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(72) Inventeurs/Inventors:
GULLIVER, LAURENCE, NZ;
RONAYNE, MICHAEL PAUL, NZ;
IRVING, CHARLES WILLIAM DOUGLAS, GB

(73) Propriétaire/Owner:
FISHER & PAYKEL HEALTHCARE LIMITED, NZ

(74) Agent: RICHES, MCKENZIE & HERBERT LLP

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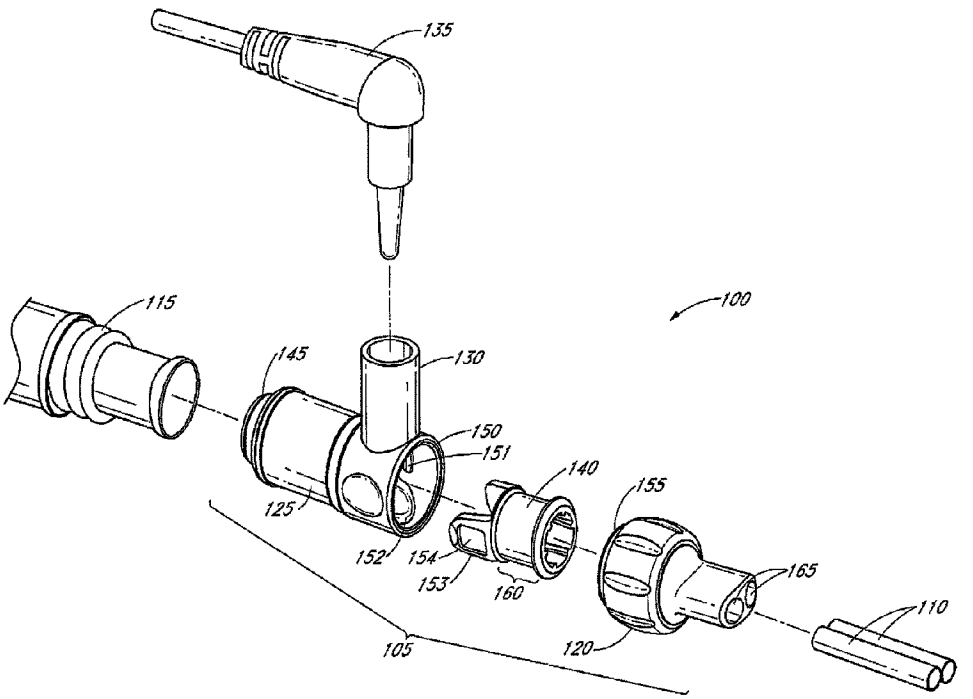

(57) Abrégé/Abstract:
In an embodiment, a connector or connector assembly for attaching a nasal cannula with a gas delivery hose includes a sensor port for a sensor probe positioned near an end of a nasal cannula, which can allow the sensor probe to be placed closer to the patient's nostrils than previous connector parts allowed. In an embodiment, the connector is configured to advantageously allow the nasal cannula to rotate relative to the gas delivery hose, thereby allowing a patient or healthcare provider to untangle or otherwise straighten the hose or the cannula. In an embodiment, the connector assembly is configured to automatically align locking protrusions on a first component with locking recesses on a second component, where insertion of the second component within the first component causes the second component to rotate relative to the first component, thereby aligning the locking protrusions with associated locking recesses.

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(71) Applicant *(for all designated States except US)*: **FISHER & PAYKEL HEALTHCARE LIMITED** [NZ/NZ]; 15 Maurice Paykel Place, Auckland (NZ).

(72) Inventors; and
(75) Inventors/Applicants *(for US only)*: **GULLIVER, Laurence** [NZ/NZ]; 101 Paihia Road, One Tree Hill, Auckland (NZ). **RONAYNE, Michael Paul** [NZ/NZ]; 19 Endymion Place, Half Moon Bay, Auckland (NZ). **IRVING, Charles William Douglas** [GB/GB]; Bath, Bath and North East Somerset (GB).

(74) Agents: **SIM, Jeremy G** et al.; A J Park, PO Box 949, Wellington, 6140 (NZ).

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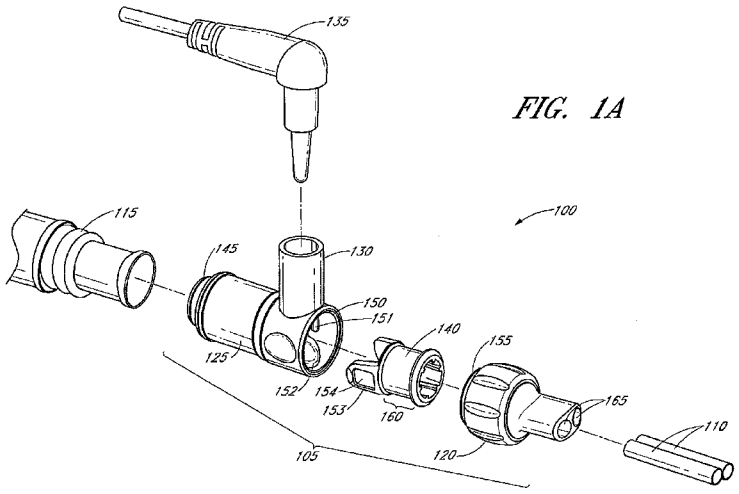

FIG. 1A

(57) **Abstract**: In an embodiment, a connector or connector assembly for attaching a nasal cannula with a gas delivery hose includes a sensor port for a sensor probe positioned near an end of a nasal cannula, which can allow the sensor probe to be placed closer to the patient's nostrils than previous connector parts allowed. In an embodiment, the connector is configured to advantageously allow the nasal cannula to rotate relative to the gas delivery hose, thereby allowing a patient or healthcare provider to untangle or otherwise straighten the hose or the cannula. In an embodiment, the connector assembly is configured to automatically align locking protrusions on a first component with locking recesses on a second component, where insertion of the second component within the first component causes the second component to rotate relative to the first component, thereby aligning the locking protrusions with associated locking recesses.

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CONDUIT CONNECTOR FOR A PATIENT BREATHING DEVICE

FIELD OF THE DISCLOSURE

[0001] This disclosure relates to the field of connectors for gas delivery hoses.

BACKGROUND OF THE DISCLOSURE

[0002] A nasal cannula is a device used to deliver supplemental oxygen, other gases, or airflow to a patient or person for treatment or for aiding respiration. Typically, the cannula includes a plastic tube and a set of two prongs which are placed in the nostrils. Oxygen or other gases can flow from these prongs.

[0003] The nasal cannula can be connected to an oxygen tank, a portable oxygen generator, a wall connection in a hospital via a flowmeter, or other gas source. Nasal cannulas can supply oxygen to a patient at rates that depend partly on size. For example, infant or neonatal nasal versions can carry less oxygen and can have smaller prongs than adult versions. The cannula can be used to supply oxygenated air, humidified air or other gas mixtures.

[0004] It is therefore an object of the present invention to provide a connector and/or a connector for gas delivery hoses which will go at least some way towards addressing the foregoing problems or which will at least provide the public with a useful choice.

[0005] In this specification where reference has been made to patent specifications, other external documents, or other sources of information, this is generally for the purpose of providing a context for discussing the features of the invention. Unless specifically stated otherwise, reference to such external documents is not to be construed as an admission that such documents, or such sources of information, in any jurisdiction, are prior art, or form part of the common general knowledge in the art.

[0006] Further aspects and advantages of the present invention will become apparent from the ensuing description which is given by way of example only.

SUMMARY OF THE DISCLOSURE

[0007] In some situations, a nasal cannula is used to provide humidified airflow or oxygen therapy. In order to monitor the airflow being received by the patient, a sensor probe can be used. However, the further the distance of the probe from the prongs that provide air to the nostrils, the greater the potential variance between the sampled air and the air inhaled by the patient. Thus, a conduit connector that places the sensor probe in the airflow closer to the patient can enhance the accuracy of the measurements taken.

[0008] As a nasal cannula or other breathing device can be connected to a patient for extended periods of time, the nasal cannula can generate discomfort for the patient or otherwise begin to perform sub-optimally. For example, as the patient moves around in a hospital bed, the nasal cannula tubing can become tangled or twisted, thereby causing the patient discomfort or limiting the airflow within the cannula. Thus, a design that facilitates adjustments of the nasal cannula can provide greater comfort to the patient or improve performance.

[0009] At times, the nasal cannula or an airflow source may need to be removed or replaced. If detaching the nasal cannula from the airflow source is difficult or time consuming, detaching the nasal cannula may cause significant discomfort for the patient. Further, in emergencies, a slow or difficult connection mechanism can potentially place the patient's health in danger. Thus, a conduit connector that provides a "quick-connect" or "quick-release" feature that facilitates attachment and detachment of the nasal cannula from an airflow source, as well as facilitating interchangeability of components, can provide greater comfort and/or safety.

[0010] In order to address the issues discussed above, aspects of the present disclosure include a connector or connector assembly for attaching a nasal

cannula with a gas delivery hose. In an embodiment, the connector assembly includes a sensor port for a sensor probe. The sensor port is positioned near an end of a nasal cannula, towards the patient. In an embodiment, the connector is configured to allow the sensor to be placed closer to the patients nostrils than previous connector parts allowed.

[0011] Aspects of the present disclosure also include a self-aligning connector assembly configured to automatically align locking protrusions on a first component with locking recesses on a second component, wherein insertion of the second component within the first component causes the second component to rotate relative to the first component, thereby aligning the locking protrusions with associated locking recesses. In an embodiment, the connector is configured to advantageously allow the nasal cannula to rotate relative to the gas delivery hose. By allowing rotation, the connector enables a patient or healthcare provider to untangle or otherwise straighten the hose or the cannula, thereby increasing patient comfort.

[0012] The term "comprising" as used in this specification means "consisting at least in part of". When interpreting each statement in this specification that includes the term "comprising", features other than that or those prefaced by the term may also be present. Related terms such as "comprise" and "comprises" are to be interpreted in the same manner.

[0013] This invention may also be said broadly to consist in the parts, elements and features referred to or indicated in the specification of the application, individually or collectively, and any or all combinations of any two or more said parts, elements or features, and where specific integers are mentioned herein which have known equivalents in the art to which this invention relates, such known equivalents are deemed to be incorporated herein as if individually set forth.

Accordingly, in one non-limiting aspect the invention resides in a connector assembly for a gas delivery conduit for providing gases to a patient, the connector assembly comprising: a first conduit connector, and a connecting adapter configured to releasably attach the first conduit connector to a second conduit connector, the connecting adapter comprising: a connecting adapter body; and one or more locking fingers configured to releasably attach to the first conduit connector, the one or more locking fingers protruding longitudinally from the connecting adapter body; and the first conduit connector comprising: a first conduit body; and one or more locking tabs configured to releasably attach with the one or more locking fingers of the connecting

adapter, the one or more locking tabs formed on an interior surface of the first conduit body, and an alignment tab formed on an interior surface of the first conduit body, the alignment tab configured to automatically align the one or more locking fingers of the connecting adapter with the one or more locking tabs of the first conduit connector upon insertion of the connecting adapter within the first conduit connector.

In another non-limiting aspect, the invention resides in a connector adapter configured to releasably attach a first conduit connector to a second conduit connector, the connector adapter comprising: a body comprising a substantially cylindrical tube extending between a terminal aperture and a source aperture, the substantially cylindrical tube having two locking fingers extending from the source aperture, each locking finger including a locking recess formed on an outer surface thereof, wherein each locking finger widens along its length from its end to its base at the source aperture, and wherein each locking recess is configured to engage with a corresponding locking tab formed on an interior surface of the first conduit connector, and wherein the connector adapter is configured to interact with one or more alignment tabs on an interior surface of the first conduit connector such that each said locking recess is aligned with a corresponding locking tab on the first conduit connector when the connector adapter is brought into connection with the first conduit connector.

In yet a further non-limiting aspect, the invention resides in connector adapter configured to releasably attach a first conduit connector to a second conduit connector, the connector adapter comprising: a conduit body having two locking fingers configured to releasably attach to the first conduit connector, the locking fingers protruding longitudinally from the conduit body; and the locking fingers each having a locking recess formed on an exterior surface of the respective locking finger, the locking recesses configured to engage with locking tabs formed on the first conduit connector; and each locking finger widens from its end to its base.

[0014] The invention consists in the foregoing and also envisages constructions of which the following gives examples only.

BRIEF DESCRIPTION OF THE DRAWINGS

[0015] Throughout the drawings, reference numbers may be re-used to indicate correspondence between referenced elements. The drawings are provided to illustrate embodiments of the disclosure described herein and not to limit the scope thereof.

[0016] FIG. 1A illustrates an exploded perspective view of a gas delivery conduit having a connector embodiment for attaching a first tube with a second tube, the connector having a source conduit connector, a terminal conduit connector and a connecting adapter;

[0017] FIG. 1B illustrates a side view of the connector embodiment of FIG. 1A;

[0018] FIG. 1C illustrates a perspective view of another connector embodiment having other embodiments of the source conduit connector, the terminal conduit connector and the connecting adapter;

[0019] FIG. 2A illustrates a perspective view of the terminal aperture side of the source conduit connector of FIG. 1A;

[0020] FIGS. 2B-2G illustrate various views of the source conduit connector of FIG. 1C;

[0021] FIGS. 3A and 3B illustrate perspective views of the connecting adapter of FIG. 1A from a source aperture side and a terminal aperture side, respectively;

[0022] FIGS. 3C-3G illustrate various views of the connecting adapter of FIG. 1C;

[0023] FIGS. 4A and 4B illustrate a perspective view of a source aperture side of the terminal conduit connector and a top view of the terminal conduit connector of FIG. 1A;

[0024] FIGS. 4C-4G illustrate various views of the terminal conduit connector of FIG. 1C;

[0025] FIGS. 5A-5C illustrate longitudinal cross-sectional views of the connector of FIG. 1A;

[0026] FIG. 6 illustrates a cross-section taken along across an axis of FIG. 1B and illustrates the engagement of the connecting adapter with the source conduit connector;

[0027] FIGS. 7-16 illustrate alternate connector embodiments;

[0028] FIG. 17 illustrates an alternate conduit connector embodiment; and

[0029] FIGS. 18A-18C illustrate different views of another alternate conduit connector embodiment;

[0030] FIGS. 19A-19B illustrate an alternate connector adapter embodiment configured to connect with the source conduit connector embodiment of FIGS. 20A-20B;

[0031] FIGS. 20A-20B illustrate an alternate source conduit connector embodiment having an annular ring for attaching to the alternate connector adapter embodiment of FIGS. 19A-19B;

[0032] FIGS. 21A-D illustrate different views of an embodiment of a nasal cannula that connects to an airflow source via the various connector embodiments discussed in the disclosure.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

[0033] FIG. 1A and 1B illustrate a perspective view and side view, respectively, of a gas delivery conduit 100 comprising an embodiment of a connector 105 for attaching a first tube 110 from a nasal cannula, face mask, intubation tube or other breathing device for a patient with a second tube 115 from a respirator, humidifier, breathing circuit, or other airflow device for providing gas to the patient. The connector can allow components of the gas delivery conduit 100 to be connected or disconnected from each other, thus facilitating disconnection and reconnection of the breathing device and airflow device with potentially minimal disturbance to the patient or gas delivery system.

[0034] For example, a patient can receive humidified, oxygenated and/or pressurized gases through a nasal cannula 110 connected to the gas delivery tube 115 that in turn is connected to a humidifier or respirator. For ease of explanation,

the following disclosure refers to embodiments of the connector for connecting a nasal cannula with a gas delivery tube (e.g., for providing oxygen), but references to such embodiments are not intended to limit the disclosure and other embodiments are possible. For example, in other embodiments, gases are supplied to the patient by alternative patient interfaces, such as a nasal or full-face mask, or provided using alternative airflow sources.

[0035] In the illustrated embodiment, the connector 105 includes a terminal conduit connector 120 for receiving a nasal cannula 110, a source conduit connector 125 for receiving a gas delivery tube 115 and a connecting adapter 140 for connecting the conduit connectors. The source conduit connector 125 includes an optional sensor port 130 for receiving a sensor probe 135. In the illustrated embodiment, the terminal conduit connector 120 and source conduit connector 125 are releasably connected by the connecting adapter 140. The gas delivery tube 115 is configured to connect with the source conduit connector 125 and the nasal cannula 110 is configured to connect with the terminal conduit connector 120, forming a gas conduit 100 for providing oxygen or other gases to a patient. Generally, the oxygen flows from the gas delivery tube 115 to the nasal cannula 110. For ease of explanation, apertures of components of the gas conduit proximal to the gas delivery tube 115 are referred to as source apertures while apertures proximal to the nasal cannula 110 are referred to as terminal apertures.

[0036] In the illustrated embodiment, a source aperture 145 of the source conduit connector 125 connects with the gas delivery tube 115, for example, by fitting over and/or around the gas delivery tube 115 to form a seal. The source conduit connector 125 may be releasably attached to the gas delivery tube 115 or permanently attached. In one embodiment, the terminal aperture 150 of the source conduit connector 125 includes locking tabs 151 and/or alignment tabs 152 for receiving the connecting adapter 140. In one embodiment, the locking tabs are configured to lock with locking recesses 154 formed on fingers 153 of the connecting adapter 140, thereby forming a releasable seal. In one embodiment, the alignment tabs 152 are configured to cause the connecting adapter 140 to rotate

within the terminal aperture 150 if the locking tabs are misaligned with the locking recesses when inserted into the terminal aperture 150. The alignment tabs cause the connecting adapter 140 to rotate until the locking tabs and locking recess are aligned. In an embodiment, the recesses 154 are holes extending through the fingers 153 and configured to perform the same function as the recesses 154.

[0037] In one embodiment, the locking tabs are configured to engage with the locking recesses 154 with an audible click in order to provide positive feedback that a connection has been fully made. Such a click can be generated, in one embodiment, when the fingers 153 are biased as they pass over the locking tabs and then generate a click when the locking recesses 154 snap-fit over the locking tabs. Audible clicks can also be generated in other ways, such as when other components engage with each other.

[0038] In the illustrated embodiment, a source aperture 155 of the terminal conduit connector is configured to receive the connecting adapter 140 to form a rotatable connection. In one embodiment, ridges formed within the terminal conduit connector are adapted to lock with a channel 160 formed on the circumference of the connecting adapter 140. The terminal conduit connector 120 and connecting adapter 140 are able to rotate relative to each other by allowing the ridges to rotate along the channel 160. In one embodiment, raised edges or collars along a terminal and source apertures of connecting adapter 140 prevent or inhibit disconnection of the terminal conduit connector 120 from the connecting adapter 140.

[0039] The terminal conduit connector 120 can include a terminal aperture configured to receive a cannula tube of a nasal cannula 110. The terminal aperture 165 can include two openings for receiving a double conduit cannula tube. Each conduit can connect to a prong for insertion into a patient's nostril. The nasal cannula 110 can be releasably attached to the terminal conduit connector 120 or permanently attached.

[0040] FIG. 1B illustrates a side view of the connector 105. The source conduit connector 125 is connected to the terminal conduit connector 120. The

sensor probe 135 is connected to the connector 105 via the sensor port 130. Axis 167 illustrates the cross-section along which FIG. 6 is taken.

[0041] FIG. 1C illustrates a perspective view of another connector embodiment having other embodiments of the source conduit connector 125, the terminal conduit connector 120 and the connecting adapter 140 (hidden in this view). This embodiment shares many of the structures and features discussed above with respect to FIG. 1A, such as the sensor port 130.

[0042] FIG. 2A illustrates a perspective view of the terminal aperture 150 side of the source conduit connector 125 of FIG. 1A. In the illustrated embodiment, the source conduit connector 125 includes a substantially cylindrical tube having a terminal aperture 150 and a source aperture 145 (FIG. 1A). The source conduit connector 125 can also include an optional sensor port 130 for receiving a sensor probe 135. In FIG. 2A, the sensor port 130 includes a substantially cylindrical tube extending perpendicularly from the source conduit connector 125. In some embodiments, the tube is perpendicular to the body of the conduit connector 125. In some embodiments, the tube is substantially perpendicular but may be angled by a few degrees (e.g., less than 5, 10, or 15 degrees) from perpendicular. In some embodiments, the tube is angled by more than 15 degrees. One or more finger grooves 202 can be formed on the outside surface of the source conduit connector 125 in order to provide additional purchase or friction to a user, for example, for connecting or disconnecting the connector 105 (FIG. 1A) components. For example, two finger grooves 202 can be placed on opposite sides of the source conduit connector 125.

[0043] In the illustrated embodiment, the source conduit connector 125 includes locking tabs 151 and alignment tabs 152 for receiving the connecting adapter 140 (FIG. 1A). In FIG. 2A, two locking tabs 151 are formed on the interior surface of the source conduit connector 125 and configured to lock with locking recesses formed on the connecting adapter 140. The locking tabs 151 can be formed opposite each other.

[0044] In FIG. 2A, the alignment tab 152 is formed by a single, continuous protrusion or ridge formed on the interior surface of the source conduit connector 125. In one embodiment, the single continuous protrusion or ridge alternates from a first distance toward the terminal aperture 150 of the source conduit connector 125 to a second distance away from the terminal aperture 150. The continuous protrusion or ridge can form a bowl or saddleback shape, with alternating valleys 215 and apexes 220. The apexes 220 are configured to direct fingers of the connecting adapter 140 into the valleys 215, wherein the locking tabs 151 can lock with locking recesses on the fingers. For example, the apexes 220 can be sloped towards the valleys 215, such that the fingers, when inserted into the source conduit connector 125, are directed by the slope of the apexes 220 towards the valleys 215.

[0045] In FIG. 2A, the source conduit connector 125 includes an optional sensor port 130 for receiving a sensor probe 135. In the illustrated embodiment of FIG. 2A, the sensor port 130 is positioned near the terminal aperture 150 or substantially adjacent to the aperture 150. By placing the sensor port 130 close to the aperture 150, the sensor probe 135 is able to sample gas flow closer to the patient. Such sampling can provide more accurate measurement of the condition of the gas flow that the patient receives. For example, if the sensor probe 135 is positioned further away from the patient, there may be a greater difference between the sampled gas flow and the gas flow inhaled by the patient. Thus, gas flow that appears to be within the patient's comfort zone (e.g., based on temperature or humidity) may cause discomfort to the patient as the condition of the measured gas flow is different from the condition of the inhaled gas flow. In one example, the airflow source 115 can include a heating element that warms the air, but as the airflow leaves the source 115, the temperature of the airflow can cool rapidly. As a result, in one embodiment, the sensor should be placed as close to the patient as possible to obtain more accurate results. Similarly, due to condensation, humidity changes occur very rapidly. Again, the closer the sensor can be placed to the patient, the more accurate the sensor measurements will be. As will be apparent, similar benefits can be obtained without the optional sensor port 130 by positioning

the sensor probe 135 close to the aperture 150 or towards the patient or nasal cannula 110. For example, this can be done by replacing the sensor port with an integrated sensor as described below.

[0046] As illustrated in FIG. 2A, the sensor probe 135 is positioned into the gas flow within the gas delivery conduit 100 in order to sample, measure and/or analyze the gas flow. The sensor probe 135 can include any type of sensor(s), such as, for example, a temperature sensor, thermistor, flow meter, oxygen (O_2), carbon dioxide (CO_2), nitric oxide and/or humidity sensor. The sensor probe 135 can be reusable or disposable and can be detachable or integrated with a conduit connector. The sensor probe 135 can be connected to a monitoring system having one or more processors for analyzing measurements and can communicate with the monitoring system via a cable or wirelessly. The monitoring system can include a display or other output device (e.g., speaker, alarm or wireless transmitter) for displaying measurements or generating an alarm. The sensor probe 135 and/or monitoring system can include a memory device such as, for example, an electrically erasable programmable read only memory (EEPROM), erasable programmable read only memory (EPROM), flash memory, non-volatile memory or the like. The sensor probe 135 can include a plurality of conductors for communicating signals to and from its components, including sensing component conductors and memory device conductors.

[0047] In some embodiments, the sensor port 130 is configured to accept different types of sensor probes 135, allowing sensor probes 135 to be changed based on the current use. For example, a humidity sensor can be used during humidity therapies while an oxygen sensor can be used during oxygen therapies.

[0048] In some embodiments, there may be only a single locking tab 151 or three or more locking tabs 151. In some embodiments, the alignment tabs 152 can be formed by multiple protrusions or discontinuous ridges rather than a single continuous protrusion. For example, two disconnected apexes 220 can be formed on opposite sides of the interior surface of the source conduit connector 125. In

some embodiments, the source conduit connector 125 can include either alignment tabs 152 or locking tabs 151.

[0049] FIGS. 2B-2G illustrate various views of the source conduit connector 125 of FIG. 1C. This embodiment shares many of the structures and features discussed above with respect the source conduit connector 125 of FIG. 1A.

[0050] FIG. 2B illustrates a perspective view of the source conduit connector 125 facing the terminal aperture 150 and showing, formed on the interior surface, a locking tab 151 and the alignment tab 152.

[0051] FIG. 2C illustrates a side perspective view of the source conduit connector 125 showing the source aperture 145.

[0052] FIG. 2D illustrates a side view of the source conduit connector 125 showing the source aperture 145, the terminal aperture 150, a finger groove 202, and the sensor port 130.

[0053] FIG. 2E illustrates a cross-sectional view of the source conduit connector 125 taken along the indicated line in FIG. 2D. FIG. 2E shows the source aperture 145, the terminal aperture 150 and, on the interior surface, the locking tabs 151 and the alignment tab 152.

[0054] FIG. 2F illustrates a terminal aperture 150 facing view of the source conduit connector 125 showing the sensor port 130 and, on the interior surface, the locking tabs 151 and the alignment tab 152.

[0055] FIG. 2G illustrates a sensor port aperture facing view of the source conduit connector 125 showing the aperture of the sensor port 130 opening into the body of the source conduit connector 125. In FIG. 2G, the sensor port 130 is shown substantially adjacent and perpendicular to the terminal aperture 150, away from the source aperture 145.

[0056] FIGS. 3A and 3B illustrate perspective views of the connecting adapter 140 of FIG. 1A from a source aperture 305 side and a terminal aperture 310 side, respectively. In the illustrated embodiment, the connecting adapter 140 includes a substantially cylindrical tube having two locking fingers 153 extending from the source aperture 305. The locking fingers 153 can be spaced apart to form

an insertion aperture 312 for the sensor probe 135 (FIG. 1A) to fit between the fingers 153. The insertion aperture 312 can provide an opening through which a portion of the sensor probe 135 extends into the gas delivery conduit 100, in order to sample airflow from within the gas delivery conduit 100 (FIG. 1A). The insertion aperture 312 can also allow the sensor probe 135 to be positioned closer to the nasal cannula 110 (FIG. 1A), for example, by allowing the connecting adapter 140 to extend around or over the sensor probe 135, towards the airflow source 115 (FIG. 1A). In one embodiment, the insertion aperture 312 allows the sensor probe 135 to be placed closer to the patient while simultaneously allowing a portion of the connecting adapter 140 to engage with the source conduit connector 125 (FIG. 1A). For example, without the insertion aperture 312, the sensor probe 135 may have to be placed past the ends 314 of the connecting adapter 140, further away from the nasal cannula 110, which can eliminate, inhibit or reduce some of the potential benefits discussed above for placing the sensor probe 135 closer to the patient.

