

Sept. 24, 1968

G. O. DOHERTY

3,402,717

ENDOTRACHEAL TUBE WITH VALVED BALLOON HAVING A REMOVABLE INFLATION STYLET INSERT THEREIN

Filed Aug. 12, 1965

2 Sheets-Sheet 1

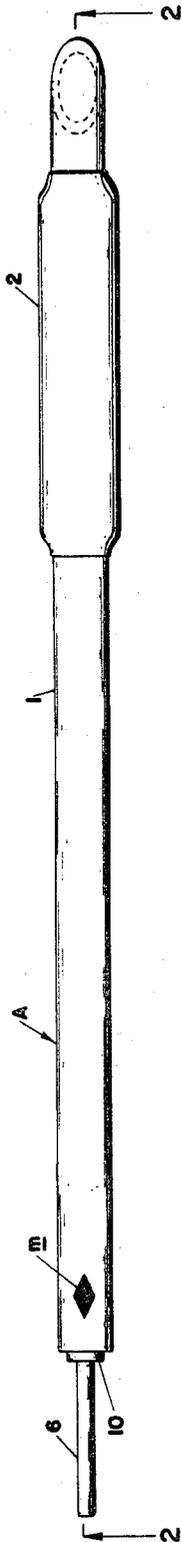


FIG. 1

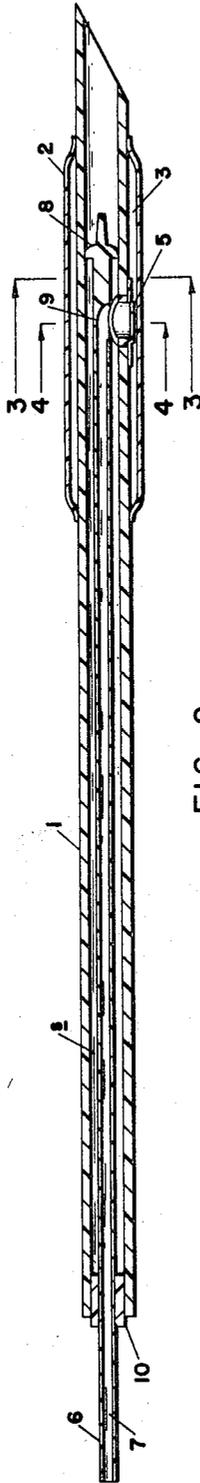


FIG. 2

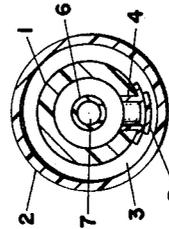


FIG. 4

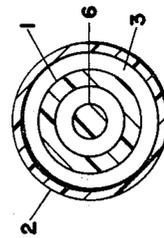


FIG. 3

INVENTOR  
GEORGE O. DOHERTY  
BY *John W. Pope* <sup>III</sup>  
ATTORNEY

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G. O. DOHERTY  
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2 Sheets-Sheet 2

