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(54) Title: NASAL TRUMPET

(57) Abstract: A nasal trumpet includes an elongate tubular member and an inflatable cuff. The tubular member has a proximal end and a distal end, is made at least in part of a partially flexible soft polymeric material and has sufficient length so that the distal end is disposable in the patient's oropharynx approximately 1 to 3 cm above the vocal cords while the proximal end is disposed outside a patient at a nostril opening of the patient. The cuff is attached to and surrounds the tubular member at the proximal end thereof so that the cuff is disposable inside the patient's nostril when the distal end of the tubular member is disposed approximately 1 to 3 cm above the patient's vocal cords and the proximal end of the tubular member is disposed outside a patient at the patient's nostril open - ing.

NASAL TRUMPET

BACKGROUND OF THE INVENTION

This invention relates to a nasal trumpet that provides an airway, for exemplary use in procedures involving spontaneously breathing patients under sedation or anesthesia and sometimes awake. This can be used in a wide variety of clinical situations like GI endoscopy, other out of operating room procedures done mainly (not exclusively) under sedation or anesthesia, Emergency room procedures, dental chair procedures and many operating room procedures. This invention also relates to an associated medical method.

The number of upper gastro-intestinal (GI) endoscopy and out of operating room procedures done under anesthesia/deep sedation has increased remarkably in recent years. The increase is particularly noticeable in developed countries and especially in the United States. Availability of propofol, an intravenous anesthetic agent, and ultra-short acting opioids such as remifentanil are responsible for this increase in anesthesia during upper GI (gastro-intestinal) endoscopy procedures. The complexity of the procedures, both therapeutic and diagnostic, makes anesthesia inevitable for many procedures. Changing population demographics is another contributing factor. Many endoscopic therapeutic interventions that were considered experimental only a few years ago are used routinely especially in the treatment of some GI cancers. Better diagnostic tools make earlier and relatively less invasive therapeutic interventions possible.

Again aging population also increases patients' co-morbidity, making it very risky for the endoscopist to administer conscious sedation.

Administration of anesthesia for these procedures is challenging. Typically this involves a careful preoperative anesthetic evaluation especially with respect to potential airway difficulties. In the procedure room the patient is attached to monitors including an oxygen saturation monitor. An opioid, usually fentanyl, is administered followed by propofol. The administration of correct doses of propofol, that render the patient unconscious

while retaining the ability to self-ventilate and allow the endoscopist to introduce the upper GI endoscope without the patient coughing, is the most challenging aspect of this kind of anesthesia. It is further complicated by the three-fold pharmacokinetic and pharmacodynamic variation. Frequently, patients are either over-sedated (hence apneic with the danger of severe desaturation) or under sedated (with coughing and ineffective ventilation again risking severe desaturation). Frequently, this requires withdrawal of the endoscope and institution of rescue medications (usually more propofol) or alternate ventilation strategies. Although they are effective in majority of the cases, occasional major morbidity and mortality can occur. This is especially true in ERCP's (endoscopic retrograde cholangio-pancreatography) as they are frequently done in prone position.

A recent ASA (American Society of Anesthesiologists) closed claim analysis showed that about half of all anesthesia deaths occurring outside of the operating room are in GI endoscopy and half of these GI endoscopy anesthesia related deaths are airway related. Indeed many anesthesiologists are reluctant to work in this area because of the likelihood of an insecure airway. Anesthesiologists always like to be in complete control of the airway and in upper GI endoscopy procedures the anesthesiologists are needed to share the airway with an endoscopist.

In the management of potentially fatal airway problems, anesthesiologists occasionally use existing devices to make the procedures safe from both anesthetic and endoscopy standpoints. Generally, it is important to preoxygenate these patients to gain more time to address any apnea or coughing issues that lead to rapid desaturation.

A few particular methods for managing potential airway problems include (1) routine use of a nasopharyngeal airway, (2) use of high-frequency jet ventilation as a rescue method of positive pressure ventilation via a nasopharyngeal airway, and (3) use of a nasopharyngeal airway inserted in the mouth and connected to the breathing system.

A nasopharyngeal airway is utilizable in the absence of any contraindications and where atraumatic insertion is possible. This airway is in turn attached to a Mapelson breathing system and a 100% oxygen source. As a result, oxygen saturation is maintained in spite of hypoventilation. This also allows some degree of positive pressure ventilation, however unreliable and ineffective especially when needed due to leakage in the mouth, the same nostril and/or the other nostril. Although most problems can be overcome by manual methods, leakage from the same nostril is difficult to prevent. Due to the nature of the material of the nasal trumpet and conventional connection hardware, inadvertent disconnection and resulting failed ventilation is a real problem. Due to longer distance from the tip of the nose to the nasopharynx, one needs longer trumpets in men and larger women. However, existing trumpets also have larger diameters with increasing risk of bleeding during deployment.