[0057] In some embodiments, each locking finger 153 includes a locking recess 154 formed on the outer surface of the locking finger 153. In one embodiment, the locking recesses 154 are configured to lock with the locking tabs of the source conduit connector 125. In some embodiments, the locking fingers 153 include a flexible or semi-rigid material such that sufficient longitudinal force can cause the locking recesses 154 to pass over locking tabs 151 of the source conduit connector 125, thereby releasing the connecting adapter 140 from the source conduit connector 125. For example, pushing the connecting adapter 140 into the source conduit connector 125 (on assembly or connection) or pulling out the adapter 140 (on disconnection) can cause the locking tabs of the source conduit connector 125 to engage or disengage with the locking recesses 154 of the locking finger 153.

[0058] The connecting adapter 140 can include a locking channel 160 formed along the circumference of its external surface. In FIG. 3A, the edges of the channel are bounded by collars 320, 325 at the source and terminal apertures. Ridges, such as on the terminal conduit connector 120 (FIG. 1A), can lock into the

channel 160. For example, pushing the connecting adapter 140 into the terminal conduit connector 120 (on assembly or connection) or pulling out the adapter 140 (on disconnection) can cause the ridges of the terminal conduit connector 120 to engage or disengage with the locking channel 160. The collars can prevent or inhibit disconnection of the ridges due to longitudinal force (e.g., force along the conduit 100 axis), while allowing the ridges to rotate along the locking channel 160. In some embodiments, the terminal collar 320 includes a flexible or semi-rigid material such that sufficient longitudinal force can cause the ridges to pass over the collar 320 and cause the connecting adapter 140 to release from the terminal conduit connector 120.

[0059] The connecting adapter 140 can have one or more optional spines 330 formed longitudinally on its interior surface. The spines 330 can provide rigidity to the connecting adapter and, in one embodiment, are spaced evenly along the interior circumference of the connecting adapter 140. In one embodiment, the spines 330 are tapered and can provide greater rigidity on one end compared to the other. For example, the source aperture 305 side of the connecting adapter 140 may need greater flexibility in order to attach and/or detach with the source conduit connector 125 and the spines 330 can taper (in height or width) towards the source aperture 305.

[0060] In some embodiments, the connecting adapter 140 can have one, two, three, four or more locking fingers 153 or spines 330. In some embodiments, other types of connection mechanisms can be used, such as, for example, a threaded mechanism, pinion mechanism, friction fit, circlip and/or adhesive or other chemical connector.

[0061] In some embodiments, different types of connecting adapters can be provided for connecting different types of conduit connectors. For example, a respirator conduit can have a different type of source conduit connector than a humidifier conduit. By changing the connecting adapter, the same nasal cannula can be connected to either the respirator conduit or the humidifier conduit. By providing interchangeable connecting adapters, the nasal cannula does not have to

be changed, thereby minimizing patient discomfort by eliminating or reducing the need to replace the nasal cannula attached to the patient. Likewise, different types of terminal conduit connectors can be connected to the same type of source conduit connector by changing adapters. For example, the nasal cannula can be replaced with a face mask having a different terminal conduit connector type by attaching it to the same humidifier by using a different connecting adapter. The interchangeability of the connectors can potentially speed up the setup of gas delivery conduits, which can be particularly beneficial in emergency situations.

[0062] FIGS. 3C-3G illustrate various views of the connecting adapter 140 of FIG. 1C. This embodiment shares many of the structures and features discussed above with respect the connecting adapter 125 of FIG. 1A.

[0063] FIG. 3C illustrates a top view of the connecting adapter 140 showing two locking fingers 153 extending from the body of the connecting adapter 140 and two locking recesses 154 formed on the exterior surface of the locking fingers 154. In some embodiments, raised strips 350 form the bottom boundary of the recesses 154 on the respective locking fingers 153. Each raised strip 350 can provide additional support and/or rigidity to each locking recess 350, allowing a more secure connection of the locking recesses with the corresponding locking tabs.

[0064] FIG. 3D illustrates a side view of the connecting adapter 140 showing a locking finger 153 extending from the body of the connecting adapter 140, a locking recess 154 formed on the exterior surface of the locking fingers, and the locking channel 160 formed along the circumference of the adapter's external surface. In the embodiment of FIG. 3D, the locking finger 153 widens from its end 314 to its base 340. By widening at its base, where the finger 153 connects with the body of the connecting adapter 140, the strength of the locking finger 153 is enhanced, making it more difficult to deform the locking finger 153 and disconnect it when it is engaged with the locking tab 151 of the source conduit connector 125. Additionally, the raised strip 350 can also enhance the strength of the locking finger 153.

[0065] FIG. 3E illustrates a perspective view of the terminal conduit connector 120 facing aperture of the connecting adapter 140. FIG. 3E shows the locking finger 153, the locking recess 154, the locking channel 160 and the spines 330 formed longitudinally on the interior surface of the connecting adapter.

[0066] FIG. 3F illustrates a front facing view of an aperture of the connecting adapter 140 facing the terminal conduit connector 120. FIG. 3G illustrates a front facing view of an aperture of the connecting adapter 140 facing the source conduit connector 125. The spines 330 are shown formed on the interior surface of the adapter 130.

[0067] FIGS. 4A and 4B illustrate a perspective view of the source aperture 155 side of the terminal conduit connector 120 and a top view of the terminal conduit connector 120 of FIG. 1A. FIG. 4A illustrates the terminal conduit connector 120 without the connecting adapter 140 inserted, while FIG. 4B illustrates the terminal conduit connector 120 with the connecting adapter 140. In the illustrated embodiment, the terminal conduit connector 120 includes ridges 405 spaced along the circumference of the interior surface of the terminal conduit connector 120. In one embodiment, the ridges 405 are protrusions or tabs formed longitudinally by surrounding cutouts, or axially, along the terminal conduit connector 120. The ridges 405 and surrounding cutouts can decrease frictional engagement with the connecting adapter 140, thereby improving rotatability. The ridges 405 can be tapered, in width or in height. The tapering can allow insertion of the connecting adapter 140 to be accomplished with less force while requiring more force for removing the connecting adapter 140 as a larger surface area of each locking tab engages with the terminal collar 320 (FIG. 3A) of the connecting adapter 140. In one embodiment, a locking groove 410 is formed along the circumference of the terminal conduit connector 120 and is configured to engage with the terminal collar 320 of the connecting adapter 140, thereby increasing the longitudinal force needed to disengage the terminal conduit connector 120 from the connecting adapter 140.

[0068] In one embodiment, the terminal conduit connector 120 includes a terminal aperture 165 on the terminal conduit connector 120 configured to receive a cannula tube of a nasal cannula 110 (FIG. 1A). The terminal aperture 165 can include two openings for receiving a double conduit cannula tube, wherein each conduit connects, on the opposite end of the tube, to a prong for insertion into a patient's nostril. In the illustrated embodiment, the openings are optionally surrounded by an angled surface configured to funnel airflow into the double conduit cannula tube, which can improve airflow. The terminal conduit connector 120 can also include one or more finger grooves 415 formed on the outside surface of the terminal conduit connector 120 in order to provide additional purchase or friction to a user, for example, for connecting or disconnecting the connector 105 (FIG. 1A) components. In FIG. 4A, multiple finger grooves 415 are spaced along the outside circumference of the terminal conduit connector 120.

[0069] Other configurations of the terminal conduit connector 120 are possible. For example, in some embodiments, the locking tab 405 is a single, continuous ridge. In other embodiments, the ridges 405 are formed perpendicular or angled relative to the axis of the terminal conduit connector 120. In some embodiments, the locking groove 410 is not included. The aperture 165 can be a single opening. For example, the aperture 165 can be configured to receive a single conduit to a face mask.

[0070] FIGS. 4C-4G illustrate various views of the terminal conduit connector 120 of FIG. 1C. This embodiment shares many of the structures and features discussed above with respect the terminal conduit connector 120 of FIG. 1A.

[0071] FIG. 4C illustrates a side view of the terminal conduit connector 120 showing the terminal apertures 165 for receiving nasal cannula and the source aperture 155. A first portion of the body of the terminal conduit connector 120 that receives the connecting adapter 140 is a first height. A second portion of the body of the terminal conduit connecter 120 that receives the nasal cannula is a second, lower height.

[0072] FIG. 4D illustrates a top down view of the terminal conduit connector 120 showing the terminal apertures 165 and the source aperture 155. The first portion of the body of the terminal conduit connector 120 has a first width while the second portion of the body has a second, narrower width.

[0073] FIG. 4E illustrates a facing view of the terminal apertures 165. FIG. 4F illustrates a facing view of the source aperture 155 that shows the ridges 405 spaced along the circumference of the interior surface of the terminal conduit connector 120.

[0074] FIGS. 5A-5C illustrate longitudinal cross-sectional views of the connector 105 embodiment of FIG. 1A. FIGS. 5A-5C illustrate the terminal collar 320 of the connecting adapter 140 engaged with the locking groove 410 of the terminal conduit connector 120. A portion of the sensor probe 135 fits between the fingers 153 of the connecting adapter. FIGS. 5A-5C illustrate the fingers 153 fitting against the alignment tabs 152. In one embodiment, the source conduit connector 125 includes an inner cylinder 505 within an outer cylinder 510, forming an insertion groove 515 for receiving the delivery tube 115 (FIG. 1A). In one embodiment, pressure from the inner and outer cylinders maintains a pressure fit with the delivery tube 115, keeping the delivery tube 115 connected to the source conduit connector 125.

[0075] FIG. 6 illustrates a cross-section taken along an axis 167 of FIG. 1B facing towards the nasal cannula 110 (FIG. 1A) and illustrates the engagement of the connecting adapter 140 with the source conduit connector 125. In the illustrated embodiment, the source conduit connector 125 and terminal conduit connector 120 are attached via the connecting adapter 140. The locking tabs 151 formed on the interior surface of the source conduit connector 125 engage with the recesses 154 on the fingers 153 of the connecting adapter 140. The engagement inhibits longitudinal movement of the adapter and limits accidental disengagement of the connector 105 (FIG.1A). The alignment tabs 152 can guide the fingers 153 into position for engagement.

[0076] As illustrated in FIG. 6, the sensor port 130 provides the sensor probe 135 with access to the airflow within the gas delivery conduit 100 (FIG. 1A).

Airflow from the airflow source passes by the sensor probe 135 before exiting through the terminal aperture 165 of the terminal conduit connector 120.

[0077] As will be apparent, there are many possible embodiments for the connector 105. For example, in some embodiments, the connector 105 does not include a connecting adapter 140 or another component. In some embodiments, elements, such as tabs, protrusions, recesses, channels or grooves, are located on different components. For example, while the above disclosure describes a first element of a connecting mechanism (e.g., protrusion or tab) to be located on a first component while a second element of the connecting mechanism (e.g., recess, channel or groove) is located on a second component, in some embodiments, the locations of the elements can be switched, with the first element on the second component and the second element on the first component. In some embodiments, certain elements may not be included. In one embodiment, a first connector component can be configured to attach over a second connector component while in another embodiment, the second connector component can be configured to attach over the first connector component.

[0078] In some embodiments, different types of connections can be used to attach the components of the connector 105. For example, adhesives or other chemical agents may be used to permanently affix some components together. In other examples, different mechanical connection mechanisms can be used, such as a snap fit, thread, friction fit or circlip. The components of the connector 105 can be composed of various types of flexible, semi-rigid, or rigid materials. For example, the connecting adapter 140 and source conduit connector 125 can include polypropylene materials and the terminal conduit connector 120 can include of THERMOLAST materials. Other materials such as plastics, thermoplastics, silicone, glass-filled nylon, metal, spring steel, polycarbonate, PVC, polyethylene, rubber (e.g., natural or vulcanized), polyurethane, or the like can be used. For example, in one embodiment, the connecting adapter 140 includes ABS plastic, the source conduit connecter 125 includes polypropylene, and/or the terminal conduit connector 120 includes thermoplastic elastomer.

[0079] In some embodiments, some of the releasable connection mechanisms can be stronger than others. In one embodiment, the connection formed by the connecting adapter 140 with the source conduit connector 125 is weaker than the connection formed by the connecting adapter 140 with the terminal conduit connector 120. Thus, pulling apart the conduit connectors 120, 125 can cause the connecting adapter 140 to separate from the source conduit connector 125 while remaining connected to the terminal conduit connector 120. This configuration can facilitate changing patient interfaces by allowing another patient interface to be easily or quickly attached to the source conduit connector 125. Other configurations are possible, for example, the connecting adapter 140 can be configured to remain connected with the source connecting conduit 125.

[0080] In some embodiments, the connections of the connector 105 are configured to allow a quick connect or quick release of the connector 105 components. For example, the components can be configured to connect or release with a single motion (e.g., when pushed together or pulled apart). The components can be configured to self-align during engagement, such that the connecting mechanisms of the components align automatically. In another example, the connections of the connector 105 with the gas delivery tube 115 (FIG. 1A) and/or the nasal cannula 110 can be stronger relative to other connections (e.g., the connections with the connecting adapter 140), such that longitudinal force applied to the gas delivery conduit 100 causes those other, weaker connections to disconnect first. In some embodiments, the connections with the gas delivery tube 115 and/or the nasal cannula 110 are permanent or semi-permanent, in order to eliminate or reduce accidental disconnections.

[0081] Other embodiments of the connector 105 are possible. In some embodiments, the terminal aperture 165 includes a single opening, two openings, or three or more openings. There can be one, two, or more than two finger grooves 415 (FIG. 4A) on the outside. In some embodiments, the gas delivery conduit 100 or portions of the conduit can be attached to the patient via a lanyard (e.g., around the patient's neck), clip, or other fastening mechanism. The seals formed by the

components can be air-tight or can allow some air to leak. In some embodiments, components of the connector 105 can be colored differently to indicate a size of the connector. For example, red can indicate adult sized connectors while blue can indicate infant connectors. In some embodiments, the gas deliver conduit 100 can include one or more spring tube sections, which can increase flexibility.

[0082] The components of the connector 105 can be formed in various sizes, depending on its intended use. For example, connectors for gas delivery conduits 100 for children or infants can be smaller than connectors for gas delivery conduits 100 for adults. In some embodiments, the source conduit connector 125 has an outer diameter in the range of 5-30mm, though this diameter may be larger or smaller in other embodiments. In one embodiment, the outer diameter is about 15mm. The other connector components 105 can be sized correspondingly to the source conduit connector 125. For example, the other components may be sized approximately the same as the source conduit connector 125 in order to engage with it.

[0083] FIG. 7 illustrates an alternate connector embodiment 700 of the connector of FIG. 1A. In FIG. 7, the terminal conduit connector 705 includes dual ball and socket connections 710 for individually connecting cannula tubes to the terminal conduit connector. The ball and socket connections 710 can be moved independently of each other. This can allow the cannula tubes to be untwisted or untangled separately, thereby facilitating adjustment of the nasal cannula. In addition, while longer cannula tubes generally allow a greater degree of adjustments of the nasal cannula, the greater freedom of movement provided by the ball and socket connections 710 can potentially provide similar degrees of adjustments while allowing cannula tubes of shorter length to be used.

[0084] FIG. 8 illustrates another alternate connector embodiment 800 of the connector of FIG. 1A. In FIG. 8, the terminal conduit connector 805 and sensor probe 810 connects substantially perpendicularly to the source conduit connector 815. The source conduit connector 815 connects to a swivel tube 820 that in turn connects to a gas delivery tube 825. As the sensor probe, terminal conduit

connector and source conduit connector are rotatably attached to the gas delivery tube via the swivel tube 820, the connector can be laid flat on a patient's bed, potentially increasing patient comfort or keeping the connector out of the way. In the illustrated embodiment, the connector 800 is shaped to form a substantially 90 degree angle, thereby redirecting airflow over the sensor probe 810 and into the nasal cannula 830. This redirection of the airflow can advantageously allow the sensor probe 810 to detect disconnection of the terminal conduit connector 805 by detecting a change in the airflow. For example, the sensor probe 810 can detect a change in the direction, speed or compositions (e.g., humidity or temperature) of the airflow and determine that the terminal conduit connector 805 is no longer attached to redirect the airflow.

[0085] FIG. 9 illustrates another alternate connector embodiment 900 of the connector of FIG. 1A. In FIG. 9, the terminal conduit connector 905 can connect either substantially perpendicularly or substantially straight with the source conduit connector 910. The dual orientation of the terminal conduit connector 905 can provide greater flexibility in adjusting the nasal cannula 920.

[0086] The source conduit connector 910 can include an aperture 930 through which the sensor probe 925 can partially extend into the terminal conduit connector 910, thus placing the sensor probe 925 closer to the entry point of the airflow into the cannula. In the illustrated embodiment, the aperture 930 is notched to allow the sensor probe 925 to extend past the aperture 930. This can allow the sensor probe 925 to gather more accurate measurements of the temperature, humidity or other parameter of the gases inhaled by the patient.

[0087] FIG. 10 illustrates another alternate connector embodiment 1000 of the connector of FIG. 1A. In FIG. 10, a terminal conduit connector 1005 connects to a connecting adapter 1010, which connects to a source conduit connector 1015. The connecting adapter 1010 includes a collar 1020 having a greater diameter than the adjacent terminal conduit connector and source conduit connector. Thus, when the connector is assembled, a portion of the collar 1020 extends past the outer housing of the connected terminal conduit connector and source conduit connector

and remains visible as a ring. The collar 1020 can be colored to indicate sizing information for the connector 1000. The collar 1020 can also provide a better friction hold to a user, thereby allowing a shorter connector to provide similar amount of frictional grip, which can facilitate the attachment and/or detachment of the connector components.

[0088] FIG. 11A and FIG. 11B illustrate another alternate connector embodiment 1100 of the connector of FIG. 1A. In FIG. 11, a terminal conduit connector 1105 fits within a source conduit connector 1110, while a threaded cap 1115 fits over the terminal conduit connector 1105 and engages with a threaded end 1120 of the source conduit connector. The threaded cap 1115 engages with a collar of the terminal conduit connector 1125 and keeps the terminal conduit connector pressed against the source conduit connector. Fins 1126 formed on the body of the terminal conduit connector 1105 can provide a space between the exterior of the terminal conduit connector 1105 and the interior of the source conduit connector 1110.

[0089] In one embodiment, the threaded cap 1115 only engages with some of the thread flutes on the threaded end 1120 of the source conduit connector. For example, if the threaded end 1120 has six thread flutes, the thread cap 1115 is configured to engage with only three of the flutes, leaving the other three thread flutes vacant. The partial engagement of the threads can allow condensate collecting in the connector to escape out along the vacant threads, along an outflow path 1135, thereby preventing or inhibiting condensate from entering the cannula 1130. The outflow path 1135 or venting channel can be partly formed by the space 1137 between the exterior of the terminal conduit connector 1105 and the interior of the source conduit connector 1110.

[0090] FIG. 12 illustrates another alternate connector embodiment 1200 of the connector of FIG. 1A. In FIG. 12, a terminal conduit connector 1205 connects to a connecting adapter 1210, which connects to a source conduit connector 1215. The connecting adapter includes an end 1220 for connecting with the terminal

conduit connector 1205, for example, via threads or friction fit. The source aperture 1225 of the connecting adapter 1210 fits over the source conduit connector 1215.

[0091] FIG. 13 illustrates another alternate connector embodiment 1300 of the connector of FIG. 1A. In FIG. 13, a terminal conduit connector 1305 connects to a source conduit connector 1310. Locking tabs 1315 formed on a connecting end of the terminal conduit connector engage with other locking tabs within the source conduit connector 1310. Twisting the terminal conduit connector 1305 relative to the source conduit connector 1310 can cause the locking tabs 1315 to disengage, allowing the connector 1300 to be separated.

[0092] FIG. 14 illustrates another alternate connector embodiment 1400 of the connector of FIG. 1A. In FIG. 14, a terminal conduit connector 1405 connects to a source conduit connector 1410. A locking thread 1415 formed on a connecting end of the terminal conduit connector engages with the source conduit connector. Twisting the terminal conduit connector 1405 relative to the source conduit connector 1410 can cause the locking thread 1415 to disengage, allowing the connector 1400 to be separated.

[0093] In one embodiment, one side of the conduit connector 1410 can be configured to engage with another component using a unique or proprietary connection mechanism while the other side of the conduit connector 1410 uses a generic or standard connection mechanism. The generic connection can allow connection to a variety of components, made by different manufacturers. Meanwhile, the proprietary connection only allows connection to components of a single or a select set of manufacturers. Providing two different types of connectors can be beneficial in situations when one component requires greater accuracy than another and requiring use of a particular component allows components with known or predetermined characteristics to be used. Meanwhile, the generic connection can provide greater interoperability. In one example embodiment, the generic connection 1420 attaches using a friction fit while the proprietary connection 1425 connects with the locking thread 1415.

[0094] FIG. 15 illustrates another alternate connector embodiment 1500 of the connector of FIG. 1A. In FIG. 15, a terminal conduit connector 1505 connects a source conduit connector 1510. The edge of the source conduit connector 1510 can engage with a locking groove 1512 on the terminal conduit connecter 1505. An O-ring seal 1515 creates a seal between the terminal conduit connector and source conduit connector. In the illustrated embodiment, a sensor port 1520 is formed on the source conduit connector away from the source conduit connector's connection with the terminal conduit connector.

[0095] FIG. 16 illustrates another alternate connector embodiment 1600 of the connector of FIG. 1A. In FIG. 16, a terminal conduit connector 1605 connects with a connecting adapter 1610, which connects with a source conduit connector 1615. In the illustrated embodiment, the connecting adapter 1610 includes three fingers 1620 for engaging with the source conduit connector 1615. The fingers 1620 can be spaced apart to create an insertion aperture 1630 for a sensor probe 1605 to fit between two of the fingers 1620. The insertion aperture 1630 allows the sensor probe 1605 to be positioned closer to the nasal cannula 1635. For example, without the insertion aperture 1630, the sensor probe 1605 may have to be placed past the ends of the connecting adapter 1610, further away from the nasal cannula 1635.

[0096] FIG. 17 illustrates an embodiment of a conduit connector 1700 having an integrated sensor probe 1705. The sensor probe 1705 is positioned to fit into an insertion aperture formed by two fingers of a connecting adapter (e.g., connecting adapter 140 of FIG. 1). By fitting into an insertion aperture, the sensor probe 1705 can be positioned closer to a nasal cannula. In the illustrated embodiment, the sensor probe 1705 is positioned at approximately the same distance from an aperture 1707 of the conduit connector 1700 as locking tabs 1720. The sensor probe 1705 fits between the fingers of the connecting adapter when the fingers engage with the locking tabs 1720. In one embodiment, the conduit connector 1700 does not have a sensor port.

[0097] FIGS. 18A-18C illustrate different views of an embodiment of a conduit connector 1800 having a receptacle for a detachable sensor probe. In the illustrated embodiment of FIG. 18A, the receptacle includes channels 1805, 1810 for receiving the sensor probe. The channels 1805, 1810 can extend partially or wholly within an interior surface of the conduit connector 1800. The sensor probe can be plate-shaped, rectangular shaped, oval shaped, diamond shaped or any other shape configured to be received by the receptacle. In one embodiment, the sensor probe comprises alignment tabs configured to engage with the channels 1805, 1810. The alignment tabs can be configured to position the sensor probe into a predetermined position within the conduit connector 1800, such as a position where sensor measurements can be more effectively taken or a position between an insertion aperture formed by one or more locking fingers of a connecting adapter.

[0098] In one embodiment, the receptacle can include a catch, notch, tab, wall or other structure for locking or securing the sensor probe in place once the predetermined position is reached. In some embodiments, the receptacle can include other structures for receiving and/or securing the sensor probe in addition or alternatively to the channels 1805, 1810. For example, the receptacle can comprise ridges configured to engage with channels on the sensor probe. The conduit connector 1800 can also include one or more locking tabs 1820.

[0099] FIG. 18B illustrates a back perspective view and FIG. 18C illustrates a cross-sectional view of the embodiment of FIG. 18A. In the illustrated embodiment, an insertion groove for a second conduit, such as a hose or deliver tube, is formed by a space between the outer wall 1825, 1830 and an inner wall 1827, 1832 of the conduit connector 1800. In the illustrated embodiment, and end of the outer wall extends past an end 1822 of the inner wall. However, in other embodiments, the inner and outer wall may be the same length or the inner wall may extend past the outer wall.

[0100] FIGS. 19A-19B illustrate an alternate connector adapter embodiment configured to connect with the source conduit connector embodiment of FIGS. 20A-20B.

[0101] FIG. 19A illustrates a side view of the connecting adapter facing one of two locking fingers 153 and its locking recess 154. A channel 160 formed on the body of the connecting adapter provides an engagement surface for a corresponding terminal conduit connector, as shown in various embodiments of the disclosure. In FIG. 19A, the locking recess 154 extends across the locking finger 153 to provide engagement with an annular locking ring on the source conduit connector embodiment of FIGS. 20A-20B.

[0102] FIG. 19B illustrates a perspective view of the connecting adapter of FIG. 19A showing the locking fingers 153 and its locking recess 154.

[0103] FIGS. 20A-20B illustrate an alternate source conduit connector 125 embodiment having an annular ring for attaching to the alternate connector adapter embodiment of FIGS. 19A-19B.

[0104] FIG. 20A illustrates a perspective view of the source conduit connector facing the terminal aperture 150 side. Formed within the interior surface of the source conduit connecter is an annular locking ring 2005 formed by a raised strip running circumferentially within the body of the source conduit connector. The locking recesses 154 of the connecting adapter of FIGS. 19A and 19B are configured to engage with the annular locking ring 2005 when the connecting adapter is inserted into the source conduit connector.

[0105] FIG. 20B illustrates a cross sectional view taken along the indicated cross section line in FIG. 20A. The cross-sectional view shows the annular locking ring 2005 formed on the interior surface of the source conduit connecter.

[0106] FIGS. 21A-D illustrate different views of an embodiment of a nasal cannula 2100 that connects to an airflow source via the various connector embodiments discussed in the disclosure. In some embodiments, the nasal cannula is for infants.

[0107] FIG. 21A illustrates a top perspective view of the patient facing side of the nasal cannula 2100. The nasal cannula 2100 includes two prongs

2105a, 2105b that fit into the patient's nostrils. Airway tubes 2110 extend from the prongs and connect to an air source (e.g., via the connector 105 of FIG. 1A).

[0108] FIG. 21B illustrates a top perspective view of the external side of the nasal cannula 2100 facing away from the patient. FIG. 21B shows the two prongs 2105a, 2105b and two airway tubes 2110a, 2110b connected to the two prongs.

[0109] FIG. 21C illustrates a side view of the nasal cannula 2100 showing one of the prongs 2105 and one of the airway tubes 2110.

[0110] FIG. 21D illustrates a bottom view of the nasal cannula 2100 showing the two prongs 2105a, 2105b and the two airway tubes 2110a, 2110b connected to the two prongs.

[0111] In some embodiments, certain features can be associated with different components or left out. For example, the connection mechanism in the terminal conduit connector 120 can be implemented by the source conduit connector 125 and/or the connection mechanism of the source conduit connector 125 can be implemented by the terminal conduit connector 120. In another example, the sensor port 130 can be located on the terminal conduit connector 120 rather than the source conduit connector 125. Some features can be implemented by a different component (e.g., the terminal conduit connector 120, source conduit connector 125 or connecting adapter 140) rather than in the component described as implementing the feature in the above disclosure.

