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(54) **MEDICAL DEVICES AND METHODS OF PLACEMENT**

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| ***A61B 1/015*** | (2006.01) |
| ***A61B 1/018*** | (2006.01) |
| ***A61B 5/01*** | (2006.01) |
| ***A61B 7/02*** | (2006.01) |
| ***A61B 5/00*** | (2006.01) |
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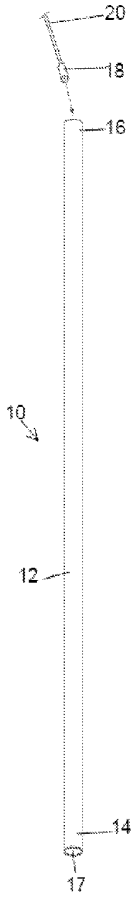
| ***A61B 1/24*** | (2006.01) |
| ***A61B 1/267*** | (2006.01) |
| ***A61B 1/273*** | (2006.01) |
| ***A61B 1/303*** | (2006.01) |
| ***A61M 16/04*** | (2006.01) |
| ***A61M 29/00*** | (2006.01) |
| ***A61M 16/06*** | (2006.01) |
| ***A61J 15/00*** | (2006.01) |
| ***A61M 16/00*** | (2006.01) |
| ***A61B 1/05*** | (2006.01) |

(52) **U.S. Cl.**

CPC ..... ***A61B 1/00154*** (2013.01); ***A61B 1/051*** (2013.01); ***A61B 1/00114*** (2013.01); ***A61B 1/07*** (2013.01); ***A61B 1/015*** (2013.01); ***A61B 1/018*** (2013.01); ***A61B 5/01*** (2013.01); ***A61B 7/023*** (2013.01); ***A61B 1/00016*** (2013.01); ***A61B 1/00009*** (2013.01); ***A61B 5/0008*** (2013.01); ***A61B 1/233*** (2013.01); ***A61B 1/24*** (2013.01); ***A61B 1/2673*** (2013.01); ***A61B 1/2736*** (2013.01); ***A61B 1/303*** (2013.01); ***A61M 16/0488*** (2013.01); ***A61M 29/00*** (2013.01); ***A61M 16/0465*** (2013.01); ***A61M 16/0666*** (2013.01); ***A61J 15/00*** (2013.01); ***A61M 16/0057*** (2013.01); ***A61M 16/0463*** (2013.01)

(57) **ABSTRACT**

The present invention provides improved medical devices equipped with a visualization device for intubation, ventilation, drug delivery, feeding and continuous remote monitoring of a patient. The present invention also provides methods for rapid and accurate placement of a medical device in a patient and continuous real time monitoring, including a remote monitoring, of the patient after the placement.