High-frequency jet ventilation has the drawbacks of being cumbersome, not tested and frequently unavailable. Also most anesthesiologists are not trained in its use. Inserting a nasopharyngeal airway in the mouth provides a high oxygen source but does not allow positive pressure ventilation owing to leaks.

SUMMARY OF THE INVENTION

The present invention aims to provide a device for improving patient ventilation during upper GI procedures. More particularly, the present invention aims to provide an improved nasal trumpet airway that allows positive pressure ventilation. Utilizing this device, an anesthetic practitioner can potentially obviate the above-described problems.

A nasal trumpet in accordance with the present invention comprises an elongate tubular member having a proximal end and a distal end, the tubular member being made at least in part of a partially flexible soft polymeric material and having sufficient length so that the distal end is disposable in a patient's oropharynx approximately 1 to 3 cm above the patient's vocal cords while the proximal end is disposed outside a patient at a nostril opening

of the patient. An inflatable cuff is attached to and surrounds the tubular member at the proximal end thereof so that the cuff is disposable inside the patient's nostril when the distal end of the tubular member is disposed approximately 1 to 3 cm above the patient's vocal cords and the proximal end of the tubular member is disposed outside a patient at the patient's nostril opening.

Pursuant to another particular feature of the present invention, the nasal trumpet further comprises a breathing system connector port connected to the tubular member at the proximal end. The connector port may be unitary or integral with the tubular member, for instance, integrally molded therewith or connected thereto via welding or other permanent coupling.

The nasal trumpet may additionally comprise one or more flanges extending transversely to an axis of the tubular member at a proximal end thereof. Where a breathing system connector port is provided on the tubular member at the proximal end thereof, the flange may be one of two elongate coplanar flanges or wings extending in opposite directions from the connector port. The tubular member is preferably provided at the distal end, in a sidewall of the tubular member, with at least two oxygen-egress apertures.

A nasal trumpet in accordance with the present invention thus comprises an elongate tubular member having a proximal end and a distal end and further comprises an inflatable cuff attached to and surrounding the tubular member at the proximal end thereof so that the cuff is disposable inside a nostril of a patient upon a deployment of the tubular member. Preferably, the nasal trumpet also includes a breathing system connector port fixedly or permanently connected to the tubular member at the proximal end.

A medical method in accordance with the present invention utilizes a nasal trumpet comprising an elongate tubular member having a proximal end and a distal end and further comprising an inflatable cuff attached to and surrounding the tubular member at the proximal end thereof. The method comprises inserting the tubular member into a nostril of the patient,

thereafter inflating the cuff inside the nostril to form an airtight seal between the tubular member and a wall of the nostril, connecting the tubular member to a breathing apparatus, and thereafter operating the breathing apparatus to ventilate the patient via the tubular member. The method may further comprise closing, blocking or sealing another nostril of the patient.

The nasal trumpet is preferably inserted so that the distal end of the tubular member is disposed in the oropharynx approximately 1 to 3 cm above the patient's vocal cords while the proximal end is disposed outside the patient at a nostril opening of the patient.

Pursuant to further features of the present invention particularly applicable to upper GI endoscopy procedures (including NOTES - natural orifice translumenal endoscopic surgery), the medical method also utilizes a bite block including a body member defining a passageway provided with at least one first sealing element, the body member including a flange with at least one second sealing element about a periphery thereof. The method then includes attaching the body member to a patient so that the flange is disposed outside and adjacent to the patient's mouth and so that the at least one second sealing element engages the patient's face about the patient's mouth to form an airtight seal between the body member and the patient's face. An elongate instrument shaft such as a flexible endoscope shaft is inserted through the passageway in the bite block, with the first sealing element forming an airtight seal with the instrument shaft. Positive ventilation of the patient is maintained while the instrument shaft is used to perform a diagnostic and/or therapeutic procedure inside the patient.

Where the instrument shaft is a shaft of an endoscope, the medical method further comprises operating the endoscope to view internal tissue structures of the patient while operating the breathing apparatus to ventilate the patient and maintaining the body member in airtight engagement with the patient's face and the endoscope.

The nasal trumpet is preferably deployed in the nostril prior to the deployment of the body member of the bite block in or on the patient.