[0112] Conditional language used herein, such as, among others, "can," "could," "might," "may," "e.g.," and the like, unless specifically stated otherwise, or otherwise understood within the context as used, is generally intended to convey that certain embodiments include, while other embodiments do not include, certain features, elements and/or states. Thus, such conditional language is not generally intended to imply that features and/or elements are in any way required for one or more embodiments.

[0113] Although the foregoing disclosure has been described in terms of certain preferred embodiments, other embodiments will be apparent to those of

ordinary skill in the art from the disclosure herein. It is contemplated that various aspects and features of the disclosure described can be practiced separately, combined together, or substituted for one another, and that a variety of combination and subcombinations of the features and aspects can be made and still fall within the scope of the disclosure. Accordingly, the present disclosure is not intended to be limited by the recitation of the preferred embodiments, but is to be defined by reference to the appended claims.

[0114] The foregoing description of the invention includes preferred forms thereof. Modifications may be made thereto without departing from the scope of the invention.

We Claim:

1. A connector assembly for a gas delivery conduit for providing gases to a patient, the connector assembly comprising:

a first conduit connector, and

a connecting adapter configured to releasably attach the first conduit connector to a second conduit connector, the connecting adapter comprising:

a connecting adapter body; and

one or more locking fingers configured to releasably attach to the first conduit connector, the one or more locking fingers protruding longitudinally from the connecting adapter body; and

the first conduit connector comprising:

a first conduit body; and

one or more locking tabs configured to releasably attach with the one or more locking fingers of the connecting adapter, the one or more locking tabs formed on an interior surface of the first conduit body, and

an alignment tab formed on an interior surface of the first conduit body, the alignment tab configured to automatically align the one or more locking fingers of the connecting adapter with the one or more locking tabs of the first conduit connector upon insertion of the connecting adapter within the first conduit connector.

2. The connector assembly of claim 1, wherein the first conduit connector further comprises a sensor port for receiving a sensor probe, the sensor port formed substantially perpendicularly adjacent to an aperture on the first conduit body, the aperture configured to receive the connecting adapter into the first conduit body.

3. The connector assembly of claim 2, wherein the sensor port forms an opening into an insertion aperture formed by the one or more locking fingers of the connecting adapter when the connecting adapter is attached to the first conduit connector, the opening configured to allow the sensor probe to extend into the insertion aperture.

4. The connector assembly of claim 2, wherein the sensor port is formed on the first conduit body such that ends of the one or more locking fingers of the connecting adapter extends past an opening formed by the sensor port when the connecting adapter is attached to the first conduit connector.

5. The connector assembly of any one of claims 1 to 4, wherein the first conduit connector further comprises a sensor probe positioned to fit into an insertion aperture formed by the one or more locking fingers of the connecting adapter when the connecting adapter is attached to the first conduit connector.

6. The connector assembly of any one of claims 1 to 5, wherein the first conduit connector further comprises a receptacle for receiving a detachable sensor probe, the receptacle formed within the first conduit body, the receptacle configured to position the detachable sensor probe into an insertion aperture formed by the one or more locking fingers of the connecting adapter when the connecting adapter is attached to the first conduit connector.

7. The connector assembly of any one of claims 1 to 6, wherein engagement of the one or more locking tabs of the first conduit connector with the one or more locking fingers of the connecting adapter generates an audible sound.

8. The connector assembly of any one of claims 1 to 7, wherein the connecting adapter is configured to provide a quick connect mechanism between the first conduit connector and the second conduit connector.

9. The connector assembly of any one of claims 1 to 8, wherein the connecting adapter comprises two locking fingers.

10. The connector assembly of any one of claims 1 to 9, wherein the connector assembly is configured to attach an airflow source with a breathing device for a patient.

11. The connector assembly of any one of claims 1 to 10, wherein the patient breathing device comprises a nasal cannula.

12. The connector assembly of claim 10 or claim 11, wherein the airflow source comprises a humidifier.

13. The connector assembly of claim 10 or 12, wherein the airflow source comprises an oxygen source.

14. A connector for a gas delivery conduit, the connector configured to attach an airflow source with a breathing device for a patient, the connector comprising:

a first conduit body comprising a first aperture for connecting with an airflow source and a second aperture for connecting with a breathing device;

a second conduit body formed substantially perpendicularly on the first conduit body, the second conduit body including a third aperture for receiving a sensor probe and providing the sensor probe with access to airflow within the first conduit body; and

a locking tab formed on an interior surface of the first conduit body, the locking tab configured to releasably attach with a connecting mechanism attached to the breathing device;

wherein the second conduit body is substantially adjacent to the second aperture of the first conduit body, and

the connector further comprising an alignment tab formed on the interior surface of the first conduit body, the alignment tab configured to automatically align a locking finger of the connecting mechanism with the locking tab.

15. The connector of claim 14, wherein the alignment tab comprises a single continuous ridge formed circumferentially on the interior surface of the first conduit body, the single continuous ridge alternating from a first distance toward the second aperture to a second distance away from the second aperture.

16. The connector of any one of claims 14 to 15, wherein the breathing device comprises a nasal cannula.

17. The connector of any one of claims 14 to 16, wherein the airflow source comprises a humidifier.

18. The connector of any one of claims 14 to 17, wherein the airflow source comprises an oxygen source.

19. The connector of any one of claims 14 to 18, wherein the sensor probe is configured to measure at least one of humidity and temperature.

20. The connector of any one of claims 14 to 19, wherein the first conduit body is substantially cylindrical.

21. A conduit connector for a gas delivery conduit, the conduit connector comprising:

a conduit connector body;

a locking tab configured to releasably attach with a connecting adapter, the locking tab formed on an interior surface of the conduit connector body; and

an alignment tab configured to self-align the connecting adapter with the locking tab when the connecting adapter is attached to the conduit connector body, the alignment tab formed on the interior surface of the conduit connector body.

22. The conduit connector of claim 21, wherein the alignment tab comprises a single continuous ridge formed circumferentially on the interior surface of the conduit connector body.

23. The conduit connector of claim 21 or claim 22, wherein the conduit connector comprises a sensor port for receiving a sensor probe, the sensor port formed adjacent to an aperture on the conduit connector body, the aperture adjacent the locking tab.

24. The conduit connector of claim 23, wherein the sensor port is formed substantially perpendicularly to the conduit connector body.

25. The conduit connector of claim 23 or claim 24, wherein the sensor port is configured to allow the sensor probe to extend into an insertion aperture formed by the connecting adapter when the connecting adapter is attached to a first conduit connector.

26. The conduit connector of any one of claims 23 to 25, wherein the sensor port is closer to said aperture than an end of the connecting adapter when the connecting adapter is attached to the conduit connector.

27. The conduit connector of any one of claims 21 to 26, further comprising a sensor formed adjacent an aperture of the conduit connector

body and at the same distance or closer to the aperture than the locking tabs, wherein the aperture is configured to connect with the connecting adapter.

28. The conduit connector of any one of claims 21 to 27, wherein the locking tab comprises an annular ring circumferentially formed on the interior surface of the conduit connector body.

29. The conduit connector of any one of claims 21 to 28, wherein the locking tab comprises a raised protrusion formed on the interior surface of a first conduit body.

30. A connecting adapter configured to releasably attach a first conduit connector to a second conduit connector, the connecting adapter comprising:

a connecting adapter body having one or more locking fingers configured to releasably attach to the first conduit connector, the one or more locking fingers protruding longitudinally from the connecting adapter body; and

one or more locking recesses formed on respective locking fingers, the one more locking recesses configured to engage with locking tabs formed on an interior surface of the first conduit connector, and

wherein the connecting adapter is configured to interact with one or more alignment tabs on the first conduit connector such that the one or more locking recesses are aligned with one or more locking tabs on the first conduit connector when the connecting adapter is connected to the first conduit connector.

31. The connecting adapter of claim 30, wherein locking fingers are configured to extend at least partially around a sensor probe within the first conduit connector.

32. The connecting adapter of any one of claims 30 to 31, wherein the one or more locking fingers of the connecting adapter are configured to mechanically couple with the first conduit connector such that the mechanical coupling provides a space for a sensor probe in an area of the mechanical coupling.

33. The connecting adapter of any one of claims 30 to 32, wherein the connecting adapter further comprises:

a channel formed on an outside surface of the connecting adapter body, the channel configured to rotatably engage with one or more connecting ridges formed on an inside surface of the second conduit connector.

34. The connecting adapter of any one of claims 30 to 33, wherein the first conduit connector connects to an airflow source and the second conduit connector connects to a cannula.

35. A connector assembly, the connector assembly comprising:

a first connector to provide gases to a patient interface, the first connector comprising a locking groove formed around a circumference of an interior surface of the first connector, the first connector providing for a first aperture receivable of a connecting adapter, and a second aperture receivable of a conduit,

the connecting adapter comprising:

a collar for engagement with the locking groove of the first connector, and

a connecting adapter body with one or more locking fingers configured to releasably attach to the first connector, the one or more locking fingers protruding longitudinally from the connecting adapter body,

one or more locking recesses formed on respective locking fingers the one more locking recesses configured to engage with locking tabs formed on an interior surface of the second connector and;

a second connector, the second connector comprising a first aperture for connecting with an airflow source, and a second aperture receivable of the connecting adapter, the second connector comprising:

one or more locking tabs configured to releasably attach with the one or more locking fingers of the connecting adapter

an alignment tab formed on an interior surface of the second connector, the alignment tab configured to automatically align the one or more locking fingers of the connecting adapter with the one or more locking tabs of the second connector upon insertion of the connecting adapter within the second connector.

36. The connector assembly of claim 35, wherein the alignment tab is configured to automatically align the one or more locking fingers of the connecting adapter with the one or more locking tabs of the second connector by causing the connecting adapter to rotate relative to the first connector upon insertion of the connecting adapter within the first connector.

37. The connector assembly of claim 35 or claim 36, wherein the first connector provides for a pneumatic seal with the second connector.

38. The connector assembly of any one of claims 35 to 37, wherein the first connector comprises at least one lip located around the first aperture, the at least one lip providing for a sealing surface for sealing with the second connector.

39. The connector assembly of any one of claims 35 to 38, wherein the interior surface of the first connector comprises at least one ridge.

40. The connector assembly of claim 39, wherein the at least one ridge is formed longitudinally.

41. The connector assembly of claim 39 or claim 40, wherein the at least one ridge is tapered in width or height.

42. The connector assembly of any one of claims 35 to 41, wherein the connector further comprises one or more finger grooves formed on an outside surface of a terminal conduit connector.

43. The connector assembly of any one of claims 35 to 42, wherein the at least one second aperture of the first connector comprises two openings, each opening receivable of a conduit to provide gases to a patient interface.

44. The connector assembly of claim 43, wherein the two openings are located adjacent to each other.

45. The connector assembly of claim 43 or claim 44, wherein each conduit connects at a terminal end to a prong for insertion into a patient's nostril.

46. The connector assembly of any one of claims 35 to 45, wherein the at least one second aperture of the first connector is surrounded by an angled surface of the connector, the angled surface configured to funnel airflow into said conduit.

47. The connector assembly of any one of claims 35 to 46, wherein the connector is colored to indicate sizing information of the connector or an associated patient interface.

48. The connector assembly of any one of claims 35 to 47, wherein the second aperture of the first connector is a terminal aperture configured to receive a conduit of a patient interface.

49. The connector assembly of any one of claims 35 to 48, wherein the first aperture of the first connector is a source aperture configured to receive a flow of gases.

50. The connector assembly of any one of claims 35 to 49, wherein the first aperture of the first connector and second aperture of the first connector are substantially co-axial.

51. The connector assembly of any one of claims 35 to 50, wherein the first aperture of the first connector is larger in diameter than the second aperture of the first connector.

52. A connector assembly comprising:

a first connector, the first connector comprising one or more locking tabs formed on an interior surface of the first connector, and

a second connector, the second connector comprising:

a first aperture and

a second aperture,

one or more locking fingers, the locking fingers configured to releasably attach with the one or more locking tabs of the first connector, to removably couple the first connector and the second connector, and

wherein the first connector comprises an alignment tab formed on an interior surface of the second connector, the alignment tab configured to automatically align the one or more locking fingers of the second connector with the one or more locking tabs of the second connector upon insertion of the first connector within the second connector.

53. The connector assembly of claim 52, wherein the second aperture of the connector is a terminal aperture configured to receive a conduit of a patient interface.

54. The connector assembly of claim 52 or claim 53, wherein the first aperture of the connector is a source aperture configured to receive a flow of gases.

55. The connector assembly of any one of claims 52 to 54, wherein the at least one second aperture is surrounded by an angled surface of the connector, the angled surface configured to funnel airflow into a conduit of a patient interface.

56. The connector assembly of any one of claims 52 to 55, wherein the first connector or the second connector comprises a connector body, and at least one receptacle comprising a channel for receiving a sensor probe.

57. The connector assembly of claim 56, wherein the sensor probe is one of: plate-shaped, rectangular shaped, oval shaped, or diamond shaped.

58. The connector assembly of claim 56 or claim 57, wherein the sensor probe is positioned to fit into an insertion aperture formed by two fingers of said second connector.

59. The connector assembly of any one of claims 52 to 58, wherein the at least one channel extends partially, or wholly, within an interior surface of the connector body.

60. The connector assembly of any one of claims 52 to 59, wherein the connector comprises one channel or, two channels, optionally the channels are opposing.

61. The connector assembly of any one of claims 52 to 60, wherein one or more locking recesses are formed on respective locking fingers.

62. The connector assembly of claim 61, wherein the locking recesses of the locking fingers of the second connector are configured to engage with the locking tabs of the first connector.

63. The connector assembly of any one of claims 52 to 62, wherein the locking fingers extend from a body of the second connector.

64. The connector assembly of any one of claims 52 to 63, wherein the alignment tab is configured to automatically align the one or more locking fingers of the second connector with the one or more locking tabs of

the second connector by causing the first connector to rotate relative to the second connector.

65. A nasal cannula assembly comprising the connector of any one of claims 14 to 20.

66. A conduit connector assembly comprising:

a first conduit connector, the first conduit connector comprising one or more locking tabs formed on an interior surface of the first conduit connector,

a second conduit connector, the second conduit connector comprising:

one or more locking fingers, the locking fingers configured to releasably attach with the one or more locking tabs of the first connector, to removably couple the first conduit connector and the second conduit connector, and

wherein the first conduit connector comprises an alignment tab formed on an interior surface of the first conduit connector, the alignment tab configured to automatically align the one or more locking fingers of the second conduit connector with the one or more locking tabs of the first conduit connector upon insertion of the second conduit connector within the first conduit connector.

67. The conduit connector assembly of claim 66, wherein the second conduit connector comprises a first aperture and a second aperture.

68. The conduit connector assembly of claim 67, wherein the second aperture of the second conduit connector is a terminal aperture configured to receive a conduit of a patient interface.

69. The conduit connector assembly of claim 67 or 68, wherein the first aperture of the second conduit connector is a source aperture configured to receive a flow of gases.

70. The conduit connector assembly of any one of claims 67 to 69, wherein the at least one second aperture is surrounded by an angled surface

of the second conduit connector, the angled surface configured to funnel airflow into said conduit.

71. The conduit connector assembly of any one of claims 66 to 70, wherein the first conduit connector or the second conduit connector comprises a conduit connector body, and at least one receptacle comprising two channels for receiving a sensor probe.

72. The conduit connector assembly of claim 71, wherein the two channels extend partially, or wholly, within an interior surface of the conduit connector body, optionally the channels are opposing.

73. The conduit connector assembly of any one of claim 71 or claim 72, wherein the sensor probe is one of: plate-shaped, rectangular shaped, oval shaped, or diamond shaped.

74. The conduit connector assembly of any one of claims 71 to 73, wherein the sensor probe is positioned to fit into an insertion aperture formed by two fingers of said second conduit connector.

75. The conduit connector assembly of any one of claims 66 to 74, wherein one or more locking recesses are formed on respective locking fingers.

76. The conduit connector assembly of claim 75, wherein the locking recesses of the locking fingers of the second conduit connector are configured to engage with the locking tabs of the first conduit connector.

77. The conduit connector assembly of any one of claims 66 to 76, wherein the locking fingers extend from a body of the second conduit connector.

78. The conduit connector assembly of any one of claims 66 to 77, wherein the alignment tab is configured to automatically align the one or more locking fingers of the second conduit connector with the one or more locking tabs of the first conduit connector by causing the second conduit connector to rotate relative to the first conduit connector.

79. A first conduit connector for a gas delivery conduit, the first conduit connector comprising:

a first conduit connector body;

one or more locking tabs configured to releasably attach with one or more locking fingers of a second conduit connector, the one or

more locking tabs formed on an interior surface of the first conduit connector body; and

an alignment tab configured to align the one or more locking fingers of the second conduit connector with the one or more locking tabs when the second conduit connector is attached to the first conduit connector, the alignment tab formed on the interior surface of the first conduit connector body.

80. The first conduit connector of claim 79, wherein the alignment tab comprises a single alternating ridge formed circumferentially on the interior surface of the first conduit body.

81. The first conduit connector of claim 79 or claim 80, wherein the first conduit connector comprises a sensor port for receiving a sensor probe, the sensor port formed adjacent to an aperture on the first conduit connector body, the aperture adjacent the locking tab.

82. The first conduit connector of claim 81, wherein the sensor port is formed substantially perpendicularly to the first conduit connector body.

83. The first conduit connector of claim 81, wherein the sensor port is configured to allow the sensor probe to extend into an insertion aperture formed by the second conduit connector when the second conduit connector is attached to the first conduit connector.

84. The first conduit connector of claim 81, wherein the sensor port is closer to the patient than an end of the second conduit connector when the second conduit connector is attached to the first conduit connector.

85. The first conduit connector of claim 79, further comprising a sensor formed adjacent an aperture of the first conduit body and at a same distance or closer to the aperture than the locking tabs, wherein the aperture is configured to connect with a connecting adapter.

86. The first conduit connector of claim 79, wherein the first conduit connector comprises at least one receptacle comprising a channel for receiving a sensor probe.

87. The first conduit connector of claim 79, wherein the locking tab comprises an annular ring circumferentially formed on the interior surface of the first conduit body.

88. The first conduit connector of claim 79, wherein the locking tab comprises a raised protrusion formed on the interior surface of the first conduit body.

89. The first conduit connector of claim 85, wherein the alignment tab is configured to align the one or more locking fingers of the second conduit connector with the one or more locking tabs of the first conduit connector by causing the connecting adapter to rotate relative to the connector when the second conduit connector is attached to the first conduit connector.

90. A second conduit connector configured to releasably attach to a first conduit connector, the second conduit connector comprising:

a second conduit connector body having one or more locking fingers configured to releasably attach to the first conduit connector, the one or more locking fingers protruding longitudinally from the second conduit connector body; and

one or more locking recesses formed on respective locking fingers, the one more locking recesses configured to engage with locking tabs formed on an interior surface of the first conduit connector, and wherein the second conduit connector is configured to interact with one or more alignment tabs on the first conduit connector such that the one or more locking recesses of the second conduit connector are aligned with one or more locking tabs on the first conduit connector when the second conduit connector is connected to the first conduit connector.

91. The second conduit connector of claim 90, wherein locking fingers are configured to extend at least partially around a sensor probe within the first conduit connector.

92. The second conduit connector of claim 90, wherein the one or more locking fingers of the second conduit connector are configured to mechanically couple with the first conduit connector such that the mechanical coupling provides a space for a sensor probe in an area of the mechanical coupling.

93. The second conduit connector of claim 90, wherein the first conduit connector connects to an airflow source and the second conduit connector connects to a cannula.

94. A connector adapter configured to releasably attach a first conduit connector to a second conduit connector, the connector adapter comprising:

a conduit body and two locking fingers extending from the conduit body, the locking fingers configured to releasably attach to the first conduit connector and protruding longitudinally from the conduit body,

each locking finger having a locking recess formed on an exterior surface thereof, each locking recess configured to engage with a corresponding locking tab formed on an interior surface of the first conduit connector,

wherein the locking fingers are configured to be directed by one or more alignment tabs on the first conduit connector such that each said locking recess is aligned with a corresponding locking tab on the first conduit connector when the connector adapter is brought into connection with the first conduit connector.

95. The connector adapter of claim 94, configured to rotate within a terminal aperture of the first conduit connector to effect said alignment of the locking recesses with the locking tabs.

96. The connector adapter of claim 94 or 95, wherein:

the one or more alignment tabs comprises a single alternating protrusion or ridge formed circumferentially on the interior surface of the first conduit connector or a plurality of protrusions or ridges, the protrusion(s) or ridge(s) alternating from a first distance toward a terminal aperture of the first conduit connector to a second distance away from the terminal aperture of the first conduit connector so as to form alternating valleys and apexes, and

the locking fingers are configured to be directed by the apexes into the valleys.

97. The connector adapter of any one of claims 94 to 96, wherein the locking tabs are formed opposite each other.

98. The connector adapter of any one of claims 94 to 97, wherein the conduit body comprises a substantially cylindrical tube defining a source aperture at one end and a terminal aperture at the other end, and wherein the locking fingers extend from the source aperture.

99. The connector adapter of any one of claims 94 to 98, wherein each locking finger widens along its length from its end distal from the conduit body to its base that connects each locking finger with the conduit body.

100. The connector adapter of any one of claims 94 to 99, configured to releasably attach to the second conduit connector by insertion of the connector adapter into a source aperture of the second conduit connector.

101. The connector adapter of any one of claims 94 to 100, configured such that the releasable attachment to the first conduit connector and the second conduit connector allows a quick connect or quick release thereof.

102. The connector adapter of any one of claims 94 to 101, wherein the components are configured to connect or release with a single motion when pushed together or pulled apart.

103. The connector adapter of any one of claims 94 to 102, configured to generate an audible click when engaged with the first conduit connector.

104. The connector adapter of any one of claims 94 to 103, configured such that locking of the locking tabs with the locking recesses formed on the locking fingers of the connector adapter forms a releasable seal.

105. The connector adapter of any one of claims 94 to 104, configured to connect with the second conduit connector via a friction fit.

106. The connector adapter of any one of claims 94 to 105, comprising any one or more of flexible, semi-rigid, rigid, polypropylene materials, plastics, thermoplastics, thermoplastic elastomer (TPE) silicone, glass-filled nylon, polycarbonate, PVC, polyethylene, rubber, and polyurethane.

107. The connector adapter of any one of claims 94 to 106, comprising a channel formed on an outside surface of the conduit body.

108. A connector assembly for a gas delivery conduit for providing gases to a patient, comprising:

the connector adapter of any one of claims 94 to 107; and

said second conduit connector.

109. The connector assembly of claim 108, wherein the second conduit connector comprises a source aperture configured to receive the connector adapter.

110. The connector assembly of claim 108 or 109, wherein the second conduit connector comprises a terminal aperture including a single opening.

111. The connector assembly of claim 110, wherein the opening is surrounded by an angled surface configured to funnel airflow into a cannula tube.

112. The connector assembly of any one of claims 108 to 110, wherein:

a first portion of a body of the second conduit connector that receives the connector adapter is a first height, a second portion of the body of the second conduit connector that receives a nasal cannula is a second, lower height, and/or

the first portion of the body of the second conduit connector has a first width while the second portion of the body has a second, narrower width.

113. The connector assembly of any one of claims 108 to 112, wherein the second conduit connector comprises a thermoplastic elastomer, or silicone.

114. The connector assembly of any one of claims 108 to 113, wherein the connection formed by the connector adapter with the first conduit connector is configured to be weaker than the connection formed by the connector adapter with the second conduit connector.

115. A patient breathing apparatus comprising the connector assembly of any one of claims 108 to 114, comprising a nasal cannula permanently or releasably attachable to the second conduit connector.

116. The patient breathing apparatus of claim 115, wherein the nasal cannula comprises two prongs that fit into a patient's nostrils and airway tubes extending from the prongs for connecting to an air source via the connector assembly.

117. The patient breathing apparatus of claim 115 or 116, wherein the first conduit connector connects to an airflow source.

118. The patient breathing apparatus of any one of claims 115 to 117, comprising a lanyard, clip or other fastening mechanism configured to attach the apparatus to a patient.

119. A connector adapter configured to releasably attach a first conduit connector to a second conduit connector, the connector adapter comprising:

a body comprising a substantially cylindrical tube extending between a terminal aperture and a source aperture, the substantially cylindrical tube having two locking fingers extending from the source aperture, each locking finger including a locking recess formed on an outer surface thereof,

wherein each locking finger widens along its length from its end to its base at the source aperture, and

wherein each locking recess is configured to engage with a corresponding locking tab formed on an interior surface of the first conduit connector, and

wherein the connector adapter is configured to interact with one or more alignment tabs on an interior surface of the first conduit connector such that each said locking recess is aligned with a corresponding locking tab on the first conduit connector when the connector adapter is brought into connection with the first conduit connector.

120. The connector adapter of claim 119, configured to rotate within a terminal aperture of the first conduit connector to effect said alignment of the locking recesses with the locking tabs.

121. The connector adapter of claim 119 or 120, wherein:

the one or more alignment tabs comprises a single alternating protrusion or ridge formed circumferentially on the

interior surface of the first conduit connector or a plurality of protrusions or ridges, the protrusion(s) or ridge(s) alternating from a first distance toward a terminal aperture of the first conduit connector to a second distance away from the terminal aperture of the first conduit connector so as to form alternating valleys and apexes, and

wherein the locking fingers are configured to be directed by the apexes into the valleys.

122. The connector adapter of any one of claims 119 to 121, configured to releasably attach to the second conduit connector by insertion of the connector adapter into a source aperture of the second conduit connector.

123. The connector adapter of any one of claims 119 to 122, configured such that the releasable attachment to the first conduit connector and the second conduit connector allows a quick connect or quick release thereof.

124. The connector adapter of any one of claims 119 to 123, wherein the components are configured to connect or release with a single motion when pushed together or pulled apart.

125. The connector adapter of any one of claims 119 to 124, configured to generate an audible click with engaged with the first conduit connector.

126. The connector adapter of any one of claims 119 to 125, configured such that locking of locking tabs formed on an interior surface of the first conduit connector with the locking recesses formed on the locking fingers of the connector adapter forms a releasable seal.

127. The connector adapter of any one of claims 119 to 126, configured to connect with the second conduit connector via a friction fit.

128. The connector adapter of any one of claims 119 to 127, comprising any one or more of flexible, semi-rigid, rigid, polypropylene materials, plastics, thermoplastics, silicone, glass-filled nylon, polycarbonate, PVC, polyethylene, rubber, polyurethane, ABS plastic.

129. The connector adapter of any one of claims 119 to 128, comprising a channel formed on an outside surface of the body.

130. The connector adapter of any one of claims 119 to 129, wherein the connector adapter is configured such that gases, in use, are received at the source aperture and delivered to the terminal aperture.

131. The connector adapter of any one of claims 119 to 130, wherein the two fingers are (i) spaced apart; and/or (ii) diametrically opposed from each other.

132. A connector assembly for a gas delivery conduit for providing gases to a patient, comprising:

the connector adapter of any one of claims 119 to 131; and

the second conduit connector.

133. The connector assembly of claim 132, wherein the second conduit connector comprises a source aperture configured to receive the connector adapter.

134. The connector assembly of claim 132 or 133, wherein the second conduit connector comprises a terminal aperture including a single opening.

135. The connector assembly of claim 134, wherein the opening is surrounded by an angled surface configured to funnel airflow into a cannula tube.