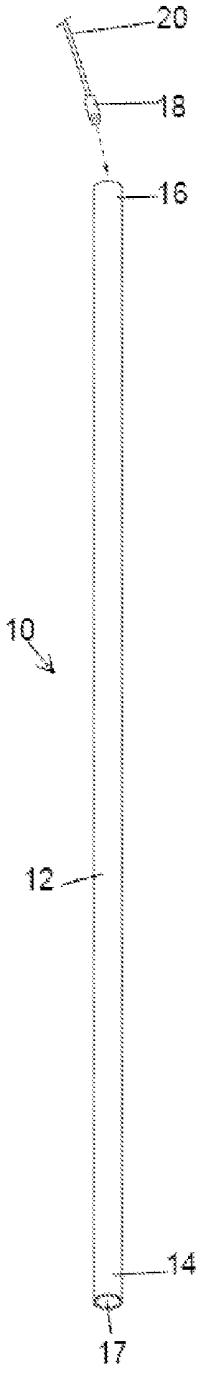



FIG. 1A

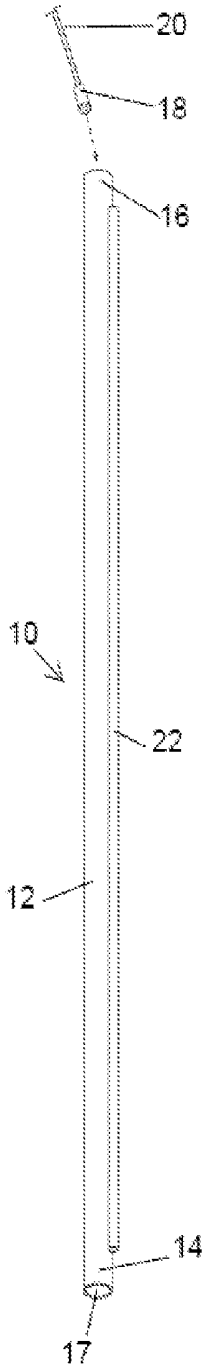



FIG. 1B

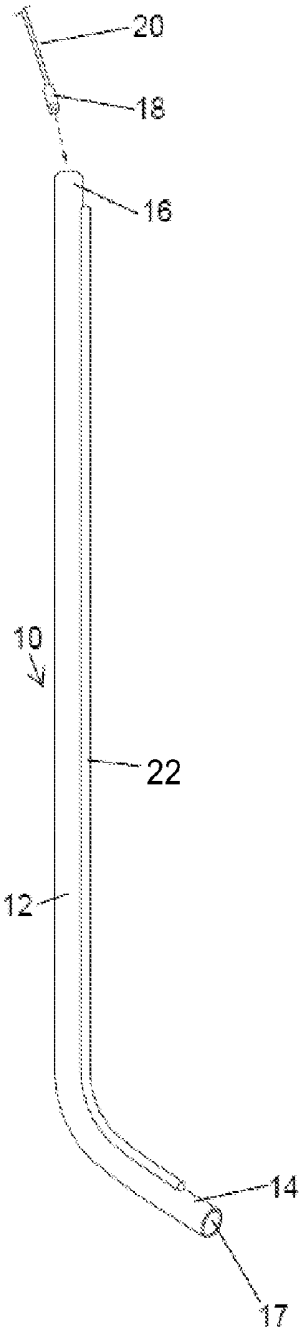



FIG. 1C

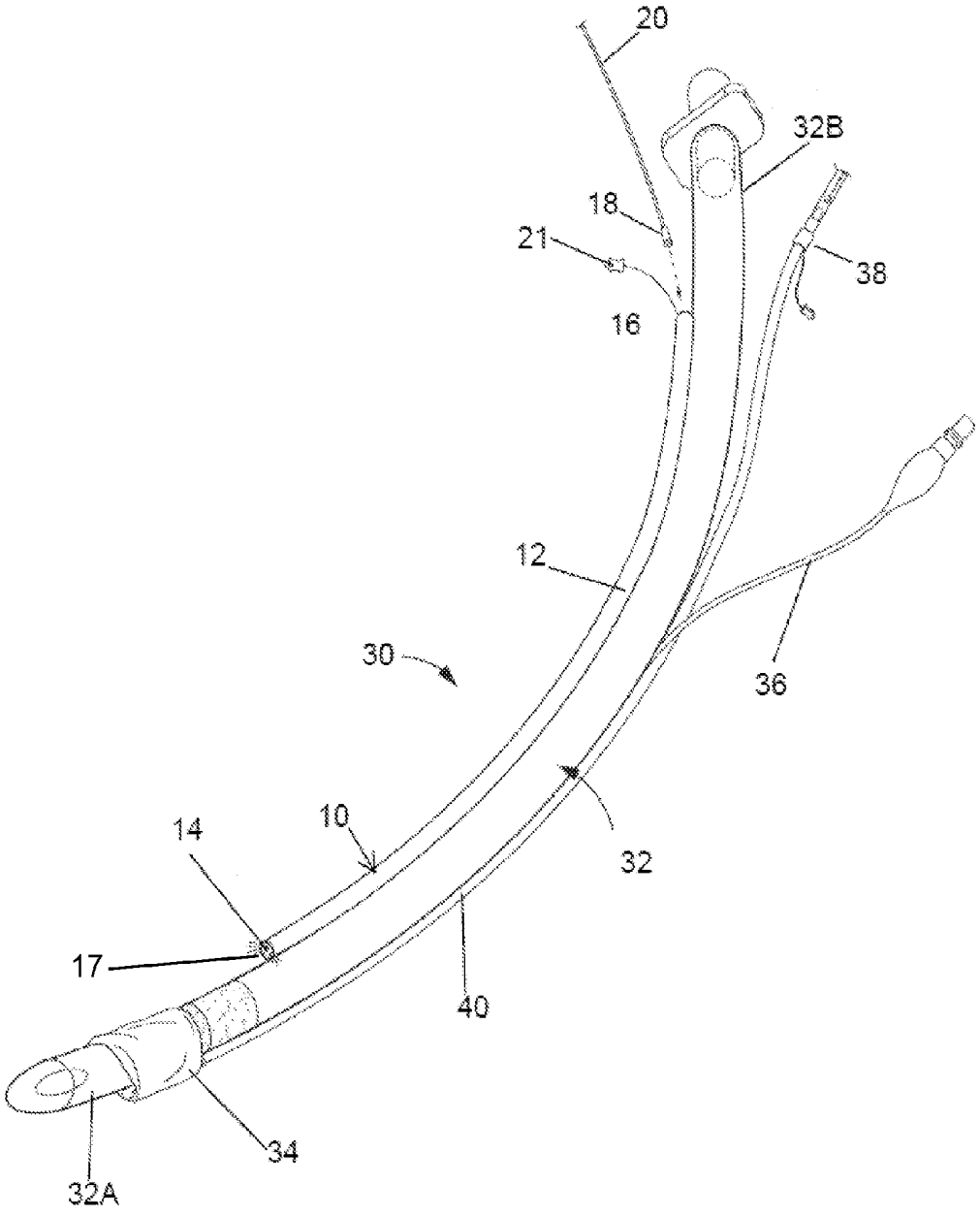



FIG. 2

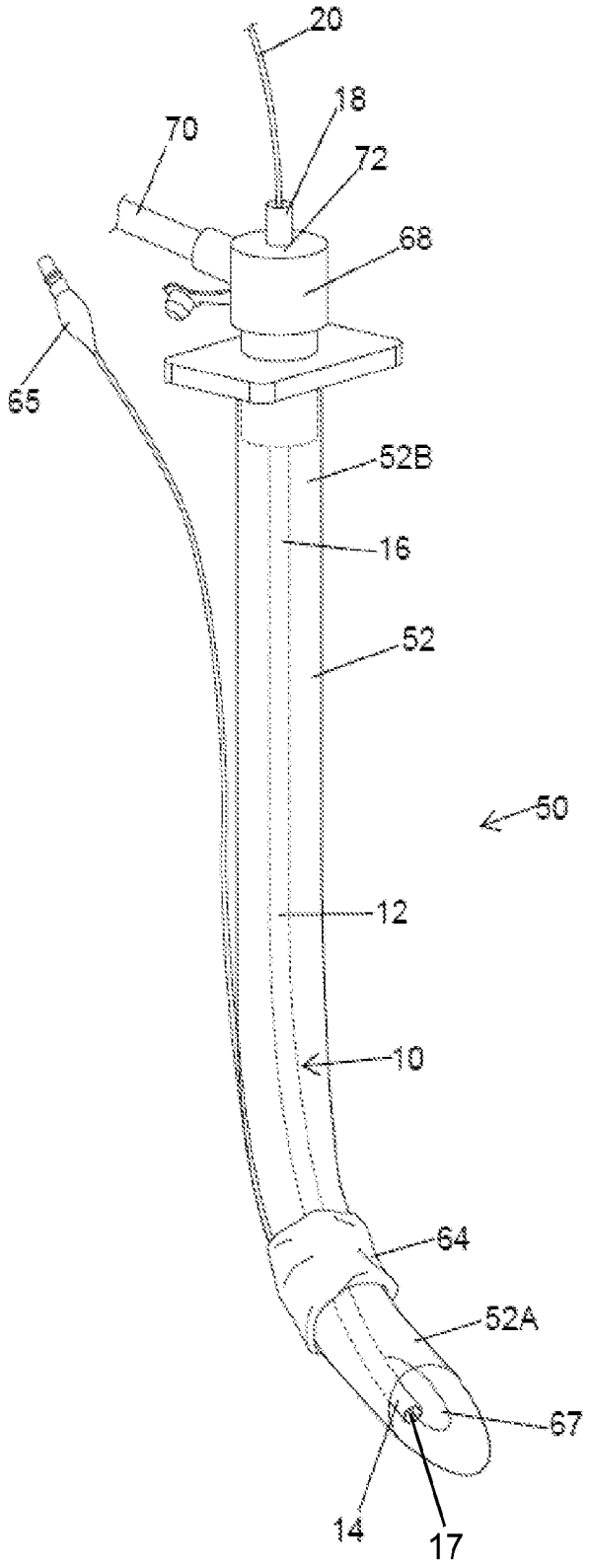



FIG. 3

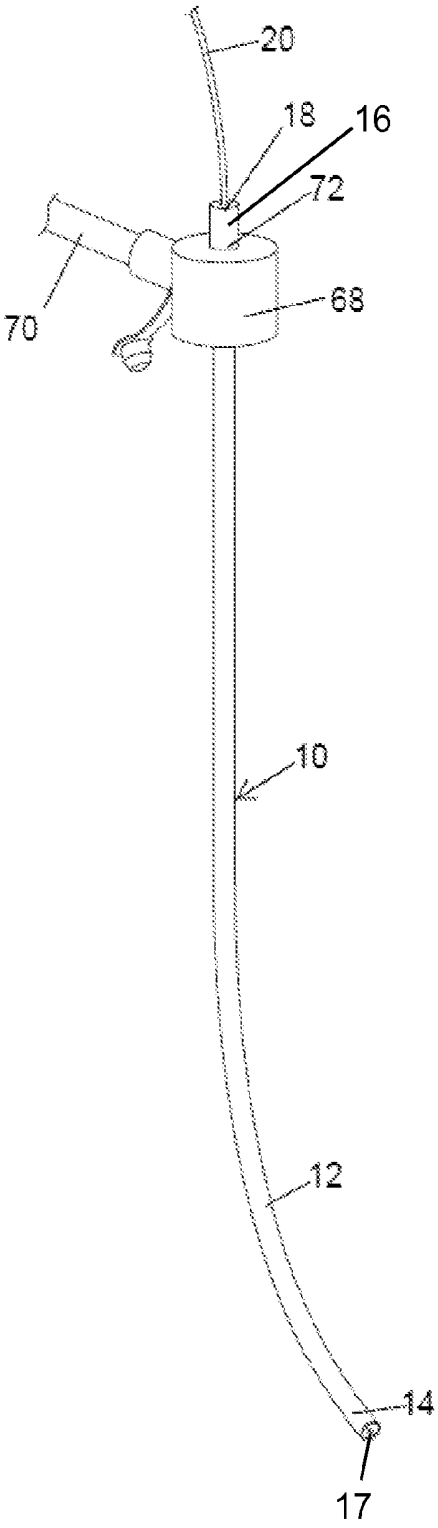



FIG. 4A

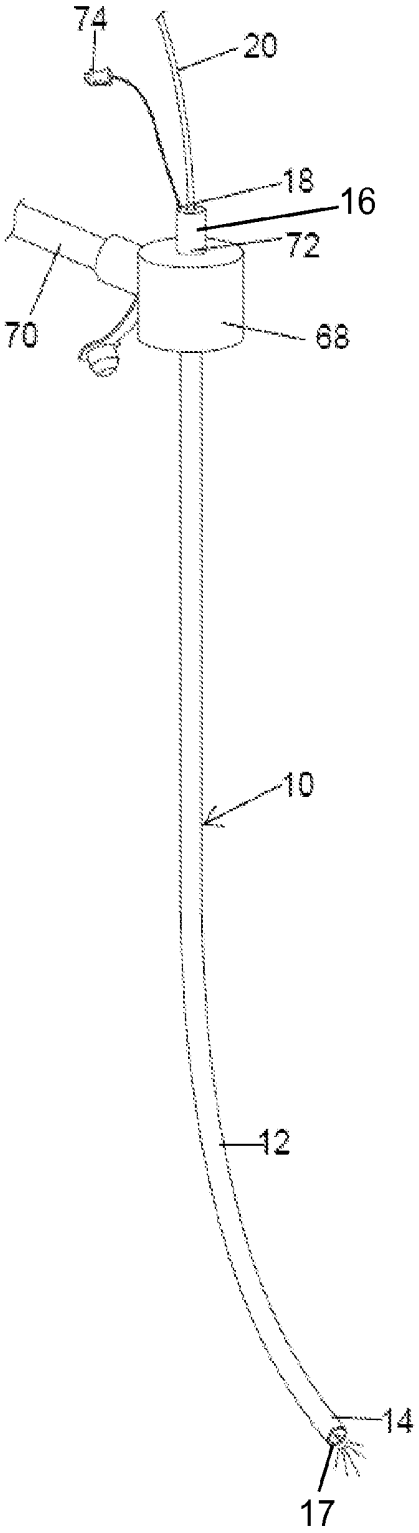



FIG. 4B

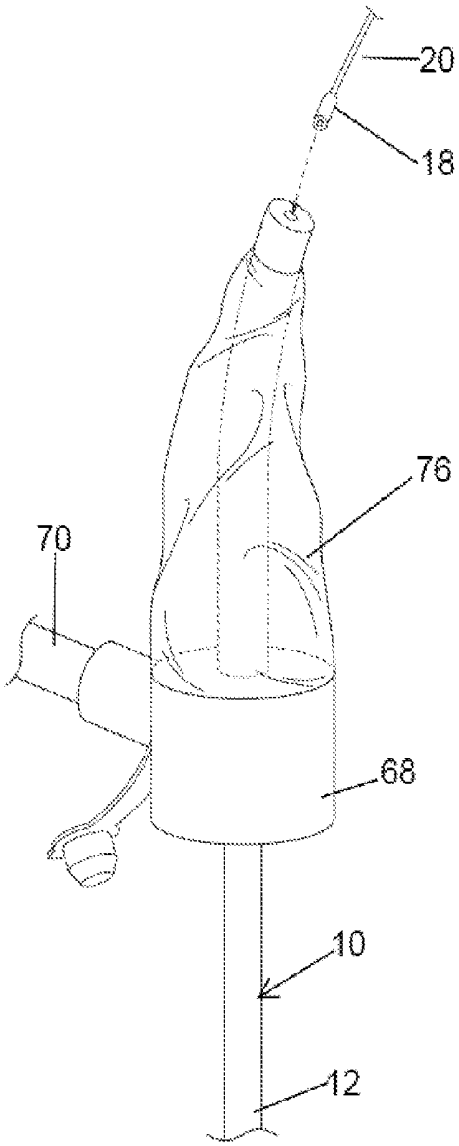



FIG. 5A

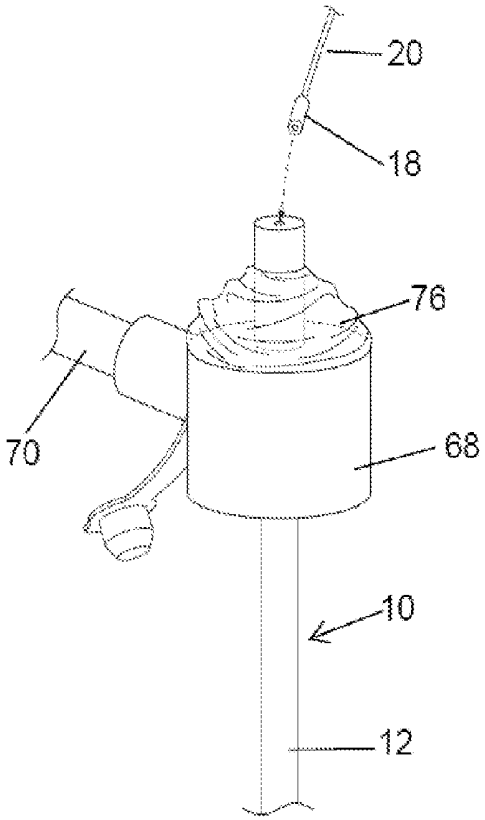



FIG. 5B

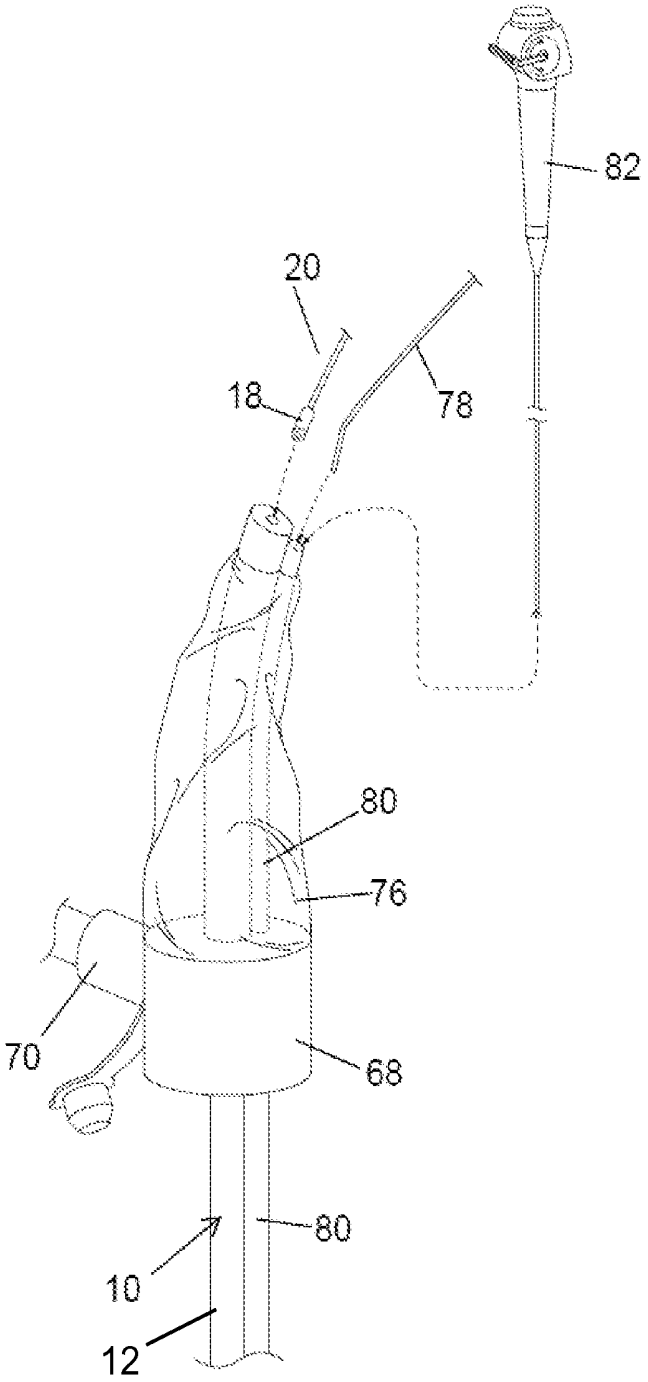



FIG. 5C

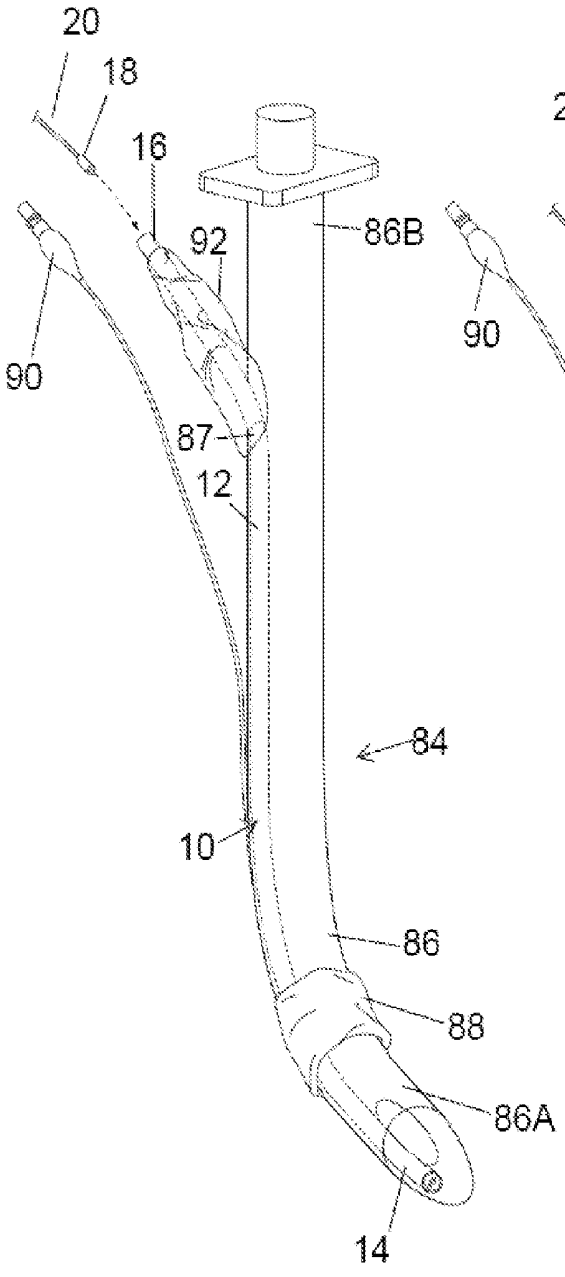

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FIG. 6A

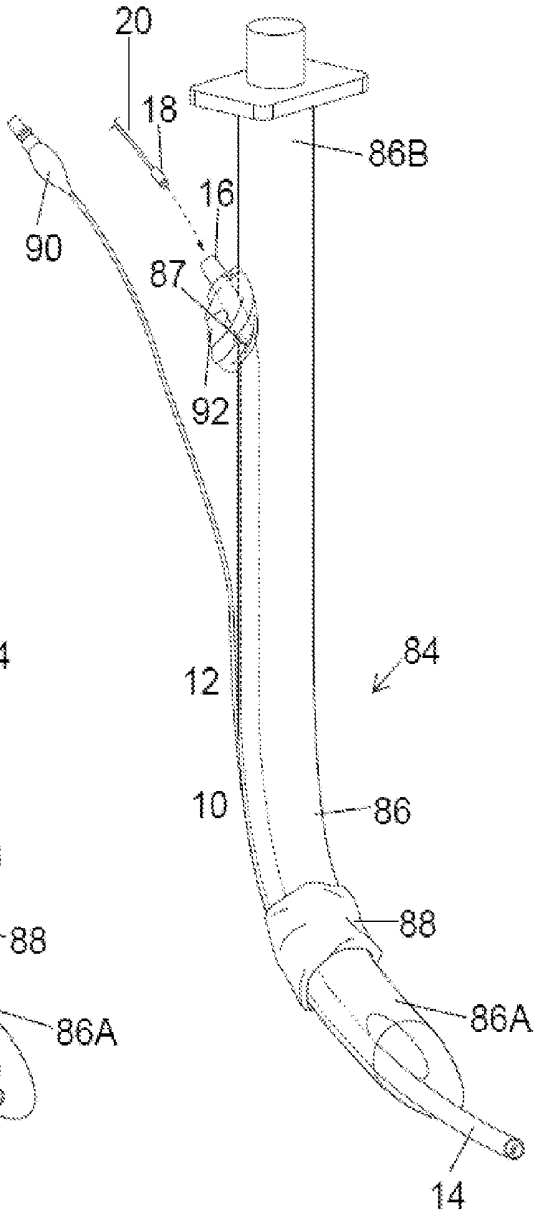
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FIG. 6B

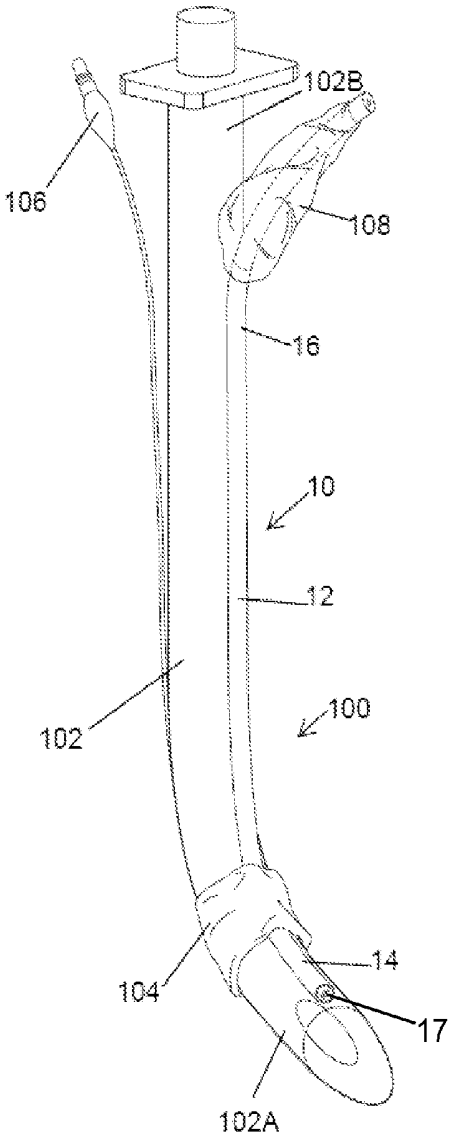
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FIG. 7A

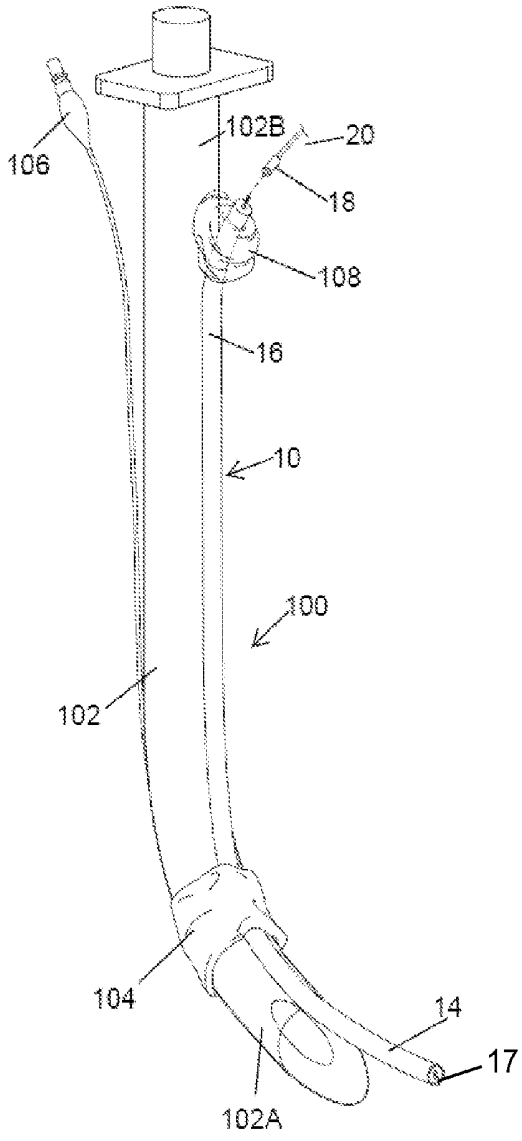
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FIG. 7B

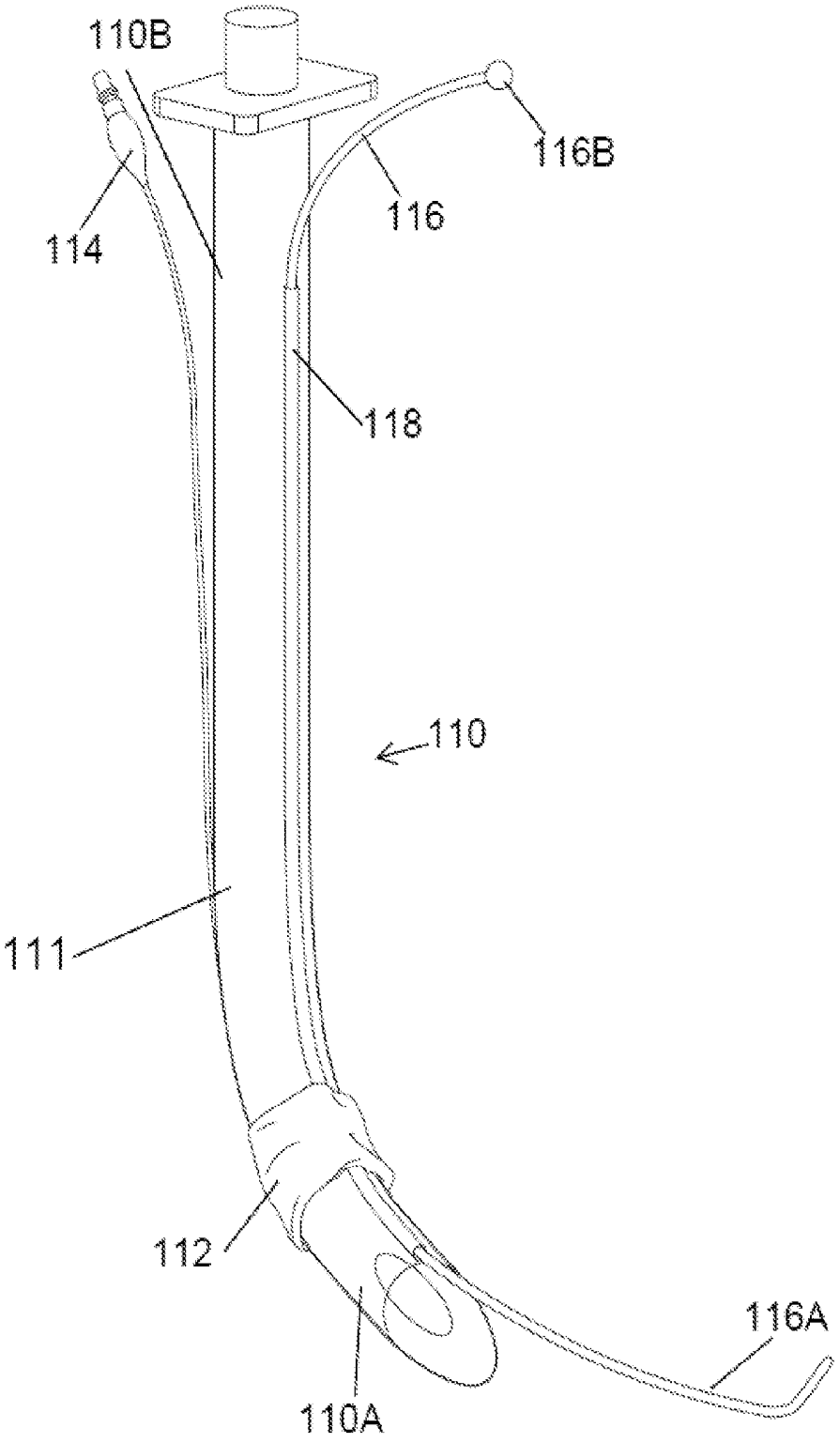


FIG. 8

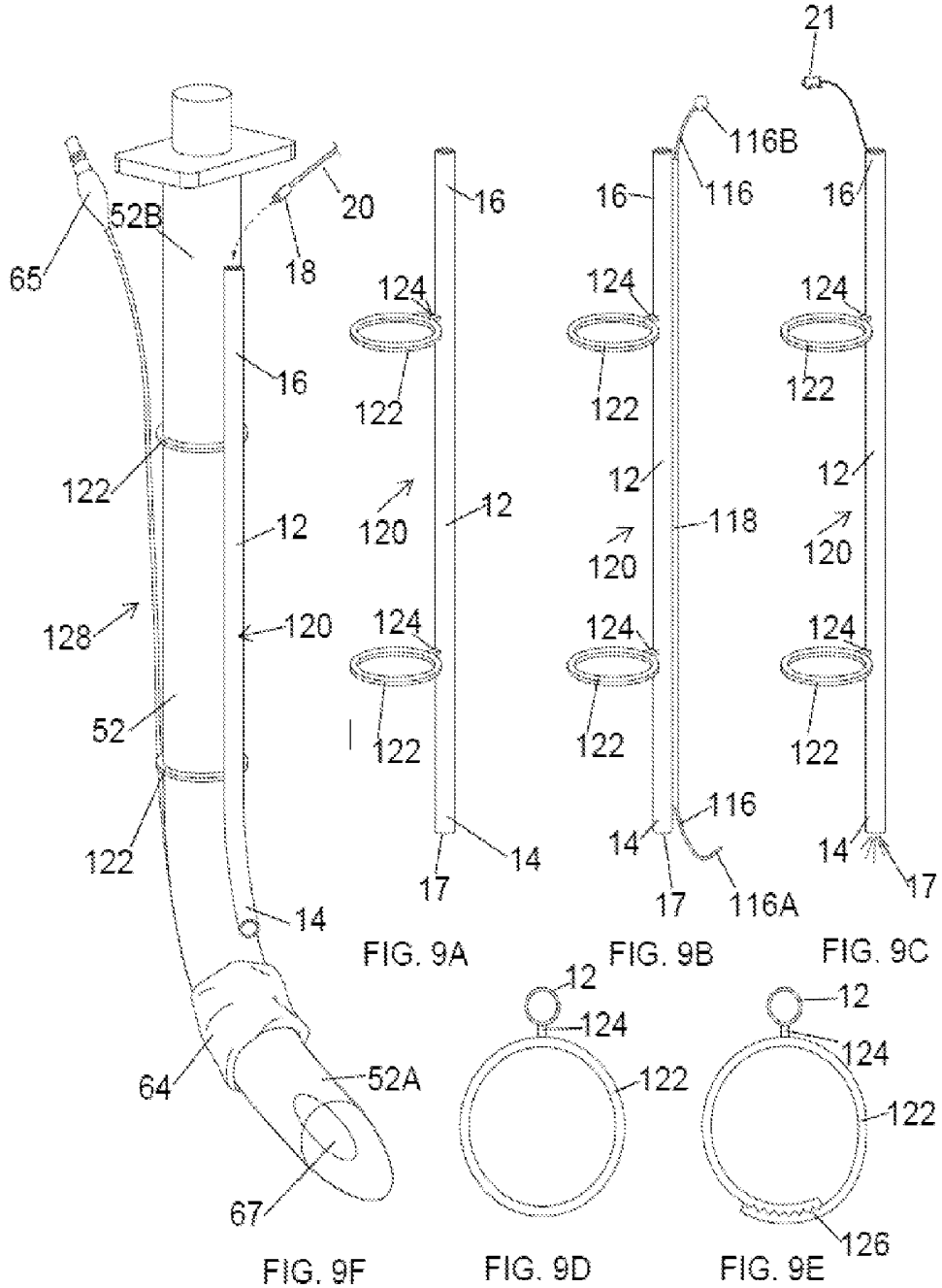


FIG. 9A FIG. 9B FIG. 9C

FIG. 9F FIG. 9D FIG. 9E

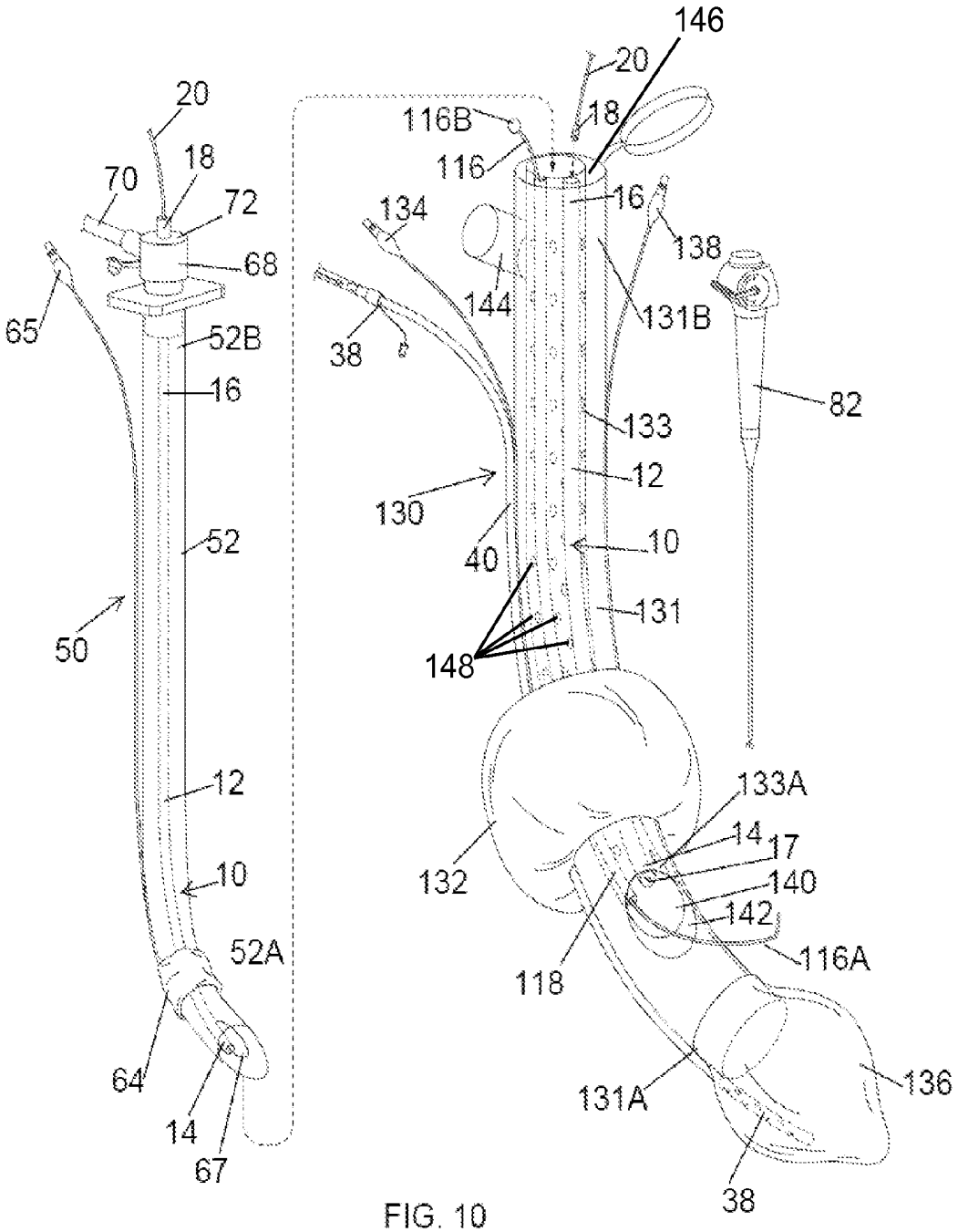
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FIG. 10