A nasal trumpet in accordance with the present invention provides an airway that enables positive pressure ventilation and the maintenance of oxygen saturation in spite of hypoventilation. This allows an upper GI procedure to continue without interruption in the event of apnea. It also allows the deepening of anesthesia without fear of apnea if coughing is an issue. The combination of the nasal trumpet and the sealing bite block make deeper degrees of anesthesia very safe.

The diaphragm permits easy scope introduction and prevents any significant leaks even under positive pressure ventilation.

The nasal tube lies in the oropharynx and away from the path of the endoscope and is also distant from the larynx for avoiding laryngeal stimulation and precipitation of coughing and laryngospasm.

The nasal trumpet and bite block of the present invention potentially makes the administration of anesthesia for upper endoscopy and NOTES procedures safe and effective. Patents can be sedated more deeply than is done currently, without fear of losing the airway. Of course, extreme vigilance should be maintained in the administration of any anesthesia.

A nasal trumpet in accordance with the present invention is useful in any situation requiring emergent ventilation (trauma bay, emergency room, etc.) in which a standard endotracheal tube is not feasible.

The cuff of a nasal trumpet as described herein allows for secure tube placement, enhanced patient stability, and the formation of an airtight seal. The integral proximal connector forms a more secure connection to ventilation equipment.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a schematic side perspective view of a ventilating nasal trumpet in accordance with the present invention.

FIG. 2 is a schematic front or proximal-side elevational view of a bite block utilizable in conjunction with the nasal trumpet of FIG. 1 in upper GI endoscopic procedures, in accordance with the present invention.

FIG. 3 is a schematic bottom plan view of the bite block of FIG. 2, showing in phantom lines an endoscope shaft.

FIG. 4 is a schematic perspective view, on a smaller scale, of the bite block of FIGS. 2 and 3.

FIG. 5 is a schematic side elevational view of the nasal trumpet of FIG. 1 deployed in a nasal passageway of a patient. FIG. 5 also depicts the bite block of FIGS. 2-4, partially in cross-section, deployed in the mouth of the patient.

DETAILED DESCRIPTION

As depicted in FIG. 1 and 5, a nasal trumpet or airway device 56 comprises a ventilation tube member 58 provided at a distal end 59 with a plurality of oxygen-egress apertures 60 and at a proximal end with a 15 mm connector 62 and an inflatable cuff 64. Cuff 64 is fixed along an inner side to ventilation tube member 58 and is coupled to a standard manually squeezable inflation bulb 66 via a catheter 70. Connector 62 is configured for receiving standard elbow anesthesia connectors 30, for instance, in a press-lock or friction fit, which in turn link to standard 22 mm adapters. Connector 62 may be integrally molded and unitary with ventilation tube member 58 or permanently connected thereto exemplarily via thermal or ultrasonic welding.

Nasal trumpet or airway device 56 is provided at a proximal end, for instance, at a base or distal side of connector 62, with a pair of opposite extending wings or flanges 72 that serve in part to position the nasal trumpet or airway device 56 against the nose NS of a patient PT and in part to fix the device to the nose NS (FIG. 5). Wings or flanges 72 are coplanar and extend transversely to an axis of tubular member 58 and connector 62.

Fixation of nasal trumpet or airway device 56 to a patient PT (FIG. 5) is effectuated at least in part by inflation of cuff 64 inside a nasal passageway or nostril NP. The fixation of nasal trumpet 56 to the patient may be effectuated additionally by applying adhesive tape (not shown) to flanges 72 and the patient's nose NS. Alternatively or additionally, a strap or band (not shown) may be fastened to flanges 72 via apertures 74 and partially wound about the patient's head (not separately designated).

At least a distal end portion of tubular airway member 58 is preferably made of a soft atraumatic polymeric material, while connector 62 is made of a harder material such as Portex® silicone rubber. A proximal end portion of tubular member 58, adjacent connector 62 may also be made of the harder silicone rubber or polymeric material.

Tubular member 58 has a circumference of between 24 and 30 mm and is longer than a conventional nasal trumpet. More particularly, tubular member 58 is of sufficient length so that distal end 59 thereof is disposable in the oropharynx approximately 1 to 3 cm above the patient's vocal cords (not shown) while connector 62 at the proximal end of the tubular airway is disposed outside a patient at a nostril opening (NO) of the patient PT (FIG. 5). Preferably, nasal trumpet 56 is provided in a multiplicity of different sizes, particularly different lengths, to accommodate patients of different sizes.

Connector 62, which is couplable to a breathing apparatus (not shown) via standard elbow anesthesia connector 30, is preferably shorter than conventional elbow anesthesia connectors. Connector 62 facilitates positive pressure ventilation without placing the connector on a face mask.

