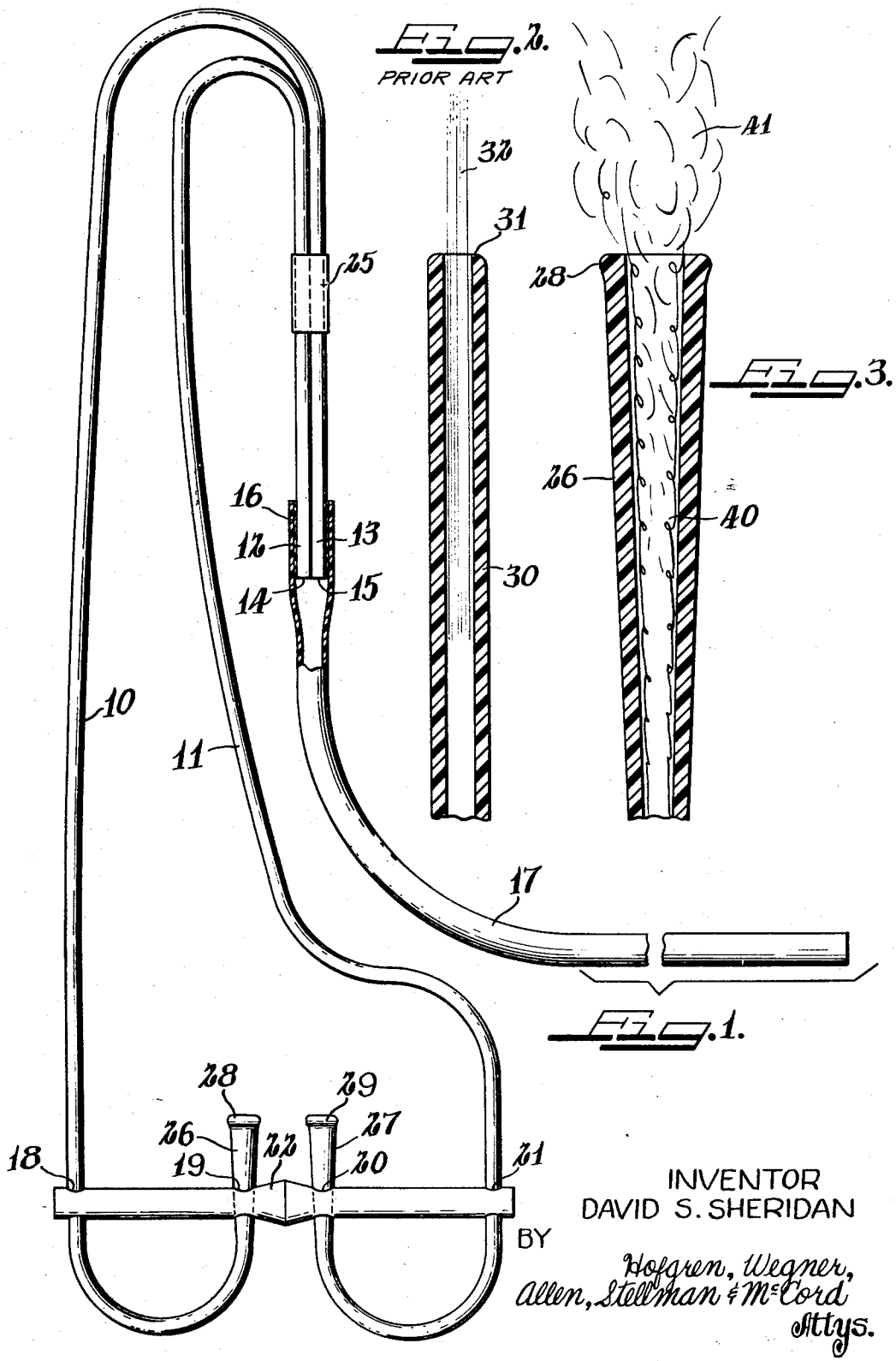

Fig. 2.

Fig. 3.

Fig. 1.

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NASAL CANNULA

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ABSTRACT OF THE DISCLOSURE

A nasal cannula for use in administering gas under pressure through the nasal passages and having a pair of narine tubes, each one of which has an internally flared section adjacent the outlet end of the tube. The flared section produces a turbulence and reduction of velocity of the gas issuing from the tube so as to reduce nasal burn in the patient's nostril.

The present invention relates to nasal cannulae which are utilized to introduce fluids, and particular gases such as oxygen, into one or both nasal passages of a patient.

My United States Patent 2,931,358 discloses a nasal cannula which is comprised of a pair of narine tubes and a means for holding the outlet ends of the tubes in a nares-insertable position on a patient. Although the nasal cannula shown and described in my patent represents a substantial step forward in the art, it does have tube outlets which are typical of nasal cannula outlets in practice today and in practice prior to the invention disclosed in my patent. Whenever nasal cannulae are utilized, there is always present the danger that "nasal burn" will occur in the nasal passages of a patient. "Nasal burn" is caused by evaporation drying of the internal walls of a nasal passage. When a jet of gas such as oxygen is released from the outlet of a narine tube of a nasal cannula, the velocity of the jet, impinging against a portion of an internal nasal passage wall, may cause that portion to be so thoroughly dried that the tissue of the wall appears to have been burned with an accompanying burning sensation being sensed by the patient. The present invention substantially eliminates "nasal burn."

