July 12, 1966 R. A. BERMAN 3,260,258

NASO-PHARYNGEAL-ESOPHAGEAL DEVICE

Filed June 10, 1963

FIG. 1

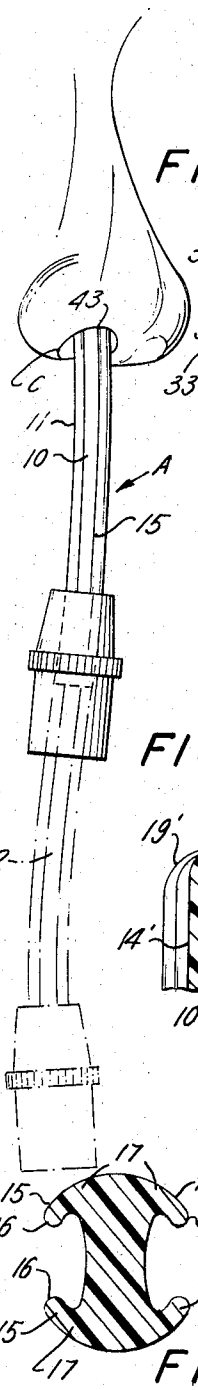

FIG. 2

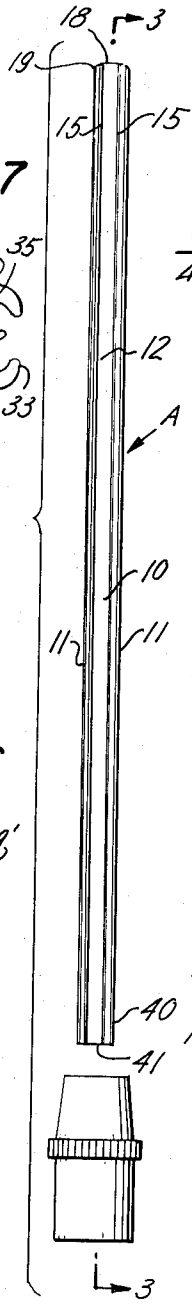

FIG. 3

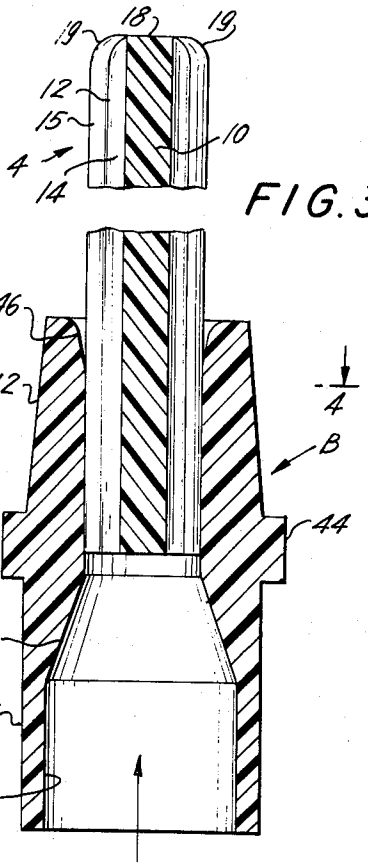

FIG. 4

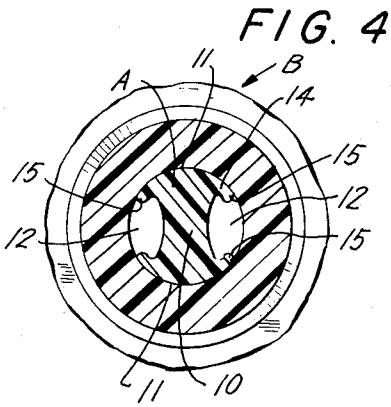

FIG. 5

FIG. 6

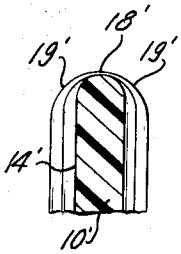

FIG. 7

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NASO-PHARYNGEAL-ESOPHAGEAL DEVICE

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2 Claims. (Cl. 128—29)

The present invention relates to a nasal respiratory device, and it particularly relates to a nasal respiratory device for insertion into a nostril or nostrils of a patient.

It is among the objects of the present invention to provide a simple readily manufactured respiratory nasal device which will be useful in assuring breathing through the nostrils and which will be readily applied during emergency without difficulty by medical personnel or by medical technicians or even by laymen in an emergency to assure breathing.