Nasal trumpet 56 may be used in an upper GI (gastrointestinal) endoscopic procedure in conjunction with a bite block 10 shown in FIGS. 2-5. Bite block 10 comprises a body member 12 that includes a tubular element 14 defining a passageway, channel, or lumen 18 between a proximal side 20 and a distal side 22 of body member 12. Tubular element 14 is insertable into a patient's mouth between the teeth UPT and LWT (FIG. 5) of the upper jaw

and lower jaw (not designated). Passageway 18 serves as a deployment pathway for an endoscope insertion shaft 24 (FIG. 3).

Body member 12 further includes an arcuate flange 26 connected to a proximal end of tubular element 14. Flange 26 is disposable outside and adjacent to the patient's mouth.

Nasal trumpet 56, and particularly tubular member 58 thereof, defines a dedicated passageway, channel or lumen that serves to maintain an airway for ventilating the patient PT. As indicated above, connector 62 of nasal trumpet 56 is connectable to a breathing apparatus (not shown), for example, via elbow joint or channel member 30 for directing or guiding oxygen to the patient.

Bite block 10 includes at least one elongate flexible tie member 32 such as a strap that is connectable to body member 12 at left and right ends 34 and 36 thereof. Strap 32 is extendible about the patient's head or neck for attaching body member 12 to the patient.

At least one sealing element 38 is fastened to a distal (or patient-facing) surface of flange 26 for engaging the patient's face about the mouth in an at least substantially airtight fit. Sealing element 38 extends along the entire periphery or outer edge 40 of flange 26. Sealing element 38 may take any form that provides an effective seal with human skin. Accordingly, sealing element 38 may be an oval ring or gasket made of closed cell foam or polymeric material. Alternatively, the sealing element may take the form of an air-filled oval tube of a flexible and gas-impermeable polymeric composition. In another implementation, the sealing element is a gel-filled oval ring contained by a liquid-permeable bladder. In all of these embodiments, sealing element 38 may be fastened to flange 26 via adhesive.

Within its lumen 18, tubular element 14 is provided with one or more sealing elements each in the form of a diaphragm 42. Diaphragm 42 is a slotted film or membrane attached to tubular element 14 and is disposed across passageway 18 for forming an airtight seal with endoscope insertion shaft 24. Other types of seals such as annular air-, water-, or gel- filled bladders or inflatable cuffs may replace or supplement diaphragm 42.

Nasal trumpet 56 partially defines a nasopharyngeal airway that, together with diaphragm 42 and sealing element 38, enables positive pressure ventilation and the maintenance of oxygen saturation in spite of hypoventilation. Diaphragm 42 permits easy scope introduction and prevents any significant leaks even under positive pressure ventilation.

Tubular element 14 or bite block 10 preferably, but not necessarily, extends solely in a distal direction from flange 26. The word "proximal" is intended to denote those facets of bite block 10 and nasal trumpet 56 that face the endoscopist, while the word "distal" denote those facets of the bite block or nasal trumpet that face or extend into the patient.

Nasal trumpet 56 may be provided internal with a tube 49 and externally with a port 50 for coupling with a tidal sample tube (not shown). Tube 49 terminates in the middle of tubular airway member 58 for end-tidal gas sampling. Port 50 may have a removable cap 52 for closure when not in use. A pilot balloon attachment (not shown) may be additionally provided.

Tubular element 14, defining the endoscope deployment pathway, is preferably made of an at least semi-rigid material, while flange 26 may be made of a semi-rigid, rigid or partially flexible material. Passageway 18 is preferably but not necessarily circular in cross-section, as endoscopes are typically cylindrical.

An endoscopic diagnostic or therapeutic method may utilize both nasal trumpet 56 and bite block 10. As shown in FIG. 5, tube assembly 56 is inserted into nostril or nasal passageway NP with cuff 64 in a collapsed configuration. More particularly, tubular member 58 is inserted into nostril or nasal passageway NP and the patient's pharynx PHX until distal end 59 is disposed in the oropharynx approximately 1 to 3 cm above the patient's vocal cords (not shown). Preferably, nasal trumpet 56 is selected from among a collection of similar nasal trumpets of different lengths or sizes so that connector 62 at the proximal end of tubular airway member 58 is disposed outside at nostril opening (NO) of the patient PT as depicted in

FIG. 5. Upon proper positioning of ventilation tube member 58, cuff 64 is located within nasal passageway NP. Bulb 66 is then squeezed to inflate cuff 64 to secure nasal trumpet 56 to the patient PT and to form an airtight seal between tubular member 58 and the wall of the nostril, as indicated in FIG. 5. It is recommended that flanges 72 be attached to the patient also via adhesive tape or via a head strap.