136. The connector assembly of any one of claims 132 to 135, wherein:

a first portion of a body of the second conduit connector that receives the connector adapter is a first height, a second portion of the body of the second conduit connector that receives a nasal cannula is a second, lower height, and/or

the first portion of the body of the second conduit connector has a first width while the second portion of the body has a second, narrower width.

137. The connector assembly of any one of claims 132 to 136, wherein the second conduit connector comprises a thermoplastic elastomer, plastics, thermoplastics, silicone, glass-filled nylon, polycarbonate, PVC, polyethylene, rubber, or polyurethane.

138. The connector assembly of any one of claims 132 to 137, wherein the connection formed by the connector adapter with the first conduit connector is weaker than the connection formed by the connector adapter with the second conduit connector.

139. A patient breathing apparatus comprising the connector assembly of any one of claims 132 to 138, comprising a nasal cannula permanently or releasably attachable to the second conduit connector.

140. A connector adapter configured to releasably attach a first conduit connector to a second conduit connector, the connector adapter comprising:

a conduit body having two locking fingers configured to releasably attach to the first conduit connector, the locking fingers protruding longitudinally from the conduit body; and

the locking fingers each having a locking recess formed on an exterior surface of the respective locking finger, the locking recesses configured to engage with locking tabs formed on an interior surface of the first conduit connector; and

each locking finger widens from its end to its base.

141. The connector adapter of claim 140, which is configured to interact with one or more alignment tabs on the first conduit connector such that the locking recesses are aligned with the locking tabs on the first conduit connector when the connector adapter is connected to the first conduit connector.

142. The connector adapter of claim 141, which is configured to rotate relatively to the first conduit connector upon interaction with the one or more alignment tabs, to effect said alignment of the locking recesses with the locking tabs.

143. The connector adapter of claim 141 or 142, wherein:

the one or more alignment tabs comprises a single alternating protrusion or ridge formed circumferentially on an interior surface of the first conduit connector or a plurality of protrusions or ridges, the protrusion(s) or ridge(s) alternating from a first distance toward a terminal aperture of the first conduit connector to a second distance away from the terminal aperture of the

first conduit connector so as to form a bowl or saddleback shape, with alternating valleys and apexes, and

the locking fingers are configured to be directed by the apexes into the valleys.

144. The connector adapter of any one of claims 140 to 143, wherein the conduit body has a source aperture and a terminal aperture, and the locking fingers protrude longitudinally from the source aperture of the conduit body.

145. The connector adapter of any one of claims 140 to 144, configured to releasably attach to the second conduit connector by insertion of the connector adapter into the second conduit connector.

146. The connector adapter of any one of claims 140 to 145, configured to connect with the second conduit connector via a friction fit.

147. The connector adapter of any one of claims 140 to 146, configured to provide a quick connect mechanism between the first conduit connector and the second conduit connector.

148. The connector adapter of any one of claims 140 to 147, wherein the connector adapter is configured to connect to or release from the first or second conduit connectors with a single motion when pushed together or pulled apart.

149. The connector adapter of any one of claims 140 to 148, wherein the locking tabs are configured to engage with the locking recesses with an audible click.

150. The connector adapter of any one of claims 140 to 149, configured such that locking of the locking tabs with the locking recesses forms a releasable seal.

151. A connector assembly for a gas delivery conduit for providing gases to a patient, comprising:

the connector adapter of any one of claims 140 to 150; and

said second conduit connector.

152. The connector assembly of claim 151, wherein the second conduit connector comprises a source aperture configured to receive the connector adapter.

153. The connector assembly of claim 151 or 152, wherein the second conduit connector comprises a terminal aperture including a single opening.

154. The connector assembly of any one of claims 151 to 153, wherein:

a first portion of a body of the second conduit connector is a first height, a second portion of the body of the second conduit connector is a second, lower height, and/or

the first portion of the body of the second conduit connector has a first width while the second portion of the body has a second, narrower width.

155. The connector assembly of any one of claims 151 to 154, wherein the connection formed by the connector adapter with the first conduit connector is configured to be weaker than the connection formed by the connector adapter with the second conduit connector.

156. The connector assembly of any one of claims 151 to 155, further comprising said first conduit connector.

157. A patient breathing apparatus comprising the connector assembly of any one of claims 151 to 156, comprising a nasal cannula and/or a lanyard, clip or other fastening mechanism configured to attach the patient breathing apparatus to a patient.

158. The patient breathing apparatus of claim 157, wherein the first conduit connector is configured to connect to an airflow source.

159. A nasal cannula assembly comprising the conduit connector of any one of claims 21 to 29.

160. A nasal cannula assembly comprising the connector assembly of any one of claims 1 to 13.

161. A nasal cannula assembly comprising the connecting adaptor of any one of claims 30 to 34.

162. A nasal cannula assembly comprising the connector assembly of any one of claims 35 to 64.

FIG. 1A

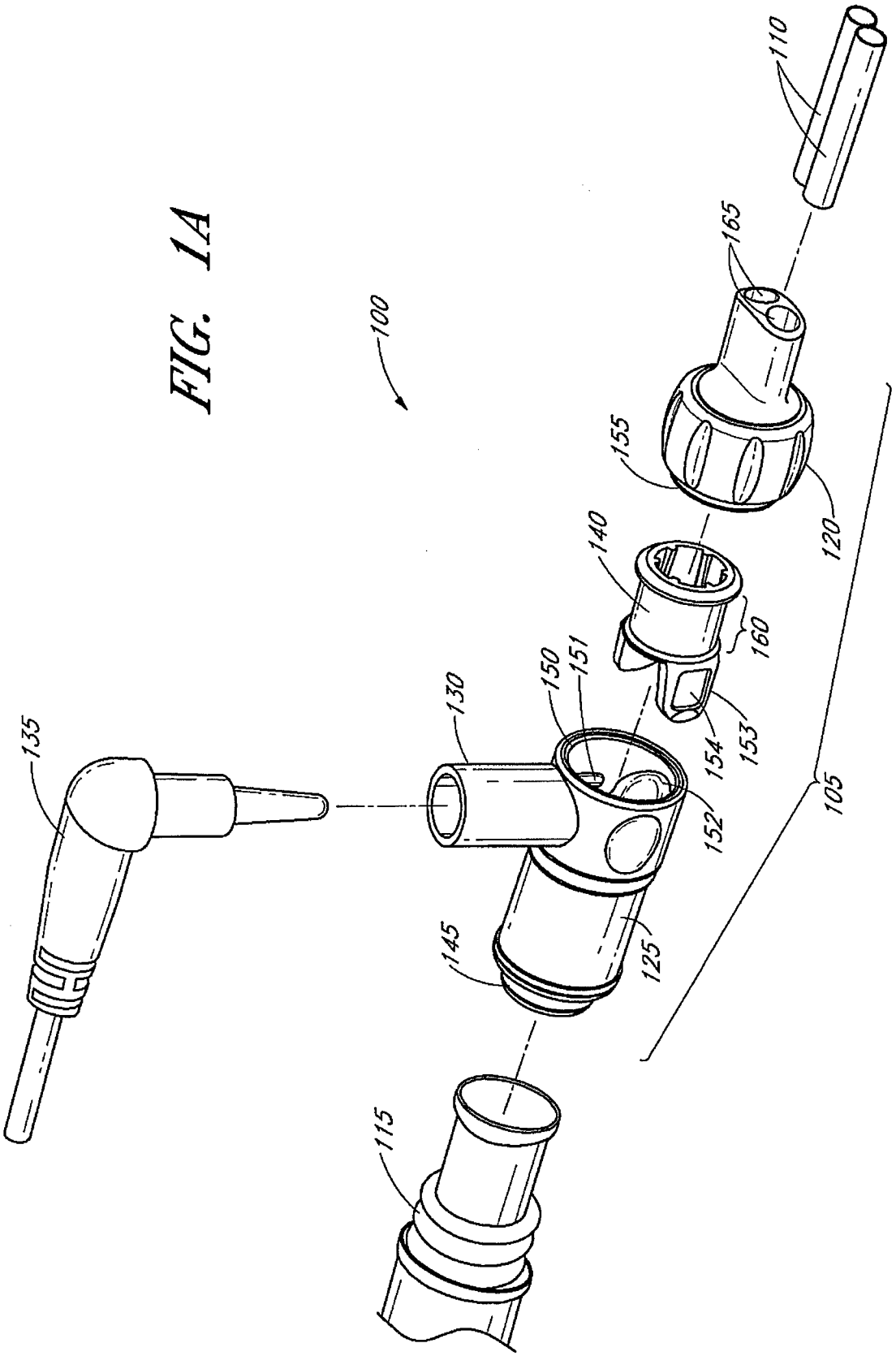
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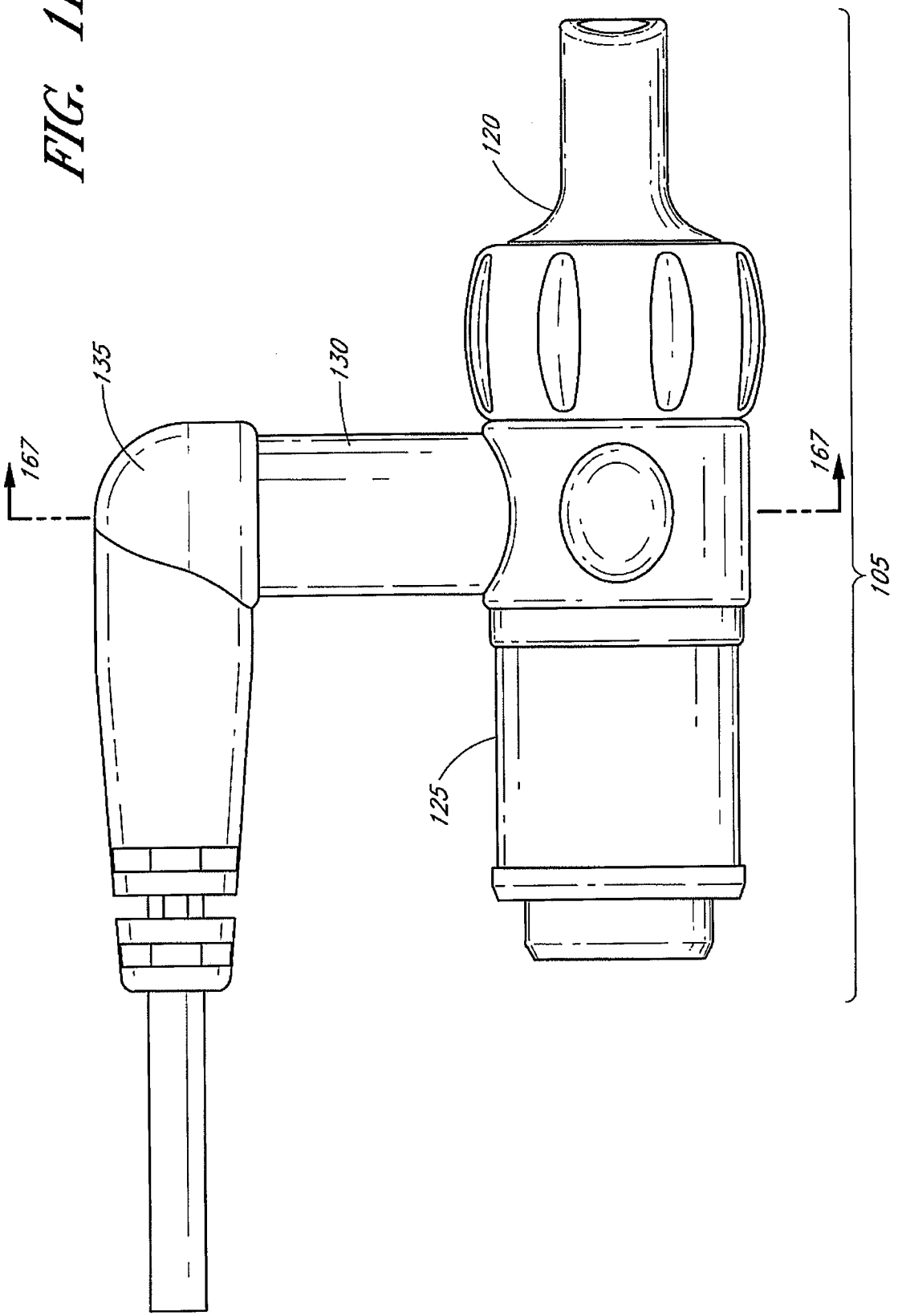
FIG. 1B