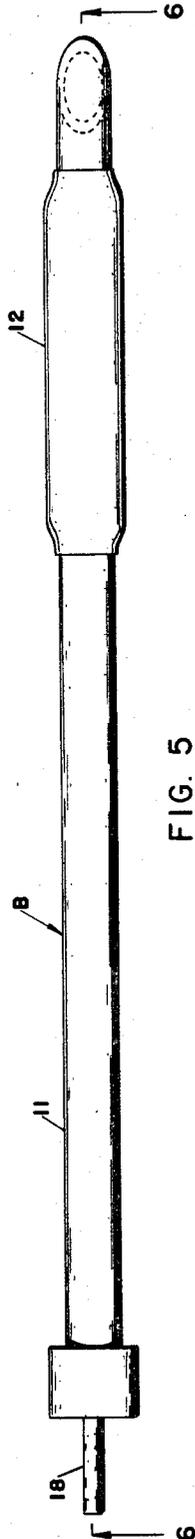


FIG. 5

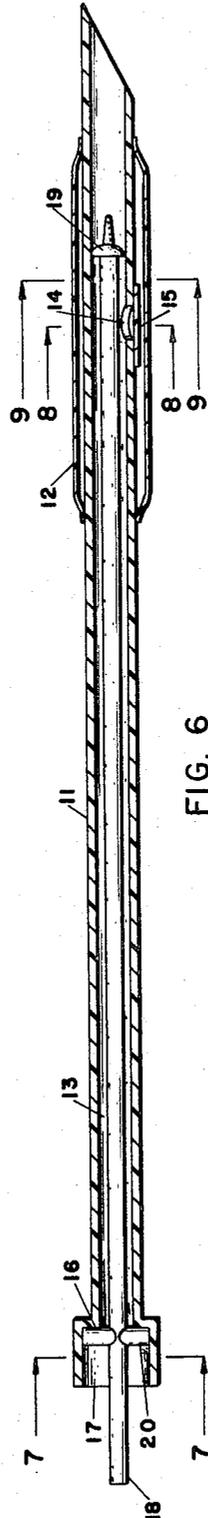


FIG. 6

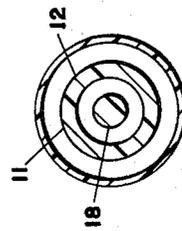


FIG. 9

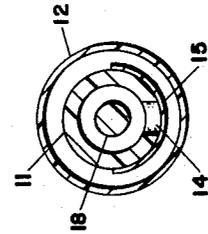


FIG. 8

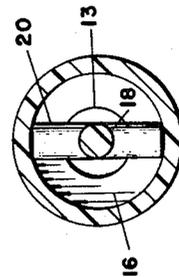


FIG. 7

INVENTOR  
GEORGE O. DOHERTY

BY *George O. Doherty*

ATTORNEY

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**ENDOTRACHEAL TUBE WITH VALVED BALLOON  
HAVING A REMOVABLE INFLATION STYLET  
INSERT THEREIN**

George O. Doherty, 2301 River Road,  
Missoula, Mont. 59801  
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16 Claims. (Cl. 128—351)

**ABSTRACT OF THE DISCLOSURE**

An endotracheal tube having an aperture fitted with a check valve opening into an inflatable cuff at one end of the tube. A stylet is provided for insertion into the tube, and it has an enlarged head at its distal end for blocking the tube beyond the aperture so that when a compressed gas is introduced into the tube through its proximal end, the check valve will open and the gas will inflate the cuff.

This invention relates in general to endotracheal tubes and, more particularly, to endotracheal tubes which are adapted for installation by means of an internal stylet.

During surgical procedures it is usually desirable to maintain control over the patient's breathing. It is, therefore, the practice to install an endotracheal tube through the patients' mouth and into the trachea and thereby administer anesthetics and oxygen. The proximal end of the tube which projects externally from the patient's mouth is operatively attached to an anesthesia machine which provides a flow of desired gases.

The conventional endotracheal tube comprises a soft, flexible relatively large-diameter piece of tubing which is diametrically sized to fit past the larynx and into the vestibular portion of the trachea. Adjacent to the caudal end, the tubing is provided with a sleeve-like inflatable rubber cuff and some kind of a secondary tube through which the cuff can be inflated. The opposite end of the secondary tube is usually provided with a syringe bulb for inflating the cuff. Generally, the cuff is positioned on the tubing so that when the latter is fully inserted, the cuff will lie in the trachea beyond the sphincter muscles of the larynx. Such cuffs, however, have proved rather unsatisfactory because the sleeve-like element which forms the cuff frequently slides upwardly over the tube upon encountering a restricted organ such as the sphincter muscles of the larynx, and, the small secondary tube leading from the cuff often becomes twisted and tangled. Finally, since such endotracheal tubes are constructed from rubber, they cannot be adequately sterilized by steam or other high temperature methods. These difficulties led to the development of the so-called Rüsche tube which employs an inflatable cuff that is built integrally into, and forms a part of the tube. The small secondary tube used to inflate the cuff passes internally through the Rüsche tube to the portion surrounded by the cuff where it is connected through the wall of the tube to the internal chamber of the cuff. However, the Rüsche type endotracheal tube is comparatively expensive, and, being made of soft rubber it cannot readily be subjected to high temperature sterilization. In addition, the internally disposed inflation tube can interfere with the insertion of surgical instruments through the tube and this makes it difficult to use a rigid or semi-rigid stylet to lend rigidity for accuracy of manipulation and direction in inserting the tube into the larynx.