Before the deployment of bite block 10, elbow anesthesia connector 30 may be inserted into connector 62 and coupled to a breathing apparatus to provide oxygen to the patient PT. Thus tubular airway member 58 communicates on one side with the breathing apparatus and on an opposite side with the trachea and lungs of the patient.

As depicted in FIG. 5, body member 12 of bite block 10 is attached to patient PT so that (a) flange 26 is disposed outside and adjacent to the patient's upper and lower lips UL and LL, (b) tubular element 14 extends into the patient's mouth between the upper and lower teeth UPT and LWT, and (c) sealing element 38 engages the patient's lips UL and LL to form an airtight seal between body member 12 and the patient's face. Endoscope shaft 24 (or other elongate surgical or diagnostic instrument) is inserted through passageway 18, with diaphragm 42 forming an airtight seal about an outer surface 54 of endoscope shaft 24. It is to be noted that tubular member 58 lies in the nasopharynx and away from the path of the endoscope 24 and is also distant from the larynx for avoiding laryngeal stimulation and precipitation of coughing and laryngospasm.

The method typically includes operating the endoscope 24 to view internal tissue structures of the patient while ventilating the patient PT by the breathing apparatus via nasal trumpet 56. Oxygen leakage is effectively eliminated or substantially reduced by the action of cuff 64 in maintaining tubular member 58 of nasal trumpet 56 in a sealing engagement with nostril NP and further by the action of sealing element 38 and diaphragm 42 in maintaining the body member 26 of bite block 10 in airtight engagement with the patient's face and the endoscope 24, respectively.

Adjustments in the position of ventilation tube member 58 may be accomplished by partially deflating cuff 64, sliding ventilation tube member 58 relative to the nose NS, and re-inflating cuff 64 thereafter. Bulb 66 may be provided with a manually actuatable valve 68 for deflation of cuff 64.

Oxygen-egress apertures 60 are elongate in the longitudinal direction and have dimensions typically 3-5 mm by 5-7 mm, depending on the size of the nasal trumpet 56. Cuff 64 has a length of 15 to 30 mm again depending on the length of the tubular member 58. Typically connector 62 is 100 mm in length, regardless of the size of the nasal trumpet 56 as a whole. A proximal end portion of tubular member 58, 25-50 mm in length, may be made of silicone rubber or polymer, for instance, Portex® silicone. Flanges 72 may be about 200 mm (in the middle) in the coronal plane and 500 mm from tip to tip.

Although the invention has been described in terms of particular embodiments and applications, one of ordinary skill in the art, in light of thisleaching, can generate additional embodiments and modifications without departing from the spirit of or exceeding the scope of the claimed invention. For instance, the nasal trumpet of the present invention can have broad utility in applications outside of endoscopy such as mouth-to-mouth resuscitation, LMA, and intubation and could be used in ACLS teaching.

In addition, the nasal trumpet 56 could optionally include an inflatable distal cuff and/or an inflatable cuff located midway along tubular member 58. A middle cuff is potentially useful to control nosebleeds until coagulation occurs and bleeding stops or until a more definitive treatment is available.

It is to be noted that tube 49 and port 50 for $C0_2$ sampling are optional and that sampling could alternatively be performed via connector 62.

Accordingly, it is to be understood that the drawings and descriptions herein are proffered by way of example to facilitate comprehension of the invention and should not be construed to limit the scope thereof.

CLAIMS:

1. A nasal trumpet comprising: an elongate tubular member having a proximal end and a distal end, said tubular member being made at least in part of a partially flexible soft polymeric material and having sufficient length so that said distal end is disposable in a patient's oropharynx approximately 1 to 3 cm above the patient's vocal cords while said proximal end is disposed outside a patient at a nostril opening of the patient; and an inflatable cuff attached to and surrounding said tubular member at said proximal end thereof so that said cuff is disposable inside the nostril when said distal end is disposed approximately 1 to 3 cm above the patient's vocal cords and said proximal end is disposed outside a patient at the patient's nostril opening.

2. The nasal trumpet defined in claim 1, further comprising a breathing system connector port connected to said tubular member at said proximal end.

3. The nasal trumpet defined in claim 2 wherein said connector port is unitary or integral with said tubular member.

4. The nasal trumpet defined in claim 3 wherein said connector port and said tubular member are molded together.

5. The nasal trumpet defined in claim 1, further comprising at least one flange extending transversely to an axis of said tubular member at a proximal end thereof.