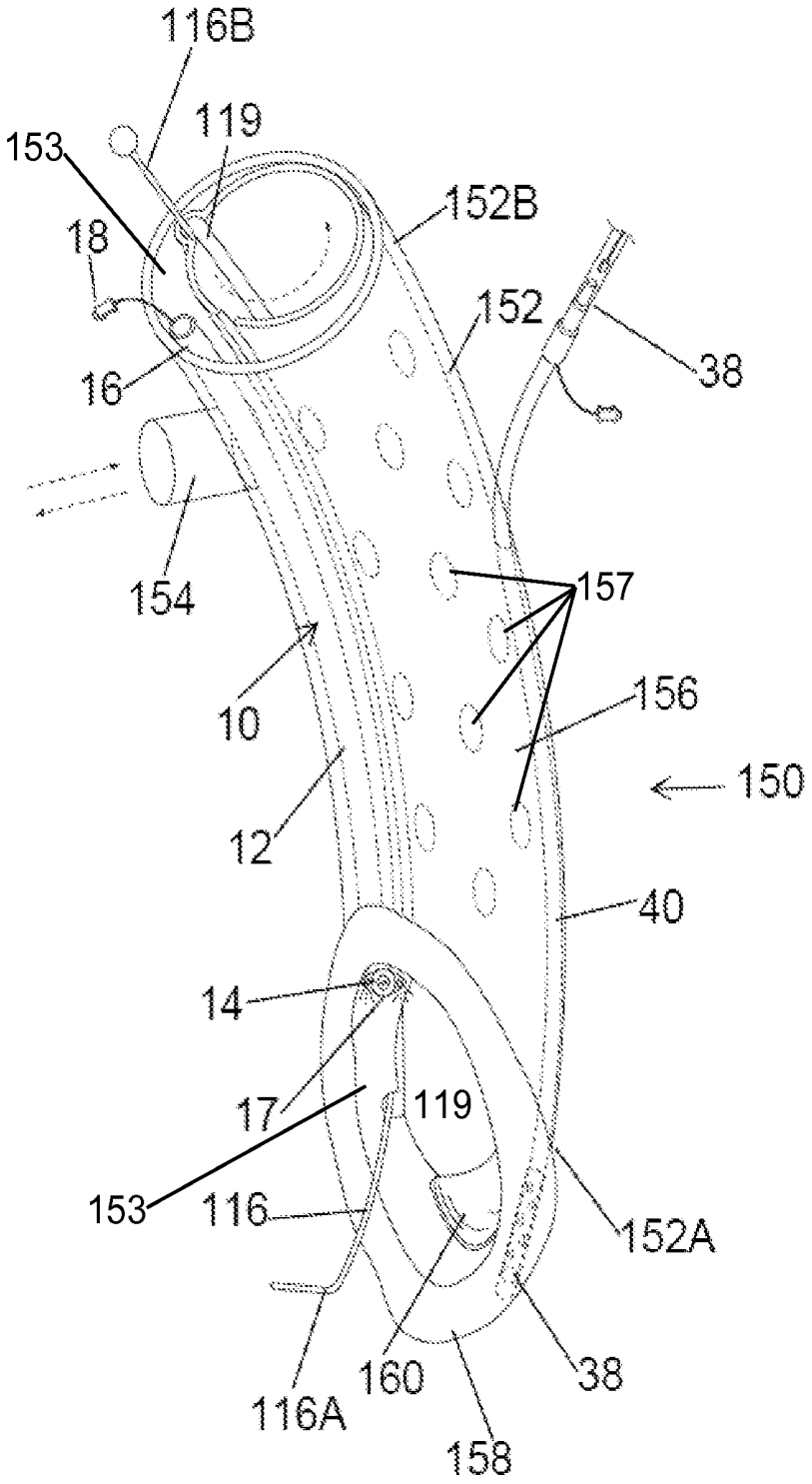
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FIG. 11A

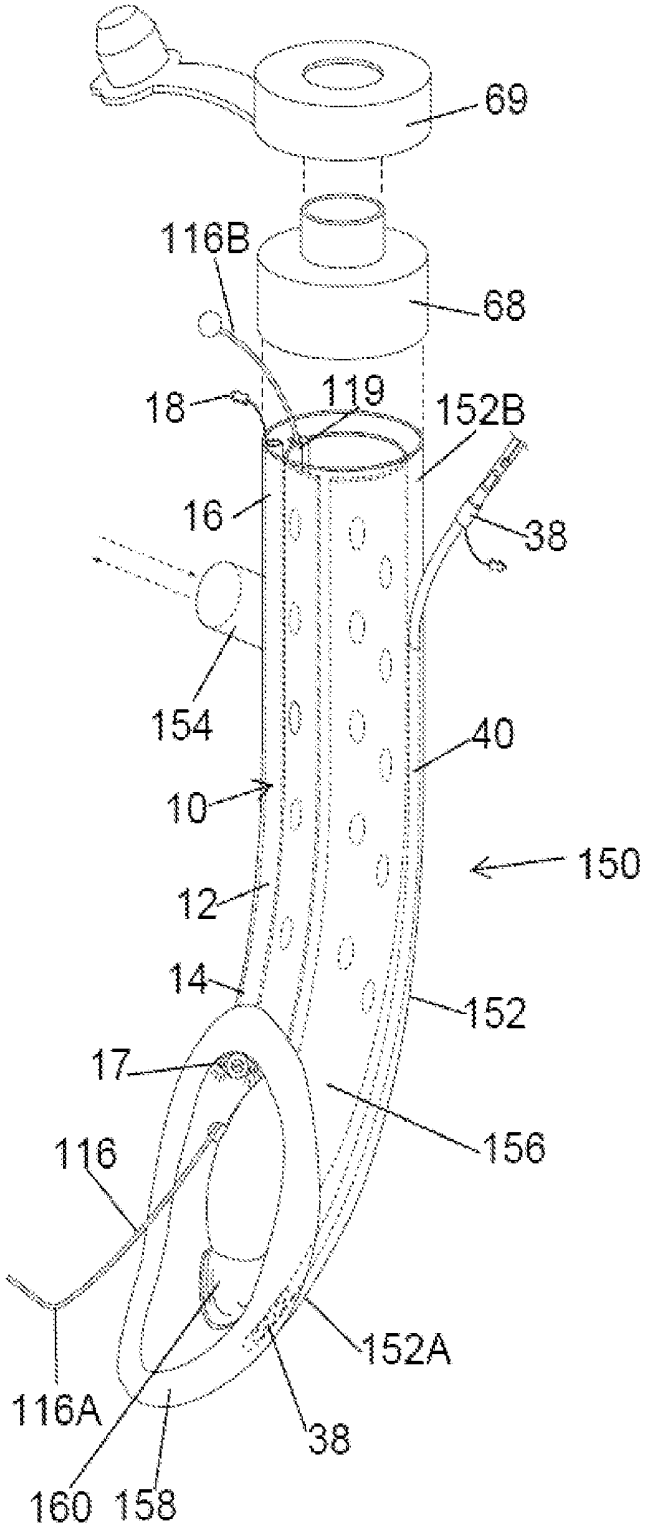
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FIG. 11B