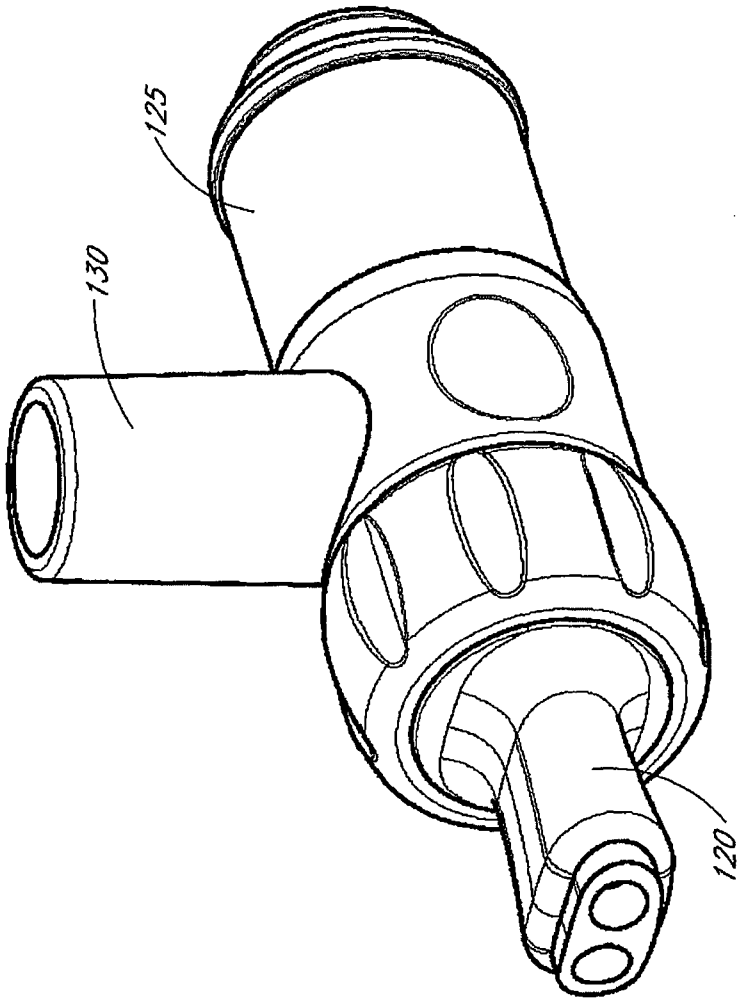


FIG. 1C

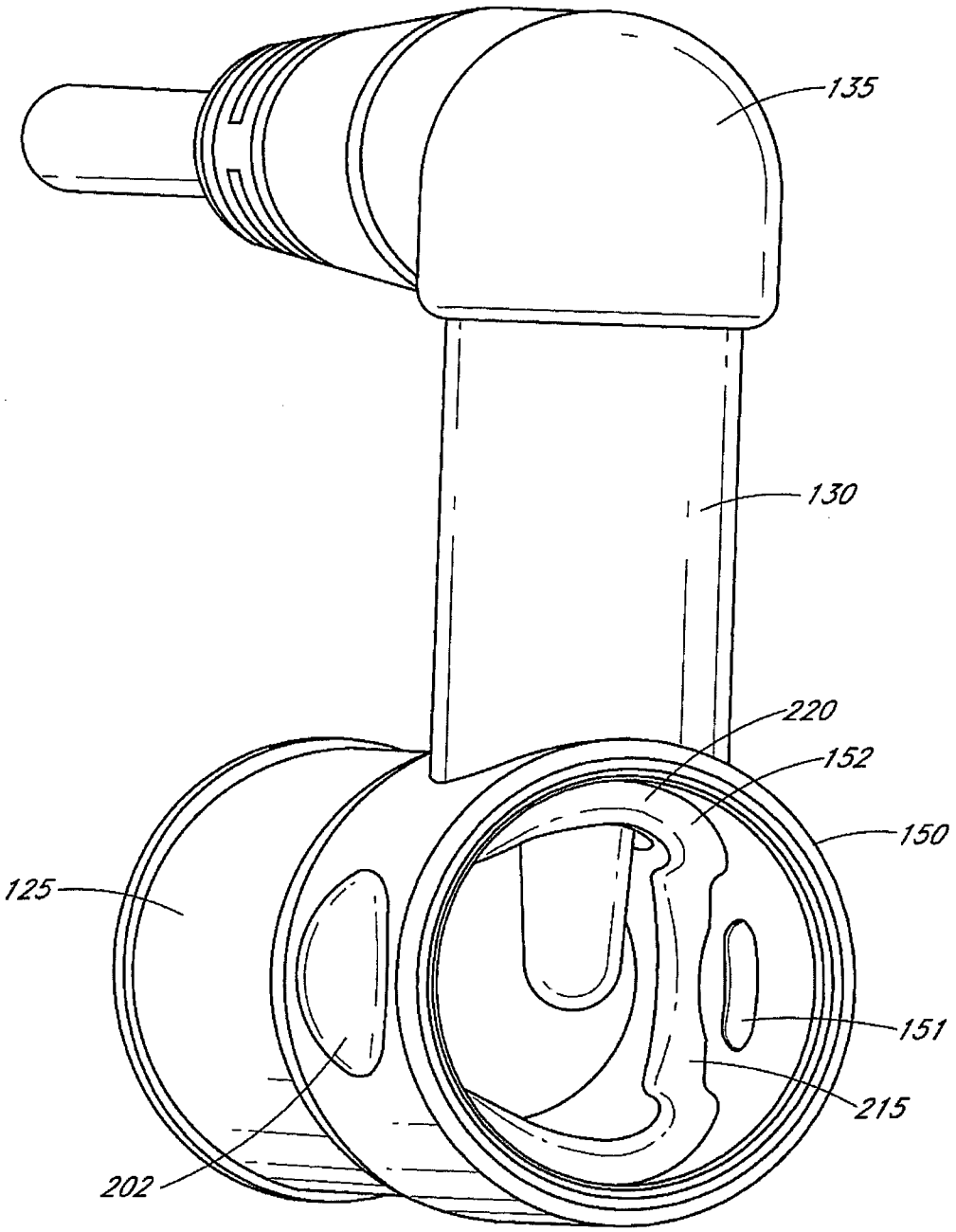


FIG. 2A

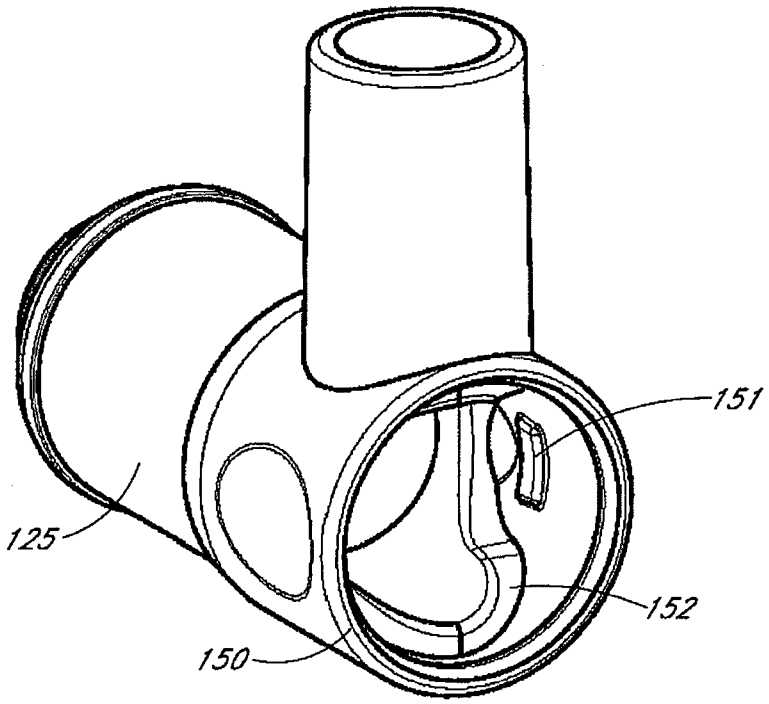


FIG. 2B

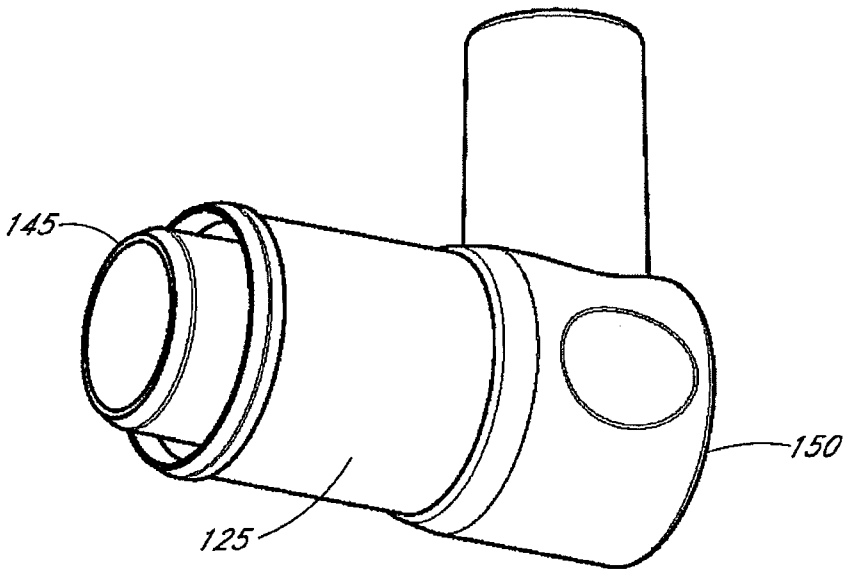


FIG. 2C

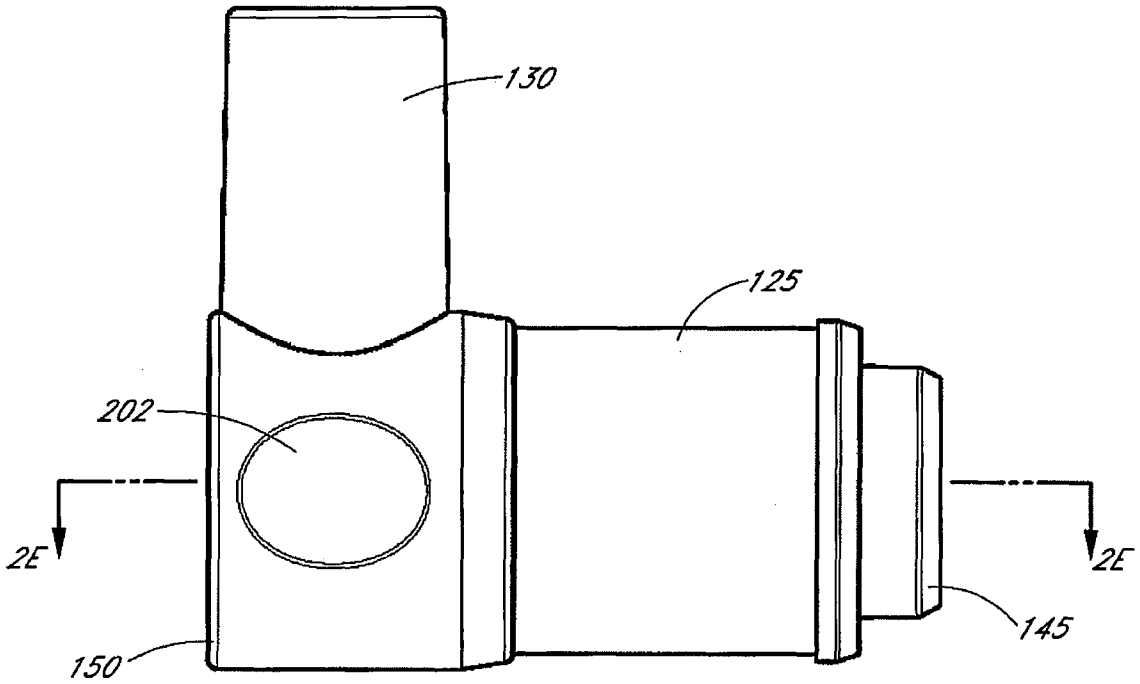


FIG. 2D

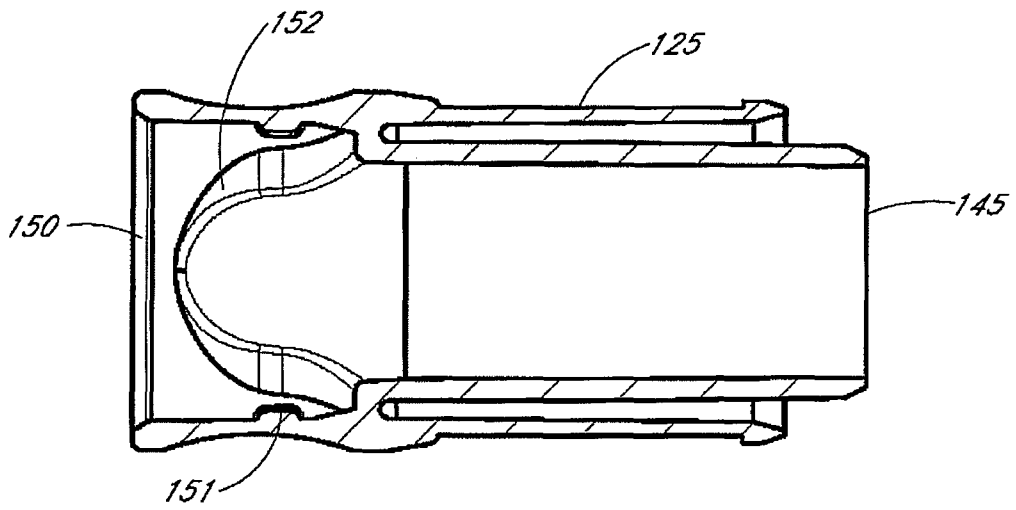


FIG. 2E

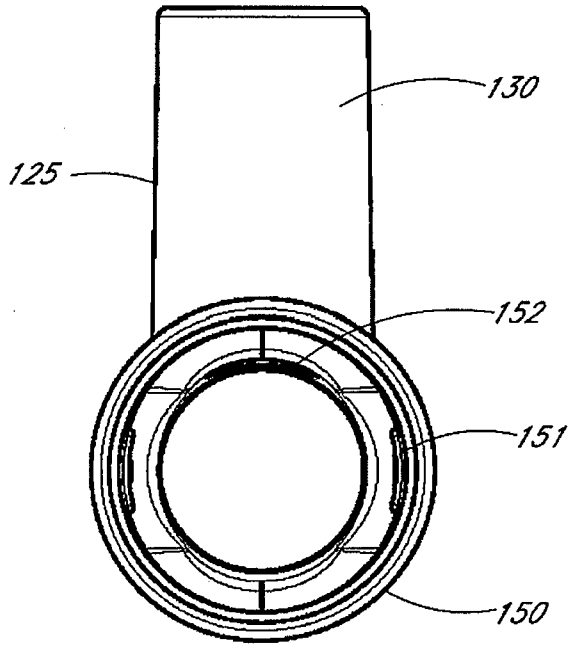


FIG. 2F

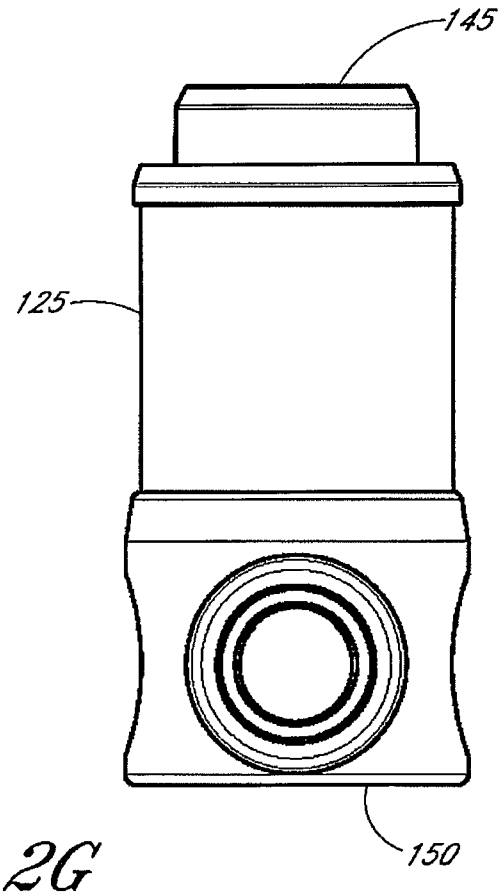


FIG. 2G

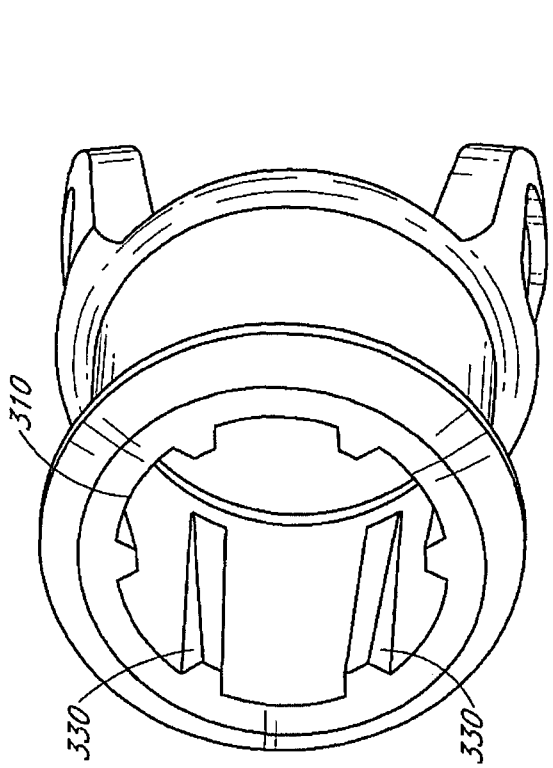


FIG. 3B

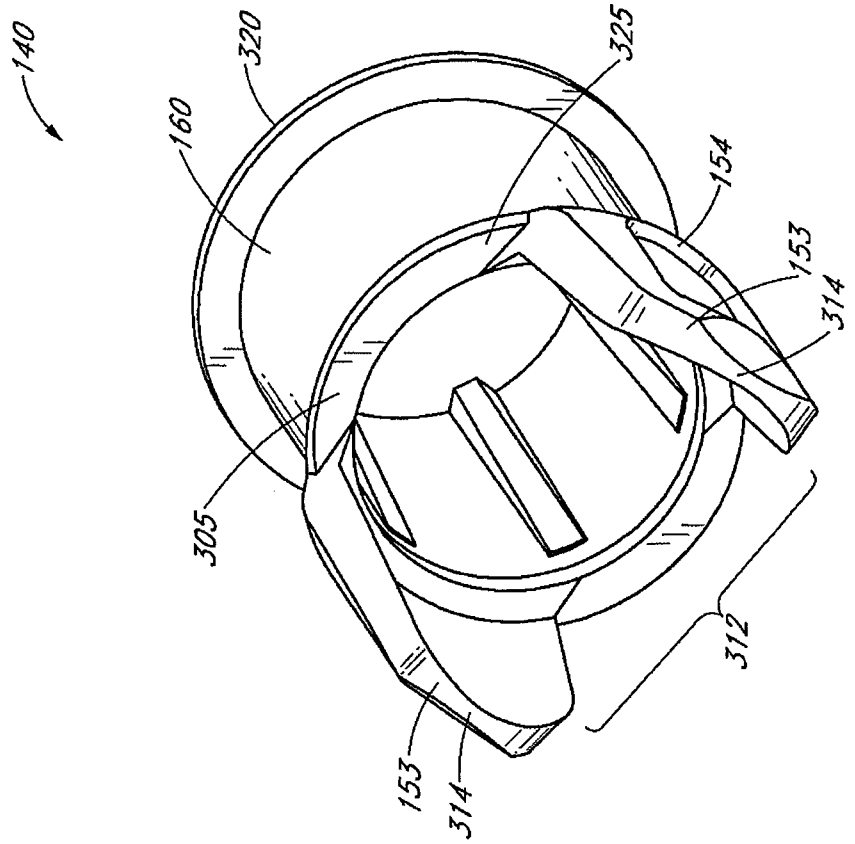


FIG. 3A

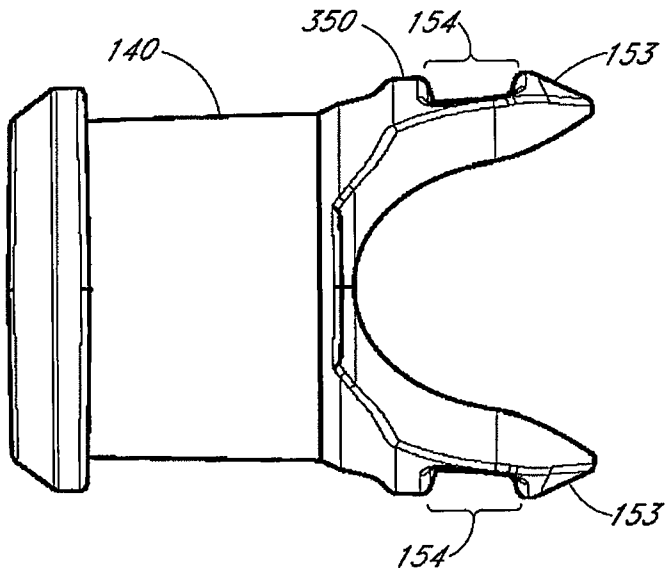


FIG. 3C

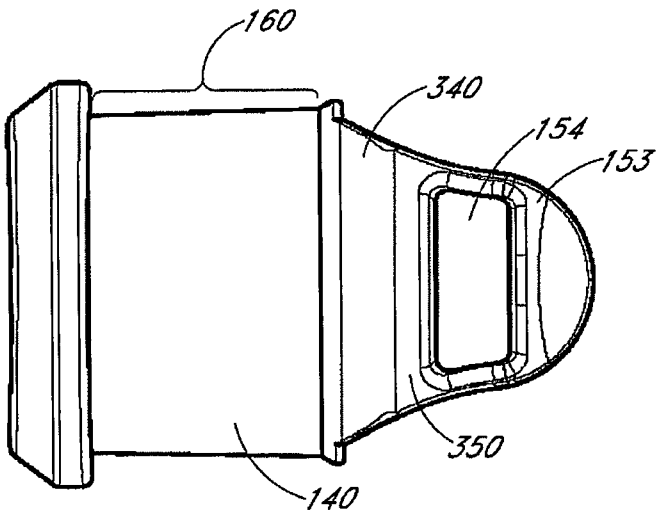


FIG. 3D

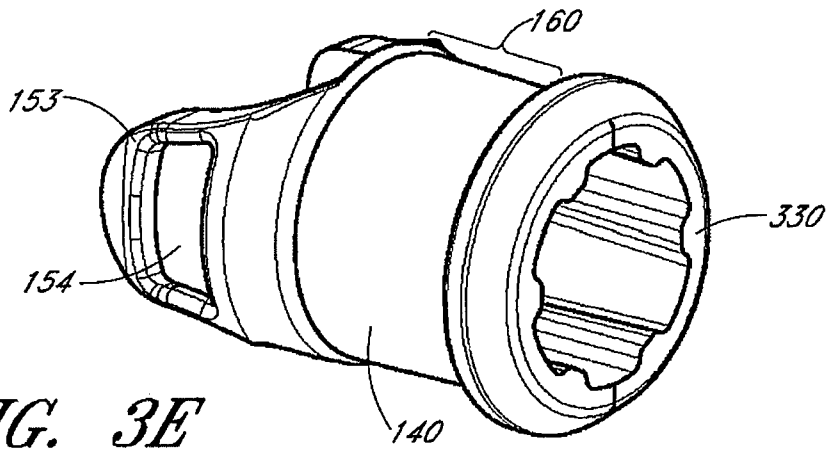


FIG. 3E

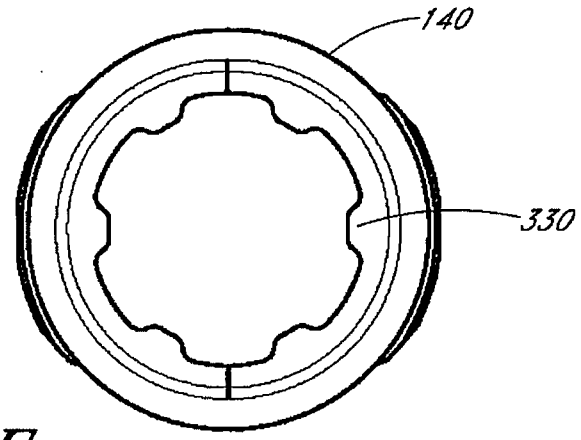


FIG. 3F

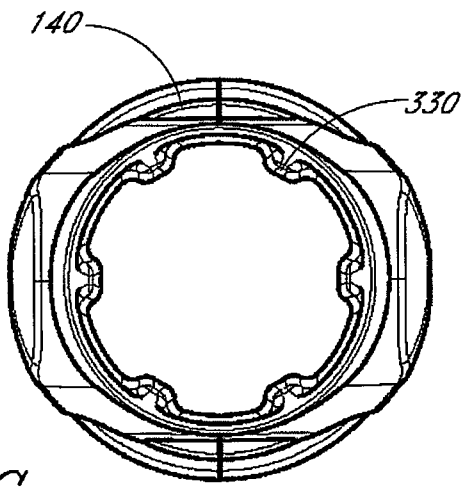