6. The nasal trumpet defined in claim 5, further comprising a breathing system connector port connected to said tubular member at said proximal end, said flange being one of two elongate flanges or wings extending in opposite directions from said connector port.

7. The nasal trumpet defined in claim 1 wherein said tubular member is provided at said distal end with at least two oxygen-egress apertures.

8. A nasal trumpet comprising: an elongate tubular member having a proximal end and a distal end; and an inflatable cuff attached to and surrounding said tubular member at said proximal end thereof so that said cuff is disposable inside a nostril of a patient upon a deployment of said tubular member.

9. The nasal trumpet defined in claim 8, further comprising a breathing system connector port connected to said tubular member at said proximal end.

10. The nasal trumpet defined in claim 9 wherein said connector port is unitary or integral with said tubular member.

11. The nasal trumpet defined in claim 9, further comprising at least one flange extending transversely to an axis of said tubular member at a proximal end thereof.

12. A medical method comprising:

providing a bite block including a body member defining a passageway provided with at least one first sealing element, said body member including a flange with at least one second sealing element about a periphery thereof;

attaching said body member to a patient so that said flange is disposed outside and adjacent to the patient's mouth and so that said at least one second sealing element engages the patient's face about the patient's mouth to form an airtight seal between said body member and the patient's face;

providing a nasal trumpet comprising an elongate tubular member having a proximal end and a distal end and further comprising an inflatable cuff attached to and surrounding said tubular member at said proximal end thereof;

inserting said tubular member into a nostril of the patient;

thereafter inflating said cuff inside the nostril to form an airtight seal between said tubular member and a wall of the nostril;

connecting said tubular member to a breathing apparatus;

thereafter operating said breathing apparatus to ventilate the patient; and

inserting a elongate instrument shaft through said passageway, said first sealing element forming an airtight seal with said instrument shaft.

13. The method defined in claim 12 wherein said instrument shaft is a shaft of an endoscope, further comprising operating said endoscope to view internal tissue structures of the patient while operating said breathing apparatus to ventilate the patient and maintaining said body member in airtight engagement with the patient's face and said endoscope.

14. The method defined in claim 12 wherein said nasal trumpet is deployed in said nostril prior to the attachment of said body member of said bite block to the patient.

15. The method defined in claim 12, further comprising closing, blocking or sealing another nostril of the patient.

16. The method defined in claim 12 wherein said nasal trumpet is inserted so that said distal end of said tubular member is disposed in the oropharynx approximately 1 to 3 cm above the patient's vocal cords while said proximal end is disposed outside the patient at a nostril opening of the patient.

17. A medical method comprising:

providing a nasal trumpet comprising an elongate tubular member having a proximal end and a distal end and further comprising an inflatable cuff attached to and surrounding said tubular member at said proximal end thereof;

inserting said tubular member into a nostril of the patient;

thereafter inflating said cuff inside the nostril to form an airtight seal between said tubular member and a wall of the nostril;

connecting said tubular member to a breathing apparatus; and

thereafter operating said breathing apparatus to ventilate the patient via said tubular member.

18. The method defined in claim 17, further comprising closing, blocking or sealing another nostril of the patient.

19. The method defined in claim 17 wherein said nasal trumpet is inserted so that said distal end of said tubular member is disposed in the oropharynx approximately 1 to 3 cm above the patient's vocal cords while said proximal end is disposed outside the patient at a nostril opening of the patient.

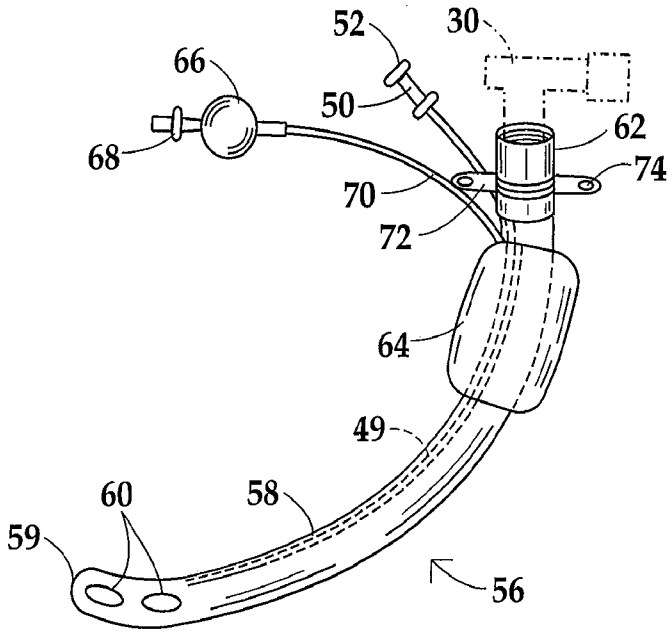
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FIG. 1