It is, therefore, the primary object of the present invention to provide an endotracheal tube which is combined with a stylet to facilitate placement within the patient's trachea.

It is another object of the present invention to provide an endotracheal tube having a securely attached cuff that

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can be inserted within the trachea to form a tight seal without the use of a secondary inflation tube and which seats with the encircling tracheal lining.

It is an additional object of the present invention to provide an endotracheal tube which is relatively simple in construction and economical to manufacture.

It is further an object of the present invention to provide an endotracheal tube which is completely disposable.

It is still a further object of the present invention to provide an endotracheal tube which can easily be sterile-packed for simplicity in shipping, storage, and ultimate use.

With the above objects in view, my invention resides in the novel features of form, construction, arrangement, and combination of parts presently described and pointed out in the claims.

In the accompanying drawings—

FIG. 1 is a top plan view of an endotracheal tube constructed in accordance with and embodying the present invention;

FIG. 2 is a sectional view taken along line 2—2 of FIG. 1;

FIGS. 3 and 4 are transverse sectional views taken along lines 3—3 and 4—4 of FIG. 2;

FIG. 5 is a side elevational view of a modified form of the present invention;

FIG. 6 is a longitudinal sectional view taken along line 6—6 of FIG. 5; and

FIGS. 7, 8 and 9 are transverse views taken along lines 7—7, 8—8, and 9—9 of FIG. 6.

Referring now in more detail and by reference characters to the drawings which represent practical embodiments to the present invention, A designates an endotracheal tube including a flexible relatively soft tube 1 made of polyethylene, polypropylene or similar flexible material. The tube 1 is of sufficient length to extend from the vestibular portion of a patient's trachea immediately caudad to the larynx and through his mouth, projecting outwardly therefrom. Attached externally to and disposed encirclingly around the distal or forward end (reference being made to the right end as shown in FIG. 1) of tube 1 is an inflatable cuff 2 which is preferably constructed from some suitable flexible material which will balloon out under air or gas pressure. The annular margins of cuff 2 are adhesively or otherwise suitably sealed to the wall of the tube 1, thereby creating an annular chamber 3 between the outer surface of tube 1 and the inner surface of cuff 2. Tube 1 is provided with an aperture 4 which provides communication between the internal bore of tube 1 and the air chamber 3. Secured along one margin to tube 1 and completely covering aperture 4 is valve flap 5 which is preferably made of rubber and will normally lie in a closure-forming position over the aperture 4 but can swing outwardly into an "open" position to admit air or gas into the chamber 3. Thus, valve-flap 5 creates a unidirectional air valve over aperture 4, all as best seen in FIG. 2 and for purposes presently more fully appearing.

Extending axially through the tube 1 in a tubular stylet 6 having a longitudinal bore 7 made of a relatively rigid material which is stiff enough to facilitate manipulation and installation of the tube 1. The stylet 6 is integrally provided near its internal or distal end (reference being made to the right end as viewed in FIG. 2) with a solid diametrically enlarged disk-like plug or head 8 which fits snugly but slidably around its periphery against the internal surface of the tube 1, the head 8 also plugging or blocking the forward end of the bore 7. Rearwardly of the head 8, the stylet 6 is provided with an opening 9 and adjacent its proximal or external end the stylet 6 is integrally provided with a relatively large plug or stopper