FIG. 3G

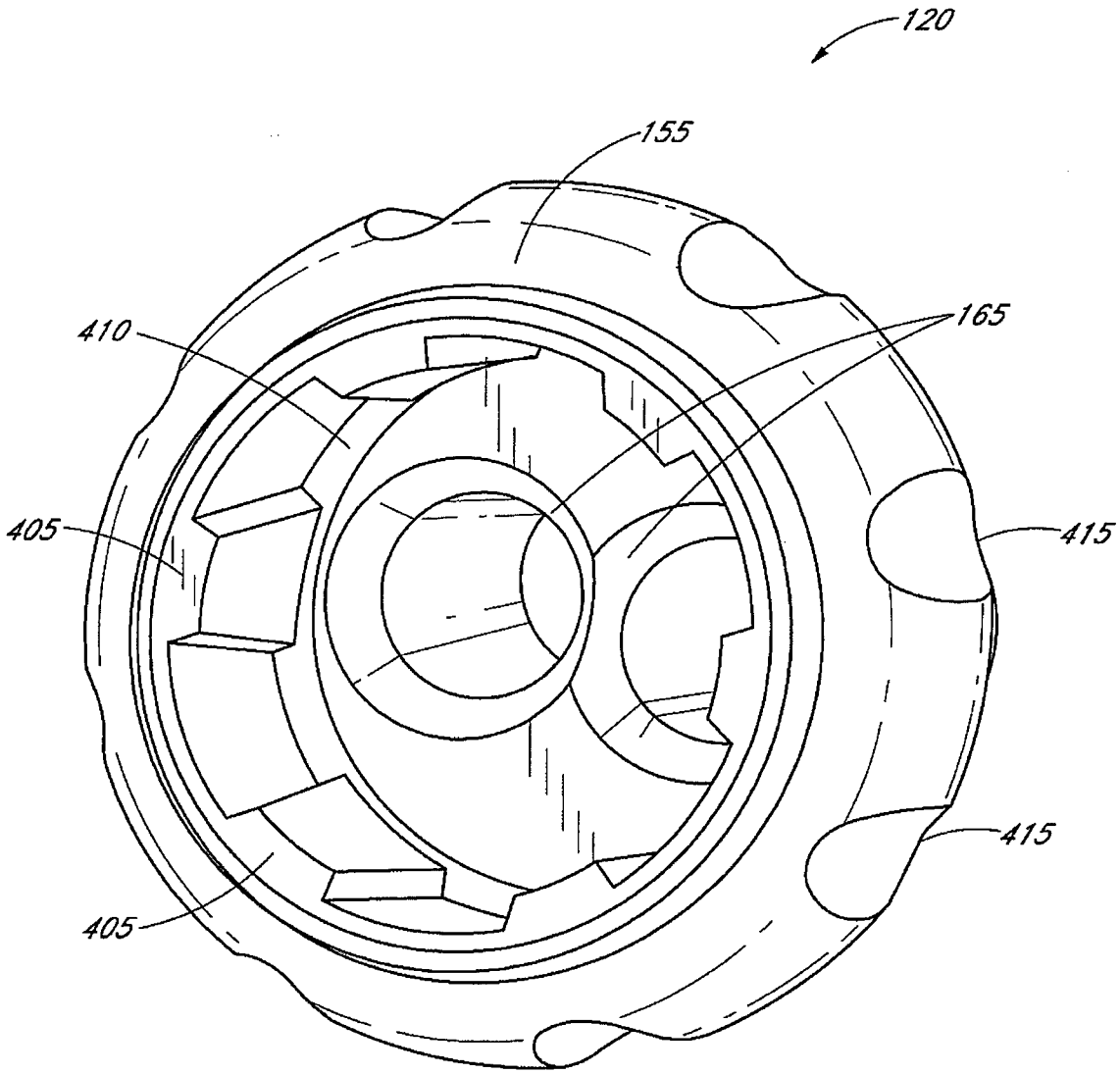


FIG. 4A

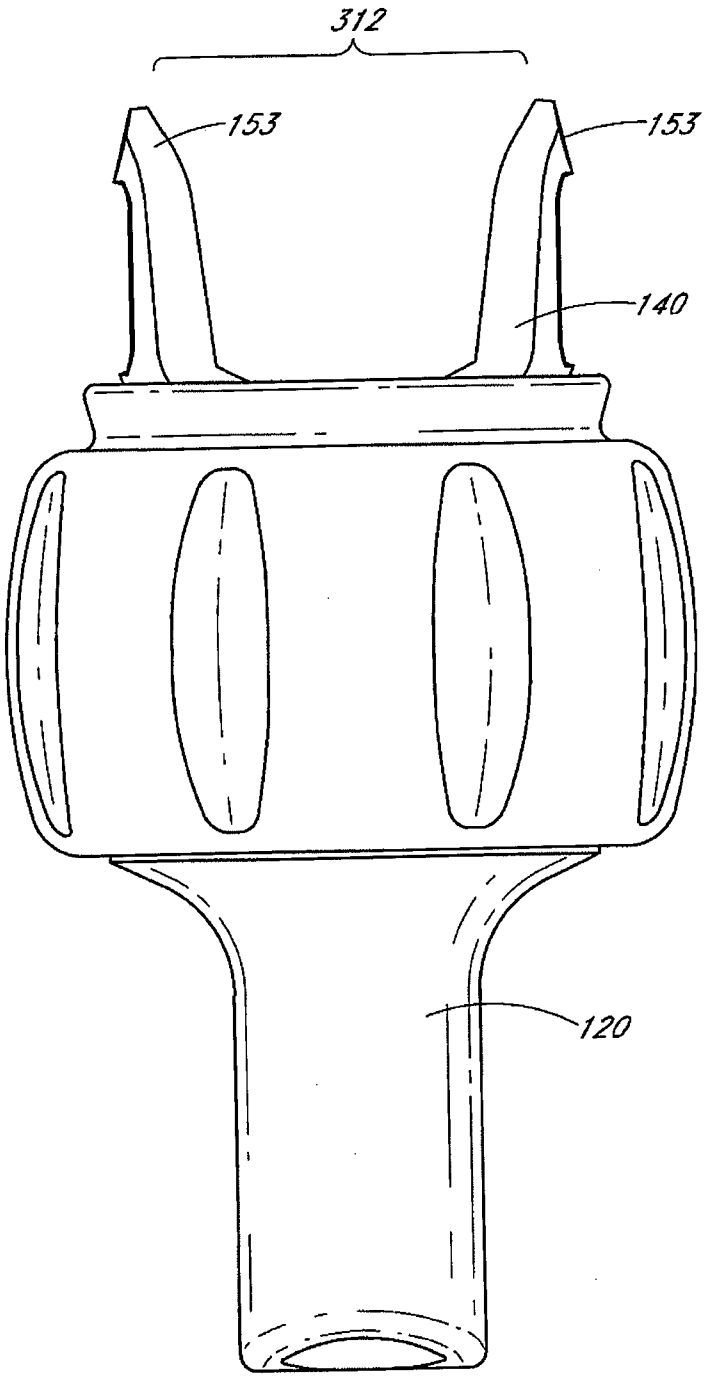


FIG. 4B

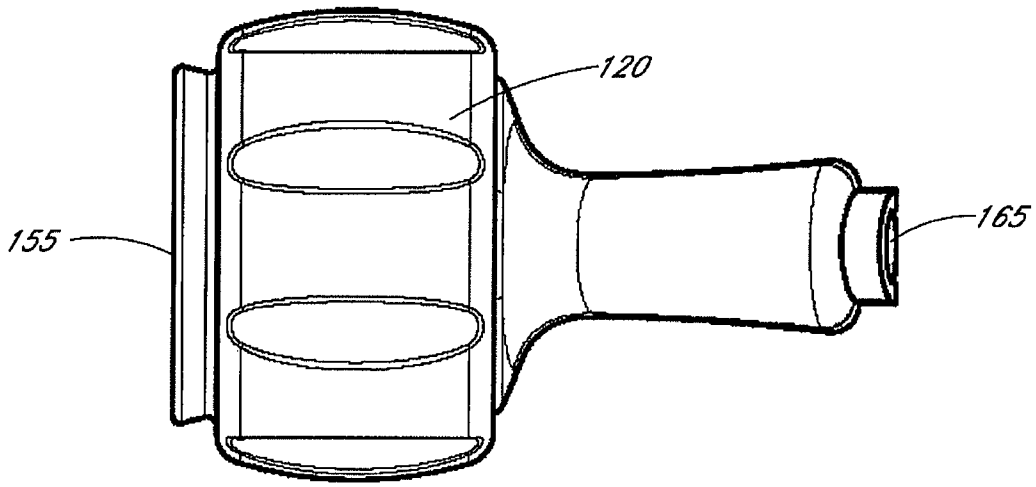


FIG. 4C

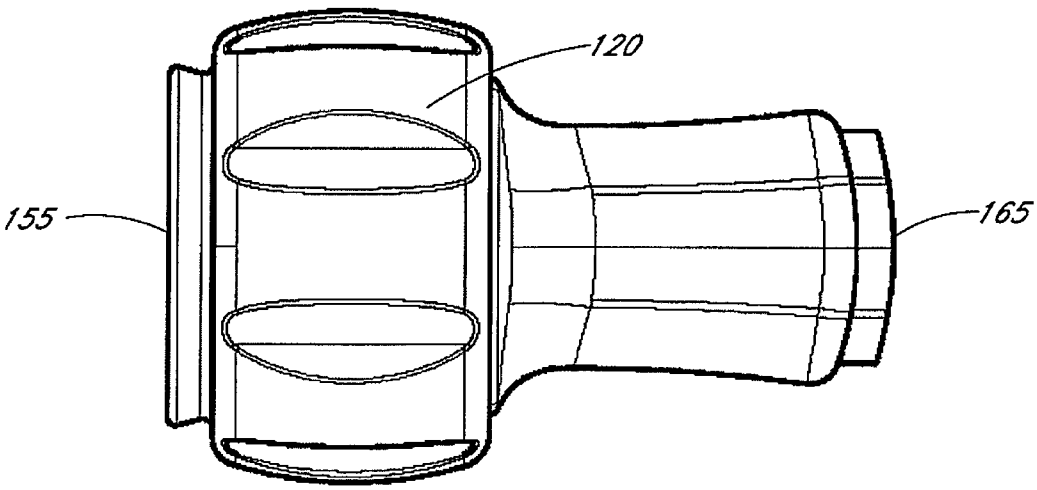


FIG. 4D

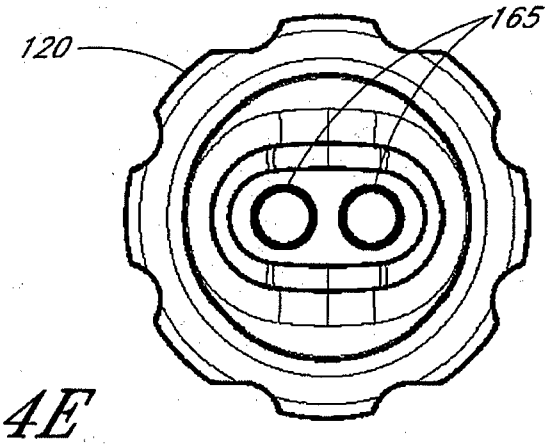


FIG. 4E

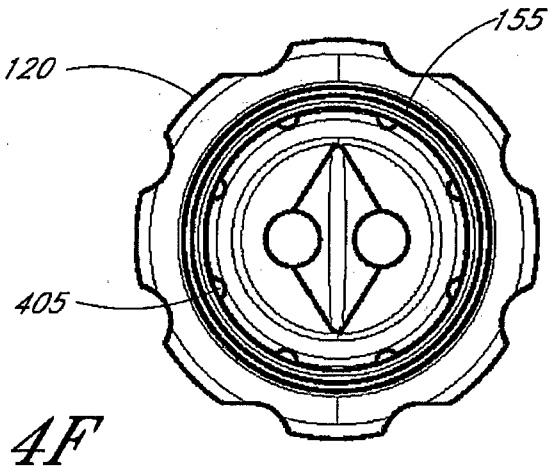


FIG. 4F

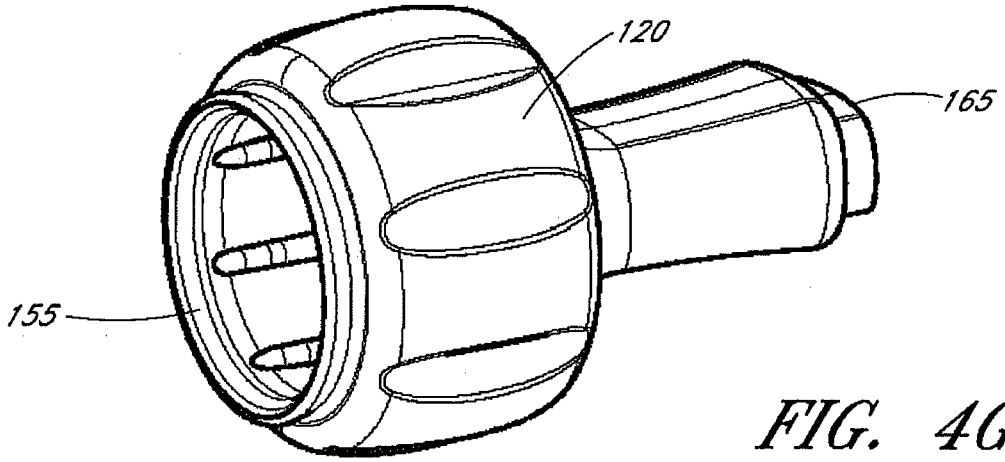


FIG. 4G

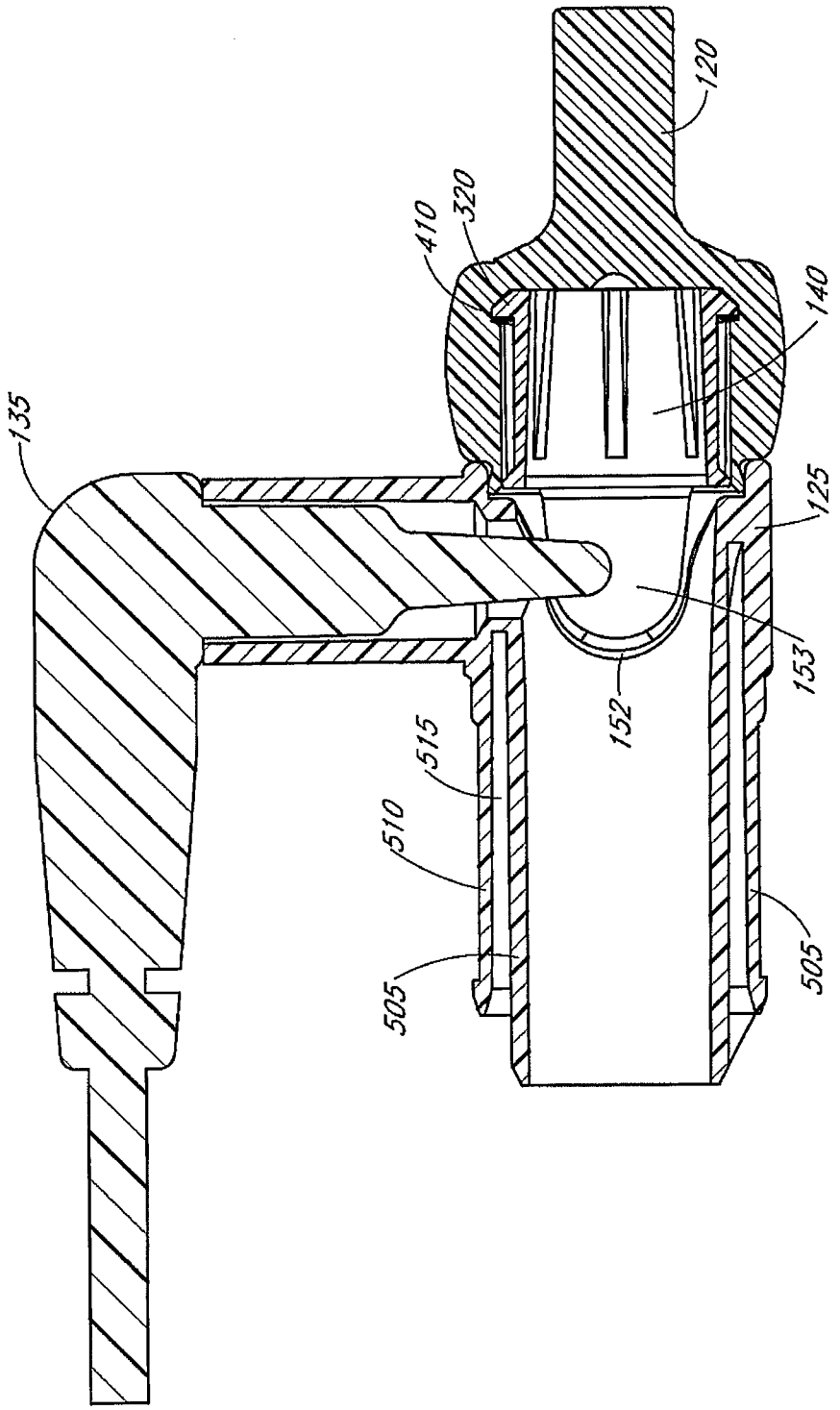


FIG. 5A

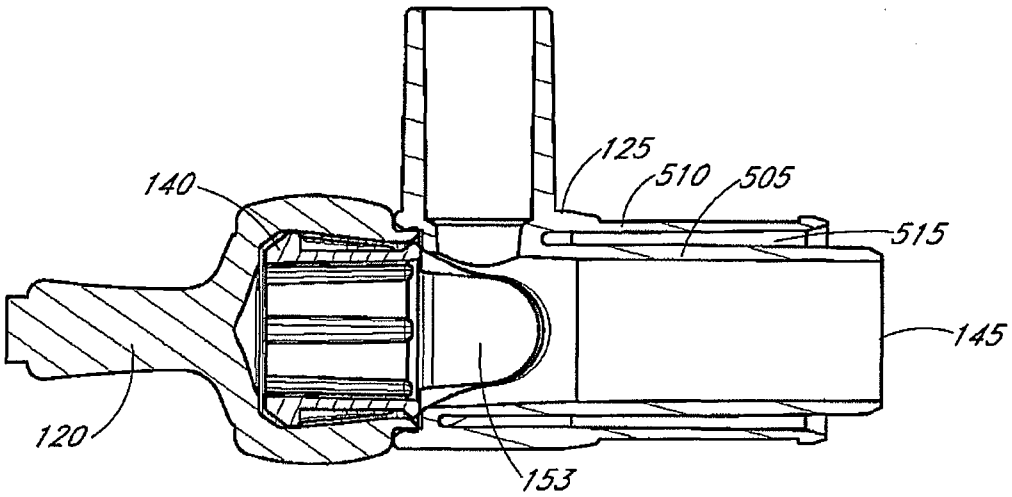


FIG. 5B

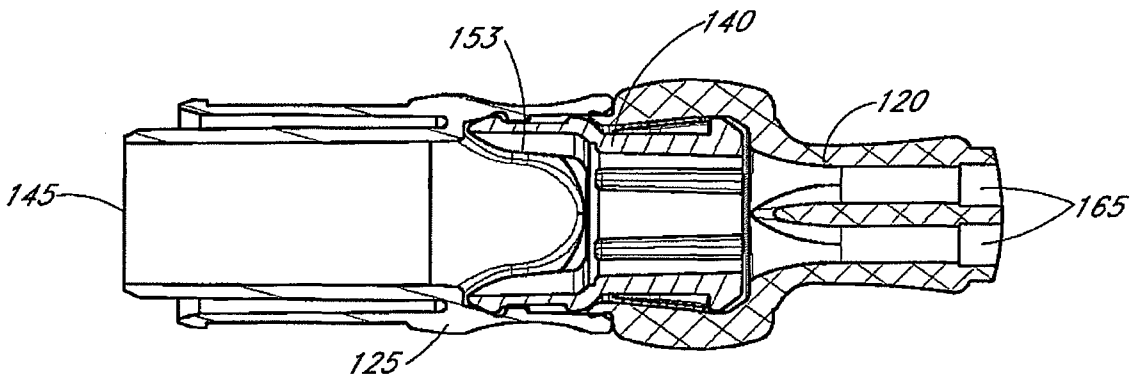


FIG. 5C

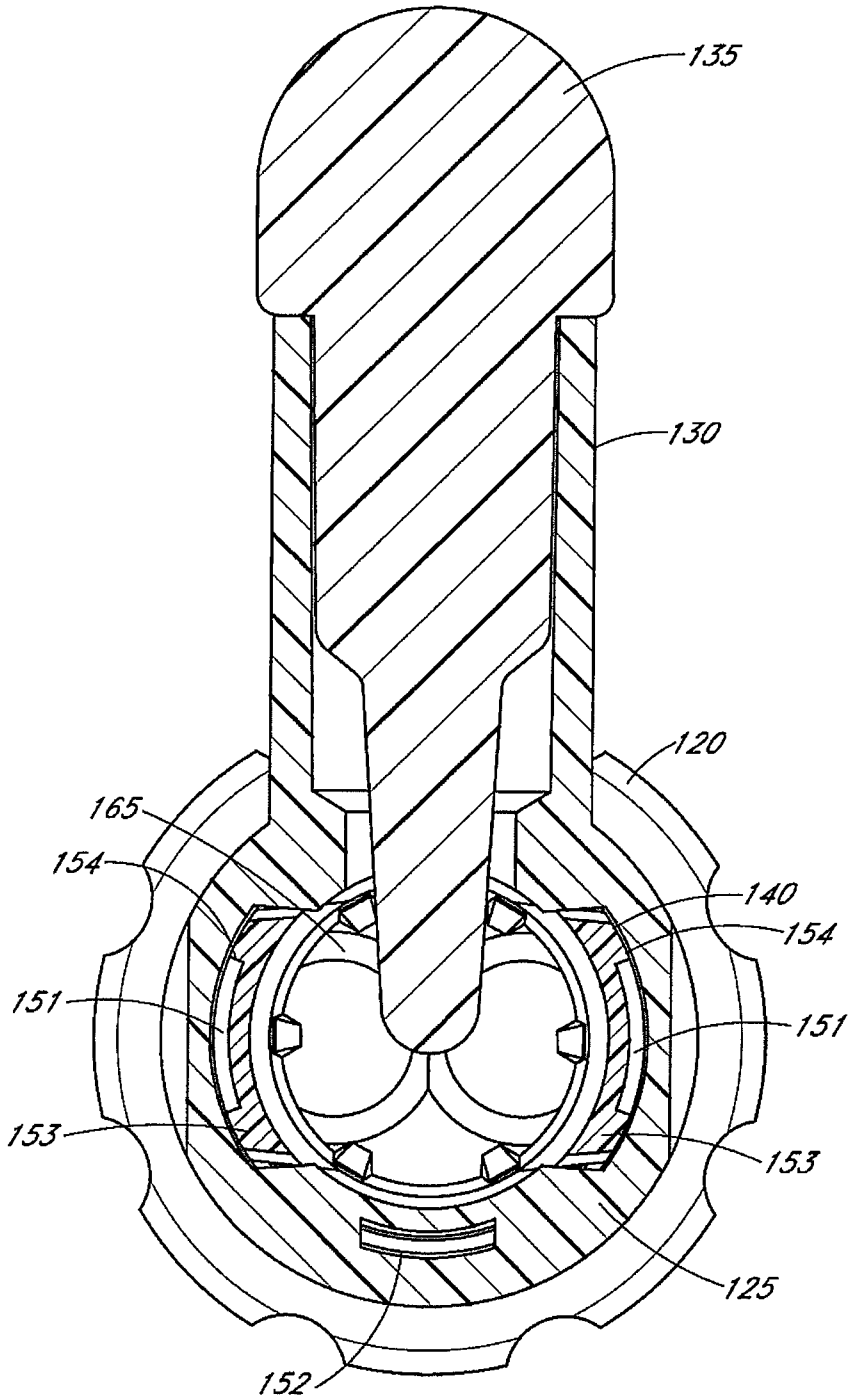


FIG. 6

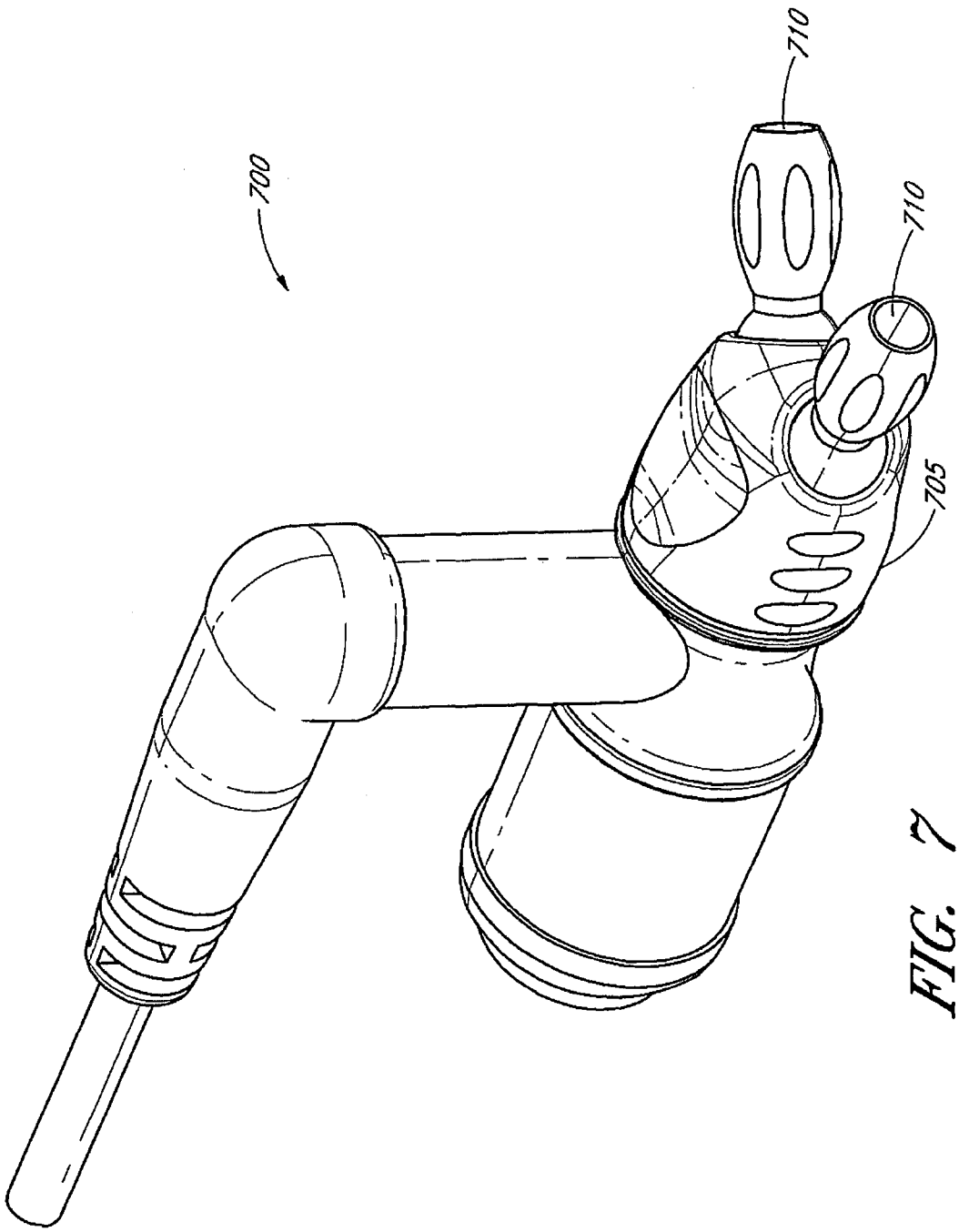


FIG. 7

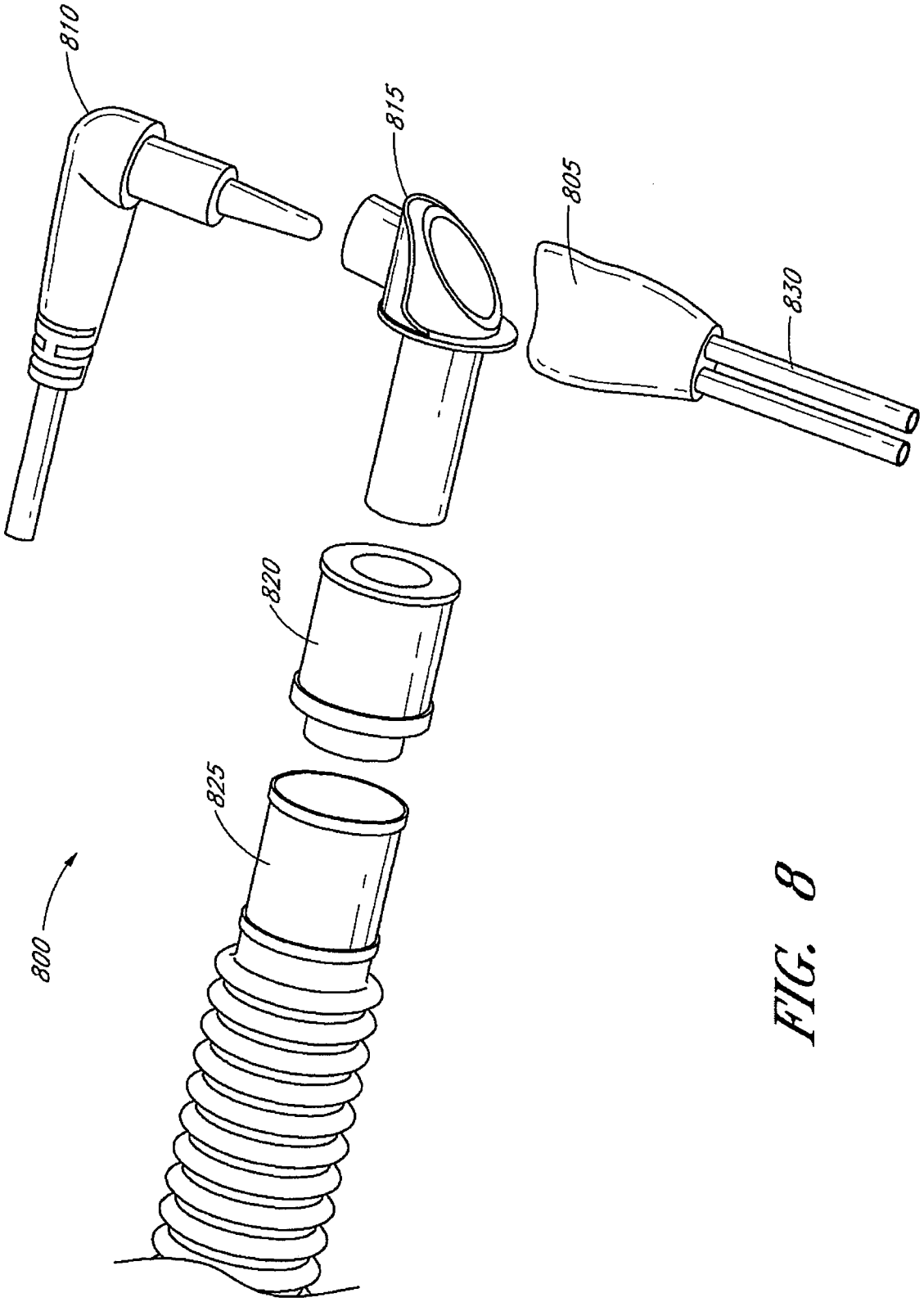


FIG. 8

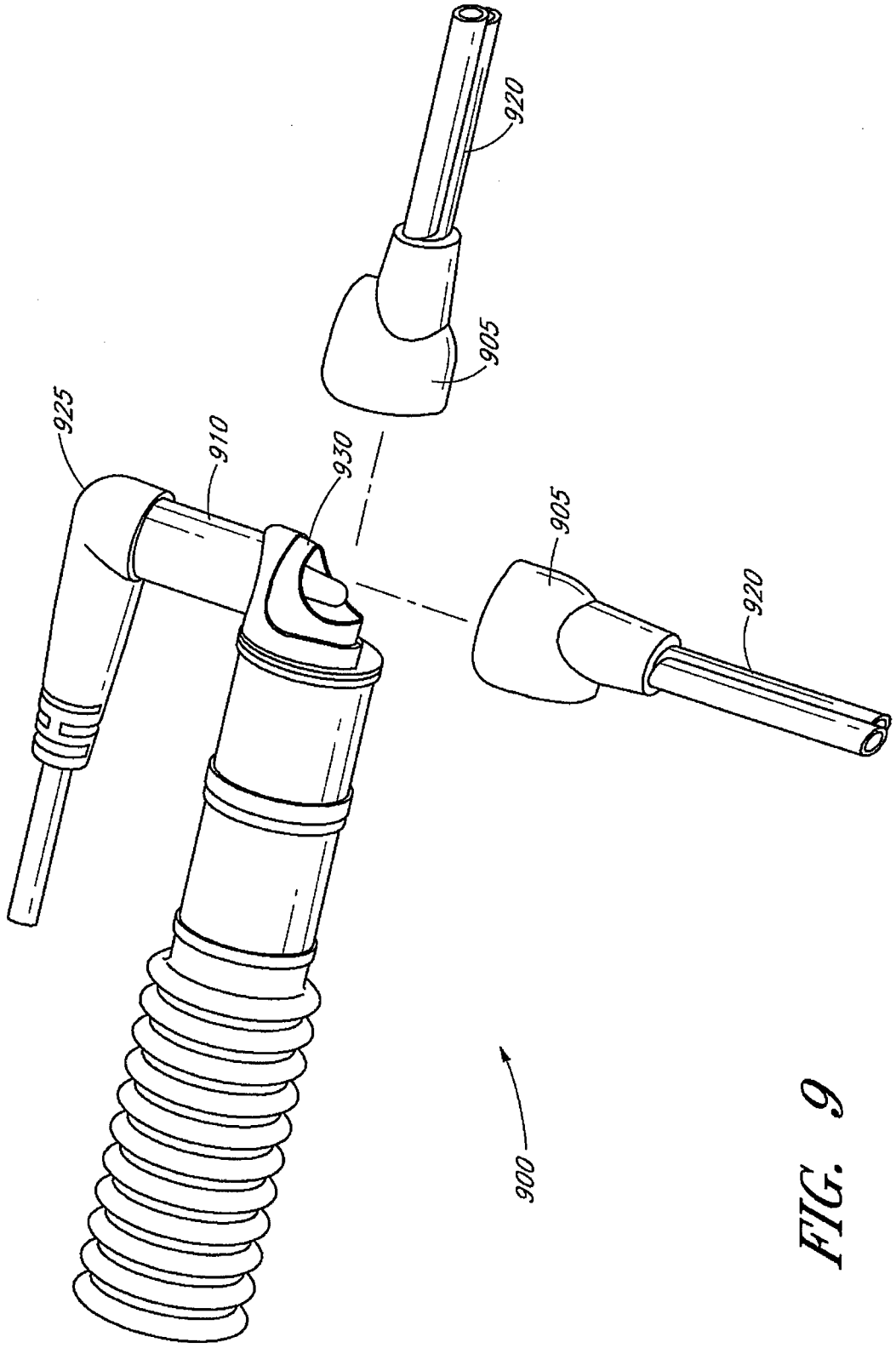
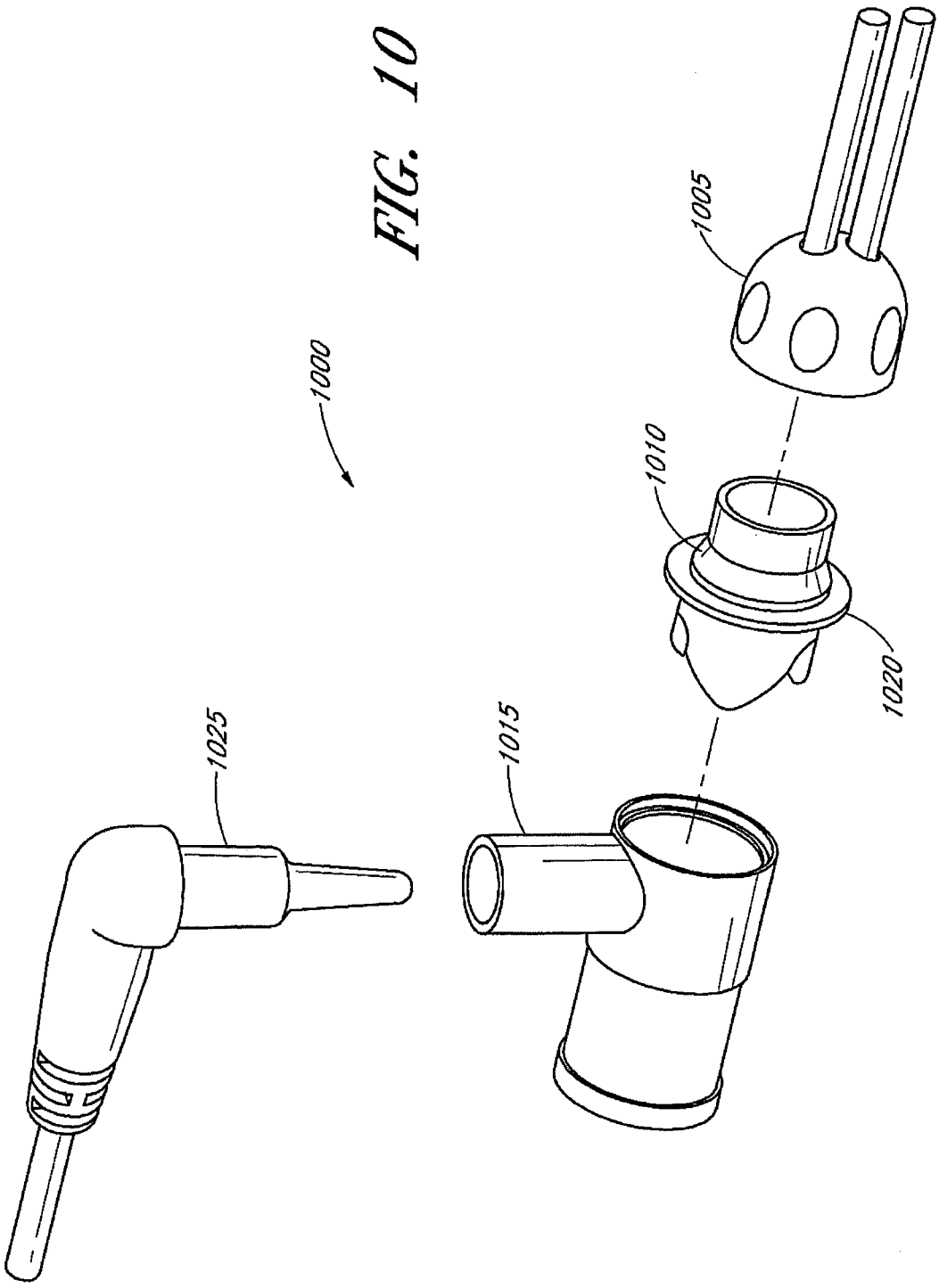