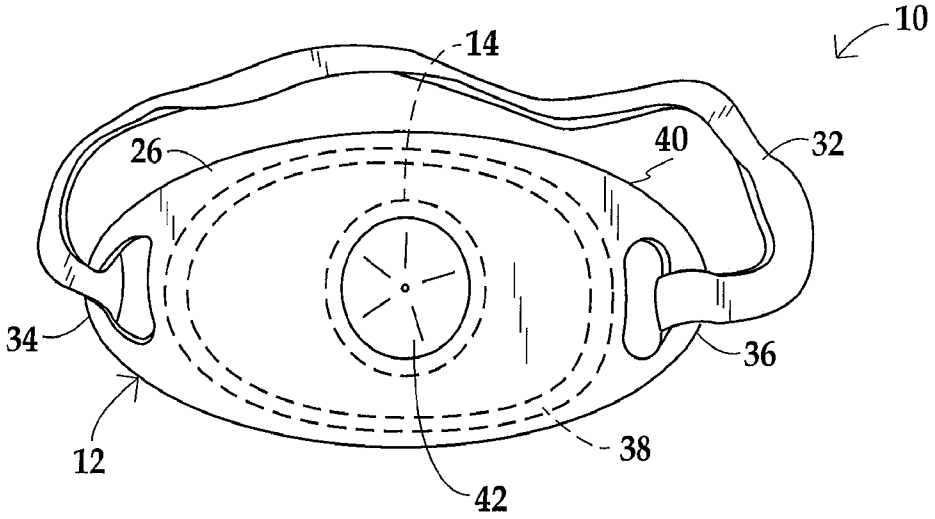
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FIG. 2