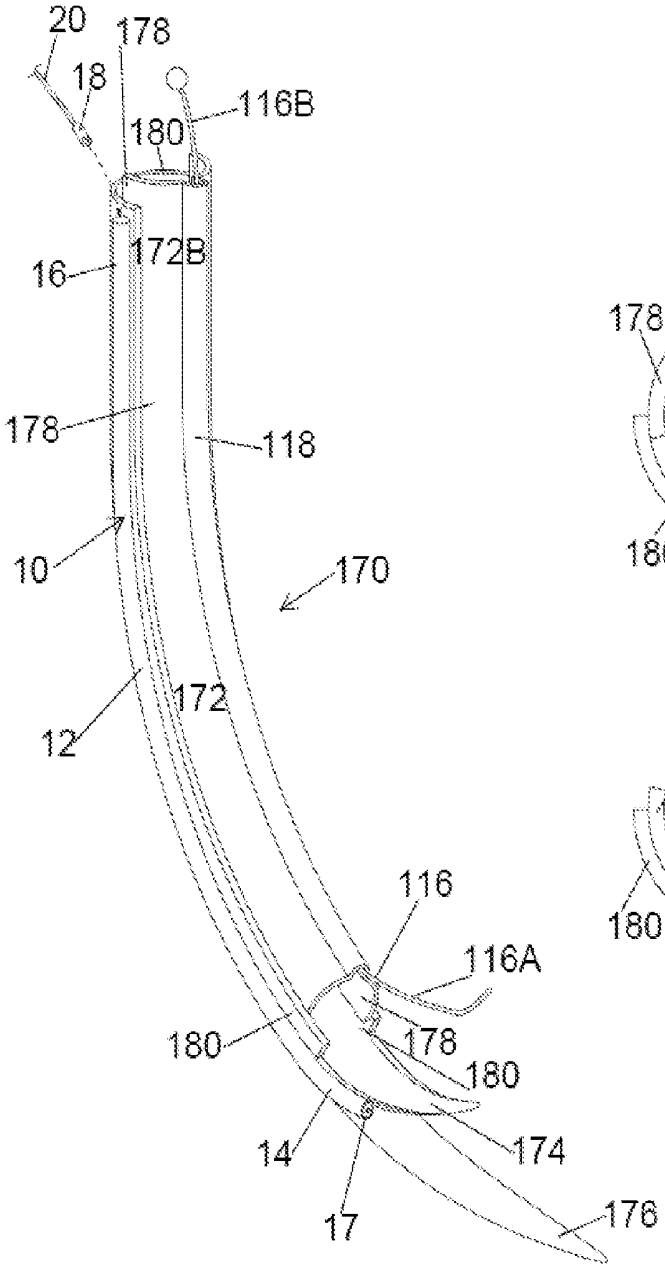


FIG. 12A

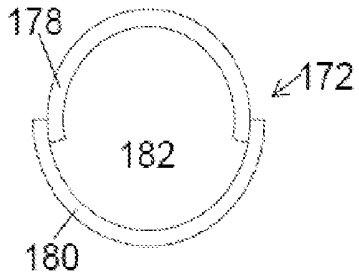


FIG. 12B

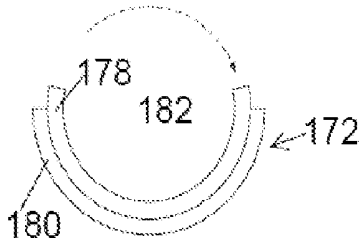


FIG. 12C

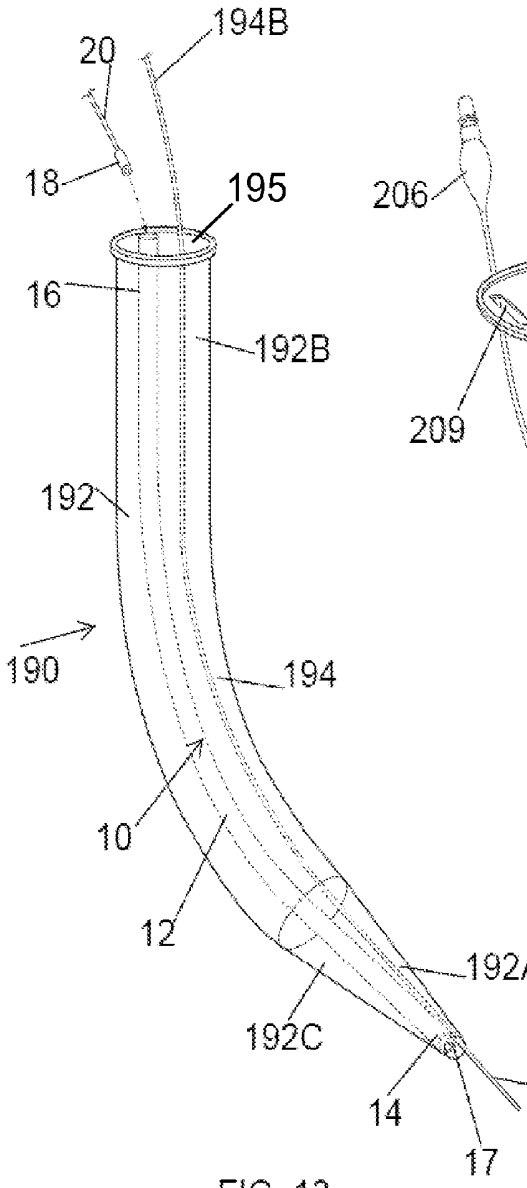


FIG. 13

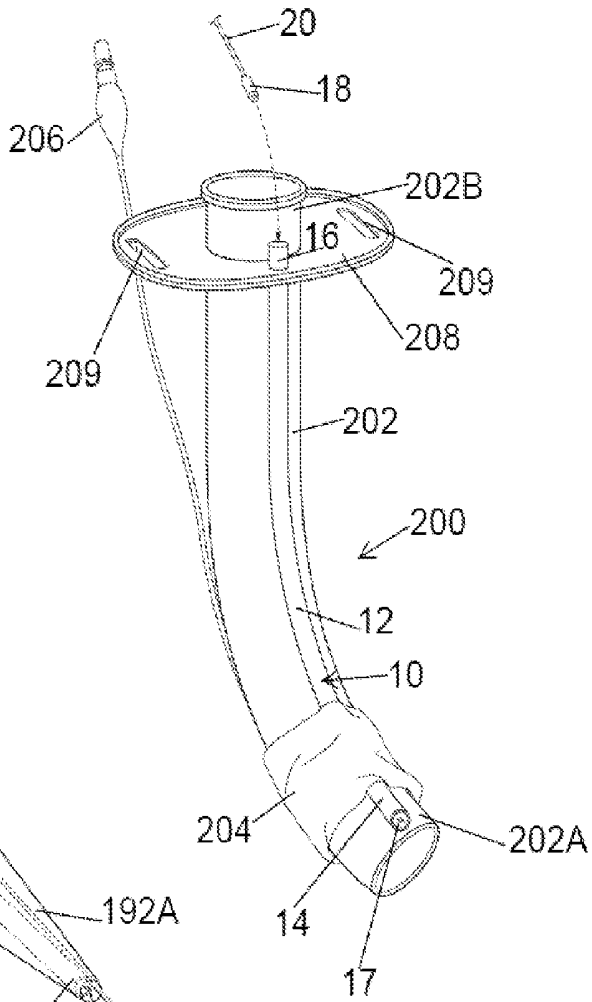


FIG. 14A

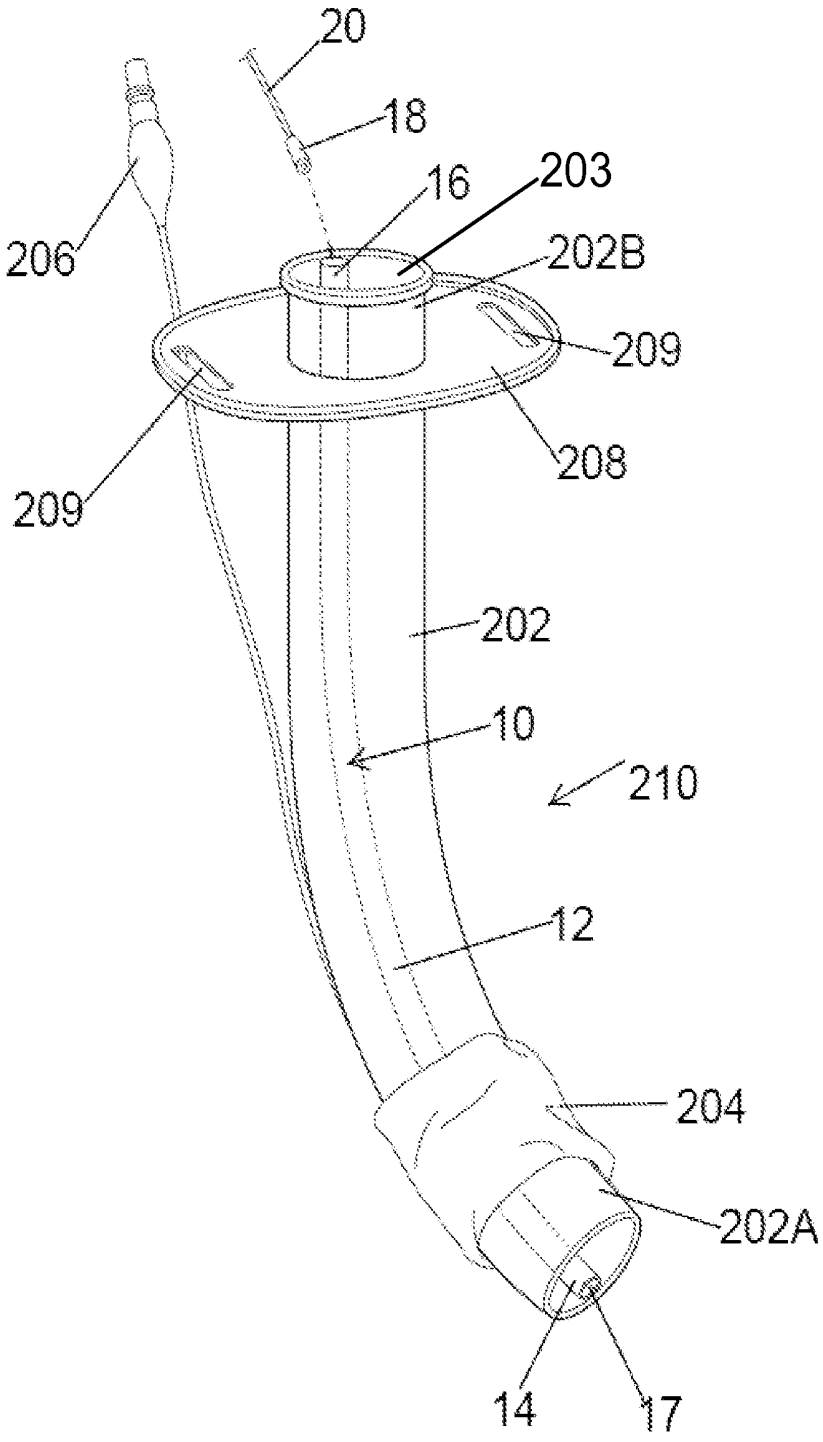


FIG. 14B

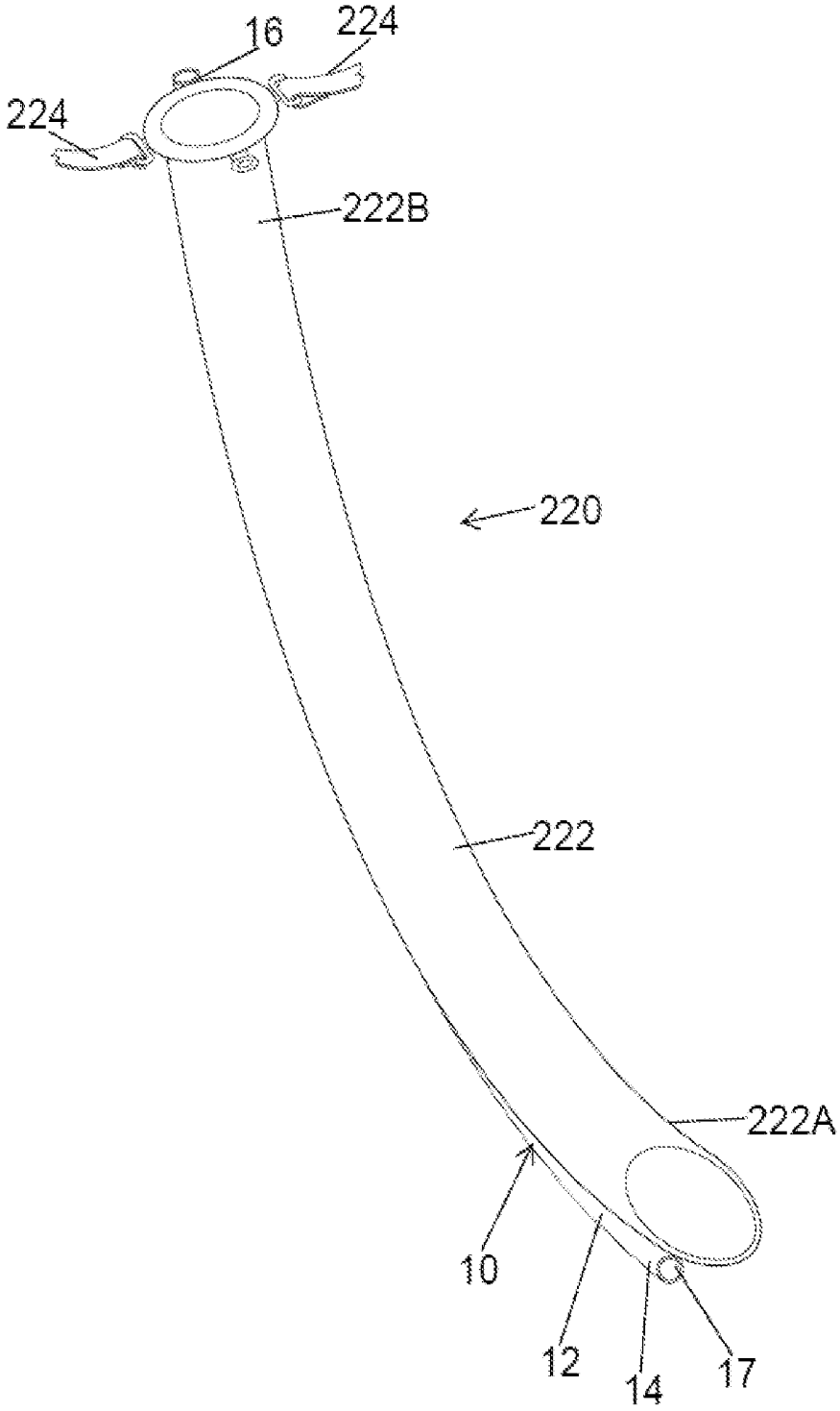


FIG. 15

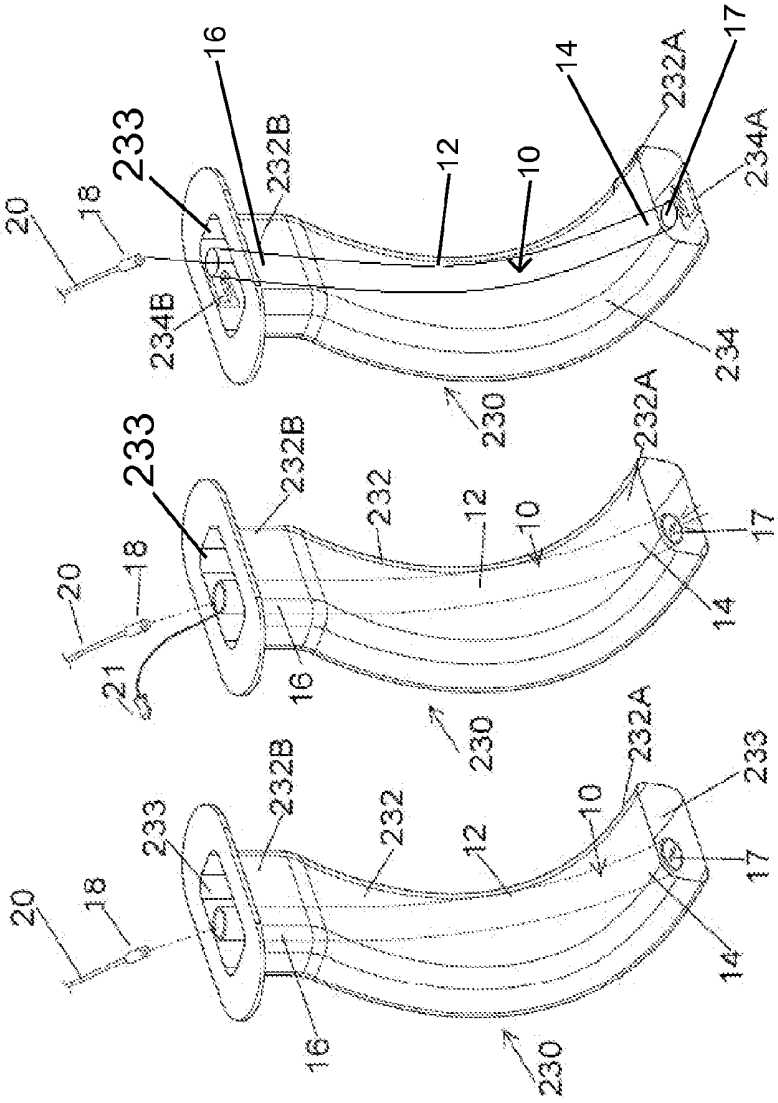


FIG. 16A FIG. 16B FIG. 16C

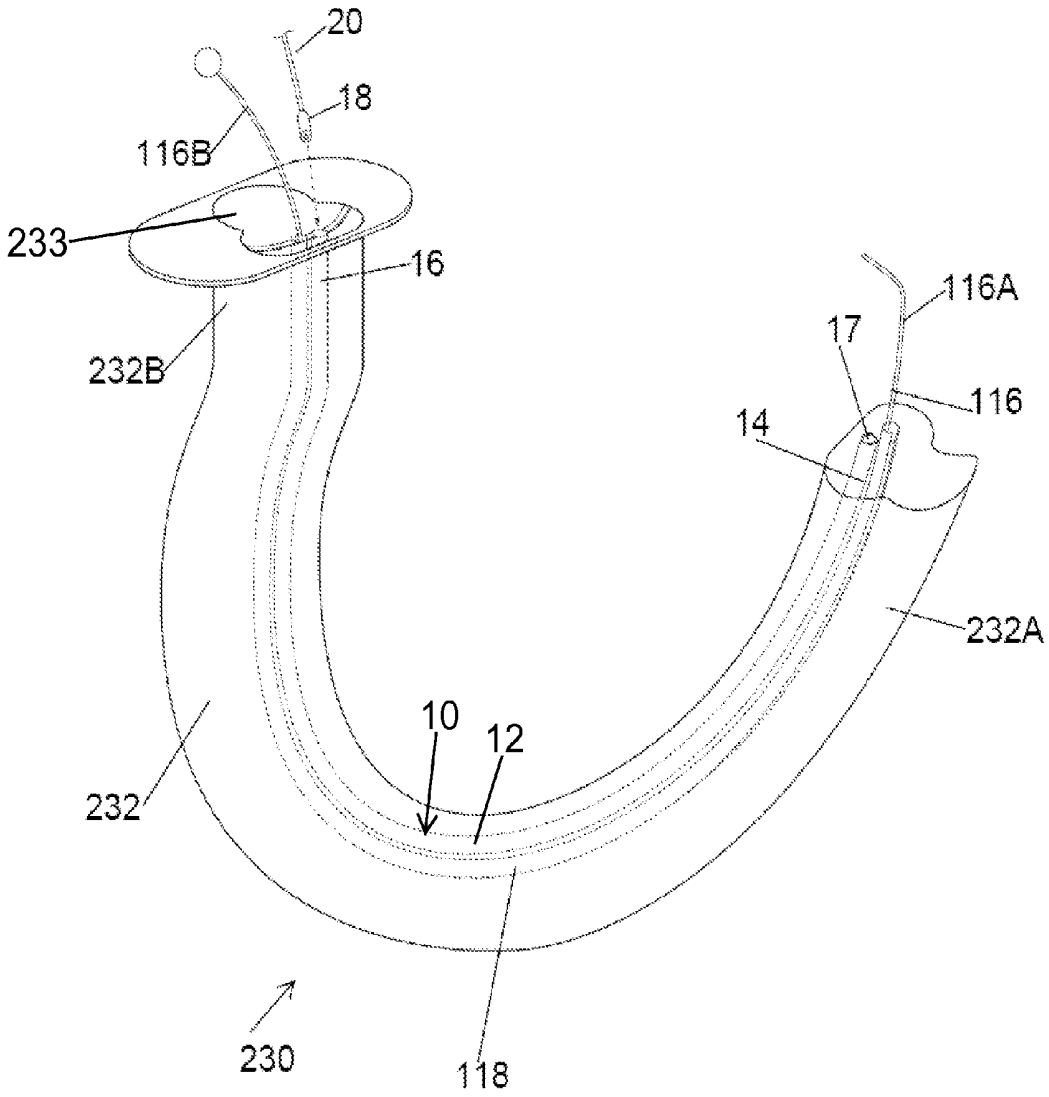


FIG. 16D

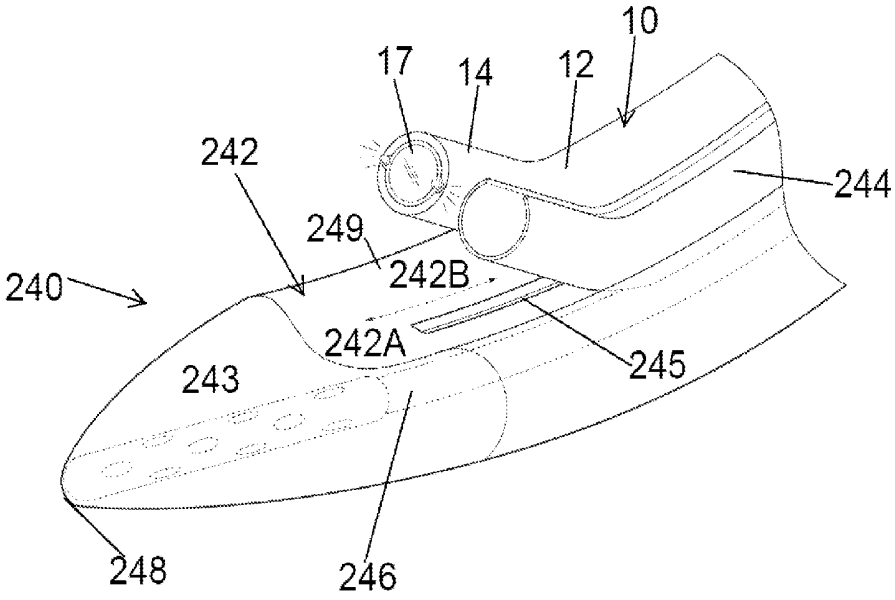


FIG. 17A

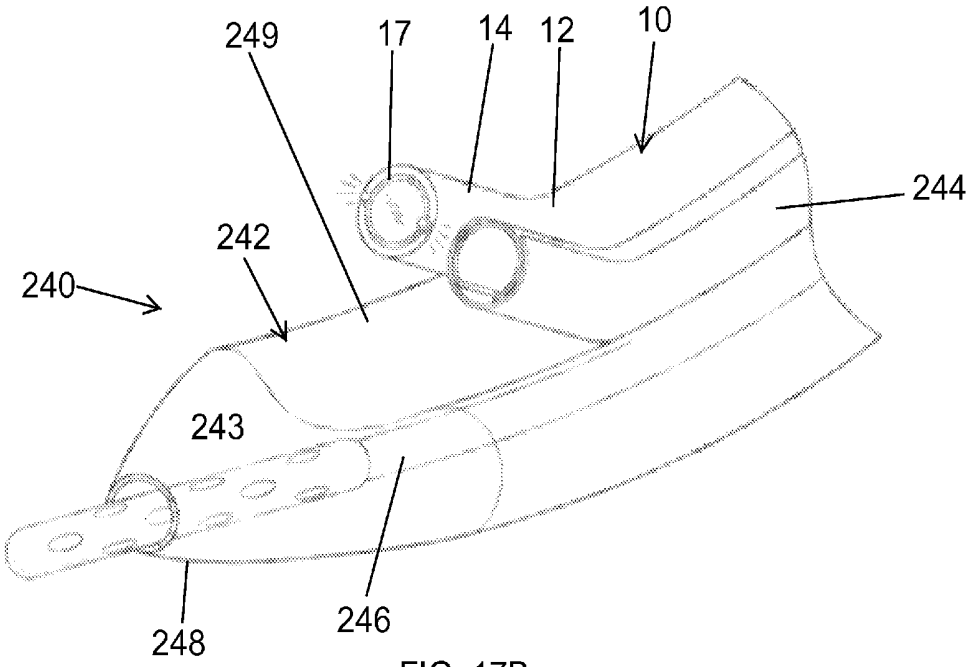


FIG .17B

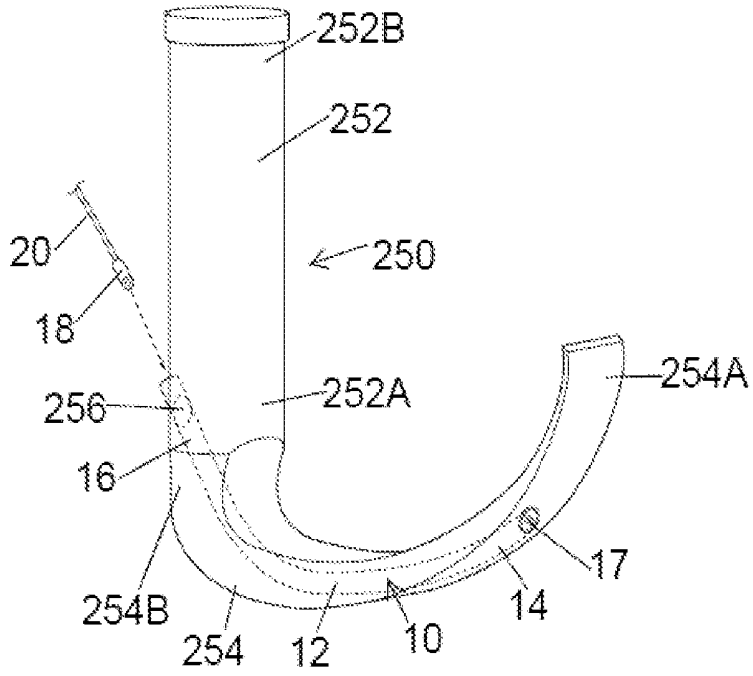


FIG. 18A

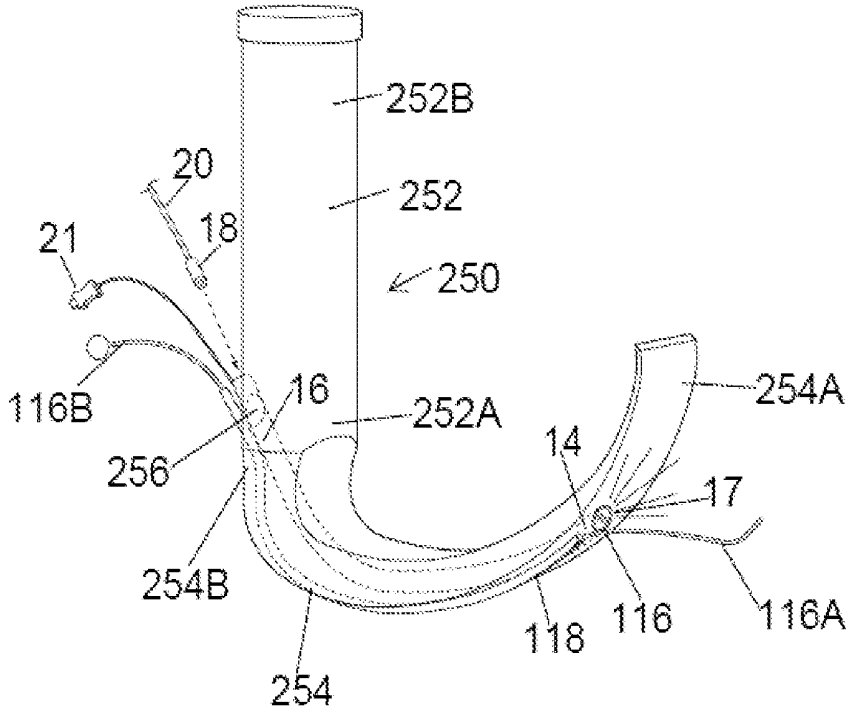


FIG. 18B

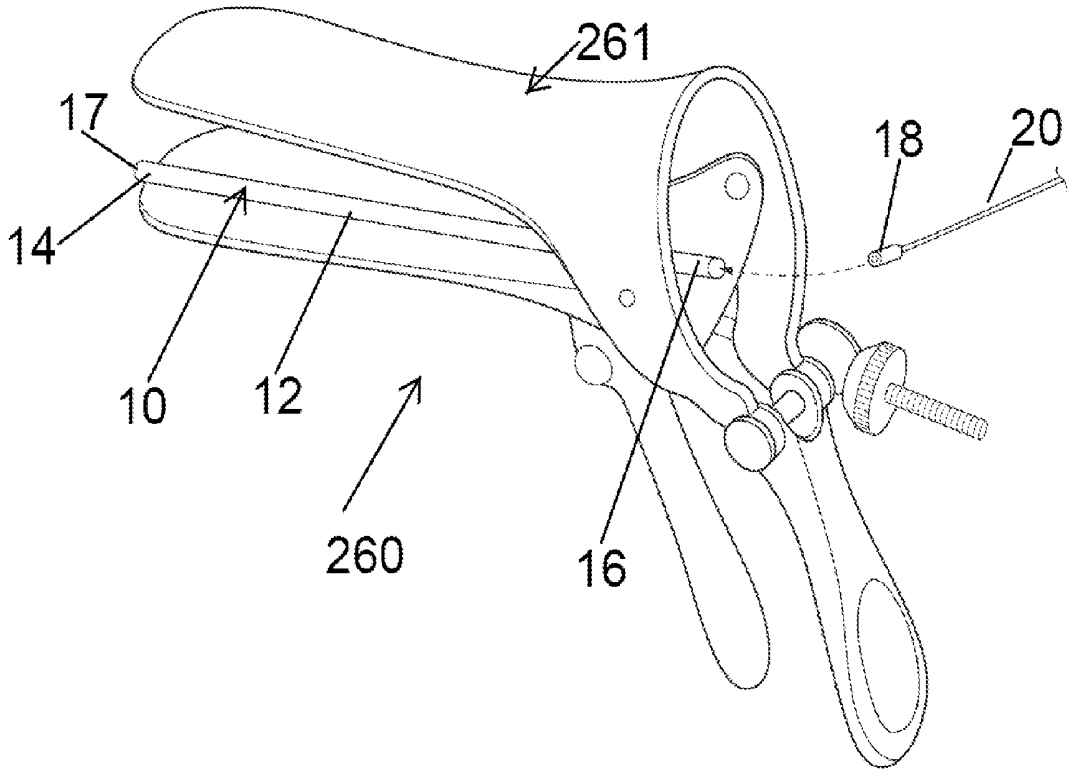


FIG. 19

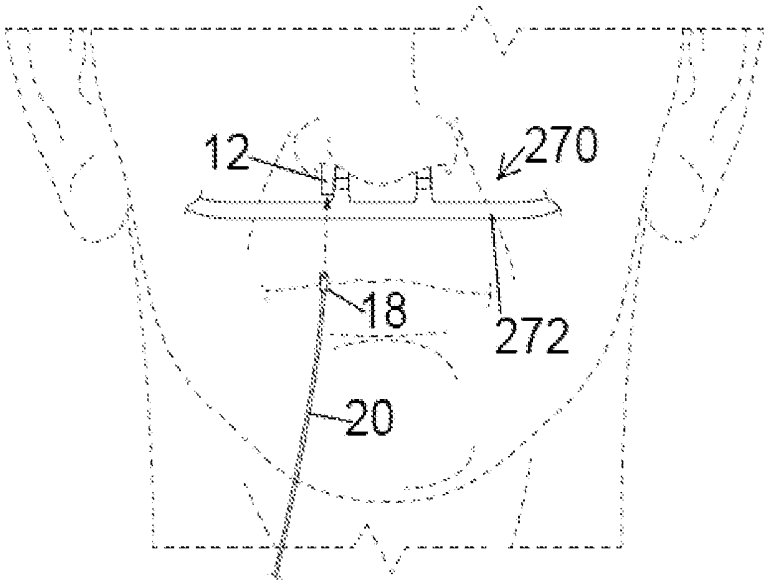


FIG. 20A

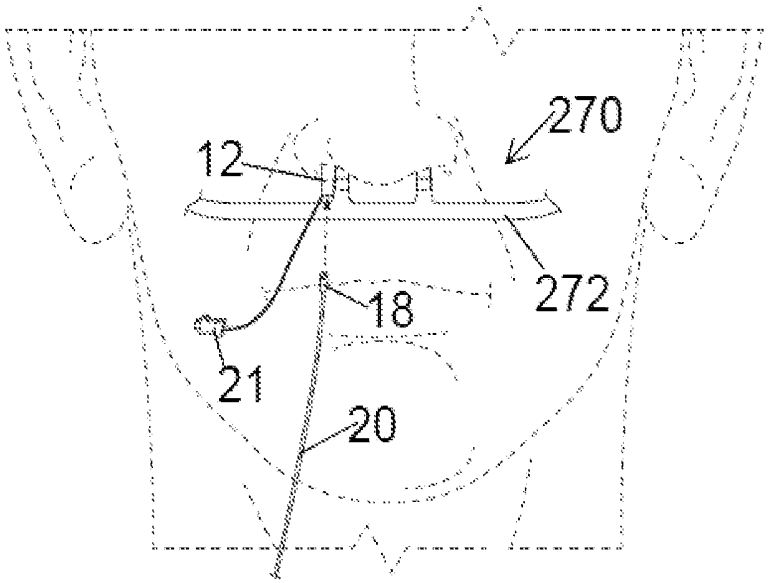


FIG. 20B

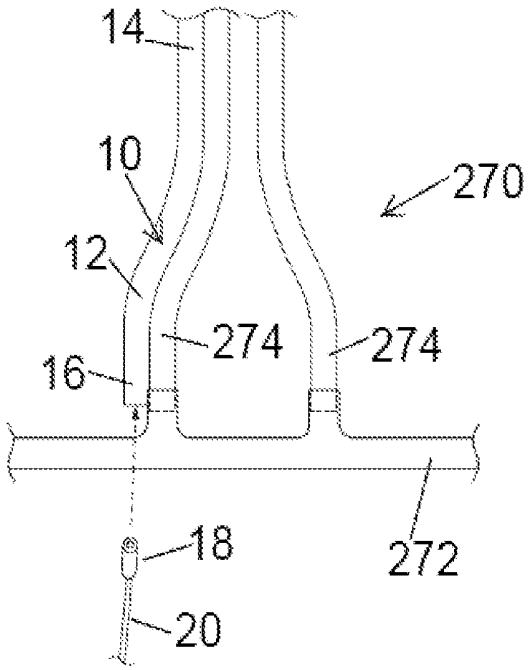


FIG. 20C

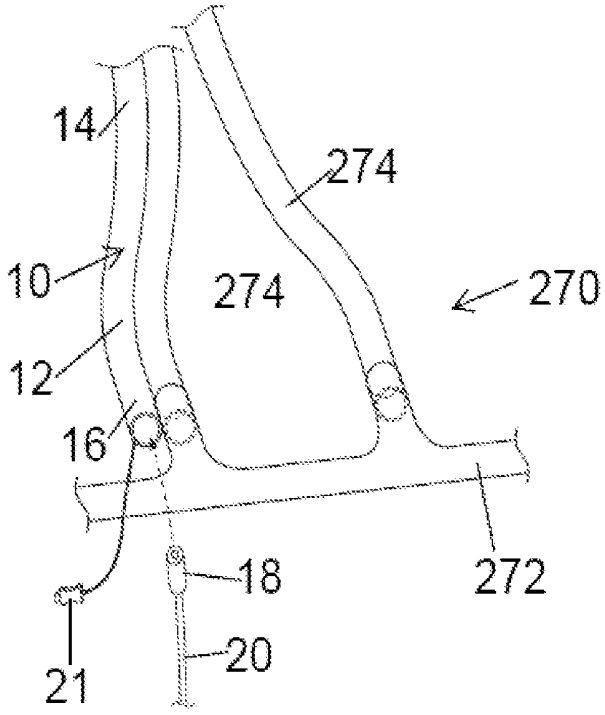


FIG. 20D

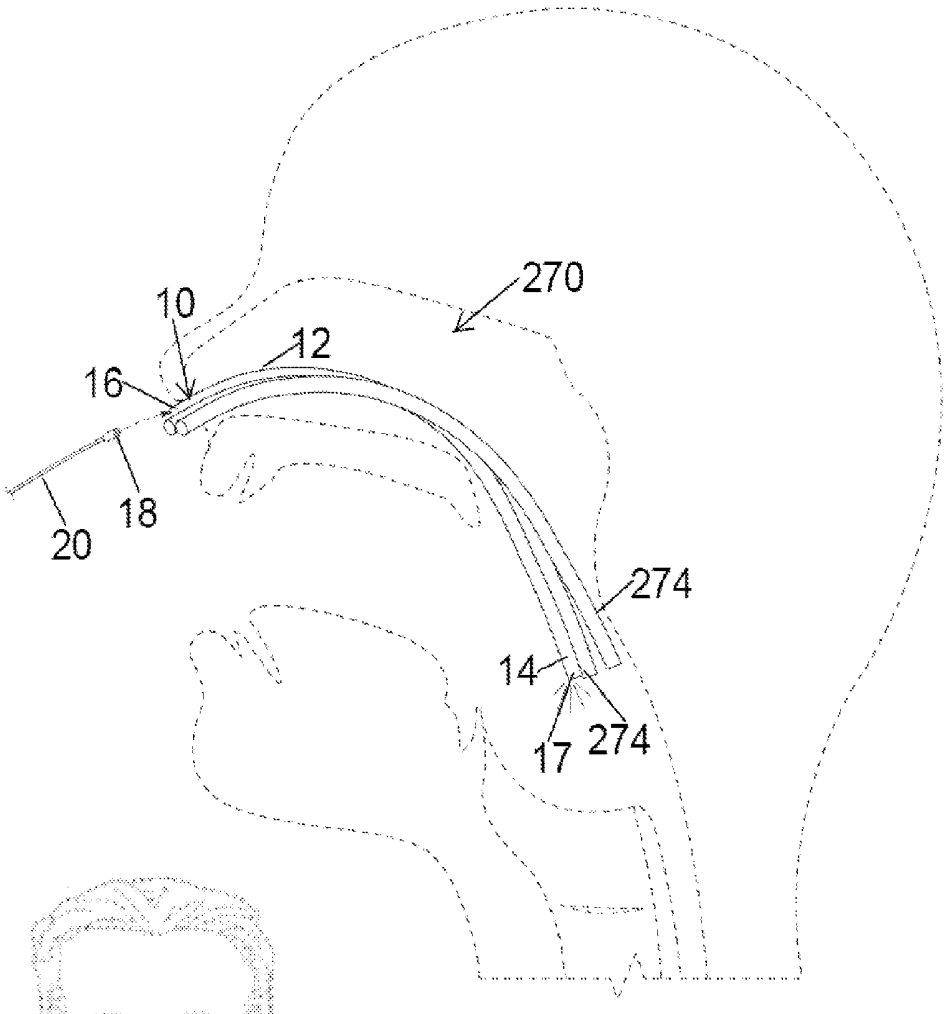


FIG. 20E

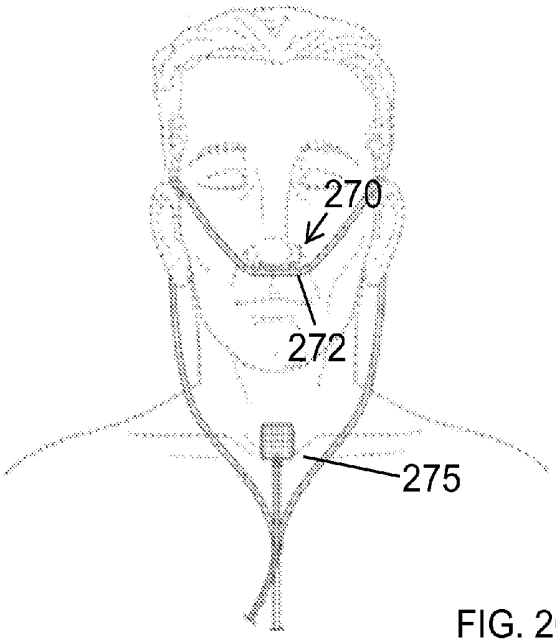


FIG. 20F

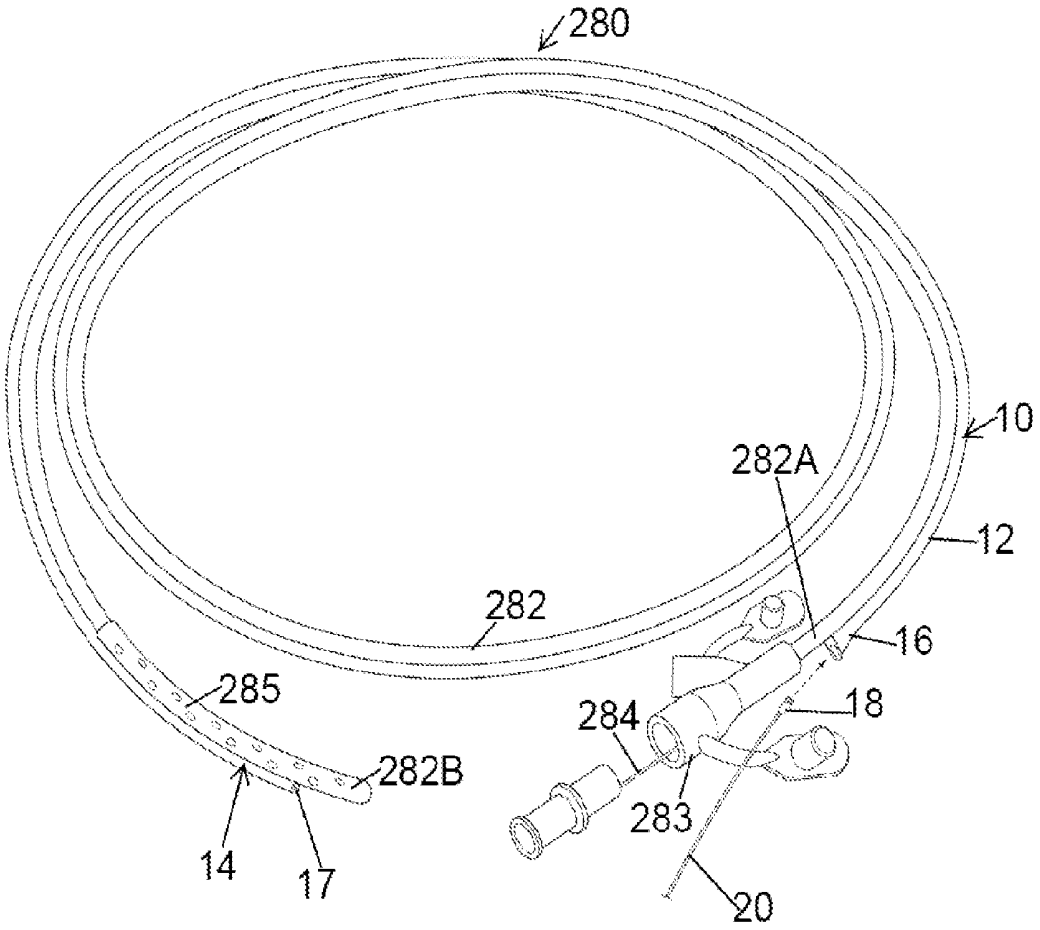


FIG. 21

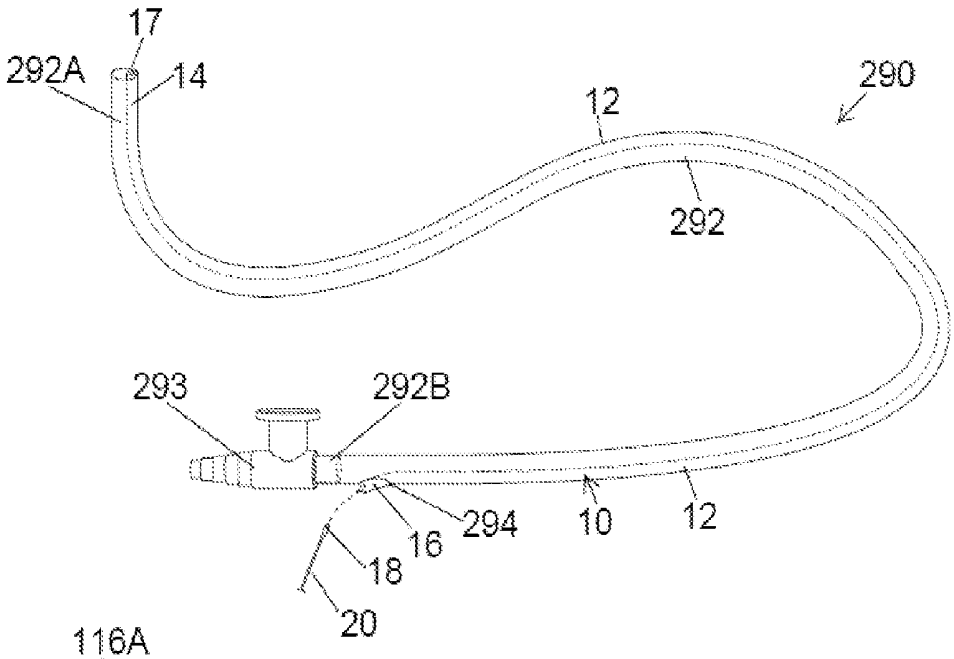


FIG. 22A

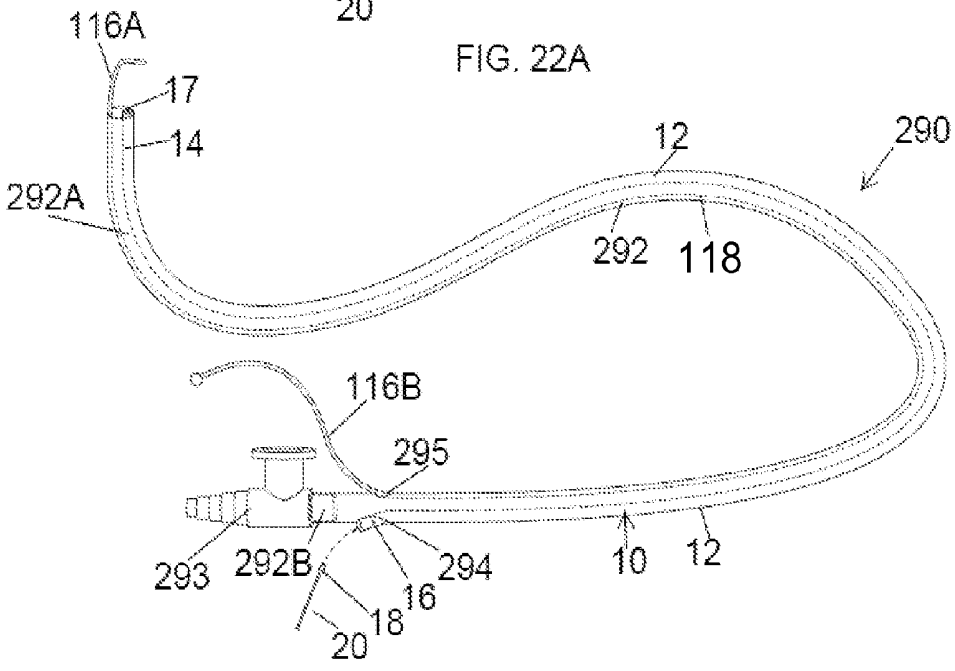


FIG. 22B

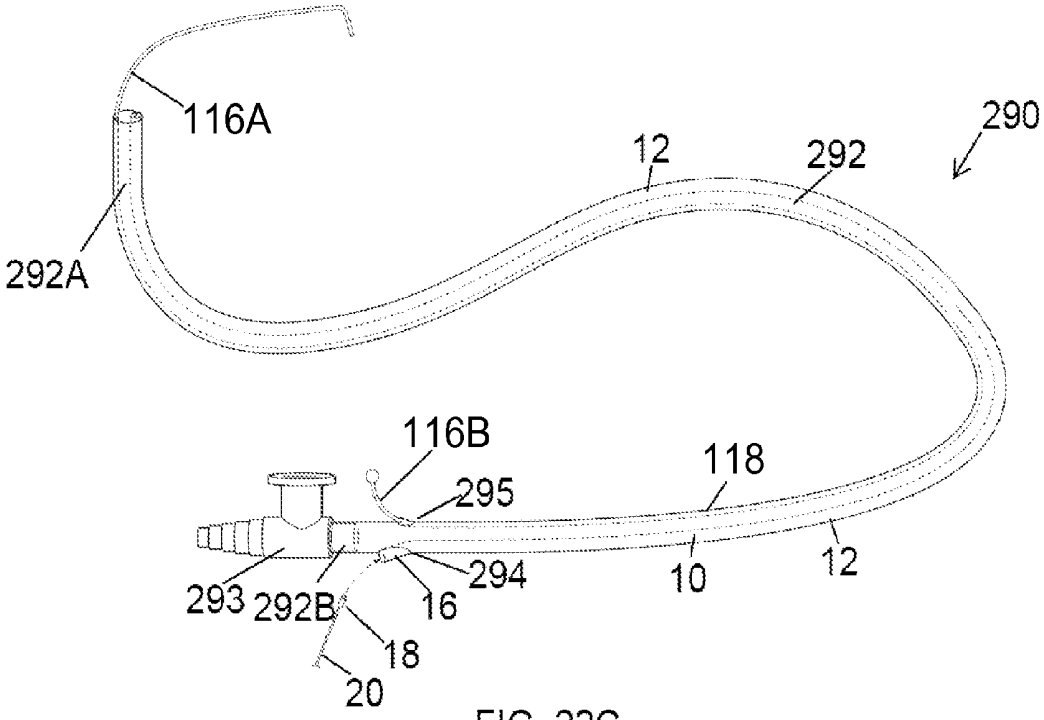


FIG. 22C

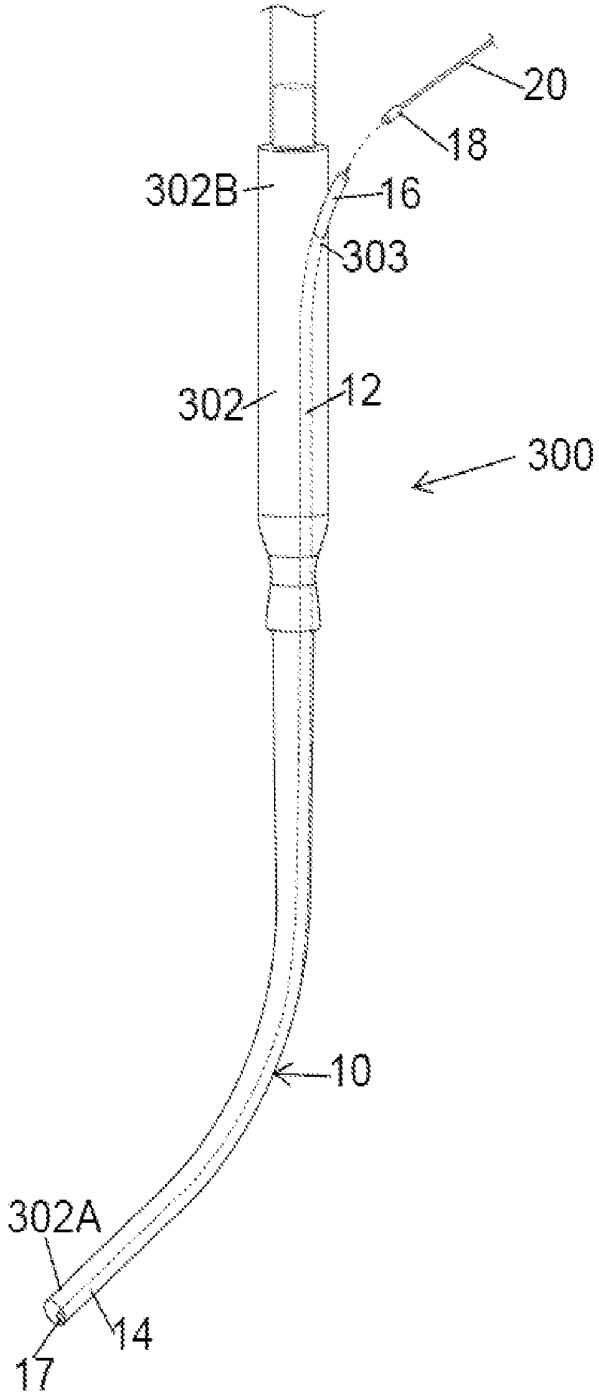


FIG. 23

FIG. 17

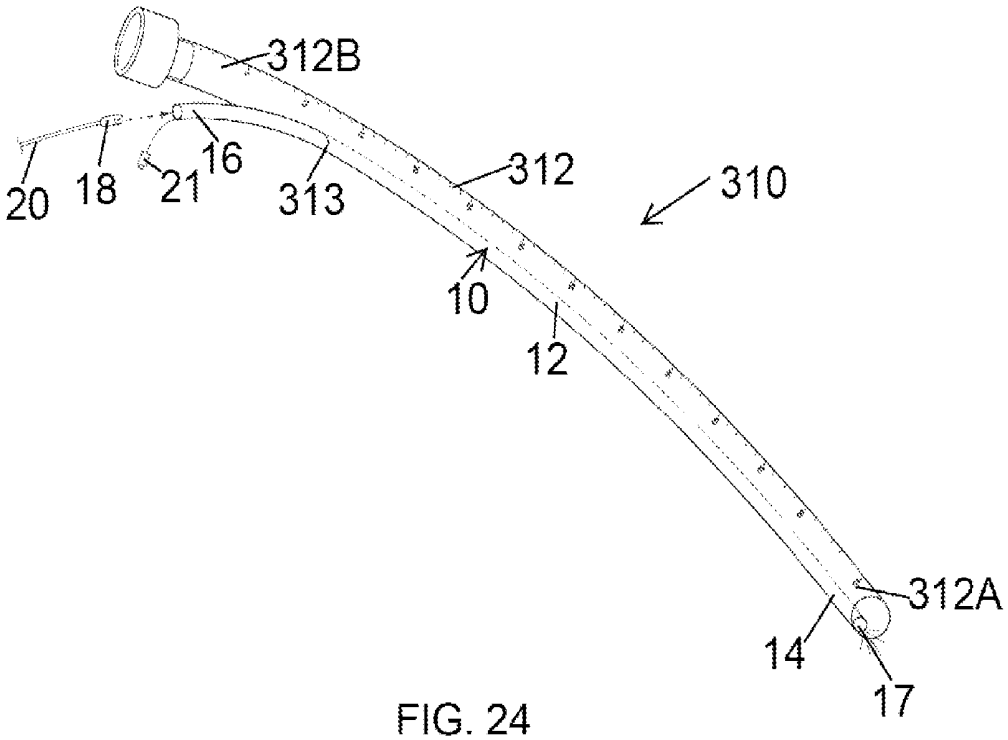


FIG. 24

# MEDICAL DEVICES AND METHODS OF PLACEMENT

## FIELD OF THE INVENTION

**[0001]** The invention provides various medical devices, each with a camera placed in a camera tube, which allows for one camera to provide continuous visualization for each device during and after placement in a patient. A sound device, such as a microphone, is incorporated in many devices and provides continuous monitoring of breath and heart sounds in a patient. The camera and microphone do not contact the patient's tissues and thus, do not require sterilization. The continuous visualization and sound monitoring of the patient are in real time and enable remote monitoring as well. Methods for rapid and accurate placement of a medical device in a patient are provided as well.

## BACKGROUND

**[0002]** Various devices are available to stabilize a patient and facilitate his breathing, feeding and medication delivery. Such devices are used in patients during surgical procedures, after certain traumas including spinal cord injuries, and in patients suffering from certain medical conditions including advanced Alzheimer disease. These devices include endotracheal tubes, airway devices, feeding tubes, oral airways, nasal cannulas and the like.

**[0003]** Because human anatomy varies significantly from a patient to a patient, properly placing a medical device in a patient's trachea requires a significant skill and is a task laced with inherent risk. The task becomes even more complicated because the insertion procedure may have to be performed immediately at an accident site, on pediatric patients, in a nursing home, on a battlefield or at a natural disaster site where many patients have to be attended at the same time.

**[0004]** The process of placing a breathing tube in a patient is called intubation. Devices such as laryngoscopes, videolaryngoscopes, fiberoptic scopes, as well as other proprietary videoscopes have been developed. These devices provide accuracy for initial placement, but do not provide continuous visualization or mobility of the image after a medical device has been placed in a patient. Newer devices, such as Vivasight SL or DL endotracheal tubes, provide continuous visualization, but are costly because they depend on a single use of disposable cameras and they are not transferrable from one medical device to another. The Totaltrack VLM supraglottic airway has a proprietary reusable camera for only its one device, and it cannot be transferred to other medical devices.