10 which is seated snugly but removably within the proximal end of the tube 1. The length of the stylet 6 is such that, when the stopper is in place, as shown in FIGS. 1 and 2, the head 8 will engage and seal the distal end of the tube 1 forwardly of the aperture 4. Thus, when air or loss of pressure within the air chamber 3. In this through the bore 7 and opening 9 into the interior space s within the tube 1 between the head 8 and stopper 10, this air or gas will then flow through the aperture 4 flexing the valve-flap 5 away from closure-forming position and inflating the cuff 2. It should be noted that the air or gas within the tube 1 stiffens the tube 1 and offsets any tendency for it to balloon inwardly or collapse if the cuff 2 encounters any external resistance from the tissues of the trachea. However, when the cuff 2 is inflated the pressure in the chamber 3 will force the valve-flap 5 into sealing engagement with the outwardly presented margins of aperture 4, thereby preventing the escape of air or loss of pressure within the air chamber 3. In this regard, it should be noted that valve-flap 5 should be constructed so that only a moderate increase in pressure within the tube 1 will lift it away from aperture 4.

When the cuff 2 has been suitably inflated, the stopper 10 is loosened and the stylet 6 entirely removed. Subsequently, when the surgical or other procedure requiring the endotracheal tube A is concluded, the endotracheal tube A can be removed by simply inserting a wire or metal rod (not shown) axially through the tube 1 and gently feeling for the aperture 4. When the aperture 4 is located, the wire or rod can be pushed through the aperture 4 for enough to flex the valve-flap away from closure-forming position and allow the air or gas which is trapped in the chamber 3 to escape. Thereupon the endotracheal tube A can be easily pulled out of the patient's throat. To facilitate location of the aperture 4, a suitable indicia-mark *m* may be imprinted or otherwise applied to the external face of the proximal end of tube 1 at a point axially outwardly from, and diametrically opposite to the aperture 4.

After manufacture and assembly, the endotracheal tube A should be suitably sterilized and cuff 2 should be deflated so that it clings snugly to the wall of tube 1. The endotracheal tube A is then sealed in a sterilized package so that it may be used immediately by a hospital upon removal from the package as more particularly described in co-pending application Ser. No. 437,365 filed Mar. 5, 1965, now abandoned.

Immediately before the operation, the endotracheal tube A is removed from the package, and smeared with a lubricant such as "Xylocaine" jelly which has anesthetic properties to lessen irritation upon placement. The anesthesiologist then inserts the forward end of tube 1 into the patient's mouth and through the larynx, using the stylet 6 to both manipulate the tube 1 and provide rigidity thereto. It should be noted that there is no secondary air tube internally disposed within tube 1 to interfere with the manipulation of the stylet 6. Also, there is no externally disposed secondary air tube to obstruct the anesthesiologist's view or to become twisted and tangled. Finally, after the cuff 2 has passed the sphincter muscle of the larynx and entered the vestibular portion of the trachea, the cuff is inflated as above described.

It is possible to provide a modified endotracheal tube B substantially as shown in FIG. 5, which is very similar to endotracheal tube A and includes a soft flexible tube 11, a cuff 12, forming an annular chamber 13 and an aperture 14. Completely disposed over aperture 14 and having its lateral margins adhesively or otherwise suitably sealed to tube 11 is a flexible saddle 15 preferably made from a thin very flexible sheet of rubber. The saddle 15 serves the same function as the valve-flap 5, that is to say, it acts as a unidirectional air valve over aperture 14 permitting inflation of cuff 12 when air or gas pressure is applied in tube 11.

At its proximal end, the tube 11 is diametrically enlarged to provide an annular shoulder 16 and cylindrical socket 17 for attachment to a conventional anesthesia machine (not shown). Extending axially through the tube 1 is a relatively rigid solid rod-like stylet 18 provided, adjacent to its interior or forward end, with a head 19 substantially similar to the head 8 of the previously described stylet and serving the same purpose. Adjacent to its external or proximal end, the stylet 18 is integrally provided with a transversely extending diametral bar 20 which abuts against the shoulder 16 and prevents the head 19 from being blown out the forward end of tube 11 when air or gas pressure is admitted through the other end of tube 1.