FIG. 9

FIG. 10



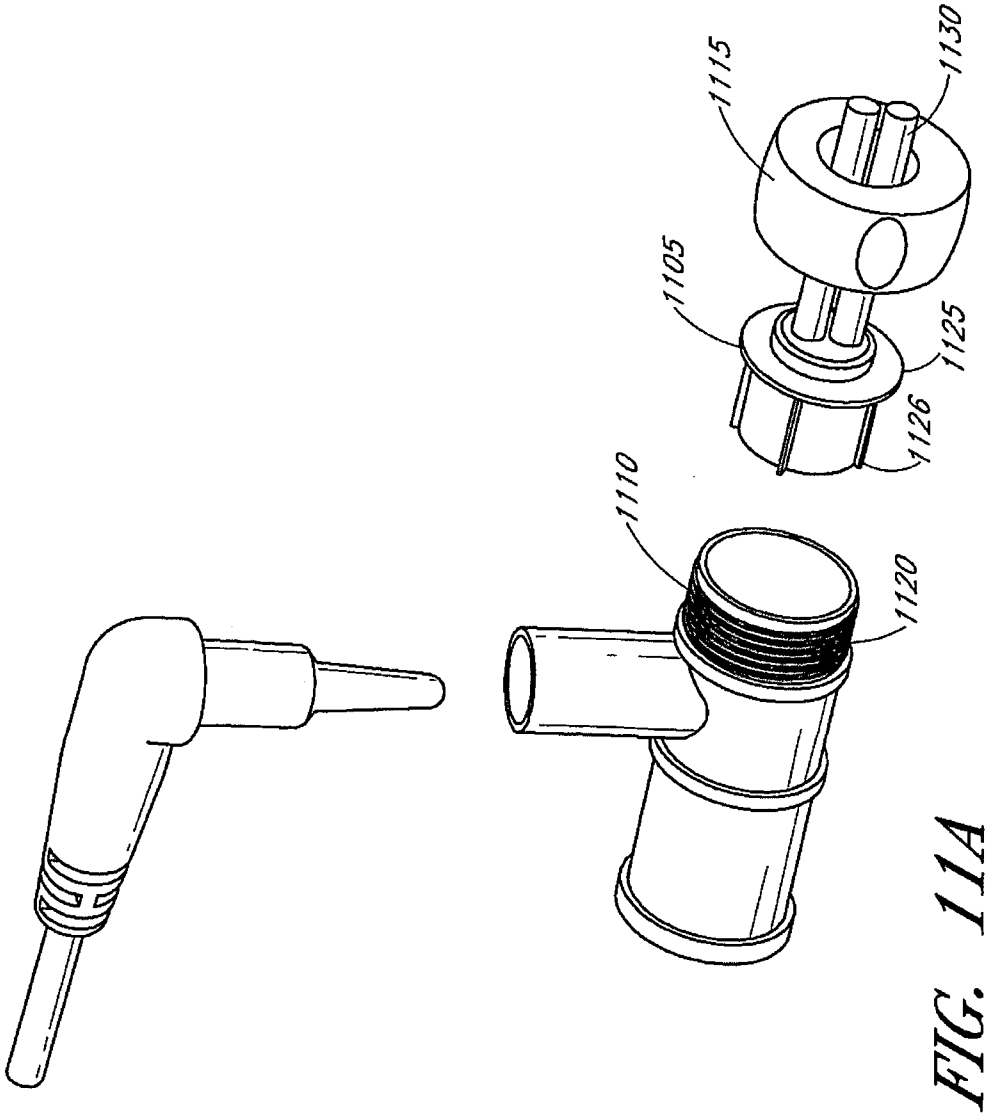


FIG. 11A

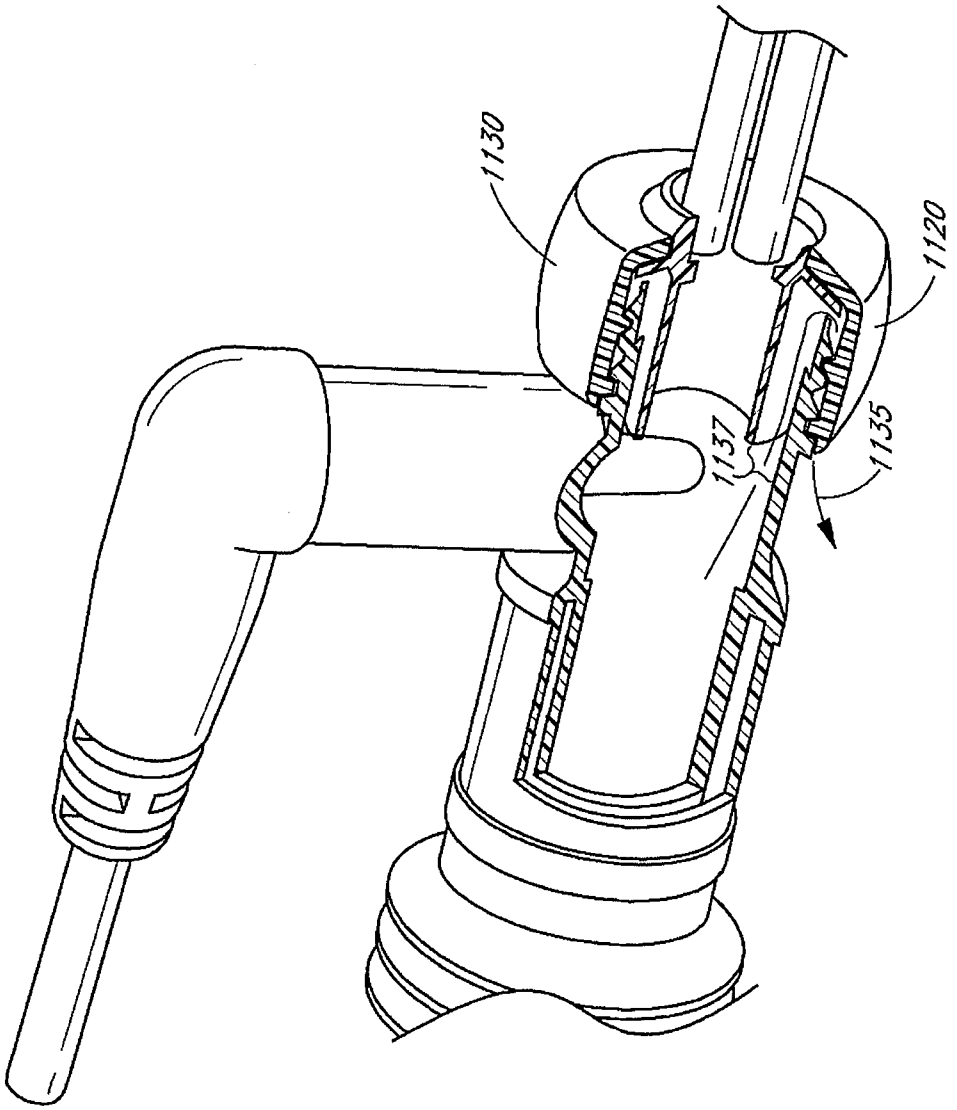


FIG. 11B

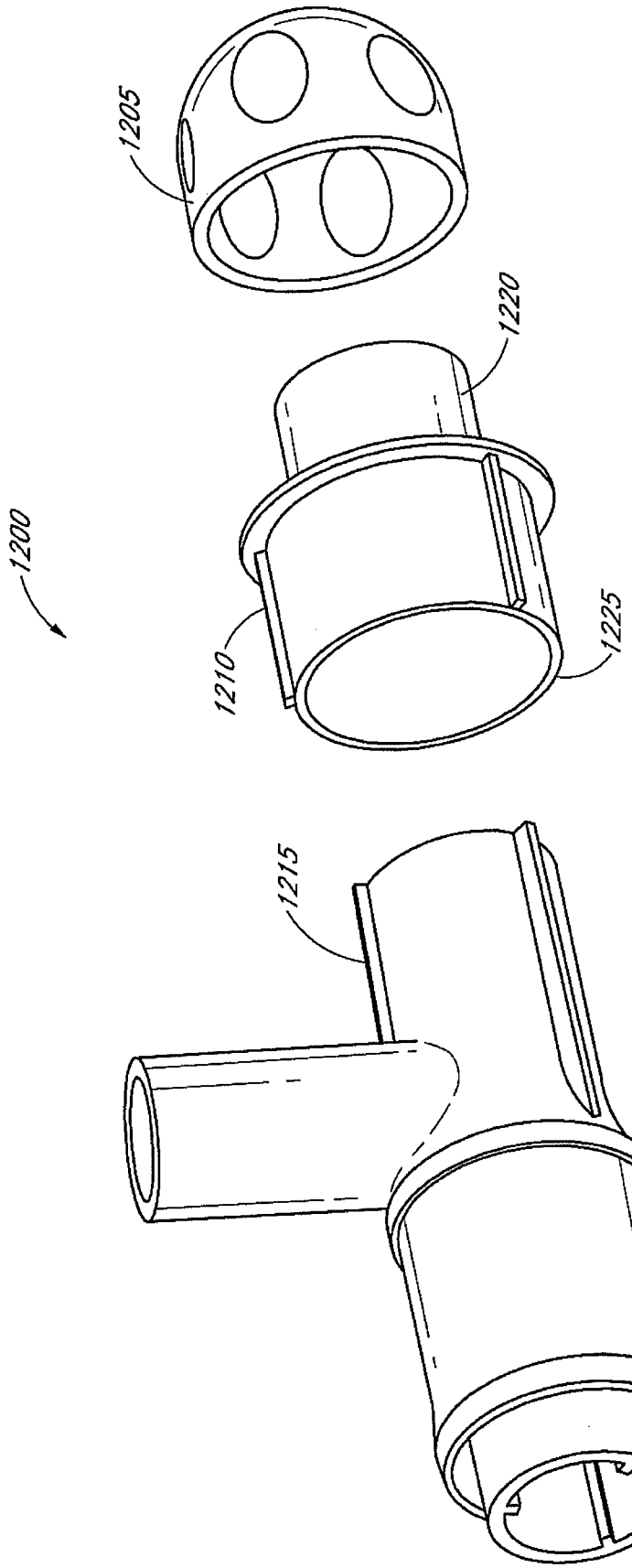


FIG. 12

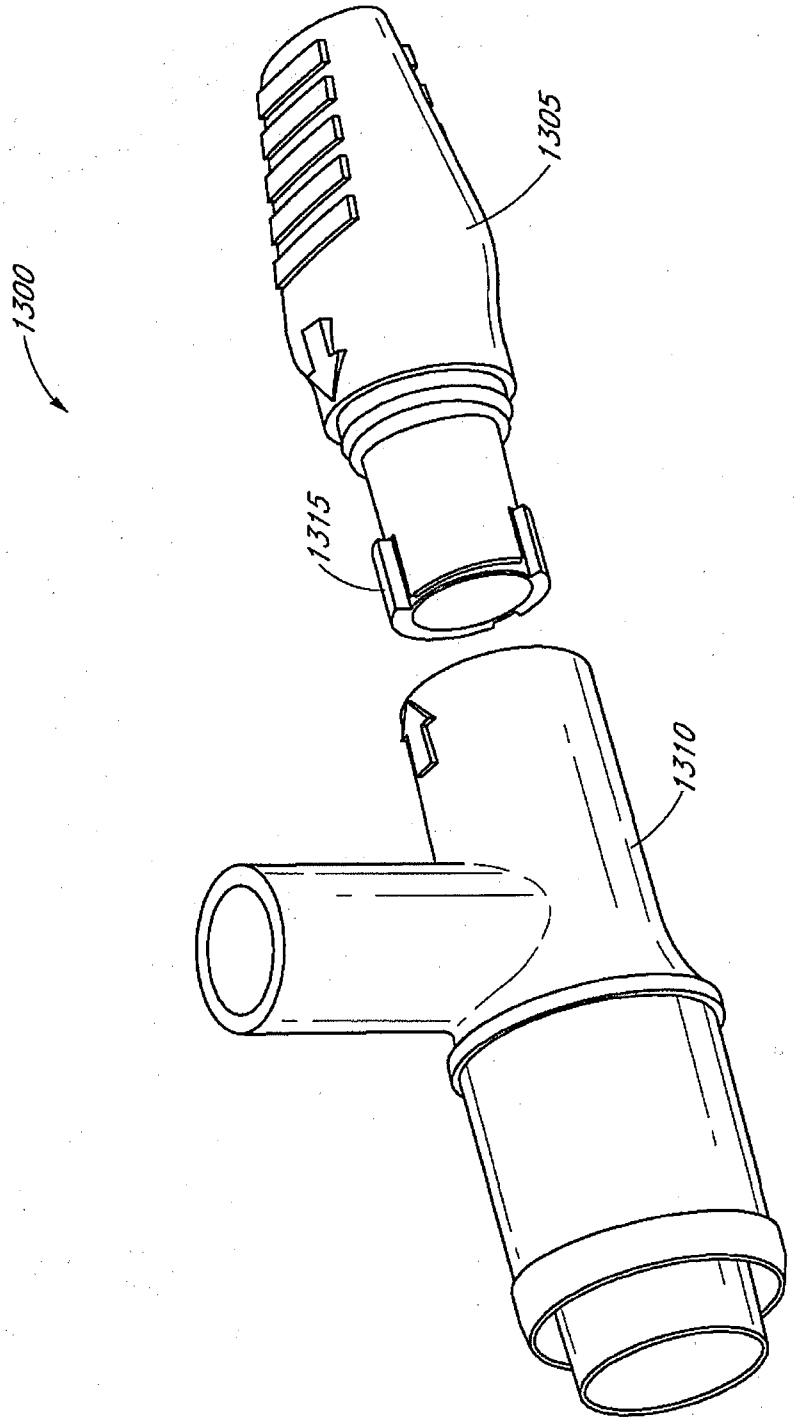


FIG. 13

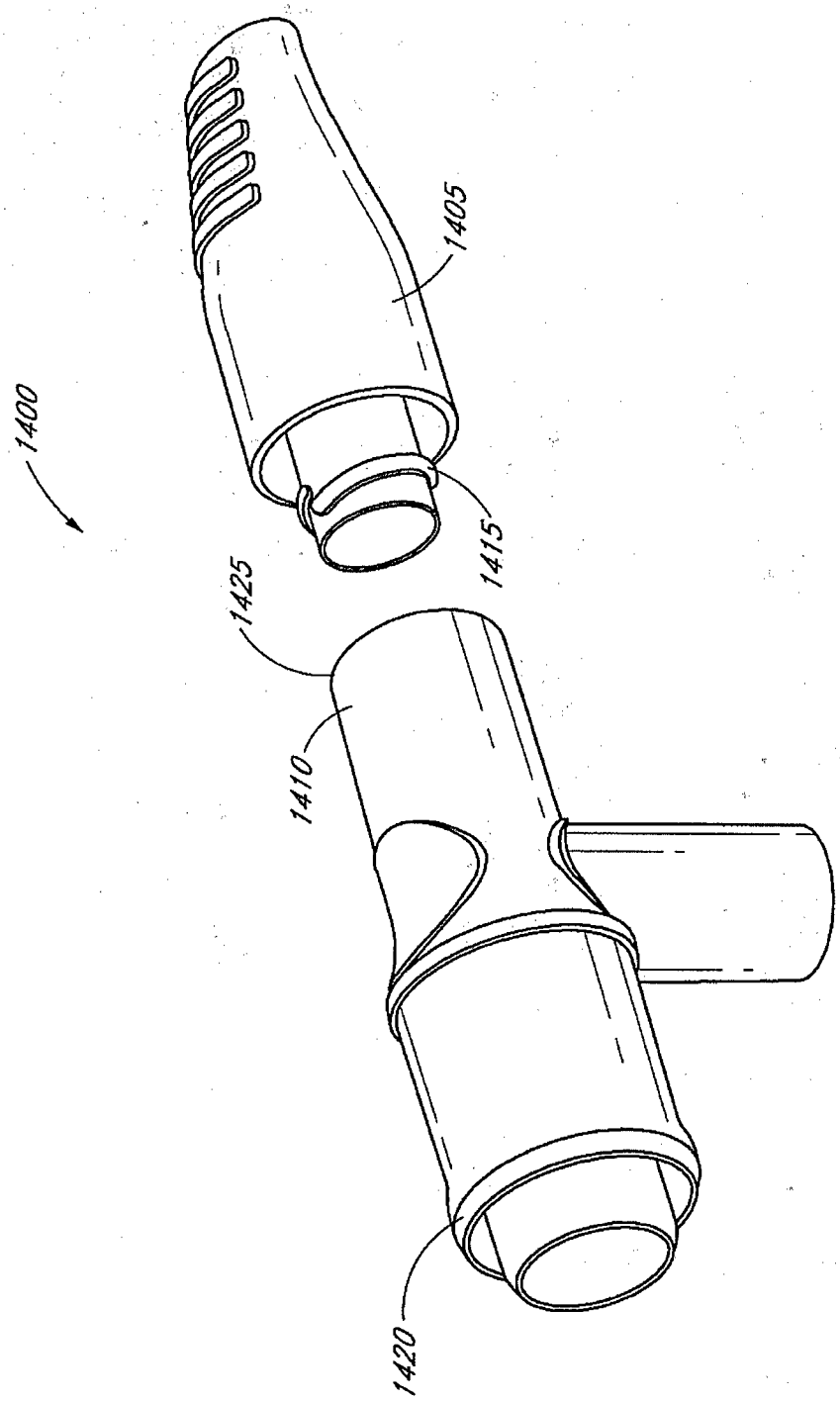


FIG. 14

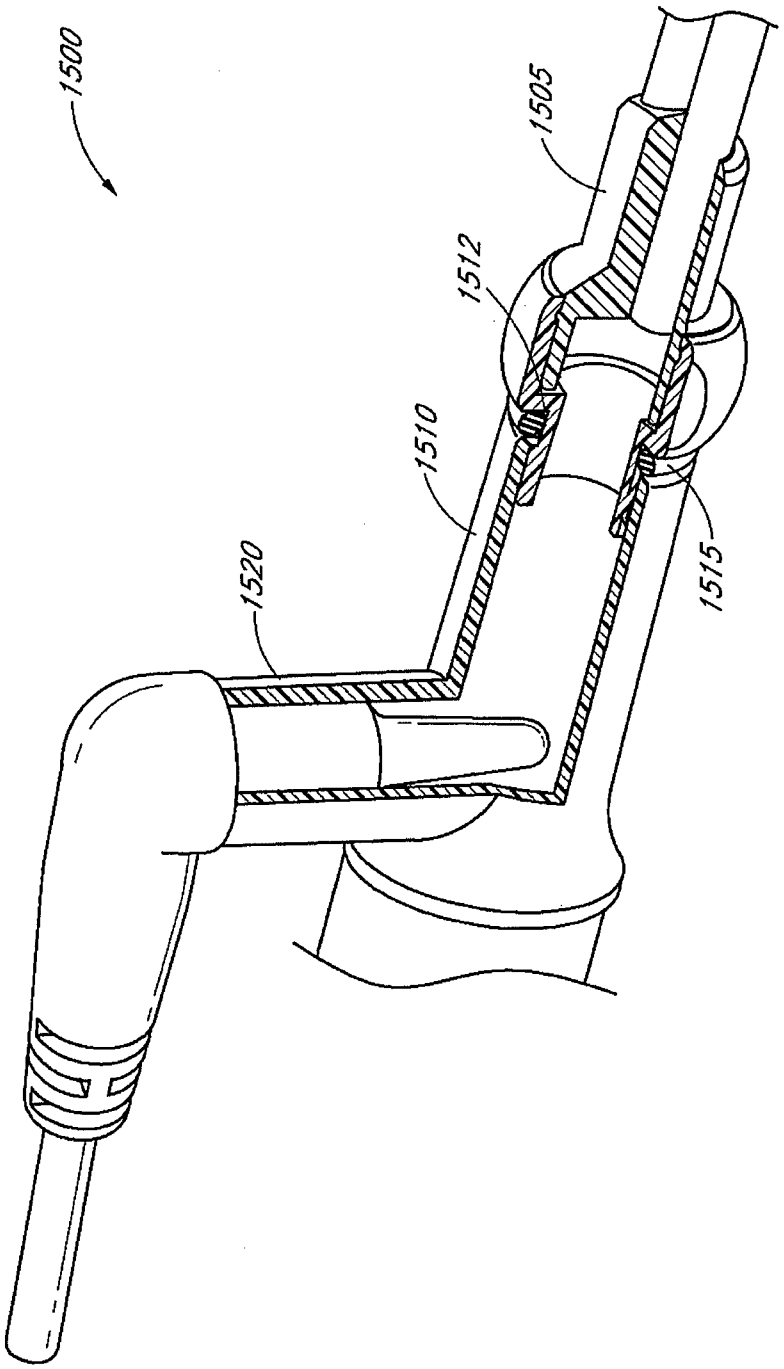


FIG. 15

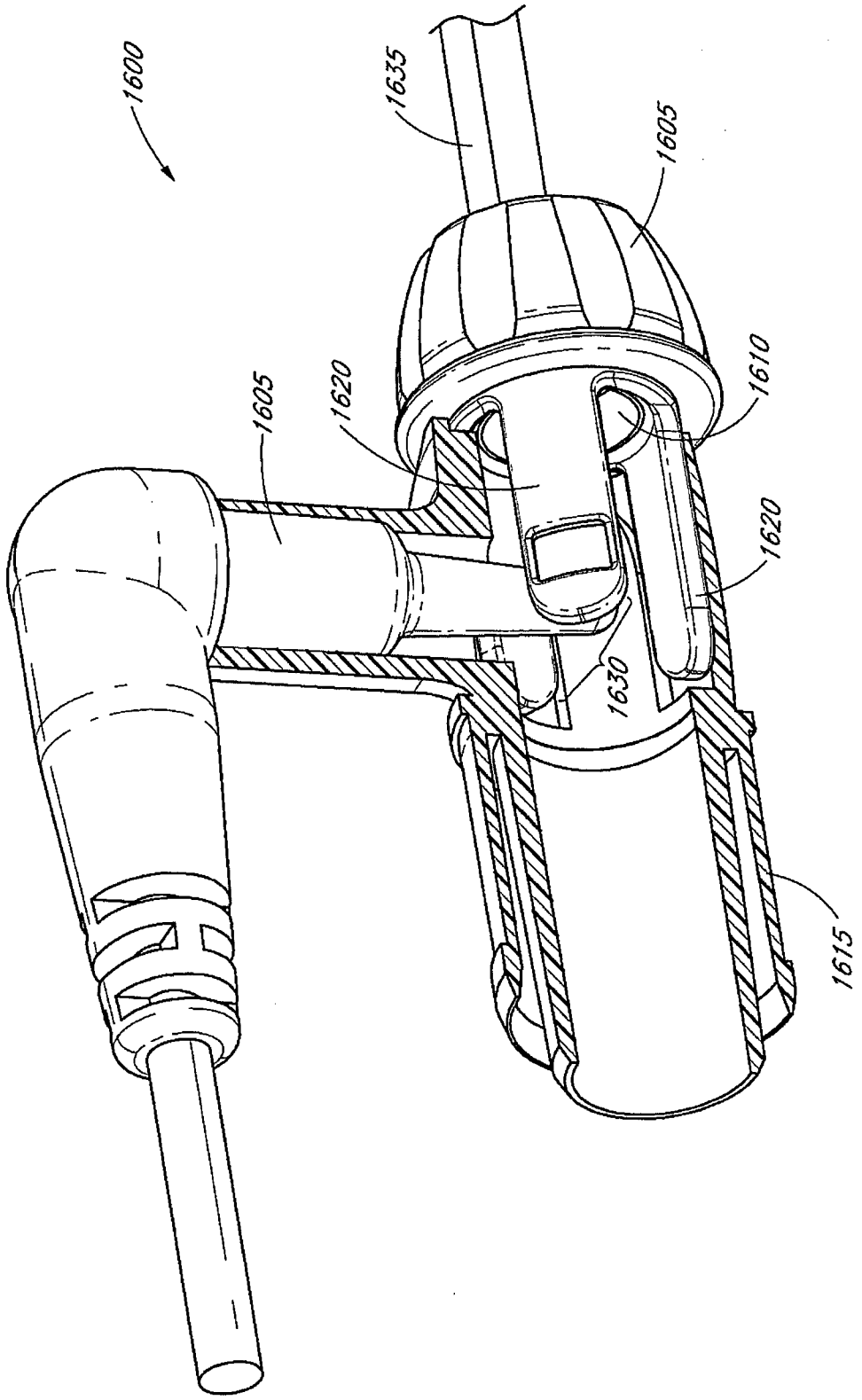


FIG. 16

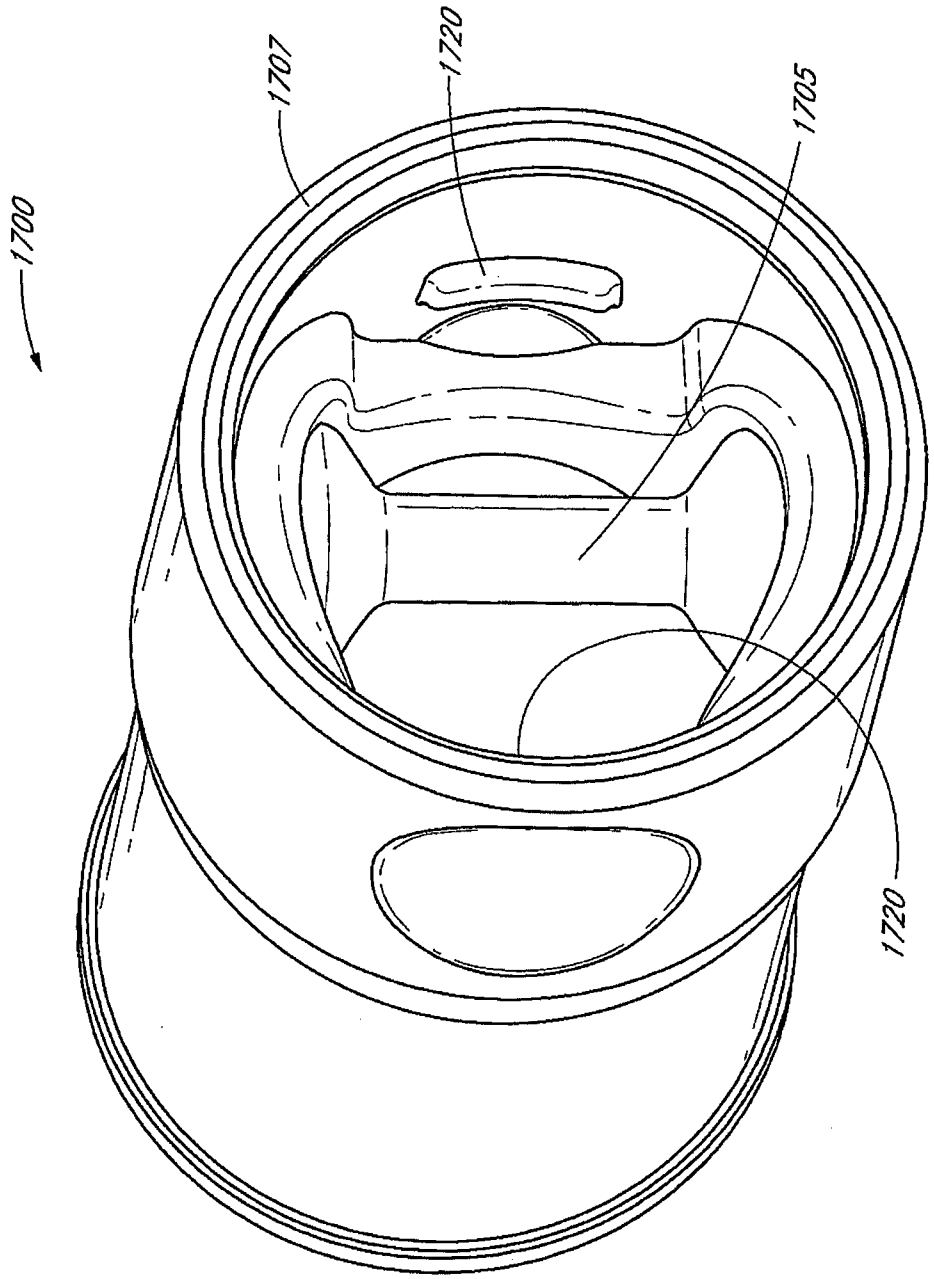


FIG. 17

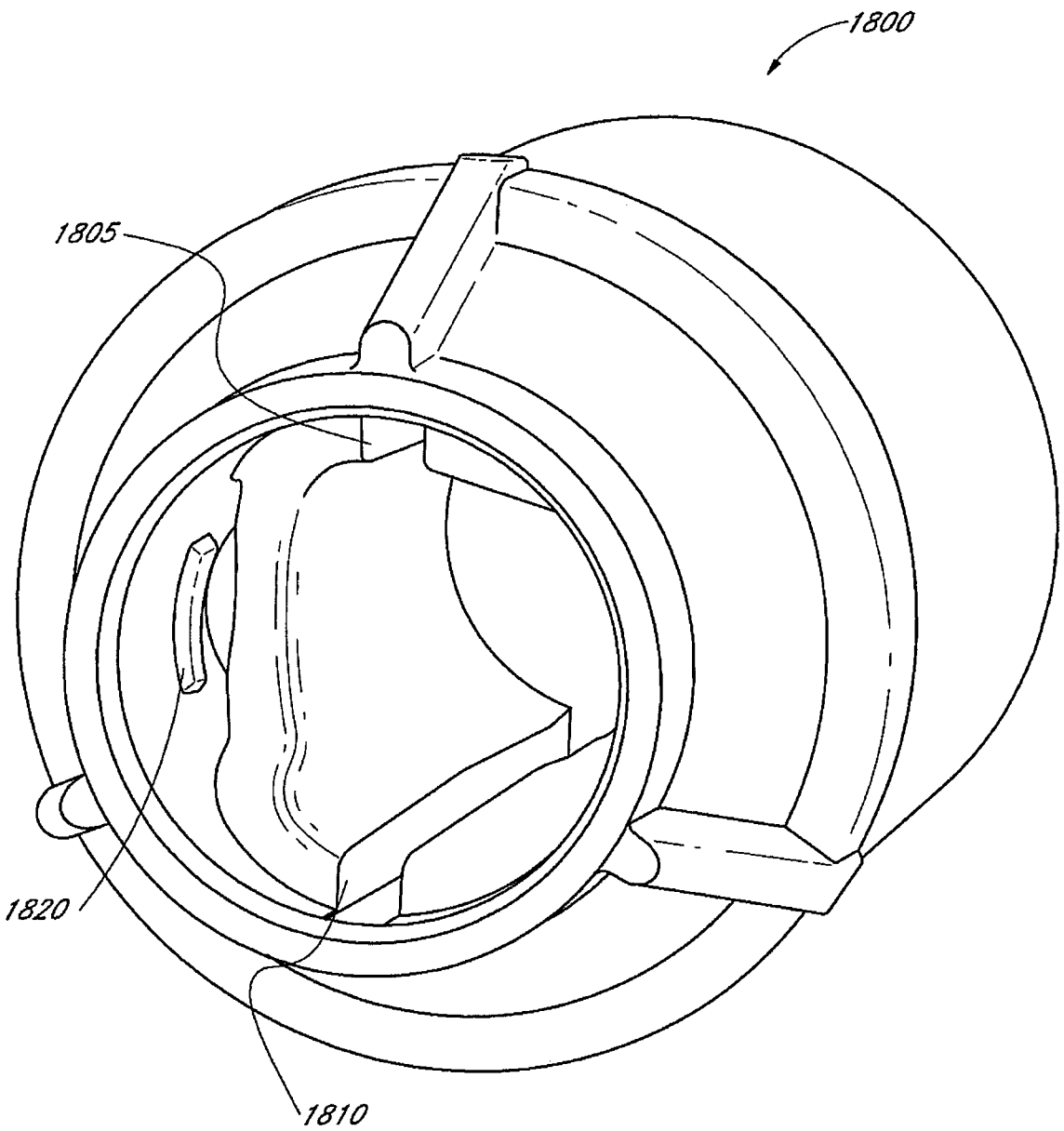


FIG. 18A

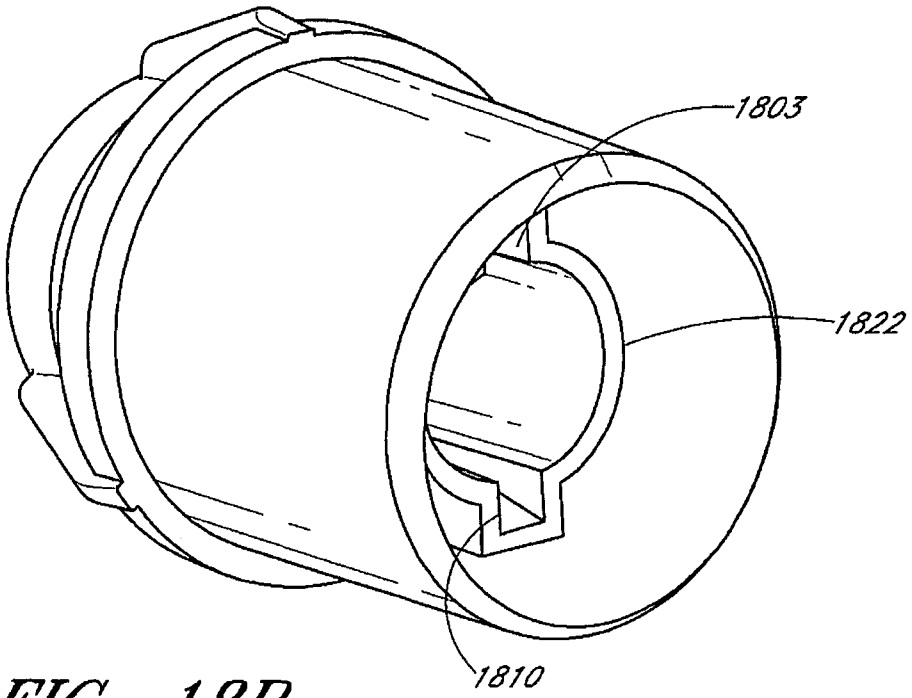


FIG. 18B