**[0005]** Thus, there remains the need for improved devices which can be easily monitored remotely by a qualified personal during placement and after placement for an adverse reaction. After a medical device has been placed in a patient, the need remains to monitor in real time the patient's possible adverse reactions such as for example, aspiration, airway secretion, apnea, etc.

## SUMMARY OF THE INVENTION

**[0006]** At least some of these needs are addressed by present medical devices which are equipped with a portable universal visualization device in which a camera is contained within a separate camera tube and which transmits information that can be accessed and monitored remotely and simultaneously from several patients in real time.

**[0007]** One embodiment provides a medical visualization device which comprises a camera tube with a distal end and a proximal end. The distal end is sealed with a transparent material and a proximal end has an opening. A camera with a wire is placed inside of the camera tube. The camera can be placed inside of the camera tube and it can be retracted from the camera tube on demand. The camera can be reused in various devices without sterilization. The camera can transmit images to a remote location wirelessly. In some embodiments, the camera tube comprises a fiber optic material. The visualization device can be equipped with at least one of the following: a light source, a stylet, a bougie and a sound- and temperature-monitoring device which can transmit the information to a remote location wirelessly. The visualization device can transmit images, sounds and other data to any number of remotely located monitoring devices and/or data storage devices. Such devices include, but are not limited to, a wireless portable device, smart phone, tablet, watch, cell phone, hand-held wireless device, computer, remote data server, radio, television, walkie-talkie and the like.

**[0008]** A further embodiment provides a method of continuous monitoring of a patient's at least one internal organ, the method comprising placing in the patient the visualization device with the camera in the sealed camera tube, causing the camera to transmit images of the internal organ in real time through the transparent material at the distal end of the camera tube, and analyzing the transmitted images. In some embodiments, the images are transmitted wirelessly to at least one remote location.

**[0009]** Various internal organs can be monitored by this method, including nasopharynx, pharynx, hypopharynx, supraglottic structures, airway, trachea, vocal cords, stomach, and vagina.

**[0010]** In some embodiments, the length of the camera tube in the visualization device is adjustable and it can be adjusted to the length of at least one of the following devices: an endotracheal tube, a supraglottic airway, airway device, oral airway, dilator, tracheostomy device, intubating oral airway, esophageal stethoscope, nasal cannula, feeding tube, suction tube and endotracheal changing tube.

**[0011]** Further embodiments provide a method for placing a medical device in a patient in which the medical device is equipped with the visualization device and a bougie. The medical device is inserted in the patient and the placement of the device is guided with the bougie under continuous visualization.