It is therefore an object of the present invention to provide a new and improved nasal cannula.

A further object is to provide a cannula which substantially eliminates the occurrence of "nasal burn" to a patient.

An additional object is to provide a nasal cannula which has an internally flared section adjacent its outlet end.

Another object is to provide a nasal cannula having an internally flared section adjacent its outlet end wherein the cross sectional area of the internal passage enlarges approximately six times in the flared section.

A principal object is to provide a narine tube having an outlet end, with an internally flared section adjacent said outlet end, wherein the tube has an internal diameter of approximately 0.210 inch.

Further objects and advantages will become apparent from the following detailed description taken in connection with the accompanying drawings in which:

FIGURE 1 is an illustration of a preferred embodiment of the present invention;

FIGURE 2 is a cross sectional view of a portion of a conventional narine tube adjacent its outlet end; and

FIGURE 3 is a cross sectional view of a section of a narine tube forming a part of the embodiment of my invention illustrated in FIGURE 1.

While this invention is susceptible of embodiment in many different forms, there is shown in the drawings and will herein be described in detail, an embodiment of the invention with the understanding that the present disclosure is to be considered as an exemplification of the principles of the invention and is not intended to limit the invention to the embodiment illustrated. The scope of the invention will be pointed out in the appended claims.

In order to prevent movement of the proximal end of a flexible plastic narine tube in the cannula from causing a bending or lateral movement of its distal end in the nasal passage of a patient, it has been found desirable to utilize a flexible plastic narine tube having an outer diameter of approximately 0.130 inch in order to remain flexible. This requirement restricts the internal passage of a narine tube to approximately 0.086 inch. Thus when a stream of oxygen is delivered at a customary rate of 4 to 6 litres per minute at atmospheric pressure to a patient, the narrow 0.086 inch stream of fluid is directed against a very small area of the internal wall of a nasal passage in a patient. The velocity of such a jet of fluid when the fluid is a gas such as oxygen tends to quickly evaporate any moisture in its direct path in the tissues of the internal wall of a nasal passage, resulting in the aforementioned "nasal burn." In order to keep a narine tube sufficiently flexible, it is undesirable to increase its diameter to reduce the ejection velocity of a fluid from its distal end. The present invention accomplishes a reduction in the ejection velocity of the flow from the distal end of a narine tube without sacrificing the narrow diameter over most of its length or its flexibility, and thereby substantially prevents the occurrence of "nasal burn."

Referring to FIGURE 1, a nasal cannula is illustrated which has a pair of flexible plastic narine tubes **10** and **11**. These tubes have respective proximal sections **12** and **13** adjacent their respective proximal ends **14** and **15** which are firmly secured in a double channel connector **16** which is illustrated inserted into the distal end of a fluid supply tube **17** which is connected through a regulator (not shown) to an oxygen tank (not shown). Thus the connector **16** provides a means for operatively joining the two tubes **10** and **11** to a single gas or fluid conveying tube.

The narine tubes **10** and **11** pass through and are frictionally held in the respective apertures **18**, **19**, **20** and **21** of a bridge **22** constructed of flexible plastic tubing. A section of flexible plastic tubing flexibly engages the tubes **10** and **11** to provide a slide **25** which may be manually positioned along most the the extent of the tubes **10** and **11** between the connector **16** and the bridge **22**. Therefore, the bridge **22** and the slide **25** provide means for holding the outlet ends of said tubes in a nares-insertable position as is more fully described in U.S. Patent 2,931,358.

As thus far described, the cannula shown in FIGURE 1 is similar to that illustrated in my U.S. Patent 2,931,358. However, referring again to FIGURE 1, a pair of flared sections **26** and **27** form an integral part of the respective tubes **10** and **11** adjacent respective distal ends **28** and **29**. The ends **28** and **29** have a slightly thickened wall to increase resistance to possible collapsing or pinching off of the ends of the tubes.

FIGURE 2 illustrates the structure of a conventional section **30** adjacent a distal end **31** which is typical of narine tube in use at the present time.