Another object is to provide a respiratory nasal device which may be applied in case of collapse of nasal breathing passages in which may be readily included in emergency kits either for ambulance drivers, doctors or in the hospital or home, in case of any blockage or stoppage in breathing through the mouth or because of action of the tongue.

Still further objects and advantages will appear in the more detailed description set forth below, it being understood, however, that this more detailed description is given by way of illustration and explanation only and not by way of limitation, since various changes therein may be made by those skilled in the art without departing from the scope and spirit of the present invention.

In accomplishing the above objects, it has been found most satisfactory according to one embodiment of the present invention to provide a simple respiratory nasal device which will have a substantially rounded cross section and may be made of an inert flexible desirably transparent plastic material.

Although the preferred plastic material is vinyl polymer or polyethylene or polypropylene, it may also be made of suitable plastic which will be flexible and yet not subject to attack by nasal fluids such as nylon.

An important feature of the present invention resides in the fact that the plastic material although soft and flexible and subject to being twisted and bent will nevertheless have axial rigidity, and it may be readily inserted by force longitudinally while at the same time the device may be twisted or turned during the insertion process.

The device should also be capable of substantial transverse compression without losing its predetermined cross sectional area.

In the preferred form of the invention, the material is extruded in elongated lengths so as to have opposite channels therein which will have indented round or cylindrical edges turned inside of the outer contour or circumference.

Desirably, the shape of the device should be such as to conform readily to the cross section of the nostril particularly to the portion thereof of minimum diameter and then extend sufficiently so that the end will project in back of the tongue and enter either the trachea, larynx or esophagus.

An important feature of the present invention resides in the fact that the air which is inserted therein under substantial blowing pressure will not be constricted to flow only out of the end of the elongated member but will also readily pass from the sides thereof so that it will not be forced into the digestive tract but will be released into the trachea or larynx without blowing up the stomach or digestive tract.

It has been found most desirable that the device is somewhat ovular in cross section rather than cylindrical with a width between the channels therein of about 3 to 10% greater than the width across the channels.

The preferred construction involves a base or spacing between the opposite channels which is equivalent to at least 50% of the thickness of the airway to give longitudinal rigidity while permitting twisting and bending transversely.

Another feature of the present invention is that it has been found desirable to form the outer walls of the airways so that the resin plastic material adjacent the outer walls and particularly at the edges of the channel will be somewhat stiffer and more polymerized than the interior plastic material so that the outer surface will be stiffer and less flexible than the interior resinous material.

Desirably this is accomplished by extruding the polymerized material at a temperature of about 270° to 350° F. following which the material is cooled to about one-half of the extrusion material and then subjected to a surface heating as by being drawn through another die so that it results in a further polymerization of the outer face.

This die may conform to the shape of the cross section and by slight converging in its exit end so as to result in a slight decrease in the transverse dimension while giving mere superficial heating to the surface ranging at a temperature of 250° to 325° F.

The intermediate section between the passageways desirably should be at least as deep as the passageways and in the preferred form, about the same width as the depth of the passageways.

Desirably, the web should be of greater length than the outside width of the passageways, and the bottom of the passageways should be curved with the passageways themselves having an elliptical cross section about the same as the elliptical cross section of the external diameter in respect to maximum and minimum dimensions.

A further feature of the present invention resides in the fact that the device should readily enter the area in back of the tongue and force the tongue away from the passageway and into the lungs so that adequate respiration may be achieved or air supplied.

It is also desirable to have an inlet handle and stop element which will stop against the ends of the nostril which will have an exit portion having exterior or interior conical or tapered facing, one for jamming into the nose and the other for fitting into the inlet to the nasal passageway with an intermediate stop.

The stop portion desirably projects so that it may serve as a convenient finger grip member while the external portion of the end piece will serve as a means of attaching a source of air or oxygen under pressure or even to permit blowing by a person to assure supply of sufficient air into the lung passageways.

The device should be of sufficient strength to force its way past collapsed nasal passageways or collapsed walls of the larynx so as to force the tongue away from the inlet to the passageways to the lungs.

It is important that the device be cut to such length as to extend into the upper part of the larynx or the upper part of the windpipe.

Although it is undesirable that it extend into the pharynx which the the upper part of the alimentary canal or esophagus, neverthless, the construction of the device is such that the air will be readily released into the passageways even though the end of the device may extend beyond and into the passageway which is supplied with air or oxygen.