**[0012]** A kit for monitoring a patient's internal organ in real time is also provided. The kit comprises a camera tube with the adjustable length and with at least one ring attached externally to the camera tube, wherein the camera tube has a distal end and a proximal end and wherein the distal end of the camera tube is sealed with a transparent material; and a reusable camera which can be placed and removed from the camera tube and which can transmit images wirelessly to at least one remote location. This real time information obtained with the visualization device can be transferred or stored to multiple distant monitoring sites.

**[0013]** Also provided is a medical device comprising a visualization device sealed to, attached to or otherwise combined with at least one of the following second devices: an endotracheal tube, a supraglottic airway device, a ventilator adaptive cap, a dilator, a tracheostomy device, a nasal trumpet, a an oral airway, an esophageal stethoscope, a laryngoscope, a speculum, a nasal cannula, a feeding tube, a suction

tube, a suction catheter, and an endotracheal changing tube; and wherein the visualization device comprises a camera tube with a distal end and proximal end, the distal end being sealed with a transparent material and a camera being placed inside of the camera tube through an opening at the proximal end. These medical devices can be further equipped with at least one of the following a bougie, a flexible stylet and a sound- and temperature-monitoring device. In some embodiments, the visualization device is sealed, attached or otherwise connected externally to the second device. In other embodiments, the visualization device can be placed inside of the second device. Various endotracheal tubes equipped with the visualization device are contemplated as well, including an endotracheal tube which comprises a sleeve through which the visualization device can be inserted, an endotracheal tube into which the visualization device is placed internally through a ventilator adaptive cap and an endotracheal tube to which the visualization device is attached externally.

## BRIEF DESCRIPTION OF THE DRAWINGS

**[0014]** FIGS. **1**A, **1**B and **1**C depict a side view of an embodiment for a visualization device as shown in FIG. **1**A which can be further equipped with a stylet as shown in FIGS. **1**B and **1**C.

**[0015]** FIG. **2** depicts a side view of an embodiment for an endotracheal device equipped with a visualization device.

**[0016]** FIG. **3** depicts a side view of an alternative embodiment for an endotracheal device equipped with a visualization device.

**[0017]** FIGS. **4**A and **4**B depict two embodiments showing a visualization device attached to a built-in ventilator adaptive cap. FIG. **4**A is an embodiment without a light source and FIG. **4**B is an embodiment with a light source.

**[0018]** FIGS. **5**A, **5**B and **5**C depict side views of further embodiments of a visualization device attached to a built-in ventilator adaptive cap and delivered through a sliding sleeve (FIGS. **5**A and **5**B), with further embodiment in FIG. **5**C which includes a bougie or a flexible stylet as shown in the insert.

**[0019]** FIGS. **6**A and **6**B depict side views of an embodiment for an endotracheal device equipped with a visualization device delivered through a sliding sleeve.

**[0020]** FIGS. **7**A and **7**B depict side views of an alternative embodiment for an endotracheal device equipped with a visualization device and delivered through a sliding sleeve.

**[0021]** FIG. **8** is a side view of an embodiment for an endotracheal device equipped with a bougie.

**[0022]** FIGS. **9**A, **9**B and **9**C are a side view of a visualization device equipped with rings. FIG. **9**A is a side view of a visualization device equipped with two rings. FIG. **9**B is a side view of the visualization device as shown in FIG. **9**A, but equipped further with a bougie. FIG. **9**C is a side view of the visualization device as shown in FIG. **9**A, but equipped further with a light source. FIG. **9**D is a cross-sectional view through the visualization device of FIG. **9**A showing a ring connected to the camera tube. FIG. **9**E is a cross-sectional view through the visualization device of FIG. **9**A showing an adjustable sliding ring with a clasp connected to the camera tube. FIG. **9**F is a side view of an endotracheal tube to which the visualization device of FIG. **9**A is connected with two sliding rings.

**[0023]** FIG. **10** is a side view of a supraglottic airway device equipped with a visualization device. An endotracheal device of FIG. **3** is shown as an insert on the left and a flexible guided stylet is shown as an insert on the right.

**[0024]** FIGS. **11**A and **11**B depict a side view of an alternative airway device with a visualization device. FIG. **11**A is a side view of the airway device and FIG. **11**B is the device as shown in FIG. **11**A, but with a ventilator adaptive cap.

**[0025]** FIGS. **12**A, **12**B and **12**C depict an oral airway intubating device with a visualization device. FIG. **12**A is a side view of the oral airway device, while FIGS. **12**B and **12**C are cross-sections through the airway device in its full cylinder form (FIG. **12**B) and in its half-cylinder form in which one half-cylinder is retracted into the other half-cylinder (FIG. **12**C).

**[0026]** FIG. **13** depicts a side view of a dilator with a visualization device.

**[0027]** FIGS. **14**A and **14**B depict a side view of a tracheostomy device with a visualization device. FIG. **14**A depicts an embodiment in which the visualization device is attached externally to a tracheostomy tube, while FIG. **14**B depicts an embodiment in which the visualization device is attached inside of the tracheostomy tube.

**[0028]** FIG. **15** depicts a side view of a nasal trumpet with a visualization device.

**[0029]** FIGS. **16**A-**16**C depict a side view of an oral airway equipped with a visualization device and FIG. **16**D depicts an intubating oral airway also equipped with a visualization device. FIG. **16**A shows a visualization device being positioned inside of the oral airway. FIG. **16**B is the same as FIG. **16**A, but includes a light source for the visualization device. FIG. **16**C is the same as FIG. **16**A, but includes a whistle. FIG. **16**D is an intubating oral airway with a main lumen into which an endotracheal tube can be placed.

**[0030]** FIGS. **17**A and **17**B depict a side view for an esophageal stethoscope equipped with a visualization device and working tube and bougie tube.

**[0031]** FIGS. **18**A-**18**B depict a side view for a one-piece laryngoscope with a visualization device. FIG. **18**A shows a laryngoscope with a visualization device, and FIG. **18**B is the same, except it is further equipped with a bougie and the visualization device is equipped with a light source.

**[0032]** FIG. **19** depicts a side view of a speculum with a visualization device.

**[0033]** FIG. **20**A-F depict a nasal cannula with a visualization device. FIG. **20**A depict positioning of the cannula on a patient's head and FIG. **20**B is the same as in FIG. **20**A, except the visualization device is equipped with a light source. FIG. **20**C is a side view of the cannula of FIG. **20**A, and FIG. **20**D is a side view of the cannula of FIG. **20**B. FIG. **20**E is a cross-sectional view of a patient's head with the cannula of FIG. **20**A inserted. FIG. **20**F is a further embodiment in which a nasal cannula with a visualization device as shown in FIG. **20**A is further combined with an external stethoscope.

**[0034]** FIG. **21** is a feeding tube equipped with a visualization device.

**[0035]** FIG. **22**A, **22**B, **22**C depict various embodiments of a suction tube equipped with a visualization device. FIG. **22**A depicts a visualization device positioned inside of the suction tube. FIG. **22**B the same as in **22**A, but equipped further with a bougie, and FIG. **22**C is the same as FIG. **22**B, but showing the bougie protruding from the distal end of the suction tube.

**[0036]** FIG. **23** depicts a suction catheter equipped with a visualization device.

**[0037]** FIG. **24** depicts an endotracheal changing tube equipped with a visualization device.

## DETAILED DESCRIPTION

**[0038]** The present invention provides improved medical devices equipped with a visualization device for intubation, ventilation, feeding and monitoring of a patient. The present invention also provides methods for rapid and accurate placement of a medical device in a patient and remote continuous real-time monitoring of the patient after the placement.

**[0039]** These medical devices are equipped with a visualization device in which a camera is placed in a separate sealed camera tube. As the camera does not come in contact with a patient, there is no need to sterilize the camera and the same camera can be reused in many applications. Thus, the same camera can be switched between different medical devices which monitor internal organs such as medical devices that are placed in patient's airway, larynx, gastrointestinal tract, chest or vaginal cavity.

**[0040]** One embodiment provides a visualization device as shown in FIG. **1**A and its further embodiments as shown in FIGS. **1**B and **1**C. A visualization device, generally **10**, in FIG. **1**A comprises a camera tube **12** with a distal end **14** and a proximal end **16**. The camera tube **12** can be a plastic tubing. In some embodiments, the camera tube **12** may comprise a fiber-optic material. The camera tube **12** is sealed at the distal end **14** with a transparent material **17**. The diameter of camera tube **12** is designed in such a way that a camera **18** with wire **20** can be inserted inside of the camera tube **12** through an opening at the proximal end **16** and moved down the camera tube **12** toward the distal end **14**, so that the camera **18** transmits continuously images obtained through the transparent material **17**. The length of the camera tube **12** can vary and it can be adjusted dependent on the length of a medical device with which the visualization device is to be used. For example, the length of the camera tube **12** may be longer when the visualization device **10** is used with a feeding tube in comparison to the length of the camera tube **12** when the visualization device **10** is used with an endotracheal tube. In some embodiments, the visualization device obtains images and transmits wirelessly, broadcasts or records this information to at least one device positioned at a remote location.

**[0041]** Because the camera tube **12** is sealed at the distal end **14** with the transparent material **17**, the camera **18** does not come in contact with patient's tissues or fluids and therefore, the camera **18** does not have to be sterilized or to be disposable, and it can be reused in further applications. However, the camera **18** can be disposable in some applications. The camera **18** can be loaded with a chip and equipped to obtain and transmit digital images in real time. The camera **18** is further connected by an electric wire **20** to an image receiving and processing device (not shown) such as a computer equipped with a monitor or a computer network. The camera **18** may also be in communication wirelessly with an image-receiving device located at any location, including multiple locations and remote locations. Because the length and diameter of the camera tube **12** can be adjusted based on patient's needs, the visualization device **10** is suitable for a broad variety of patients, including pediatric patients and adult patients with abnormal anatomy or trauma.

**[0042]** As the visualization device **10** is bendable and flexible, the visualization device **10** is easy to insert in a patient and remove from the patient. The camera **18** may have its own light source. As the visualization device **10** transmits images from a patient in real time, it can be used for guiding a medical device for proper placement. Thus, some embodiments are concerned with methods for rapid and accurate placement of a medical device inside of a patient, including a method for guided and rapid placement into patient's airway, larynx, gastrointestinal tract, chest or vaginal cavity under continuous visualization.

**[0043]** As shown in embodiment of FIG. **1**B, the visualization device **10** can be further equipped with a stylet **22** which can be sealed onto or otherwise attached to the camera tube **12** externally on at least one side of the camera tube **12** along the proximal-to-distal (**16**-**14**) axis of the camera tube **12**. The stylet **22** can be made of metal wire or some other sturdy material with the purpose to keep the otherwise flexible visualization device **10** in a particular shape. In some embodiments, the stylet **22** can be of the same length as the camera tube **12**. In other embodiments, the stylet **22** is shorter than the camera tube **12** such that at a least a portion of the camera tube **12** on either the proximal end **16** or distal end **14**, or on the both ends **16** and **14** is not in contact with the stylet **22**. As shown in FIG. **1**C, the stylet **22** can be bent into various shapes and it retains the shape into which it has been bent, which permits for visualization device **10**, which is otherwise flexible, to retain a particular shape.

**[0044]** In alternative embodiments, the visualization device **10** can be equipped with a bougie which can be attached to the camera tube **12** externally on at least one side of the camera lumen **12** along the proximal-distal (**16**-**14**) axis of the visualization device **10**.

**[0045]** The bougie can be made of various materials, including plastic material which is bendable. As the bougie is bendable, but keeps a shape into which it is bent, the bougie is suitable for guiding the visualization device **10** inside of a patient. In some embodiments, the bougie can be of the same length as the camera tube **12**. In other embodiments, the bougie can be made shorter or longer than the camera tube **12** such that only a portion of the camera tube **12** is in contact with the bougie. In some embodiments, the bougie protrudes on at least the distal end **14**.

**[0046]** The visualization device **10** can be further equipped with a portable light source (not shown) which can be either built-in the camera **18** or it can be built-in the camera tube **12**. In alternative, a light source can remain outside the camera tube **12** on the proximal end **16**, but still be placed such that the light source sheds light inside of the camera tube **12**.

**[0047]** In embodiments of FIGS. **1**A-**1**C, the camera tube **12** can be disposable, while the camera **18** is reusable without the need of sterilization. However, the camera **18** can be also disposable in at least some embodiments.

**[0048]** During placement in a patient, a visualization device **10** either alone or in combination with another medical device is positioned such that it is inserted with its distal end **14** in the patient under continuous visualization with the camera **18**.

**[0049]** Any of the visualization devices **10** described above can be attached, sealed or otherwise connected to a disposable or non-disposable medical device either externally or internally and as described in more detail below. Various medical devices for pediatric and adult patients can be built such that the camera device tube **12** is sealed or attached to the medical device during manufacturing.

**[0050]** In other embodiments, the visualization device **10** can be sold as a kit which can be attached by a medical practitioner to a pre-made medical device for pediatric and adult patients, based on a particular patient's individual

needs. The length of the camera tube **12** can vary such that the camera tube **12** is of the same or similar length with a medical device to which the visualization device **10** is sealed, attached or otherwise connected to.

**[0051]** Having the ability to verify placement for a medical device in real time from near and far allows several experts to assist and verify placement. This is accomplished by equipping the medical device with the visualization device **10**. In some embodiments, a method is provided in which the visualization device **10** is used for placing a medical device in a patient in ambulances, on battlefields, in nursing homes or hospitals. The visualization device **10** provides the ability to monitor in real time a patient. Because the visualization device **10** may interact with a plethora of devices disposable and otherwise, the use of the device **10** on various medical devices provides for a method in which a medical practitioner can customize a proper device for each patient or situation. Having the same camera equipment that can interact with various medical devices provides economy of scale such that even the smallest of organizations can have all the proper vigilance and technology.

**[0052]** At least in some embodiments the visualization device **10** can be used in assembly with at least one medical device as described in more detail below. A method in which the visualization device **10** is used on an airway device allows continuous visualization of any of the following in a patient in real time: nasopharynx, pharynx/hypo pharynx, supraglottic structures, airway, internal organ anatomy, vocal cords during normal and abnormal ventilation. This method also allows detection of abnormal anatomy and abnormal vocal cord movements.

**[0053]** Referring to FIG. **2**, this embodiment provides an endotracheal device, generally **30**. The endotracheal device **30** comprises an endotracheal tube **32** with a distal end **32**A and a proximal end **32**B. The visualization device **10** is sealed or otherwise attached externally on at least one side of the endotracheal tube **32**, along the proximal-distal (**32**B-**32**A) axis of the endotracheal tube **32**. The visualization device **10** comprises essentially of all elements as shown in FIG. **1**A, with the camera **18** inserted inside of the camera tube **12** through an opening at the proximal end **16** of the camera tube **12**, all the way down to the distal end **14** and the opening of the distal end **14** being sealed with the transparent material **17**. Because the camera **18** is positioned inside of the sealed camera tube **12**, the camera **18** does not come into contact with a patient and the camera **18** does not need to be sterilized and can be reused in multiple applications. Thus, the camera **12** does not have to be disposable or to be sterilized before further applications. However, the camera **18** can be disposable in at least some applications.

**[0054]** As the camera **18** is contained inside of the separate camera tube **12** which is positioned externally on the endotracheal tube **32**, a diameter of the camera tube **12** is not limited by a diameter of the endotracheal tube **32**. Thus, the diameter of the camera tube **12** can be larger or smaller than the diameter of the endotracheal tube **32**.

**[0055]** Thus, the visualization device **10** can be used on endotracheal devices for pediatric patients and patients with abnormal anatomy. In some embodiments, the visualization device **10** has a diameter larger than that of the endotracheal tube **32**.

**[0056]** The camera **18** is connected by electric wire **20** to an external device such as a computer and monitor (not shown). At least in some embodiments, the visualization device **10** is further equipped with a light source **21**. The light source **21** can be kept outside of the camera tube **12**, but in proximity with the proximal end **16** of the visualization tube **12** so that the light source **21** sheds light inside of the camera tube **12**. In alternative embodiments, the light source **21** can be built-in the camera tube **12** or in further embodiments, the light source **21** can be built-in the camera **18**.

**[0057]** At least in some applications, the camera **18** is a digital camera equipped with a chip and it collects and transmits images continuously. The camera **18** can be connected wirelessly or hard-wired with a computer network (not shown) which collects and analyzes images obtained by the camera **18**. This arrangement permits for remote, continuous and real time monitoring of the endotracheal device **30** during placement and after-placement in a patient. Thus, an accurate and rapid placement of the endotracheal device **30** can be achieved. Further and because the visualization device **10** continues to acquire images after the endotracheal device **30** is placed inside of a patient, the patient can be monitored in real time for adverse reactions such as bleeding, airway obstruction, shifting or malfunctioning, etc. of the endotracheal device **30** and other reactions. The endotracheal device **30** may continue to transmit images and information for as long as it remains in a patient.

**[0058]** In some embodiments, the endotracheal tube **32** is further fitted with a cuff **34** at its distal end **32**A. In other embodiments, the endotracheal tube **32** is not fitted with the cuff **34**. The cuff **34** can be inflated with a device **36** after the endotracheal device **30** is placed in a patient and its proper positioning inside of the patient is verified by images obtained with the visualization device **10**.

**[0059]** The endotracheal device **30** can be further equipped with a sound-monitoring device **38** which is sealed onto or otherwise attached externally on one side of the endotracheal tube **32** along the proximal-distal axis (**32**B-**32**A) of the endotracheal tube **32**. The sound-monitoring device **38** can be a microphone placed inside of a plastic tube **40**. It monitors heart beats and breathing tones and can be connected by wire or wirelessly to a remote device which collects and monitors patient's vital signals. In the embodiment of FIG. **2**, the visualization device **10** is placed proximally to the cuff **34** and externally to the endotracheal tube **32**. It will be understood that the endotracheal device **30** can be built with any endotracheal tube **32**, including single-lumen and double-lumen tubes. The endotracheal device **30** can be used for either pediatric or adult patients. The endotracheal device **30** can be made in various sizes.

**[0060]** In another embodiment and as shown in FIG. **3**, an endotracheal device, generally **50**, comprises an endotracheal tube **52** with a distal end **52**A and a proximal end **52**B, and a visualization device **10** placed inside of the endotracheal tube **52** through an opening in the proximal end **52**B. In this embodiment, the visualization device **10** is attached to a built-in ventilator adaptable cap **68** which connects the endotracheal device **50** to a ventilator (not shown) through an outlet **70**. The built-in ventilator adaptable cap **68** comprises an opening **72** through the cap **68**. The visualization device **10** is passed through the opening **72** and is placed inside of the endotracheal tube **52**. The built-in ventilator adaptable cap **68** is then connected with the endotracheal tube **52** at the proximal end **52**B of the endotracheal tube **52**.

**[0061]** The visualization device **10** is the same as the visualization device **10** of FIG. **1**A and it comprises a camera tube **12** with a sealed distal end **14** and an open proximal end **16**. A

camera **18** is placed inside of the camera tube **12** through the proximal end **16** of the camera tube **12**. The camera **18** is connected by electrical wire **20** to an image-monitoring device (not shown). In some embodiments, the camera **18** is connected wireless to an image-monitoring device (not shown). The camera **18** collects images continuously and in real time through a transparent material **17** with which the distal end **14** of the camera tube **12** is sealed. The images can be transmitted to a remote location.

**[0062]** The endotracheal tube **52** can be optionally equipped with a cuff **64** at the distal end **52**A such that the cuff **64** wraps around the endotracheal tube **52** and the cuff **64** can be inflated with a device **65**, once the endotracheal device **50** is properly placed inside of a patient's airway. As can be seen from FIG. **3**, the distal end **14** of the visualization device **10** extends distally from the distal end **52**A of the endotracheal tube **52** and below the cuff **64** such that even when the cuff **64** is inflated with a device **65** after placement in a patient, the visualization device **10** can still record images inside of a patient's body and below the cuff **64**. Further, the endotracheal device **50** may have an elliptical opening **67** at the distal end **52**A and the visualization device **10** can be positioned inside of the endotracheal tube **52** such that the distal end **14** of the visualization device **10** aligns with or is in close proximity with the elliptical opening **67** of the endotracheal tube **52**.

**[0063]** Referring to FIGS. **4**A and **4**B, further embodiments provide a visualization device **10** assembled with a built-in ventilator adaptable cap **68** which connects to a ventilator (not shown) by an outlet **70**. The visualization device **10** is inserted through an opening **72** in the built-in ventilator adaptable cap **68** as shown in FIGS. **4**A and **4**B. As shown in FIG. **4**B, the visualization device **10** can be further equipped with a light source **74** which can be a part of the camera tube **12** or it can be built in the camera **18**, or it can remain outside the built-in ventilator adaptable cap **68**. The visualization device **10** is assembled with the built-in ventilator adaptable cap **68** as shown in FIGS. **4**A and **4**B and can be then used in an endotracheal tube as described in connection with FIG. **3** or in a supraglottic device or with a laryngeal mask or with any other medical device to which a built-in ventilator adaptable cap **68** can be attached. As shown in FIGS. **4**A and **4**B, the camera tube **12** has a distal end **14** and a proximal end **16**. The camera **18** is placed inside of the tube **12** through an opening in the proximal end **16** and moved all the way down to the distal end **14** which is sealed with a transparent material **17**. The camera **18** collects images through the transparent material **17** and transmits the images in real time to a monitoring device which can be located remotely.

**[0064]** Further embodiments for a built-in ventilator adaptable cap **68** equipped with a visualization device **10** are shown in FIGS. **5**A, **5**B and **5**C. As can be appreciated from FIG. **5**A, the visualization device **10** comprises the camera **18** inside of the camera tube **12**. The visualization device **10** is inserted through the ventilator adaptable cap **68**. As shown in the embodiment of FIG. **5**A, a plastic clear sleeve **76** can be attached over the adaptable cap **68** such that the sleeve **76** can slide up and down as shown in FIGS. **5**A and **5**B in the proximal-distal direction, which allows the visualization device **10** to remain sterile during insertion and removal. As the visualization device **10** is inserted and removed through the sleeve **76**, the visualization device **10** remains sterile and free of contamination. The sleeve **76** is long enough to maintain the whole visualization device **10** outside the ventilation cap and remain sterile. A further embodiment is shown in FIG. **5**C in which the visualization device **10** is inserted through the sleeve **76** as shown in FIGS. **5**A and **5**B, except a bougie **78** is added through a bougie tube **80**.