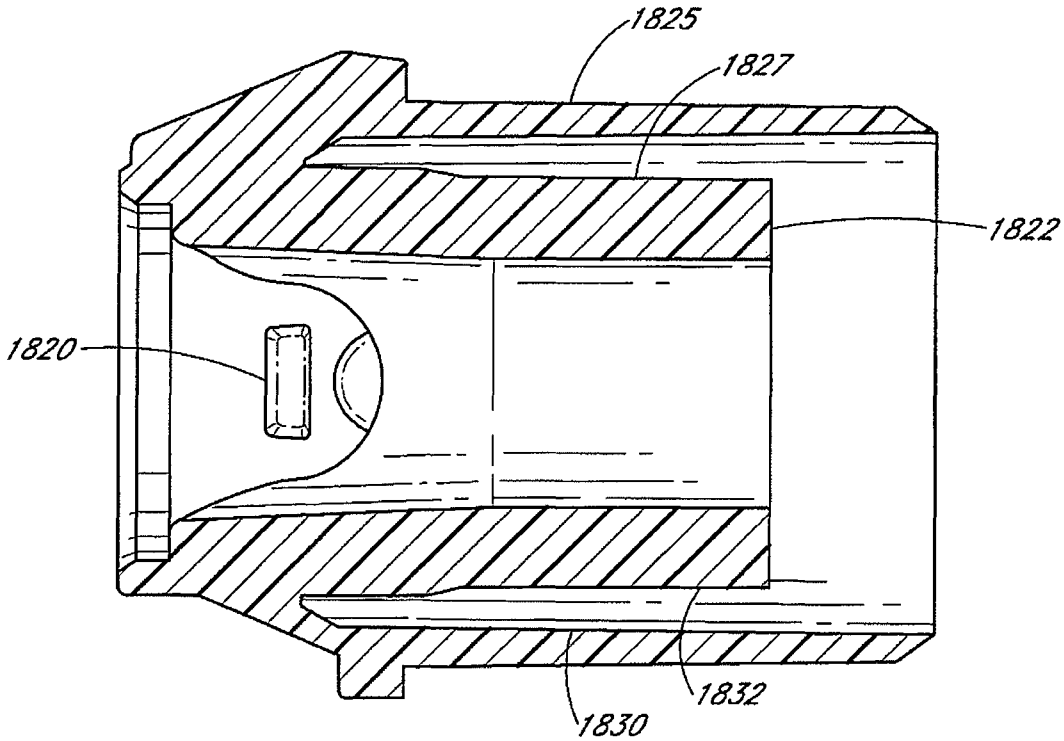


FIG. 18C

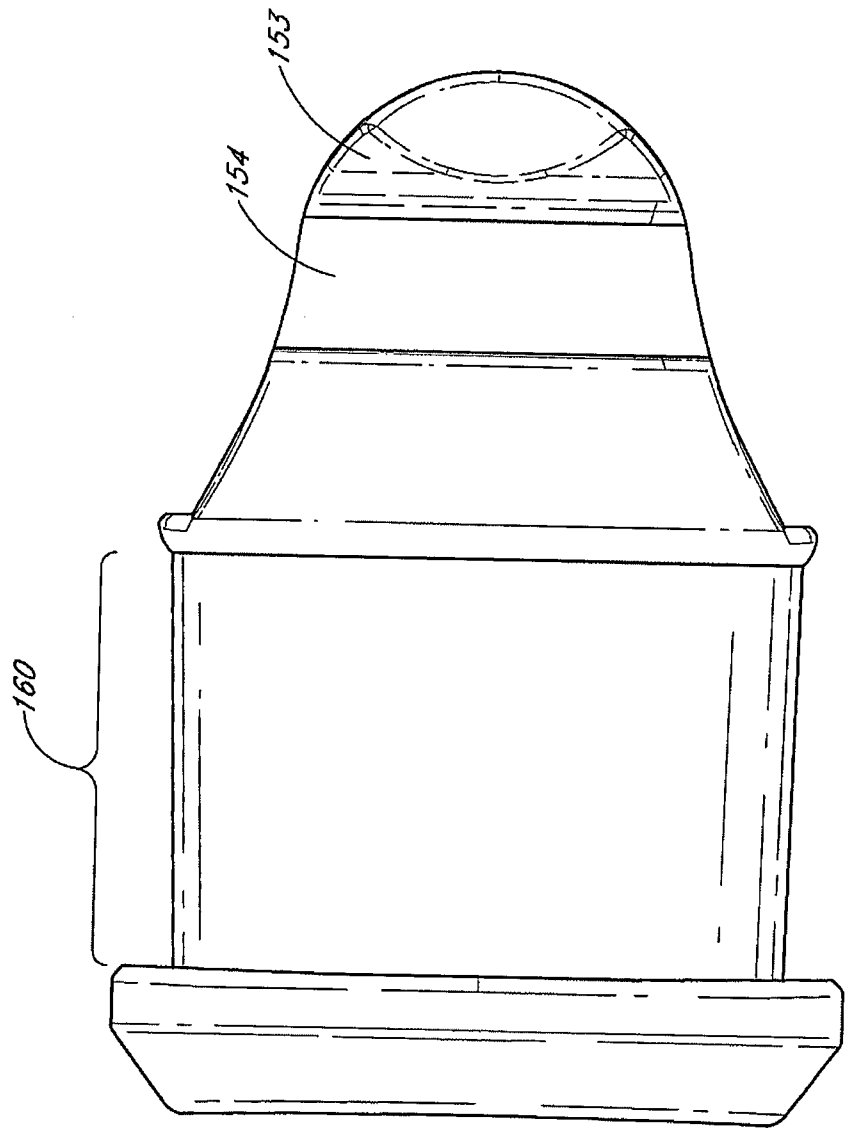


FIG. 19A

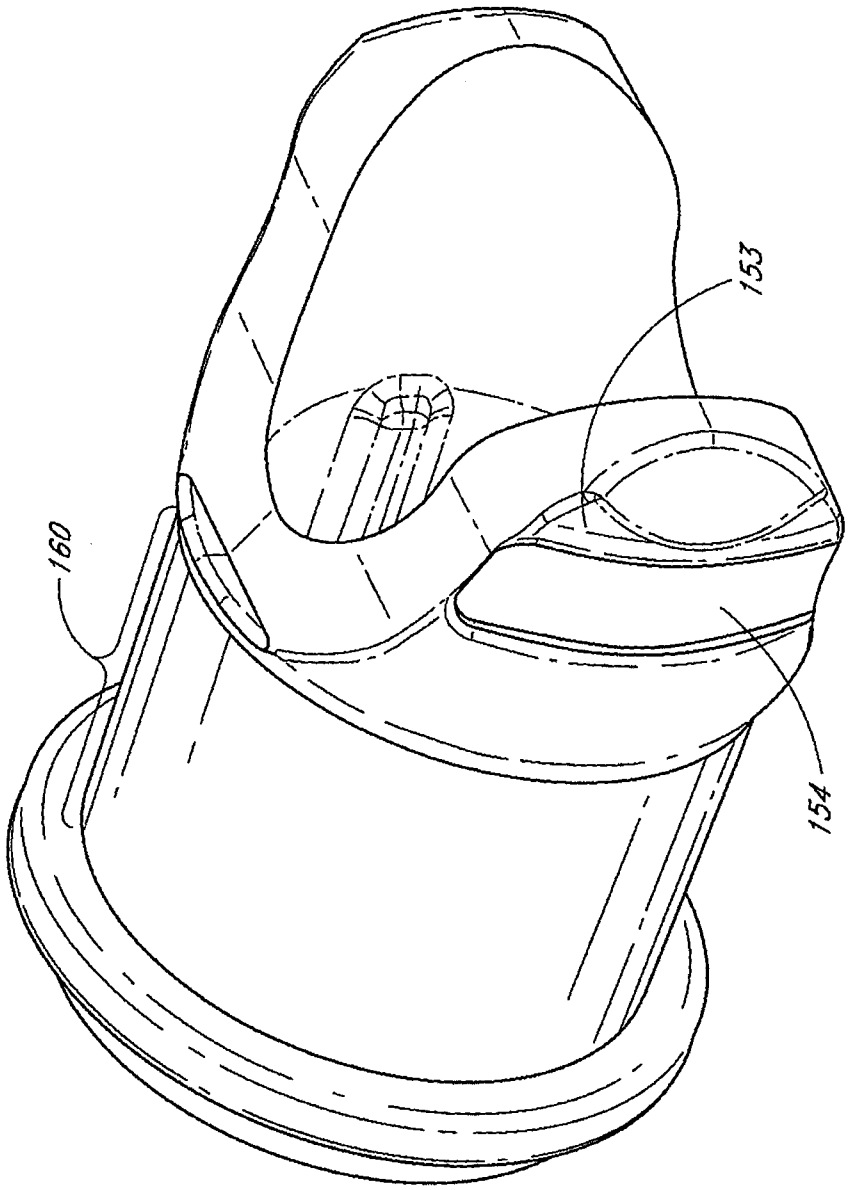


FIG. 19B

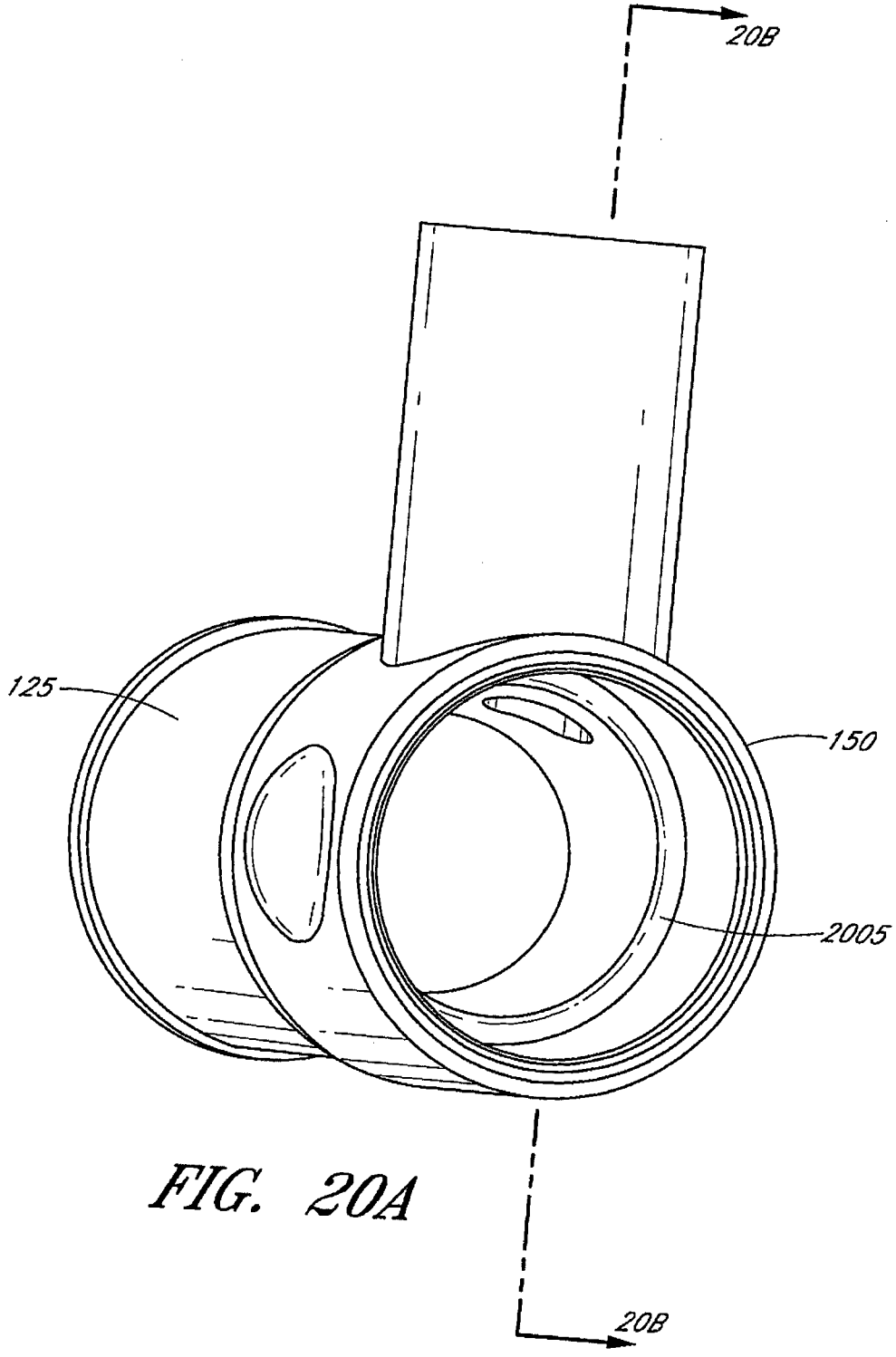


FIG. 20A

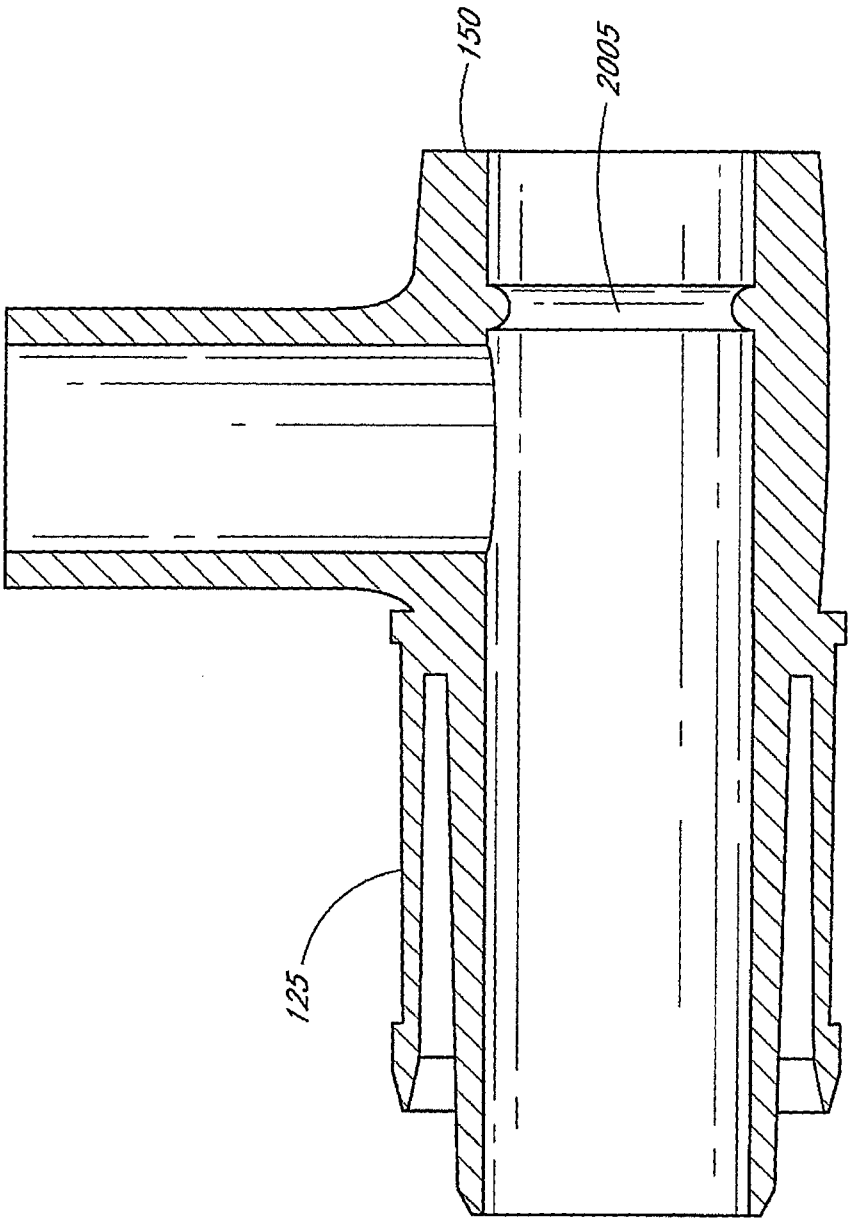


FIG. 20B

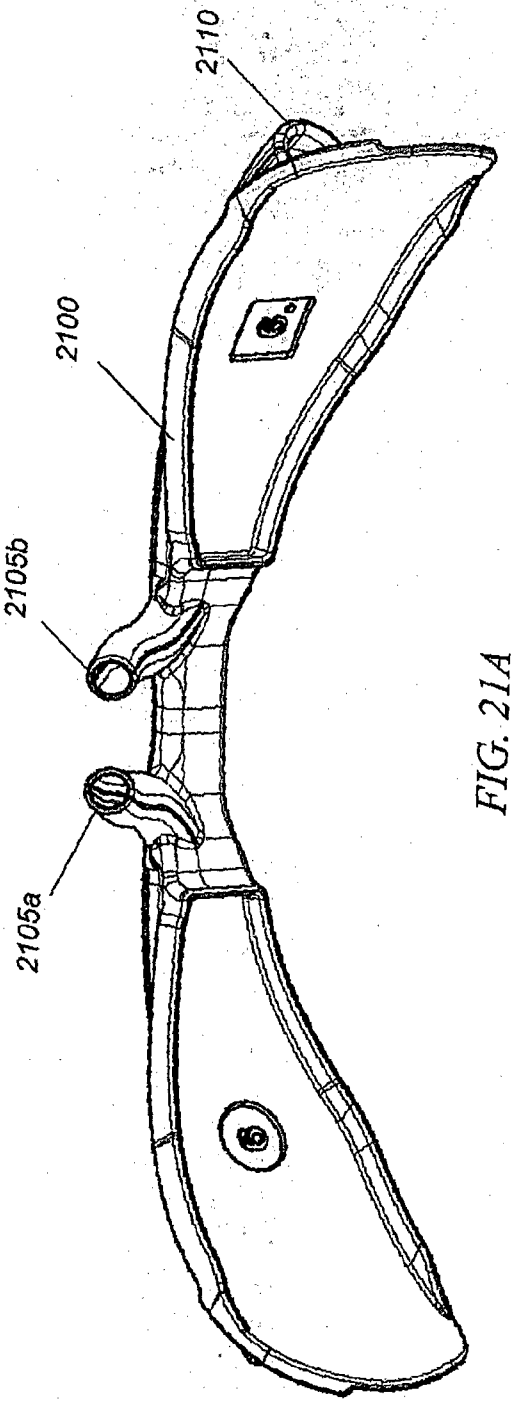


FIG. 21A

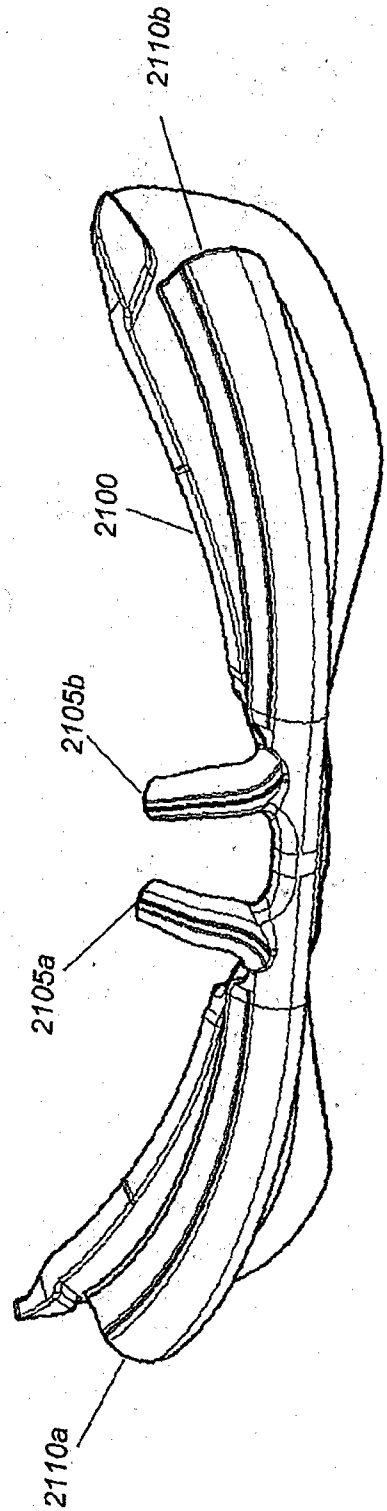


FIG. 21B

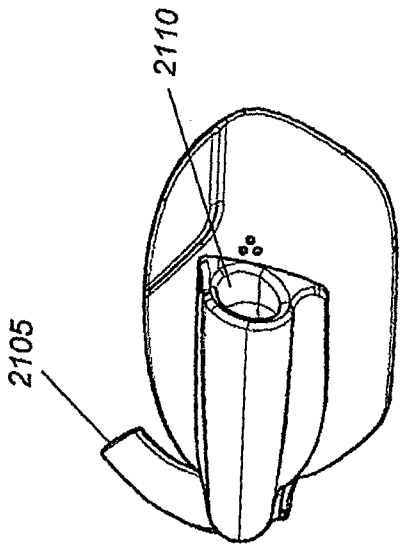


FIG. 21C

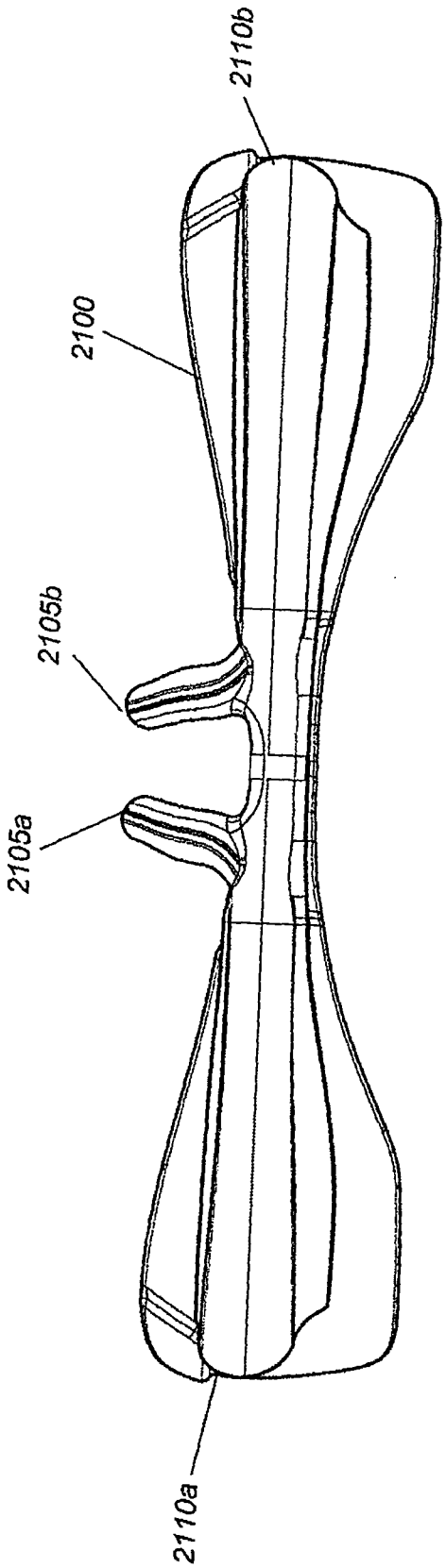
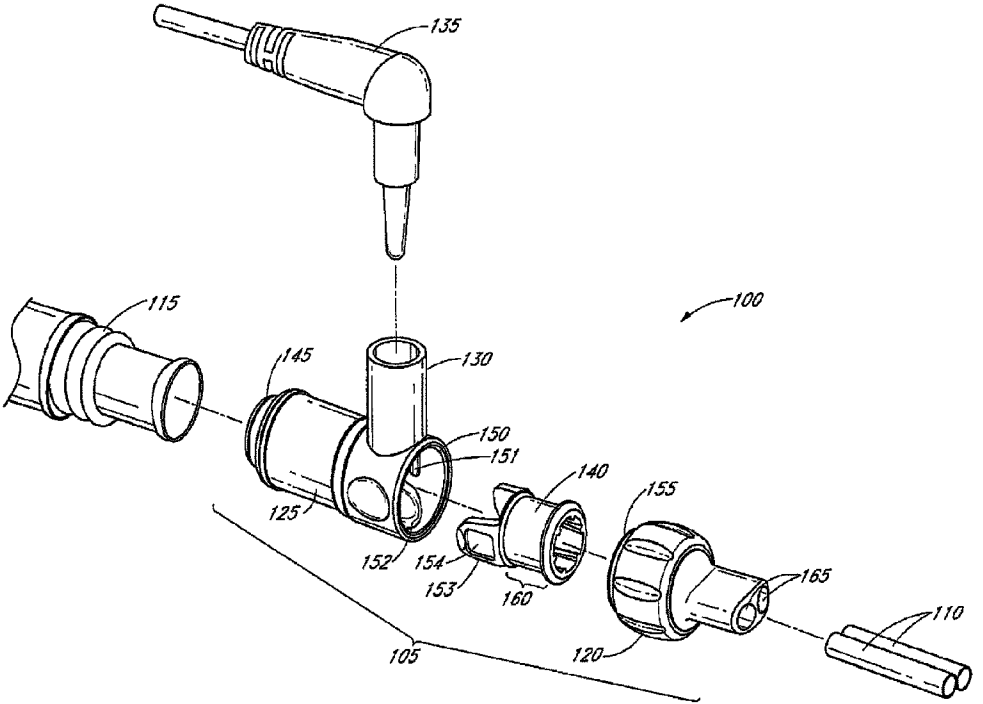


FIG. 21D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