The endotracheal tube B is inserted within the patient's throat in the same manner as the previously described endotracheal tube A. The socket 17 is conventionally connected to an anesthesia machine and air or gas is injected into the tube 1. The air or gas under pressure flows through the aperture 14 and past the saddle 15 and into the chamber 13 thereby inflating the cuff 12. When the cuff has been fully inflated, the stylet can be pulled out and discarded. The cuff 12 can be deflated substantially in the same manner as previously described in connection with endotracheal tube A.

It is readily apparent that endotracheal tubes A and B, being relatively simple in design are obviously economical to manufacture. Because of the low cost the hospital can discard the used tubes upon completion of the operation, and it need not worry over transferring infections from one patient to another through reuse of tubes. The tubes, being simple in construction, have few parts which interfere with the conduct of the operation, or obstruct the anesthesiologist's view and interfere with his movements. Moreover, the simple construction is adapted to reduce patient irritation to an absolute minimum. It should be noted that endotracheal tubes and analogous tubes of similar design but differing in size can be constructed for use with patients of different sizes as well as for insertion in other body canals such as the ureter.

It should be understood that changes and modifications in the form, construction, arrangement, and combination of the several parts of the endotracheal tubes may be made and substituted for those herein shown and described without departing from nature and principle of my invention.

Having thus described my invention, what I claim and desire to secure by Letters Patent is:

1. Means for establishing an artificial passageway through a duct in the body; said means comprising an open-ended tube having proximal and distal ends and being sized for at least partial insertion into the duct, a flexible cuff fitted around the tube adjacent its distal end for insertion into the duct and being in sealingwise engagement with the tube at two spaced locations so as to form a fluid chamber intermediate the walls of the tube and cuff, the tube having an aperture opening into the chamber, a check valve carried by the tube at the aperture for permitting a unidirectional flow of fluid into the chamber through the aperture, and plug means removably fitted into and blocking the tube intermediate the distal end and the aperture so that when a pressurized fluid is introduced into the tube from the proximal end the fluid will open the check valve and inflate the cuff for sealingwise engagement with the wall of the duct.

2. Means according to claim 1 and further characterized by withdrawal means connected to the plug means for withdrawing the plug means past the aperture and out of the proximal end of the tube.

3. Means according to claim 2 wherein the withdrawal means is an elongated element extending through the tube from its proximal end, and the plug means is a head secured to one end of the elongated element.

4. Means according to claim 3 wherein the elongated

element is provided at its end opposite the head with means for engaging the proximal end of the tube so as to prevent the head from passing completely through the tube.

5 5. Means for establishing an artificial passageway through a duct in the human body such as the trachea, ureter, or the like; said means comprising an open-ended tube having proximal and distal ends and a cross-sectional size and shape substantially similar to the cross-sectional size and shape of the duct, a pressure membrane marginally secured to the tube near its distal end and being disposed externally with respect thereto whereby to form a chamber, said tube being provided with an opening establishing communication between the interior of the tube and the interior of the chamber, a unidirectional check valve disposed exteriorly of said tube and being operatively associated with said opening, a relatively rigid stylet provided at its one end with a first plug adapted for snug-fitting association with said tube intermediate the distal end and the opening whereby to preclude fluid from passing into the duct, a second plug fitted into and sealing the proximal end of the tube, and means for introducing a fluid medium under pressure into the tube through said second plug whereby to open said unidirectional valve and inflate said membrane so as to create a bulbous external enlargement on the tube for retentive engagement with tissues along a portion of the duct.

6. Means for establishing an artificial passageway through a duct in the human body such as the trachea, ureter, or the like; said means comprising an open-ended tube having proximal and distal ends and a cross-sectional size and shape substantially similar to the cross-sectional size and shape of the duct, a pressure membrane marginally secured to the tube near its distal end and being disposed externally with respect thereto whereby to form a chamber, said tube being provided with an opening establishing communication between the interior of the tube and the interior of the chamber, a unidirectional check valve disposed exteriorly of said tube and being operatively associated with said opening for permitting unidirectional flow of a fluid medium into the chamber, a relatively rigid stylet removably inserted within the tube and extending lengthwise therein, said stylet being provided in close proximity to its one end with a flange-like element adapted for slidable and sealingwise engagement with the interior wall of said tube intermediate the distal end and the opening so that when a fluid medium is introduced into said tube under pressure from the proximal end it will open said unidirectional check valve and inflate said membrane.