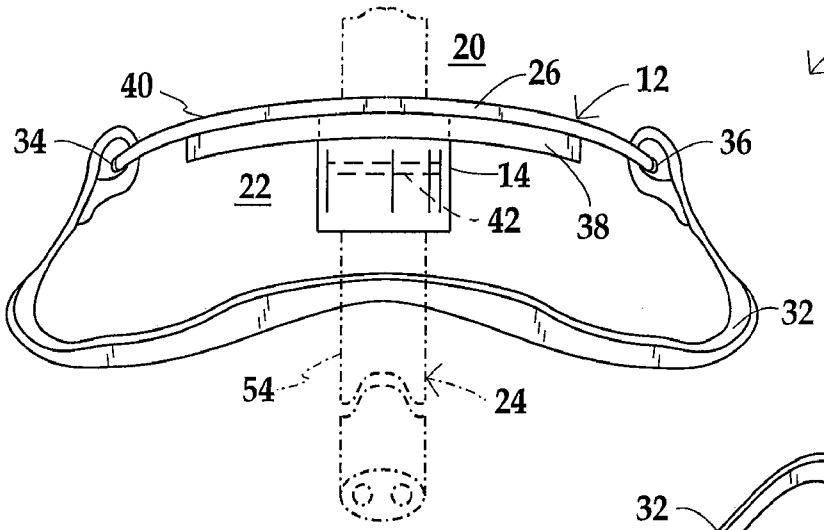

FIG. 3

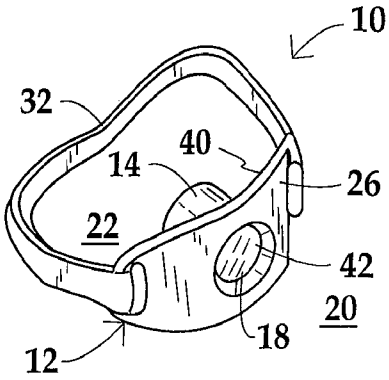

FIG. 4

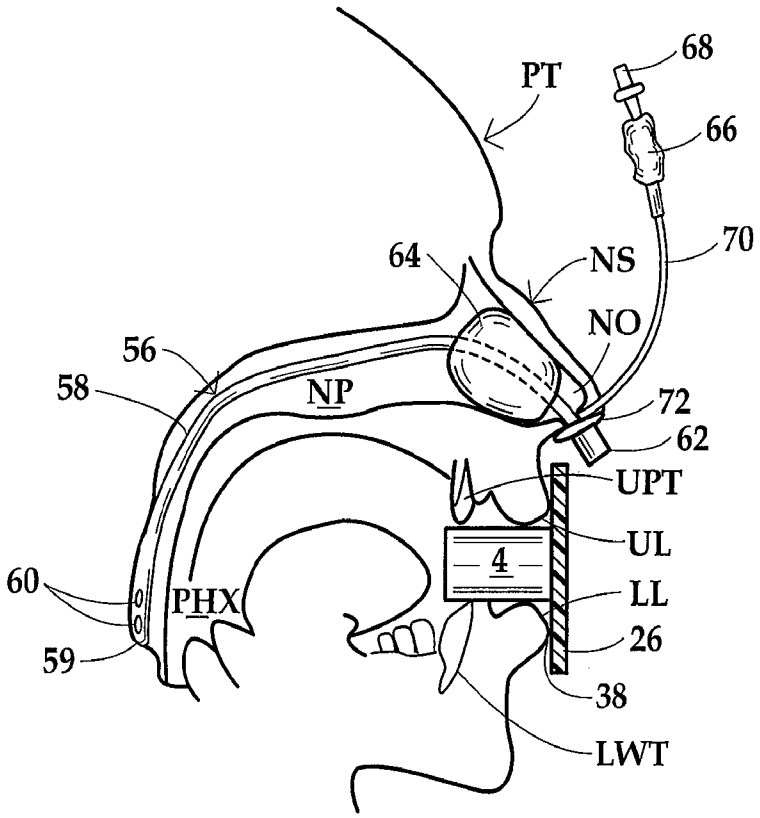

FIG. 5

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2013/066389

A. CLASSIFICATION OF SUBJECT MATTER

A61M 16/00(2006.01)i, A61M 16/04(2006.01)i

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
A61M 16/00; A62B 7/00; A61M 16/01; A61M 15/08; A61M 16/04

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
Korean utility models and applications for utility models
Japanese utility models and applications for utility models

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
eKOMPASS(KIPO internal) & Keywords: nasal, nasopharyngeal, trumpet, airway, "NRA", tube, tubular, balloon, inflatable, resilient, expand, cuff

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2012-0118286 A1 (BARODKA, V. M.) 17 May 2012. See abstract; claims 1,5; paragraphs [0007H0008] , [0010], [0027]-[0029], [0034]; and figures 1,5-7,10.	8-11
A		1-7
A	US 2010-0300450 A1 (BARODKA, V. M.) 2 December 2010. See abstract; claims 1,2,6; paragraphs [0008], [0026]-[0027] ; and figures 5,6.	1-11
A	US 6394093 B1 (LETHI, S.) 28 May 2002. See abstract; claim *V*, column 1, lines 5-9; column 2, lines 24-30; column 3, line 44-column 4, line 4; column 3, lines 17-23; and figures 1-2.	1-11
A	US 6536437 B1 (DRAGISIC, B. M.) 25 March 2003. See abstract; claims 1-5; column 1, lines 53-67; column 3, lines 3-22; lines 31-49; column 4, lines 8-29; and figures 2-4.	1-11
A	US 5791341 A (BULLARD, J. R.) 11 August 1998. See abstract ; claim 1; column 1, line 66-column 2, line 8; column 3, lines 21-50; column 5, lines 9-29; and figures 1-2,8-9.	1-11

☐ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
"E" earlier application or patent but published on or after the international filing date
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
22 January 2014 (22.01.2014)	**22 January 2014 (22.01.2014)**

Name and mailing address of the ISA/KR	Authorized officer
Korean Intellectual Property Office 189 Cheongsa-ro, Seo-gu, Daejeon Metropolitan City, 302-701, Republic of Korea Facsimile No. +82-42-472-7140	Han, Inho Telephone No. +82-42-481-3362

Form PCT/ISA/210 (second sheet) (July 2009)

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2013/066389

Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☒ Claims Nos.: 12-19
because they relate to subject matter not required to be searched by this Authority, namely:
Claims 12-19 pertain to methods for treatment of the human body and thus relate to a subject-matter which this International Searching Authority is not required, under Article 17(2)(a)(i) of the PCT and Rule 39.1(iv) of the Regulations under the PCT, to search.

2. ☐ Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box No. Ill Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

1. ☐ As all required addtional search fees were timely paid by the applicant, this international search report covers all searchable claims.

2. ☐ As all searchable claims could be searched without effort justifying an additional fees, this Authority did not invite payment of any additional fees.

3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:

4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

☐ The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.

☐ The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.

☐ No protest accompanied the payment of additional search fees.

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.
PCT/US2013/066389

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2012-0118286 Al	17/05/2012	US 2012-118297 Al	17/05/2012
US 2010-0300450 Al	02/12/2010	None	
US 6394093 Bl	28/05/2002	None	
US 6536437 Bl	25/03/2003	None	
US 05791341 A	11/08/1998	None	