With the foregoing and other objects in view, the invention consists of the novel construction, combination and arrangement of parts as hereinafter more specifically described and illustrated in the accompanying drawings, wherein is shown an embodiment of the invention, but it is to be understood that changes, variations and modifications can be resorted to which fall within the scope of the claims hereunto appended.

In the drawings wherein like reference characters denote corresponding parts throughout the several views:

FIG. 1 is a diagrammatic perspective view showing the manner of insertion of the nasal device of the present invention with the nasal device being shown in side elevation.

FIG. 2 is a side elevational view of the entire nasal device showing the end piece separated from the length thereof.

FIG. 3 is a transverse sectional view taken upon the line 3—3 of FIG. 2 with the end piece in position partly broken away so as to shorten the end thereof and upon an enlarged scale as compared to FIGS. 1 and 2.

FIG. 4 is a sectional view taken upon the line 4—4 of FIG. 3.

FIG. 5 is a diagrammatic transverse sectional view of the elongated device as shown in FIG. 4 more clearly to show the edge thereof upon an enlarged scale as compared to FIG. 4.

FIG. 6 is a transverse fragmentary alternative type formation similar to FIG. 3 and upon the same scale as FIG. 3 showing the different types of rounded ends.

FIG. 7 is a transverse sectional view showing an alternative cross sectional structure similar to FIGS. 4 and 5 and about the same scale as compared to FIGS. 4 and 5.

Referring to FIGS. 1 to 4, there is shown the nasal device or naso-pharyngeal-esophageal device A of the present invention which has an end piece B serving both as a handle and as an inserting device and which is designed to be inserted into the nasal passageway C.

The device may have a length ranging from 4 to 8" the lesser dimension being for children or infants and the maximum length being for adults while the intermediate stages are for children of various ages.

Desirably three sizes have been found to be most adequate, the 7½ to 8" length being for adults, the 5 to 6" length being for intermediate ages and the 3 to 4" length being for infants or young children.

Desirably, the maximum diameter should range not in excess of 5/16 to 3/8" for adults to 1/8 to 3/16" for infants.

The passageways should at all times not exceed 50% of the total cross sectional area.

Although one passageway should be utilized having a cross sectional area of about ¼ to 3/8" of the total cross sectional area, nevertheless, it has been found most desirable to have two opposite passageways each of approximately elliptical cross section and each occupying about 3/16 to ¼" of the total cross sectional area.

Desirably, the passageways should have curved and rounded walls gradually decreasing in thickness outwardly toward the walls of the member so that at their extreme outer edges, they will have a thickness of about ½ to ¼ of their base thickness and subject to being compressed inwardly to somewhat close the outer portion of the passageway and somewhat flatten the sides of the device.

At the same time the device should be of such a nature that the flexibility of the interior separating wall will permit collapse of the maximum diameter by 10 to 20%, under pressure without loss of substantial passageway area.

Referring particularly to the cross section shown in FIG. 4, the extruded cross section A will have a central web or wall **10**, the width of which will be about 50% of the maximum diameter although it may range from 35 to 55%.

The exterior faces **11** at the ends of the web are desirably rounded or elliptical and they are spaced apart a distance of 5 to 15% greater than the opposite side walls so as to give a suitable elliptical construction or cross section.

The channels **12** and **13** are also of elliptical cross section, which is flattened in respect to the cross section of the nasal device as well as the side walls **14** which terminate in the beaded edges **15**.

These beaded edges are desirably turned slightly inwardly away from the construction of the ellipse, and at their outer edges as indicated at **16**, they have about one-half the thickness at the base as indicated at **17**.

Desirably the edges **16** are beaded so as to have a semi-cylindrical cross section as best indicated in the diagrammatic showing of FIG. 5.

The tip **18** of the airway desirably has the rounded edges **19** which in the preferred form are semi-spherical, but which may be given slight rounds extending over 90 degrees from the beads **15** into the central web **10** leaving the tip end of the central web flat.

FIG. 2 shows the latter construction whereas FIG. 6 shows an alternative construction where the entire end portion **18'** has the spherical sides **19'**, similarly functioning parts being indicated by the same numerals as in FIGS. 2 and 3 except that they are provided with a prime.

Depending upon the plastic, it is also possible to have a sharp edge construction as indicated in FIG. 7 where the edge is unbeaded, and the base of the channel has substantially straight sides.

In FIG. 7, it will be noted that the interior wall **30** has the straight sides **31** and the dished side faces **32** terminating in the fairly sharp edge portions **33**.