7. Means for establishing an artificial passageway through a duct in the human body such as the trachea, ureter, or the like; said means comprising an open-ended tube having proximal and distal ends and a cross-sectional size and shape substantially similar to the cross-sectional size and shape of the duct, a pressure-expandable membrane marginally secured to the tube adjacent its distal end and being disposed externally with respect thereto whereby to form a chamber, said tube being provided with an opening establishing communication between the interior of the tube and the interior of the chamber, check valve means operatively associated with the opening for permitting unidirectional flow of a fluid medium into the chamber whereby to distend the membrane and create a bulbous external enlargement on the tube for retentive engagement with the tissues along a portion of the duct, and a relatively rigid stylet removably inserted within the tube and extending lengthwise therealong, said stylet having an enlarged element adapted to seat in the tube in the manner of a plug, said element being positioned along the stylet so as to be located between the distal end and the opening when the stylet is in place so that when a fluid medium under pressure fills the tube between the proximal end and the element the fluid medium will

flow into the chamber and cause the membrane to balloon out into a distended position.

8. A means for establishing an artificial passageway through a duct in the human body according to claim 7 in which said open-ended tube is provided on its exterior surface with an indicia mark circumferentially located so as to provide reference to its said opening.

9. Means for establishing an artificial passageway through a duct in the human body such as the trachea, ureter, or the like; said means comprising a flexible open-ended tube having proximal and distal ends and a cross-sectional size and shape substantially similar to the cross-sectional size and shape of the duct, a pressure membrane marginally secured to the tube adjacent its distal end and being disposed externally with respect thereto whereby to form a chamber, said tube being provided with an opening establishing communication between the interior of the tube and the interior of the chamber, a unidirectional check valve disposed exteriorly of said tube and being operatively associated with said opening for permitting unidirectional flow of a fluid medium into the chamber, a relatively rigid stylet removably inserted within the tube and extending lengthwise therein, said stylet being provided in close proximity to its one end with a flange-like element adapted for slidable and sealingwise engagement with the interior wall of said tube, said flange-like element being located intermediate said distal end and said opening when said stylet is fully inserted within said tube whereby to seal said tube and prevent escape of fluid into the duct, and means for introducing a fluid medium into said tube under pressure from the proximal end whereby to open said unidirectional check valve and inflate said membrane causing the latter to engage the wall of said duct.

10. Means for establishing an artificial passageway through a duct in the human body such as the trachea, ureter, or the like; said means comprising a flexible open-ended tube having proximal and distal ends and a cross-sectional size and shape substantially similar to the cross-sectional size and shape of the duct, a pressure membrane marginally secured to the tube adjacent its distal end and being disposed externally with respect thereto whereby to form a chamber, said tube being provided with an opening establishing communication between the interior of the tube and the interior of the chamber, a unidirectional check valve disposed exteriorly of said tube and being operatively associated with said opening for permitting unidirectional flow of a fluid medium into the chamber, a relatively rigid stylet removably inserted within the tube and extending lengthwise therein, said stylet being provided in close proximity to its one end with a flange-like element adapted for slidable and sealingwise engagement with the interior wall of said tube, said flange-like element being located intermediate the distal end and said opening when said stylet is fully inserted within said tube whereby to seal said tube and prevent escape of fluid into the duct, said stylet being provided at its other end with a plug, said plug being adapted for snug-fitting association with the proximal end of said tube when said stylet is fully inserted therein whereby to prevent escape of fluid from the proximal end of said tube, and means for introducing a fluid medium under pressure through said plug whereby to increase the pressure in said tube and open said unidirectional check valve thereby inflating said membrane and causing the latter to engage the wall of said duct.