FIGURE 3, being an enlarged cross sectional view of the distal end section **26** of the tube **10**, shows an internally flared section **40**. As illustrated in FIGURE 2 with a flow of 4 to 6 litres of oxygen per minute, a stream **32** of oxygen ejected from the distal end **31** of the conventional tube **30** is straight and characterized by non-turbulence. The stream **32** ejected from the conventional tube **30** may impinge directly upon the internal wall tissue of a patient and evaporate all the moisture from that tissue

so that "nasal burn" results. However, in the flared section **40** the flow of oxygen becomes turbulent and is ejected as a slow churning cloud which, when it impinges upon the internal wall tissue of the nasal passage of a patient, is sufficiently slow that it does not remove all of the moisture by evaporation from the tissues. Although the tube size may be varied, it has been found that an approximate internal diameter of 0.086 inch throughout the length of the tubes **10** and **11** combined with a wall thickness of approximately 0.022 inch provides a very flexible plastic tube. In the flared section **40** which extends for a length of approximately 1.125 inches, the internal diameter is increased from 0.086 inch to an internal outlet end diameter of approximately 0.210 inch. Thus the internal passage cross-sectional area enlarges almost six times in the flared section. The expansion causes a number of small turbulent eddies to form. The length of the flared section **40** is approximately 1.125 inches and extends from a point where the uniform internal diameter of approximately 0.086 inch ends and runs to the outer end of the section **40** where the internal diameter is equal to approximately 0.210 inch. The internal cross-sectional area of the flared section **40** increases 6 to 1 over a distance of from 12 to 14 times the uniform internal diameter of said tube **10** or **11**. Thus the flow is greatly reduced in velocity and is turbulent enough to leave the tube **10** in the form of a low velocity cloud mass **41** of greatly reduced velocity. The wall thickness of the end **28** is increased from 0.022 inch to a thickness of approximately 0.026 inch at the outlet end **28**. The flared end section **27** is identical to the flared end section **26**. Although the approximate dimensions for a preferred embodiment of the invention have been described, those skilled in the art will recognize that these dimensions can be substantially varied without departing from the true scope of the invention as set forth in the appended claims. The internally flared section **40** provides an internal passage whose cross-sectional area enlarges approximately six times in the flared section. When the cloud mass **41** flows against the tissue of the nasal wall of a patient, this velocity is sufficiently reduced that it cannot evaporate all of the moisture from the tissue and "nasal burn" is prevented. Although carrying the same quantity of oxygen as the conventional tube illustrated in FIGURE 2, the outer diameters of the tube ends **28** and **29** are only approximately one quarter of an inch. Therefore although the velocity of the flow has been reduced to a level that will not create "nasal burn" the diameter of the tube is still small enough to easily enter the nostrils of a patient. Since the distal end section **27** is identical to the distal end section **26**, it will eject a slowed velocity cloud mass similar to **41**, thereby preventing "nasal burn" in either nasal passage of a patient when the cannula illustrated in FIGURE 1 is applied to a patient, as more fully illustrated in my U.S. Patent 2,931,358.

Although a cannula has been illustrated and described, which provides a narine tube for each nostril of a patient, only a single tube may be desired in some applications. Thus, it would not be necessary to join both tubes to a distal end of a gas supply tube such as **17**. Further, where only one tube is utilized, the requirement for means of holding the distal end of a tube in a nares-insertable position composed of the bridge **22** and the slide **25** may not be required. All such modifications are intended to be within the scope of the appended claims.

I claim:

1. A nasal cannula for use in administering gas under pressure through the nasal passages comprising:

a pair of narine tubes, each having an inlet end, an outlet end and an internally flared section adjacent said outlet end, said tubes having an internal diameter of approximately 0.086 inch, an internal outlet end diameter of approximately 0.210 inch and a wall thickness of approximately 0.022 inch increasing in said flared section to approximately 0.026 inch at said outlet end,

means for holding the outlet ends of said tubes in a nares-insertable position, and

means connecting together the inlet ends of said narine tubes whereby said tubes may be operatively joined to a single gas conveying tube.

2. A nasal cannula for use in administering gas under pressure through the nasal passages comprising a narine tube having an inlet end, an outlet end and an internally flared section adjacent said outlet end, said internally flared section having a length of approximately 1.125 inches, said tube having an internal diameter of approximately 0.086 inch, an internal outlet end diameter of approximately 0.210 inch and a wall thickness of approximately 0.022 inch increasing in said flared section to approximately 0.026 inch at said outlet end.

3. A nasal cannula for use in administering gas under pressure through the nasal passages comprising:

a pair of narine tubes, each having an inlet end, an outlet end and an internally flared section adjacent said outlet end and having a length of approximately 1.125 inches, said tubes having an internal diameter of approximately 0.086 inch and an internal outlet end diameter of approximately 0.210 inch, and

means for holding the outlet ends of said tubes in a nares-insertable position.

4. A nasal cannula for use in administering gas under pressure through the nasal passages comprising:

a pair of narine tubes, each having an inlet end, an outlet end and an internally flared section adjacent said outlet end, said tubes having an internal passage cross-sectional area which enlarges approximately six times in said flared section,

said flared section having a length within the range of twelve to fourteen times the diameter of said internal passage, and

means for holding the outlet ends of said tubes in a nares-insertable position.

5. In a nasal cannula for use in administering gas under pressure through the nasal passages:

a narine tube, having an inlet end, an outlet end and an internally flared section adjacent said outlet end, said tube having an internal passage cross-sectional area which enlarges approximately six times in said flared section,

said flared section having a length within the range of twelve to fourteen times the diameter of said internal passage, and

means for holding the outlet end of said tube in a nares-insertable position.

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