**[0065]** The bougie **78** can be replaced with a flexible guided stylet **82** as shown in the insert to FIG. **5**C which rotates and guides a stylet inside of a patient, which is protected from patient's tissues. If the tube **80** is used with a stylet, then the tube **80** has to be sealed at the distal end. Additional tubes can be attached and placed through the sleeve **76**. Such tubes include, but are not limited to a suctions tube and a tool tube which can be used for delivering biopsy forceps and other tools. The assembly of the built-in ventilator adaptable cap **68** and visualization device **10** with the sleeve **76** can be used with any medical device to which a built-in ventilator adaptable cap can be attached, including an endotracheal tube as described in connection with FIG. **3**, a supraglottic device or with a laryngeal mask airway. If an embodiment with a bougie or stylet is used as described in connection with FIG. **5**C, the bougie **78** can protrude distally or slide independently from a medical device and guide the medical device movement inside of a patient during placement under visualization with the visualization device **10**.

**[0066]** Further embodiments for an endotracheal device equipped with a visualization device, generally **84**, are shown in FIGS. **6**A and **6**B. As can be appreciated from FIG. **6**A, the visualization device **10** which comprises the camera **18** inside of the camera tube **12** can be inserted inside of an endotracheal tube **86** through an opening **87** on one side of the endotracheal tube **86**. As shown in the embodiment of FIG. **6**A, a plastic sleeve **92** can be attached over the opening **87** such that the sleeve **92** can slide up and down as shown in FIGS. **6**A and **6**B, which facilitates keeping the visualization device **10** sterile while it is moved in or out of the endotracheal tube **86**. As the visualization device **10** is inserted and removed from the endotracheal tube **86** through the sleeve **92**, the visualization device **10** remains sterile and free of contamination. The visualization device **10** can be removed entirely from the endotracheal tube **86** through the sleeve **92** and remain sterile. The endotracheal tube **86** may be equipped with a cuff **88** positioned near the distal end **86**A. The visualization device **10** can move inside the endotracheal tube **86** along the proximal-distal (**86**B-**86**A) axis such that the visualization device **10** is distal to the cuff **88** or the visualization device **10** can protrude outside the endotracheal tube **86** distally as shown in FIG. **6**B. This permits for obtaining images from a patient with the visualization device **10** after the cuff **88** is inflated with a device **90** and obtaining the images from the area in a patient's body which is distal to the cuff **88**. This distal to the cuff **88** area is available for monitoring after the cuff **88** is inflated because of the visualization device **10** in which the camera **18** collects images through the transparent material **17** at the distal end **14**.

**[0067]** In this embodiment, the visualization device can slide up and down inside of an endotracheal tube, which permits advancement and retraction of the camera tube **12** while maintaining sterility of an endotracheal tube into which the visualization device **10** can be inserted as described above. The camera **18** can be easily advanced inside of the camera tube **12** and provide inspection of the endotracheal tube through its length as well as distal to the tip of the endotracheal tube.

**[0068]** Further embodiments for an endotracheal device, generally **100**, equipped with a visualization device **10** are

shown in FIGS. **7**A and **7**B. Additional tubes can be attached to the tube **10** or be placed adjacent to the tube **10**. Such tubes include, but are not limited to a suction tube, a tube for delivering instruments such as forcepts, a bougie or flexible stylet. As can be appreciated from FIG. **7**A, the visualization device **10** comprises the camera **18** inside of the camera tube **12** positioned externally on the endotracheal tube **102** and along the proximal-distal (**102**B-**102**A) axis. As shown in the embodiment of FIG. **7**A, a plastic sleeve **108** can be attached to the endotracheal tube **102** such that the sleeve **108** can slide up and down outside the endotracheal tube **102** as shown in FIGS. **7**A and **7**B, which facilitates the movement of the visualization device **10** along the proximal-distal (**102**B-**102**A) axis of the endotracheal tube **102**. As the visualization device **10** is inserted and removed through the sleeve **108**, the visualization device **10** remains sterile and free of contamination. The endotracheal tube **102** may be equipped with a cuff **104** wrapped around the endotracheal tube **102** near its distal end **102**A. The visualization device **10** moves outside the endotracheal tube **102** along the proximal-distal axis **102**B-**102**A such that the visualization device **10** can be proximal to the cuff **104**. This also permits for obtaining images from a patient with the visualization device **10** after the cuff **88** is inflated with a device **106** The camera tube **12** can slide proximal or distal of the cuff **104**. Thus, at least in some embodiments, the camera tube **12** would be into a sealed tunnel.

**[0069]** FIG. **8** depicts a further embodiment of an endotracheal device, generally **110**. The device **110** can be equipped with the visualization device **10** and the sound tube **40** described in connection with FIG. **2** (not shown). The endotracheal device is further equipped with a bougie **116** which can slide up and down along the proximal-distal (**116**B-**116**A) axis inside of a tube **118** which is attached externally to the endotracheal tube **111**. The endotracheal tube **111** is equipped with a cuff **112** located in proximity to a distal end **110**A of the tube. The cuff **112** can be inflated with a device **114** after the endotracheal device **110** is placed inside of a patient. The visualization device **10** can be sealed or attached to the endotracheal tube **111** either outside or inside as described above in connection with embodiments provided by FIGS. **2**, **3**, **4**A, **4**B, **5**A, **5**B, **6**A, **6**B, **7**A and **7**B. The bougie **116** guides the movement of the endotracheal device **111** during placement in a patient under visualization with the visualization device **10** and permits guided sliding down the medical device over the bougie **116** inside of the patient's airway.

**[0070]** Further embodiments of a visualization device, generally **120**, are shown in FIGS. **9**A-**9**C. As shown in FIG. **9**A, the camera tube **12** can be equipped with at least one, and preferably two external rings **122** which are sealed or otherwise connected by means **124** to the camera tube **12**. In some embodiments, one ring **122** is positioned at about ⅓ of the camera tube length from the proximal end **16** and the other ring is positioned at about ⅔ of the camera tube length from the proximal end. While in the embodiment of FIG. **9**A, the camera tube **12** is equipped with two rings **122**, other embodiments include those in which more than 2 rings are used or only one ring is used. The positioning of the rings along the proximal-distal (**16**-**14**) axis of the camera tube **12** can also vary. Other modalities include a clasp or a plastic band to hold the camera tube **12**.

**[0071]** As in all other embodiments, the camera tube **12** has a distal end **14** sealed with a transparent material **17** and a proximal end **16** with an opening through which a camera **18** is inserted into the camera tube **12**. As shown in FIG. **9**B, the visualization device **120** can be further equipped with a tube **118** sealed or otherwise attached externally along the proximal-distal (**16**-**14**) axis of the camera tube **12**. A bougie **116** is placed inside of the tube **118** such that a distal end **116**A of the bougie **116** protrudes distally over the camera tube **12**, while its proximal end **116**B extends outside the visualization device **120** proximally and can be used by a medical provider to rotate the distal end **116**A and in this way guide the movement of the visualization device **120** along with a medical device to which it is attached.

**[0072]** As shown in FIG. **9**C, the visualization device **120** can be further equipped with a light source **21** which can be either built in the camera tube **12**, built in the camera **18** or it can be kept outside the visualization device **120** and outside the patient's body. The visualization device **120** is attached to a medical device with the rings **122**, and this permits for customized positioning of the visualization device **120** as it can slide up and down along a proximal-distal axis of a medical device.

**[0073]** As shown in a cross-sectional view in FIG. **9**D, the ring **122** can be of any diameter in order to fit on a medical device of choice. As shown further in FIG. **9**E, at least in some embodiments the ring **122** may have a clasp **126** such that the diameter of the ring **122** can be adjusted according to a diameter of a medical device to which the visualization device **120** is attached with the rings **122**.

**[0074]** An embodiment as shown in FIG. **9**F provides an assembly, generally **128**, in which the visualization device **120** is attached with the rings **122** to an endotracheal tube **52**. The rings **122** can slide up and down along the proximal-distal (**52**B-**52**A) axis of the endotracheal tube **52**, and in this way the position of the visualization device **120** can be adjusted with respect to the endotracheal tube **52**. Further, the rings **122** can rotate around the endotracheal tube **52**, which permits altering the positioning of the camera device **120** if images are needed from a different area inside of a patient.

**[0075]** Because the rings **122** can be adjustable, the visualization device **120** can be used with an endotracheal tube of any size, including those for pediatric patients. Further, the visualization device **120** with at least two rings connected externally to the camera tube **12** can be provided as a kit, and a medical practitioner can assemble the visualization device with any conventional endotracheal tube or any other conventional medical device for which visualization and monitoring are needed at the time of treatment.

**[0076]** Further embodiments provide an intubation method in which an endotracheal tube, including any of the endotracheal tubes described above and equipped with the visualization device as described above, is placed in patient's airway and positioned under the patient's vocal cords under constant visualization by the visualization device **10**.

**[0077]** Referring to FIG. **10**, it depicts a side view of a supraglottic airway device, generally **130**. Any standard endotracheal tube known in the art and an endotracheal device of FIG. **3** is shown in the insert on the left of FIG. **10** can be used in combination with the supraglottic airway device **130**.

**[0078]** The supraglottic airway device **130** comprises a supraglottic tubal body **131** with a distal end **131**A and a proximal end **131**B and a lumen **146**. The supraglottic airway device **130** includes a designated intubation tube **133** which is inserted into the lumen **146** and into which an endotracheal

device **50** can be placed as shown in FIG. **10**. The distal end **133**A of the intubation tube **133** ends with an elliptical opening **140** which is located distally from a cuff **132** which can be inflated with a device **134**. The intubation tube **133** has a plurality of holes **148** distributed throughout its body to allow ventilation from outlet **144** through tubal body **131**.

**[0079]** While a standard endotracheal device, including an endotracheal device **50**, may be equipped with a visualization device, the supraglottic airway device **130** comprises its own visualization device **10** which is placed in the lumen **146**. The visualization device **10** comprises a camera tube **12** with a distal end **14** and a proximal end **16**. The distal end **14** is sealed with a transparent material **17**. The camera tube **12** is sealed or otherwise attached externally to the intubation tube **133** along the proximal-distal (**131**B-**131**A) axis. The supraglottic device **130** can be further equipped with a bougie **116** which is located inside of the tube **118**. The tube **118** is placed inside of the lumen **146** and such that the distal end **116**A of the bougie **116** protrudes from the tube **118** and outside the suproglottic tubal body **131** through an elliptical opening **142** which is located on the supraglotic tubal body **131** slightly proximally from the distal end **131**A. The elliptic opening **142** of the supraglottic tubal body **131** overlaps partially with the elliptic opening **140** of the intubation tube **133**. The bougie tube has its own opening through **140**.

**[0080]** At the distal end **131**A, the tubal body **131** is capped with a balloon **136** which can be inflated with a device **138**. In some embodiments, the bougie **116** can be replaced with a flexible guided stylet **82** shown on the right of FIG. **10**.

**[0081]** In addition to the visualization device **10**, the supraglottic device **130** can be also equipped with a sound- and temperature-monitoring device **38** which is located inside a tube **40** which is sealed or otherwise attached externally to the tubal body **131** along the proximal-distal (**131**B-**131**A) axis. The sound device **38** can monitor patient's heart beat and breathing after the supraglottic device **130** is placed inside of the patient. On its proximal end **131**B, the tubal body **131** may be connected to a ventilator (not shown) though an outlet **144**. Because the supraglottic device **130** can ventilate in a closed circuit through the tubal body **131**, an endotracheal tube **50** can be placed inside of the intubation tube **133** without the need to stop ventilation and therefore, the supraglottic device **130** provides continuous ventilation, continuous visualization in real time through the visualization device **10** and continuous sound and temperature monitoring by the sound monitoring device **38** with a temperature probe. This real time information can be transferred or stored to multiple distant monitoring sites.

**[0082]** Other advantages for the supraglottic airway device include the ability to intubate, extubate and to easily reintubate if needed under continuous ventilation and the ability to continuously visualize vocal cords and supraglottic structures. The device **130** is suitable for applications in children and adults. Further, the device **130** is equipped with the cuff **132** for blocking the pharynx and the balloon **136** which blocks the esophagus after the device **130** is placed in a patient. Furthermore, an endotracheal tube can be placed just proximal to the vocal cords in the tubal body **133**. This permits ventilation through **144** and tubal body **131** uninterrupted.

**[0083]** Referring to FIGS. **11**A and **11**B, an alternative embodiment for an airway device, generally **150**, is provided. This device can be used in pediatric and adult patients as it is adoptable to different sizes. It provides continuous visualization of supraglottic structures and it can be advanced, retracted, or rotated, side to side to provide direct visualization of vocal cords. As can be appreciated from FIGS. **11**A and **11**B, the airway device **150** comprises a tubal body **152** with a distal end **152**A and a proximal end **152**B and a lumen **153**. The tubal body **152** may be connected to a ventilator through an outlet **154**. A visualization device **10** is sealed or otherwise attached inside of the tubal body **152** along the proximal-distal (**152**B-**152**A) axis on at least one side. The visualization device **10** comprises a camera tube **12** with a distal end **14** and a proximal end **16**. The camera tube **12** is sealed at the distal end **14** with a transparent material **17**. The proximal end **16** of the camera tube **12** remains open and a camera **18** is inserted in the camera tube **12** through the proximal end **16**. The camera **18** does not come in contact with a patient's body and it does not have to be sterilized, it does not have to be disposable, although it may be disposable in at least some applications. The visualization device **10** can be further equipped with a light source which can be built in the camera tube **12** or be a part of the camera **18**. In alternative, a light source may be left outside the camera tube **12**, but still shed enough light inside of the camera tube **12** for the camera **18** to obtain images inside of a patient's body.

**[0084]** An intubation tube **156** is placed inside of the lumen **153** of the tubal body **152** along the proximal-distal (**152**B-**152**A) axis. The intubation tube **156** shares a lumen **119** with a bougie **116** which is inserted inside the lumen **119** along the proximal-distal (**152**B-**152**A) axis such that a distal end **116**A of the bougie **116** may protrude outside the tubal body **152** at the distal end **152**A and proximal end **116**B may protrude outside the tubal body **152** and the proximal end **152**B can be used by a medical practitioner to guide the movement of the airway device **150** with the bougie **116** during placement in a patient, including advancing the bougie **116** through patient's vocal cords under direct visualization by camera **18**. The intubation tube **156** has a plurality of holes **157** distributed along the intubation tube **156**.

**[0085]** At least in some embodiments, the airway device **150** is further equipped with a sound- and temperature-monitoring device **38** which can be inserted in a tube **40** which is sealed or otherwise attached inside of the tubal bodyl **52** along the proximal-distal (**152**B-**152**A) axis such as the distal end of the sound-monitoring device **38** is positioned at or near the distal end **152**A of the tubal body **152**, which is also equipped with a cuff **158** along the perimeter of the tubal body **152** at the distal end **152**A. The intubation tube **156** is designed such that at least in some embodiments the intubation tube **156** has a ramp **160** at the distal end **152**A of the airway device **150**. A standard endotracheal tube, including those described in various embodiments above, can be placed inside of the lumen **119** in the intubation tube **156** for positioning in a patient.

**[0086]** As shown in FIG. **11**B, a ventilator adaptable cap **68** and a lid **69** are attached to the tubal body **152** at the proximal end **152**B. The endotracheal tube is inserted into the device **150** through the cap **68**. Using the cap **68** with the lid **69** on the airway device **150** is preferred when ventilation is accomplished through an outlet **154**.

**[0087]** Yet another embodiment for an oral airway device, generally **170**, is provided as shown in FIGS. **12** A, **12**B and **12**C. As can be appreciated from FIG. **12**A, the airway device **170** comprises a tubal body **172** with a distal end **172**A and a proximal end **172**B. The tubal body **172** ends with two ramps **174** and **176** at the distal end **172**B. As can be appreciated from a side view in FIG. **12**A and cross-sectional views of the

tubal body **172** in FIGS. **12**B and **12**C, the tubal body **172** is made of two half-cylinders **178** and **180**. The half-cylinder **178** is slightly smaller in diameter than the half-cylinder **180**. The tubal body **172** can be present in one of the two forms: as a full cylinder shown in FIG. **12**B or as a half-cylinder as shown in FIG. **12**C. The half-cylinder **178** and the half-cylinder **180** are connected by means such that the half-cylinder **178** can rotate and retract into the half-cylinder **180**. The half-cylinder form of FIG. **12**C is achieved by the half-cylinder **178** rotating at about 180 degrees and aligning with the half-cylinder **180** such that the half-cylinder **178** is located inside of the half-cylinder **180** as shown in FIG. **12**C.

**[0088]** A visualization device, generally **10**, is sealed or otherwise attached externally to the half-cylinder **180** along the proximal-distal (**172**B-**172**A) axis. The visualization device **10** comprises of a camera tube **12** with a distal end **14** and a proximal end **16**. The distal end **14** is sealed with a transparent material **17**. A camera **18** is placed through an opening at the proximal end **16** into the camera tube **12** and is moved inside the camera tube **12** to the distal end **14**. Similarly to all other embodiments, the camera **18** does not come in contact with a patient's body, and it does not have to be disposable, does not have to be sterilized and it can be reused in multiple devices. The camera **18** is connected with wire **20** to at least one monitoring device and it transmits images in real time. The camera **18** can be connected wirelessly to at least one monitoring device which can be positioned at some remote location. A light source can be added as described in connection with the visualization device in other applications.

**[0089]** The half-cylinder **180** ends in two ramps **174** and **176** at the distal end **172**A. The ramp **174** is smaller in size than the ramp **176** and the two ramps are superimposed over each other such as the smaller ramp **174** is proximal to a lumen **182** created by half-cylinders **178** and **180** when they are in the full-cylinder form as shown in FIG. **12**B, while the ramp **176** is distal to the lumen **182**. The ramps **174** and **176** are flexible and absorb the shock from sliding and releasing an endotracheal tube which can be delivered into a patient by the oral airway device **170**. The ramps also facilitate the removal of the oral airway device **170** after the endotracheal tube is placed inside of the patient.

**[0090]** As shown in FIG. **12**A, the oral airway intubating device **170** can be further equipped with a bougie **160** which can be inserted into a tube **118** along the proximal-distal (**172**B-**172**A) axis such that a distal end **116**A of the bougie **116** protrudes distally from the oral airway device **170** and a proximal end **116**B protrudes outside the oral airway device proximately and can be used to manipulate the distal end **116**A of the bougie **116** such that it guides the movement of the airway device **170** during placement in a patient. The bougie tube **118** is located on the smaller half-cylinder **178** and it shares the lumen **182** with the tubal body **172**.

**[0091]** A further embodiment provides a dilator with a visualization device, generally **190** in FIG. **13**. As can be appreciated from FIG. **13**, the dilator **190** comprises a tubal body **192** with a proximal end **192**B and a distal end **192**A. A certain distal portion of the tubal body **192** is tapered into a conical shape **192**C such that the opening at the distal end **192**A of the tubal body **192** is significantly smaller in diameter in comparison to an opening at the proximal end **192**B. A visualization device **10** is positioned inside of a lumen **195** of the tubal body **192** and along the proximal-distal (**192**B-**192**A) axis. The visualization device **10** may be sealed or otherwise attached inside of the tubal body **192**. The visualization device **10** is essentially the same device as shown in FIG. **1**A, and it comprises a camera tube **12** with a proximal end **16** and a distal end **14**. The distal end **14** of the camera tube **12** is in close proximity with the distal end **192**A of the tubal body **192**. A camera **18** which can be either disposable or reusable is placed inside of the camera tube **12** through an opening at the proximal end **16** and all the way down to the distal end **14** of the camera tube **12**, which is sealed with a transparent material **17**. Just like other embodiments, the visualization device **10** can be equipped with a light source located outside of the dilator **194** or built in the camera tube **12**. In some embodiments, the light source can be built in the camera **18**.

**[0092]** As shown in FIG. **13**, the camera **18** is connected by electrical wire **20** to a monitoring device (not shown). In some embodiments, the camera **18** can be in communication with a monitoring device wirelessly. A guide wire at the proximal end **194**A is positioned inside of the lumen **195** of the tubal body **192**. A proximate end **194**B of the guide wire **194** protrudes outside of the tubal body **192** at the proximal end **192**B The visualization device **10** verifies appropriate placement of the dilator device **190** and allows mobility of continuous visualization as dilation proceeds. The dilator device **190** is especially well suited for use with the Seldinger technique.

**[0093]** Further embodiments provide various tracheostomy tubes equipped with a visualization device. FIG. **14**A depicts a side view of an embodiment for a tracheostomy device, generally **200**. The device **200** comprises a tubal body **202** with a distal end **202**A and a proximal end **202**B. An inflatable cuff **204** is wrapped around the tubal body **200** in some proximity to the distal end **202**A, but never at the very distal end **202**A. The cuff **204** can be inflated with a device **206** after proper placement of the device **200** in a patient. At the proximal end **202**B, the tubal body **202** protrudes through a plastic plate **208** such that some portion of the tubal body **202** is proximal to the plastic plate and will remain outside of a patient's neck after the device **202** is positioned in the patient. The plastic plate **208** may be oval in shape with the tubal body **202** protruding from the plate in the middle of the oval plastic plate **208**. The plastic plate **208** may have two openings **209**, one on each side of the plate such that the device **200** can be secured around patient's neck with some bandage by tying the device **200** through the openings **209** around patient's neck.

**[0094]** In the embodiment of FIG. **14**A, the visualization device **10** is sealed or otherwise attached to the tubal body **202** externally. The visualization device **10** comprises a camera tube **12** which is sealed or otherwise attached externally along the proximal-distal (**202**B-**202**A) axis to the tubal body **202**. The camera tube **12** is placed under the cuff **204** such that the cuff **204** wraps over the camera tube **12** and a distal end **14** of the camera tube **12** is distal to the cuff **204**. The distal end **14** is sealed with a transparent material **17**. A proximal end **16** of the camera tube **12** protrudes through the plastic plate **208** and remains outside of patient's neck. A camera **18** can be placed inside of the camera tube **12** through an opening in the proximal end **16**. The camera **18** is not disposable, does not need to be sterilized and can be easily removed from the camera tube **12**. The camera **18** is connected by electrical wire **20** to a monitoring device. In further embodiments, the camera **18** can be in communication with a monitoring device wire-

lessly. A light source can be added to the visualization device **10** as was described in other embodiments above.