11. Means for establishing an artificial passageway through a duct in the human body such as the trachea, ureter, or the like; said means comprising a flexible open-ended tube having proximal and distal ends and a cross-sectional size and shape substantially similar to the cross-sectional size and shape of the duct, a pressure membrane marginally secured to the tube adjacent the distal end and being disposed externally with respect thereto whereby to form a chamber, said tube being provided with an opening establishing communication between the interior of the tube and the interior of the chamber, a unidirectional

check valve disposed in said chamber and being operatively associated with said opening for permitting unidirectional flow of a fluid medium into the chamber, and a relatively rigid tubular stylet removably inserted within the tube and extending lengthwise therein, said stylet being provided in close proximity to its one end with a flange-like element adapted for slidable and sealingwise engagement with the interior wall of said tube, said flange-like element being located intermediate the distal end and said opening when said stylet is fully inserted within said tube whereby to seal said tube and prevent escape of fluid into the duct from the distal end, said stylet being provided at its other end with a plug, said plug being adapted for snug-fitting association with the proximal end of said tube when said stylet is fully inserted in the tube whereby to prevent escape of fluid from the proximal end of said tube, said stylet being sealed at its flanged end and having an aperture intermediate said plug and flange-like element for providing communication between the interior of said stylet and the interior of said tube.

12. Means for establishing an artificial passageway through a duct in the human body such as the trachea, ureter, or the like; said means comprising an open-ended tube having proximal and distal ends and a cross-sectional size and shape substantially similar to the cross-sectional size and shape of the duct, an inflatable cuff marginally secured to the exterior surface of the tube adjacent its distal end and in encircling relationship thereto whereby to form a first chamber, said tube being provided with an opening establishing communication between the interior of the tube and the interior of the first chamber, a unidirectional check valve disposed within said first chamber and being operatively associated with said opening for permitting unidirectional flow of a fluid medium into the first chamber, a relatively rigid stylet removably inserted within the tube and extending lengthwise therein, a flange-like element rigidly secured to said stylet at its one end, said element being adapted for slidable and sealingwise engagement with the interior wall of said tube intermediate the distal end and the opening whereby to seal said tube and prevent escape of fluid into the duct from the distal end, a plug rigidly secured to the other end of said stylet and being adapted for sealingwise engagement with the proximal end of said tube whereby to prevent an escape of fluid therefrom, the volume enclosed by said plug, tube and flange-like element defining a second chamber, and means associated with said stylet for introducing a fluid medium under pressure into said second chamber whereby to open said unidirectional check valve and to inflate the cuff.

13. Means for establishing an artificial passageway through a duct in the human body such as the trachea, ureter, or the like; said means comprising a flexible open-ended tube having proximal and distal ends and a cross-sectional size and shape substantially similar to the cross-sectional size and shape of the duct, a pressure membrane marginally secured to the tube adjacent its distal end and being disposed externally with respect thereto whereby to form a chamber, said tube being provided with an opening establishing communication between the interior of the tube and the interior of the chamber, a unidirectional check valve disposed within said chamber and being operatively associated with said opening for permitting unidirectional flow of a fluid medium into the chamber, a relatively rigid stylet removably inserted within the tube and extending lengthwise therein, said stylet being provided in close proximity to its one end with a flange-like element adapted for slidable and sealingwise engagement with the interior wall of said tube, said flange-like element being located intermediate the distal end and said opening when said stylet is fully inserted within said tube whereby to seal said tube and prevent escape of fluid into the duct, means for introducing a fluid medium into said tube under pressure from the proximal end whereby to open said unidirectional check valve and in-

flate said membrane causing the latter to engage the wall of said duct, and retention means operatively associated with said stylet for preventing it from slipping through said tube when said pressurized fluid medium is introduced therein.