This construction permits more ready collapsing of the edges toward one another and flattening of the two than in the cross section shown in FIGS. 4 and 5, and is particularly desirably used where the nasal passageway is held open in a direction parallel and between the cavities or channels **34** while the channels **34** themselves may be reduced in area by pressing inwardly of the sharp edge walls **33**.

In this construction, the central web or wall should be at least 50 to 60% of the width of the total airway and cross sectional thickness, and it should extend between the channels **34** at least 60 to 80% of the long dimension indicated by the double headed area **35**.

The base end **40** of the airway may be cut off as indicated at **41** transversely or it may be slightly tapered inwardly so as to be tightly clamped into the end piece or mouth piece B.

The mouth piece B desirably has a tapered end portion **42** or conical shape to be tightly fitted into the inlet **43** of the nasal passageway, and it has an intermediate handle section **44** which is rough or rigid so as to enable ready grasping thereof.

The end mouth piece or air pressure connection **45** is desirably cylindrical and may be used either by the mouth or be attached to a rubber hose for air or pressure to the nasal device A.

The connecting passageway or insert **46** receives the end **40** of the nasal device which is wedged therein, and this should terminate about at the handle extension **44**.

The interior should have the enlargement **47** which tapers downwardly toward the cylindrical and widened inlet passageway **48**.

Desirably, the extension **44** acts both as a stop against the nasal passageway as well as a stop for any elongated device or the lips if they are used upon the wide portion **45** for blowing air or oxygen into the trachea, or cavity behind the tongue.

The mouthpiece B is desirably formed of a relatively stiff rigid plastic molded resinous material such as polystyrene or cellulose acetate whereas the elongated nasal device A is formed of an extruded plastic material.

Both materials are desirably surface polymerized after being formed so as to be resilient to the action of nasal and other body fluids which might tend to act upon them.

They should be surface hardened so that they may be absorptive so that they may be sterilized and so that the outer surface will be fully polymerized so that no further polymerization or change in dimension will take place even though the assembled device as shown in FIGS. 1 and 2 will be permitted to stand for many months or sometimes for many years.

The plasticizer that may be used in connection with the exterior in forming the elongated element A which may be dioctyl phthalate desirably should be kept to less than 25% and desirably between 5 and 25%.

By means of surface heating as a final finishing operation, such plasticizer should be removed from the exterior surface and concentrated in the interior of the material.

The end piece B is desirably devoid of plasticizer material.

The device is particularly suitable in that it may be readily inserted with or without the addition of lubricant although a thin layer of lubricant such as petroleum jelly may be utilized, and it will be inserted into the upper part of the trachea and then forced through the nasal passageway until the end element B is stopped against the nasal inlet **43**.

It will be particularly effective when the mouth is closed as if the jaw has been broken, and it is necessary to wire the mouth together or where the tongue has fallen back and sealed the passageway.

It will be effective in forcing the tongue forward and also permitting air to flow into the trachea or larynx even though the tip end of the device may pass into the esophagus.

It is much superior to a tube in that it will not kink or bend and will not tend to force all air into the esophagus and into the digestive tract since the air may readily pass through the sides of the elongated device.

As many changes could be made in the above naso-pharyngeal-esophageal device, and many widely different embodiments of this invention could be made without departing from the scope of the claims, it is intended that all matter contained in the above description shall be interpreted as illustrative and not in a limiting sense.

Having now particularly described and ascertained the nature of the invention, and in what manner the same is to be performed, what is claimed is:

1. An elongated naso-pharyngeal esophageal device for insertion through a nasal passageway to penetrate into the upper trachea and esophageal passageway, said device having an elongated body section of inert plastic material, said body section having in cross section pairs of latterly extending convexially arcuate portions and a connecting web portion integrally connected at its side edges to said arcuate portions, the interior of the respective concave sides of said arcuate portions forming passageways on each side of the web portion, the ends of the arcuate portions being spaced apart and having beads formed thereon and a tubular end piece fitted about the end of said body section, said end piece having such outer diameter as to fit into a nostril and said end piece having a circumferential outwardly extending circular flange which acts as a stop to prevent undue penetration of said end piece into a nostril, said device enabling gases to be introduced into the lung of a person.

2. The device of claim **1**, said end of said device remote from the end carrying said end piece being rounded and bevelled and said web being relatively thick and heavy as compared to the thickness of the arcuate portions and said arcuate portions being turned inwardly on each side of said web towards each other.

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