**[0095]** FIG. **14**B depicts another embodiment for a tracheosomy device, generally **210**. In this embodiment, the device **210** comprises of the same tubal body **202**, cuff **204**, plate **208** and other components as was discussed in connection with the device **200**. However, unlike the device **200**, a visualization device **10** is placed inside of a lumen **203** of the tubal body **202**. The visualization device **10** comprises a camera tube **12** with a distal end **14** and a proximal end **16**. The camera tube **12** may be sealed or otherwise attached internally to the tubal body **202** along the proximal-distal (**202**B-**202**A) axis such as the distal end **14** of the camera tube **12** is in close proximity with the distal end **202**A of the tubal body **202**. The distal end **14** is sealed with a transparent material **17**. A camera **18** is placed inside of the camera tube **12** through an opening at the proximal end **16** which remains outside of the patient's neck after the device **210** is placed in the patient. The camera **18** is connected by electrical wire **20** to a monitoring device. In other embodiments, the camera **18** communicates with a monitoring device wirelessly. In some embodiments, the visualization device **10** comprises a light source.

**[0096]** A further embodiment provides a nasal trumpet with a visualization device, generally **220** in FIG. **15**. The trumpet **220** comprises a tubal body **222** with a proximal end **222**B and a distal end **222**A. Two fasteners **224** are attached at the proximal end **222**B of the tubal body **222**. After placing the trumpet **220** in a patient, the proximal portion of the tubal body **222** with the fasteners **224** remains outside of the patient, and the fasteners **224** can be used to secure the trumpet **220** around the patient's head.

**[0097]** A visualization device **10** is sealed or otherwise attached to the tubal body **222** externally along the proximal-distal (**222**B-**222**A) axis. The visualization device **10** comprises a camera tube **12** with a proximal end **16** and a distal end **14**. The distal end is in near proximity with the distal end **222**A of the tubal body **222**. The distal end **14** is sealed with a transparent material **17**. A camera **18** is placed inside of the camera tube **12** through an opening at the proximal end **16**. The camera **18** is moved all the way to the distal end **14** and collects images in real time inside of a patient's body during placement of the device **220** as well as after the device **220** has been properly placed and secured. As in other embodiments, the camera **18** does not come in contact with patient's body, does not have to be sterilized and can be reused in multiple devices or in different patients. The camera **18** communicates with a monitoring device (not shown) either with electrical wire **20** or wirelessly, or both.

**[0098]** Further embodiments provide various oral airways as shown in FIGS. **16**A, **16**B, **16**C, and **16**D. Referring to FIG. **16**A, an oral airway with a visualization device, generally **230**, comprises a tubal body **232** with a lumen **233**. The tubal body is slightly curved in a hook-like shape along the proximal-distal (**232**B-**232**A) axis. A visualization device **10** is placed inside of the lumen **233** of the tubal body **232**. The visualization device **10** comprises a camera tube **12** and a camera **18**. The camera tube **12** may be sealed or otherwise attached internally to the tubal body **232** inside of the lumen **233** and along the proximal-distal (**232**B-**232**A) axis. The camera tube **12** has a proximal end **16** and a distal end **14**. The distal end **14** is in close proximity with the distal end **232**A of the tubal body **232**. The distal end **14** is sealed with a transparent material **17**.

**[0099]** The camera tube **12** has an opening at the proximal end **16** through which the camera **18** is inserted into the camera tube **12** all the way to the distal end **14**. The camera **18** communicates with a monitoring device either wirelessly or by electrical wire **20**. The embodiment shown in FIG. **16**B is the same as in FIG. **16**A, except a light source **21** is added to the visualization device **10**. The light source **21** may remain outside of the camera tube **12** or it may be built in the camera tube **12** or it may be a part of the camera **18**.

**[0100]** The embodiment shown in FIG. **16**C is the same as that of the FIG. **16**A, except two whistles **234**A and **234**B are added inside of the lumen **233** of the tubal body **232**. The whistle **234**B is located at the proximal end of the tubal body **232** and it produces a sound when a patient breathes in. The whistle **234**A is located at the distal end of the tubal body **232** and it produces a sound when the patient breathes out.

**[0101]** Further embodiments include an oral airway as shown in FIGS. **16**A-**16**C, but further equipped with a sound and temperature monitoring device which is also placed inside of the lumen **233** and transmits information to a monitoring device which can be positioned at a remote location.

**[0102]** The embodiment of FIG. **16**D is an intubating airway device with a visualization device, generally **230**. The intubating airway device **230** comprises a tubal body **232** with a lumen **233** in which an endotracheal tube can be placed. A visualization device **10** comprises a camera tube **12** with a distal end **14** and a proximal end **16**. The distal end **14** is sealed with a transparent material **17**. A camera **18** is placed inside of the camera tube **12** through an opening at the proximal end **16**. The camera tube **12** is placed inside the lumen **233** of the tubal body **232**.

**[0103]** A bougie **116** is added inside of the tubal body **232** such that the bougie **116** is inserted in a tube **118** which shares the lumen with the lumen **233** along the proximal-distal (**232**B-**232**A) axis. A portion **116**A of the bougie **116** protrudes outside the distal end **232**A of the tubal body **232**. A portion **116**B of the bougie **116** protrudes outside the tubal body **232** from the proximal end **232**B and over vocal cords. An endontracheal tube can be positioned inside the lumen **233** and the bougie **116** is used under constant visualization from the camera **10** to guide the placement of the endotracheal tube through patient's vocal cords. The distal end **14** of the camera tube **12** is in proximity with the distal portion **116**A of the bougie **116** and therefore, the guided placement takes place under constant visualization.

**[0104]** Further embodiments provide an esophageal stethoscope with a visualization device. Referring to FIG. **17**A, it depicts an esophageal stethoscope with a visualization device, generally **240**. It comprises a body **242** with a lumen **243** into which a sound-monitoring device **246** is placed. The body **242** may have a cylinder-like shape tapered at the distal end, and with the distal end the body **242** protruding with a tongue-like tip **248**. At least a portion of the body **242** surface is slightly curved toward the lumen **243** and creates a surface **249**. The visualization device, generally **10**, comprises a camera tube **12** with a distal end **14** which is sealed with a transparent material **17**, and a camera **18** which is placed inside of the camera tube **12** through an opening at the proximal end of the camera tube **12**. The camera tube is positioned externally on surface **249** along the distal-proximal axis of the body **242**. The camera tube **12** is connected with the surface **249** by a sliding means **245** such that the camera tube **12** can slide along the **242**A-**242**B axis on the surface **249**.

**[0105]** The camera **18** is placed inside of the camera tube **12** and because the camera tube **12** is sealed at the distal end **14**, the camera **18** does not come in contact with a patient and the camera **18** does not need to be sterilized and it can be reused in other applications. The camera **18** is connected by electric wire **20** or wirelessly to a monitoring device. The camera **18** is not disposable and can be reused in other applications.

**[0106]** The stethoscope **240** is further equipped with a bougie tube **244** which is also located on the surface **249** and is connected to the surface **249** with a sliding means **245** such that the bougie tube **244** can slide along the **242**A-**242**B axis. FIG. **17**B provides an alternative embodiment for the stethoscope **240**, in which the sound and temperature monitoring device **246** can protrude through an opening at the **248** tip.

**[0107]** A further embodiment provides a one-piece video-laryngoscope with a visualization device, generally **250**, as shown in FIGS. **18**A and **18**B. The video-laryngoscope **250** comprises a tubal body **252** which has a proximal end **252**B and a distal end **252**A. The tubal body **252** extends with a scoop-like portion **254** at the distal end **252**A. The scoop-like portion **254** curves horizontally such that the distal end **254**A of the scoop-like portion **254** is nearly parallel to the proximal end **254**B of the scoop-like portion. The tubal body **252** has an opening **256** near its distal end **252**A. A visualization device **10** which comprises a camera **18** placed inside of a camera tube **12** is placed through the opening **256** such that the distal end **14** of the camera tube **12** may be in proximity with the proximal end **254**A of the scoop-like portion **254**. The device can be easily inserted to an upper esophagus and visualize vocal cords.

**[0108]** However, the position of the distal end **14** can be adjusted as needed by sliding the camera tube **12** through the opening **256**. The distal end **14** is sealed with a transparent material **17** such that the camera **18** does not come in contact with a patient's body and therefore, the camera **18** does not need to be sterilized and it can be reused in multiple applications. The camera **18** is inserted into the camera tube **12** through an opening at the proximal end **16**. The camera **18** is connected to at least one monitoring device either by electrical wire **20** or wirelessly.

**[0109]** The embodiment of FIG. **18**B is the same as that of FIG. **18**A, except a light source **21** is added to the visualization device **10** as described in connection with the light source **21** in other medical devices above. A bougie **116** in a tube **118** is also added through the opening **256**, and the distal end **116**A of the bougie **116** can be manipulated at the proximal end **116**B such that the placement of the device **250** is guided under continuous visualization with the camera **18**.

**[0110]** A further embodiment includes a vaginal speculum with visualization device, generally **260** as shown in FIG. **19**. Any speculum **261**, including disposable, generally known and used for a pelvic exam can be equipped with a visualization device, generally **10**, which comprises a camera **18** placed inside of a camera tube **12**. The camera tube **12** can be attached to the speculum **261** or to some other instrument. The camera **18** is placed in the camera tube **12** through an opening at a proximal end **16** and is moved all the way toward the distal end **14** which is sealed with a transparent material **17**. The camera **18** connected to at least one monitoring device by electric wire **20** or the camera **18** can be connected wirelessly.

**[0111]** Further embodiments relate to various tubing equipped with a visualization device shown in FIG. **1**A and as described in more detail below.

**[0112]** FIGS. **20**A-**20**F refer to various embodiments for a nasal cannula with a visualization device, generally **270**. FIG. **20**A shows the positioning of a nasal cannula **272** on patient's head with a visualization device **10** added to one of the two nostril tubes. The nasal cannula **272** can be any nasal cannula known in the art and used by medical practitioners. The visualization device **10** is as described in connection with FIG. **1**A and comprises a camera **18** inserted inside of a camera tube **12**. The camera tube **12** is sealed or otherwise attached externally along at least one nostril tube **274** of the nasal cannula **272** as shown in more detail in FIG. **20**C. This nasal cannula with the visualization device **10** provides continuous visualization of vocal cords, upper esophagus. The cannula can be used to determine whether vocal cords are moving correctly, if there is any abnormal anatomy and the color of the patient's tissues.

**[0113]** As shown in FIG. **20**E, the nasal cannula with the visualization device can be properly positioned through patient's nostrils as the positioning is guided and constantly visualized with the camera device **10**. The distal end **14** of the camera tube **12** aligns with the distal end of at least one nostril tube **274**. As shown in FIG. **20**F, the nasal cannula with the visualization device can be further equipped with an external stethoscope **275**, which can be placed on patient's chest externally and monitors breathing and heart-beat sounds.

**[0114]** FIGS. **20**B and **20**D show the same embodiment as in FIGS. **20**A and **20**C, except the visualization device **10** is equipped with a light source **21** as was described in connection with the light source **21** in other embodiments.

**[0115]** A further embodiment includes a feeding tube with a visualization device, generally **280**, as shown in FIG. **21**. A visualization device, generally **10**, is sealed or otherwise attached externally along the proximal-distal (**282**A-**282**B) axis of a feeding tube **282**. The visualization device **10** is essentially the same as described in connection with FIG. **1**A and other embodiments above. It comprises a camera tube **12** with a proximal end **16** and a distal end **14**. A camera **18** with wire **20** is inserted into the camera tube **12** through an opening at the proximal end **16** and is slid all the way to the distal end **14** which is sealed with a transparent material **17**. The camera **18** does not come in contact with a patient's body and can be reused in multiple devices. Any feeding tubes known in the art can be used in this embodiment, including a feeding tube with a stylet **284** as shown in FIG. **21** The feeding tube **282** can be equipped with an adaptor **283** at the proximal end **282**A. The feeding tube **282** may further comprise a plurality of holes **285** at the distal end **282**B for food distribution.

**[0116]** Further embodiments provide various suction tubes equipped with a visualization device, generally **290**, as shown in FIGS. **22**A, **22**B and **22**C. Any suction tube including but not limited to the nasal gastric tubes known in the art can be used and in general a suction tube **292** with an adaptor **293** at a proximal end **292**B is suitable, as shown in FIG. **22**A. A visualization device, generally **10**, comprises a camera tube **12** and a camera **18** with wire **20**. The camera **18** is inserted into the camera tube **12** through an opening at a proximal end **16** and is slid all the way to the distal end **14** of the camera tube **12**. The distal end **14** is sealed with a transparent material **17**. The camera **18** can transmit information to a remote location.

**[0117]** The camera tube **12** is placed inside of the suction tube **292** through an opening **294** at the proximal end **292**B of the suction tube **292**. The camera tube **12** is then aligned with

the length of the suction tube **292** such that the distal end **14** of the camera tube **12** is in close proximity with the distal end **292**A of the suction tube **292**.

**[0118]** FIGS. **22**B and **22**C is a further embodiment of a suction tube with a visualization device, generally **290** as shown in FIG. **22**A, but it is further equipped with a bougie **116** placed inside of a tube **118** which is placed inside of the suction tube **292** through an opening **295**. A distal end **116**A of the bougie **116** can protrude outside the distal end **292**A of the suction tube **292** and can be manipulated by a medical practitioner with a proximal end **116**B which protrudes outside a patient such as the placement of the suction tube **292** is guided under constant visualization with the camera **18** through the distal end **14** of the camera tube **12**. The bougie **116** under constant visualization from the camera **12** permits rapid and accurate placement of the device **290** in a patient. The bougie **116** can be used to guide the placement of the device **290** and moving it left or right in the trachea.

**[0119]** Referring to FIG. **23**, this embodiment provides a suction catheter with a visualization device, generally **300**. The suction catheter **302** is not flexible and can be any suction catheter known in the art. A visualization device, generally **10**, is positioned inside the suction catheter **302** through an opening **303** which is in near proximity with a proximal end **302**B of the suction catheter **302**. The visualization device **10** comprises a camera **18** with wire **20** which is placed inside of a camera tube **12** through an opening at a proximal end **16** of the camera tube **12** and then the camera **18** is slid to the distal end **14** which is sealed with a transparent material **17**. The distal end **14** of the camera tube **12** is aligned with the distal end **302**A of the suction catheter **302**, while the proximal end **16** of the camera tube **12** protrudes outside the patient's body such as the camera **18** can be pulled out from the camera tube **12** as needed. In other embodiments, the suction tube is placed externally and this combination can work with suction caps.

**[0120]** Referring to FIG. **24**, this embodiment provides an endotracheal changing tube with a visualization device, generally **310**. An endotracheal changing tube can be any endotracheal changing tube as known in the art. A visualization device, generally **10**, comprises a camera **18** with wire **20** which is placed inside of a camera tube **12** through an opening at a proximal end **16** of the camera tube **12** and slid all the way to a distal end **14** of the camera tube **12**. The distal end **14** is sealed with a transparent material **17**. The visualization device **10** is placed inside of the endotracheal changing tube **312** through an opening **313** in the changing tube **312** such as the camera tube **12** is aligned with the changing tube **312** along the proximal-distal (**312**B-**312**A) axis, and the distal end **14** of the camera tube **12** is in close proximity with the distal end **312**A of the changing tube **312**. In other embodiments, the camera tube **12** can be placed outside of the endotracheal changing tube or it can be fitted externally onto an endotracheal changing tube known in the art.

**[0121]** While certain medical devices are described above, a person of skill would appreciate that this invention also includes embodiments with various obvious modifications as would be easily apparent to a person of skill.

**1**. A medical visualization device, the device comprising:

a camera tube, the camera tube comprising a distal end and a proximal end, wherein the distal end is sealed with a transparent material and a proximal end has an opening; and

a camera with a wire placed inside of the camera tube, wherein the camera can be placed inside of the camera tube and it can be retracted from the camera tube on demand and wherein the camera can be reused in various devices without sterilization and wherein the camera can transmit images to a remote location wirelessly.

**2**. The medical visualization device of claim **1**, wherein the camera tube comprises a fiber optic material.

**3**. The medical visualization device of claim **1**, wherein the device can transmit information wirelessly and wherein the device is further equipped with at least one of the following: a light source, a stylet, a sound and temperature monitoring device, suction tube, bougie tube, stylet tube and a tool tube.

**4**. The medical visualization device of claim **1**, wherein the camera is a digital camera.

**5**. The medical visualization device of claim **1**, wherein the visualization device is in communication with at least one monitoring device wirelessly.

**6**. A method of continuous monitoring of a patient's at least one internal organ, the method comprising placing in the patient the visualization device of claim **1**, transmitting images of the internal organ in real time with the camera through the transparent material at the distal end of the camera tube, and analyzing the transmitted images.

**7**. The method of claim **6**, wherein the images, sound, data, information about temperature are transmitted wirelessly, broadcast or recorded to at least one device positioned at a remote location

**8**. The method of claim **6**, wherein the internal organ is selected from at least one of the following: nasopharynx, pharynx, hypo pharynx, supraglottic structures, subglottic airway, vocal cords, thorax, stomach and vagina.

**9**. The visualization device of claim **1**, wherein the length of the camera tube can be adjusted to the length of at least one of the following second devices by sliding: an endotracheal tube, a supraglottic airway, airway device, oral airway, dilator, tracheostomy device, intubating oral airway, esophageal stethoscope, nasal cannula, feeding tube, stylet, bougie, suction tube and endotracheal changing tube and wherein the camera tube can slide along the distal/proximal axis of the device.

**10**. A method for placing a medical device in a patient, the method comprising equipping the medical device with the visualization device of claim **1** and a bougie and guiding the placement of the device with the bougie under continuous visualization with the visualization device of claim **1**.

**11**. A kit for monitoring a patient's internal organ in real time, the kit comprising a camera tube with the adjustable length and with at least one ring attached externally to the camera tube, wherein the camera tube has a distal end and a proximal end and wherein the distal end of the camera tube is sealed with a transparent material; and

a reusable camera which can be placed and removed from the camera tube and which can transmit images wirelessly to at least one remote location, and wherein the kit may further optionally comprise a flexible stylet.

**12**. The kit of claim **11**, wherein the ring is adjustable and equipped with a clasp which can be used to make a diameter of the ring larger or smaller.

**13**. A medical device comprising a visualization device sealed to, attached to or otherwise combined with at least one of the following second devices: an endotracheal tube, a supraglottic airway device, a ventilator adaptive cap, a dilator, a tracheostomy device, a nasal trumpet, an oral airway, an

esophageal stethoscope, a laryngoscope, a stylet, a bougie, a speculum, a nasal cannula, a feeding tube, a suction tube, a suction catheter, and an endotracheal changing tube; and wherein the visualization device comprises a camera tube with a distal end and proximal end, the distal end being sealed with a transparent material and a camera being placed inside of the camera tube through an opening at the proximal end.

**14**. The medical device of claim **13** which further comprises at least one of the following a bougie and a sound- and temperature-monitoring device.

**15**. The medical device of claim **13** wherein the camera can be placed and retracted from the device and reused in other devices.

**16**. The medical device of claim **13**, wherein the visualization device is sealed, attached or otherwise connected externally to the second device.

**17**. The medical device of claim **13**, wherein the visualization device is equipped with a light source.

**18**. The medical device of claim **13**, wherein the second device is an endotracheal tube selected from the group consisting of: an endotracheal tube which comprises a sleeve through which the visualization device can be inserted, an endotracheal tube into which the visualization device is placed internally through a ventilator adaptive cap and an endotracheal tube to which the visualization device is attached, b.

**19**. The medical device of claim **13**, wherein the second device is the supraglottic airway device or airway device.

**20**. The medical device of claim **13**, wherein the visualization device is combined with the ventilator adaptive cap by being inserted through the cap.

**21**. The medical device of claim **13**, wherein the second device is an endotracheal tube and wherein the visualization device is placed inside of the endotracheal tube through an opening on one side of the endotracheal tube, and wherein a plastic sleeve being attached over the opening such that the sleeve can slide up and down and facilitates keeping the visualization device sterile while it is moved in and out of the endotracheal tube.

**22**. The medical device of claim **13**, wherein the second device is an endotracheal tube, and wherein the visualization device being positioned externally on the endotracheal tube along the proximal-distal axis of the endotracheal tube, and wherein a plastic sleeve being attached to the endotracheal tube such that the sleeve can slide up and down outside the endotracheal tube and facilitates the movement of the visualization device along the proximal-distal axis of the endotracheal tube.

**23**. The medical device of claim **22**, wherein the endotracheal tube is equipped with a cuff wrapped around the endotracheal tube near its distal end; and wherein the visualization device can slide outside the endotracheal tube along the proximal-distal axis such that the visualization device can be proximal or distal to the cuff.

**24**. The medical device of claim **13**, wherein the visualization device is equipped with at least one ring, the visualization device is positioned externally on the second device along the proximal-distal axis of the second device, and the visualization device is connected to the second device with the at least one ring, and wherein the visualization device can slide along the proximal-distal axis of the second device.

**25**. The medical device of claim **13**, wherein the second device is an oral airway which comprises a tubal body with a lumen, the tubal body is slightly curved in a hook-like shape and the visualization device is placed inside of the lumen and the visualization device can slide inside of the lumen along the proximal-distal axis of the oral airway.

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摘要(译)

本发明提供了改进的医疗装置，其配备有用于插管，通气，药物输送，进给和患者的连续远程监测的可视化装置。本发明还提供了用于在患者中快速且准确地放置医疗装置的方法，以及在放置之后对患者进行连续实时监测，包括远程监控。