14. Means for establishing an artificial passageway through a duct in the human body such as the trachea, ureter, or the like; said means comprising a flexible open-ended tube having proximal and distal ends and a cross-sectional size and shape substantially similar to the cross-sectional size and shape of the duct, said tube being sized and adapted at one end for operative attachment to a source of pressurized fluid such as an anesthesia machine, a pressure membrane marginally secured to the tube adjacent its distal end and being disposed externally with respect thereto whereby to form a chamber, said tube being provided with an opening establishing communication between the interior of the tube and the interior of the chamber, a unidirectional check valve disposed within said chamber and being operatively associated with said opening for permitting unidirectional flow of a fluid medium into the chamber, a relatively rigid stylet removably inserted within the tube and extending lengthwise therein, said stylet being provided in close proximity to its one end with a flange-like element adapted for slidable and sealingwise engagement with the interior wall of said tube, said flange-like element being located intermediate the distal end and said opening when said stylet is fully inserted within said tube whereby to seal said tube and prevent escape of fluid into the duct, means for introducing a fluid medium into the proximal end of said tube under pressure whereby to open said unidirectional check valve and inflate said membrane causing the latter to engage the wall of said duct, and retention means rigidly secured to said stylet at its opposite end for preventing it from slipping through said tube when said pressurized medium is introduced therein.

15. Means for establishing an artificial passageway through a duct in the human body such as the trachea, ureter, or the like; said means comprising a flexible open-ended tube having proximal and distal ends and a cross-sectional size and shape substantially similar to the cross-sectional size and shape of the duct, said tube being diametrically enlarged at its proximal end in the provision of an annular shoulder and cylindrical socket, a pressure-expandable membrane marginally secured to the tube adjacent its distal end and being disposed externally with respect thereto whereby to form a chamber, said tube being provided with an opening establishing communication between the interior of the tube and the interior of the chamber, a unidirectional check valve disposed exteriorly of said tube and being operatively associated with said opening for permitting unidirectional flow of a fluid medium into the chamber, a relatively rigid stylet removably inserted within the tube and extending lengthwise therein, said stylet being provided in close proximity to its one end with a flange-like element adapted for slidable and sealingwise engagement with the interior wall of said tube, said flange-like element being located intermediate the distal end and said opening when said stylet is fully inserted within said tube whereby to seal said tube and prevent escape of fluid into the duct, means for introducing a fluid medium into the proximal end of said tube under pressure whereby to open said unidirectional check valve and inflate said membrane causing the latter to engage the wall of said duct, and a transversely extending retention bar rigidly secured to the opposite end of said stylet, said bar being sized to fit within said socket and bear against said shoulder whereby to prevent said stylet from slipping through said tube when said pressurized fluid medium is introduced therein.

16. Means for establishing an artificial passageway through a duct in the human body such as the trachea, ureter, or the like; said means comprising a flexible open-ended tube having proximal and distal ends and a cross-

sectional size and shape substantially similar to the cross-sectional size and shape of the duct, an inflatable cuff secured to the exterior surface of the tube in encircling relationship thereto adjacent its distal end whereby to form a first chamber, said tube being provided with an opening establishing communication between the interior of the tube and the interior of the chamber, a unidirectional check valve disposed within said first chamber and being operatively associated with said opening for permitting unidirectional flow of a fluid medium into the chamber, a relatively rigid tubular stylet removably inserted within the tube and extending lengthwise therein, said stylet being sealed at its one end for preventing escape of fluid therefrom and open at its opposite end for operative connection to a source of pressurized fluid, a flange-like element rigidly secured to said stylet near its sealed end, said element being adapted for slidably and sealingwise engagement with the interior wall of said tube intermediate the distal end and said opening for preventing the escape of fluid into the duct, and a plug rigidly

secured to the stylet and being adapted for sealingwise engagement with the proximal end of said tube whereby to prevent an escape of fluid therefrom, the volume enclosed by said plug, tube and flange-like element defining a second chamber, said stylet being provided with an aperture located intermediate said plug and flange-like element for providing communication between the interior of said stylet and said second chamber whereby to permit said fluid medium to pass therefrom through said second chamber and into said first chamber thereby inflating said cuff so that it engages the wall of the duct.

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DALTON L. TRULUCK, *Primary Examiner.*