Feb. 16, 1965 N. Z. KOENIG 3,169,529

TRACHEOSTOMY TUBE

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FIG. 1.

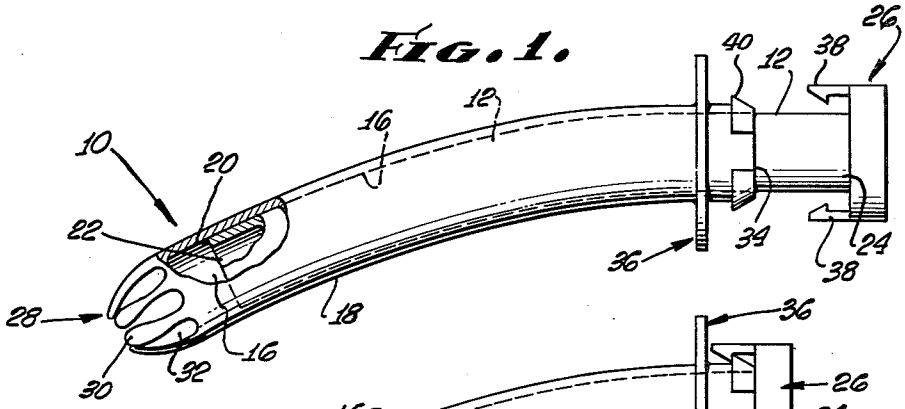


FIG. 2.

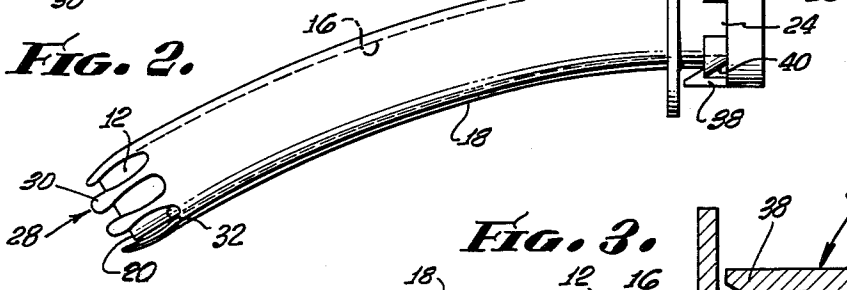


FIG. 3.

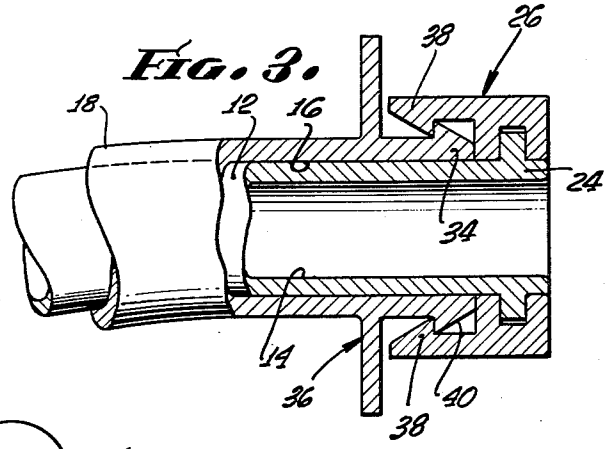


FIG. 4.

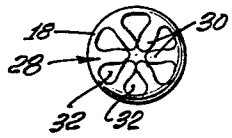
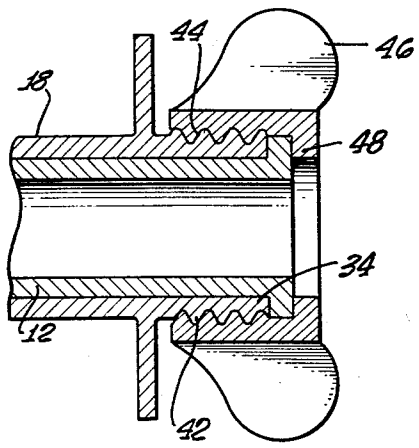


FIG. 5.



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FIG. 6.

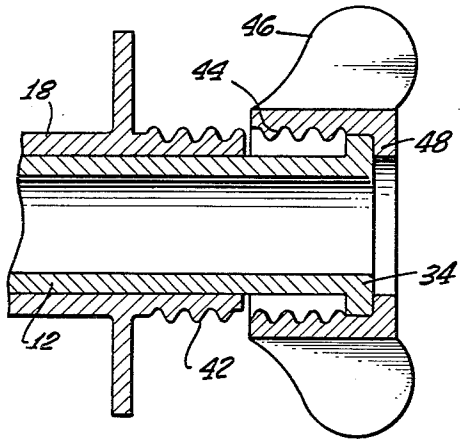


FIG. 7.

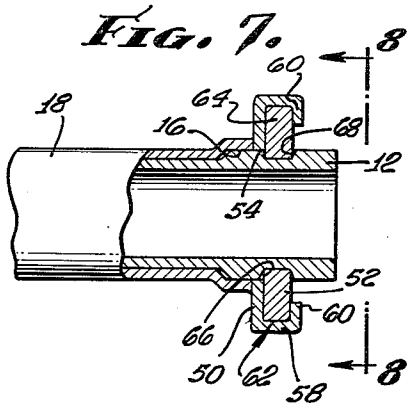


FIG. 8.

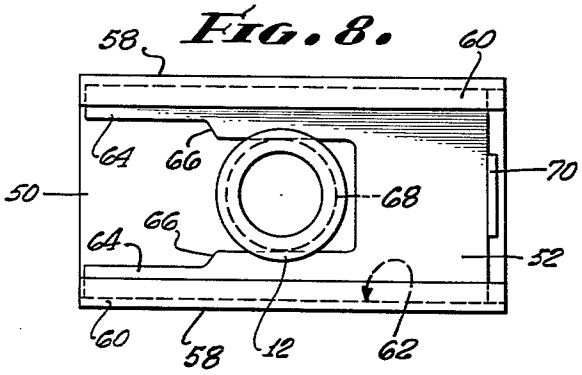


FIG. 10.

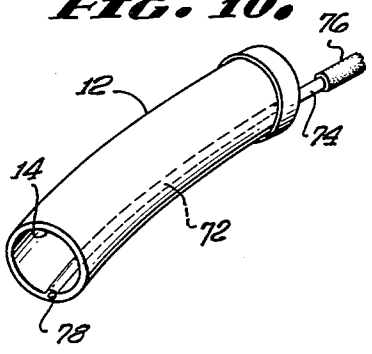
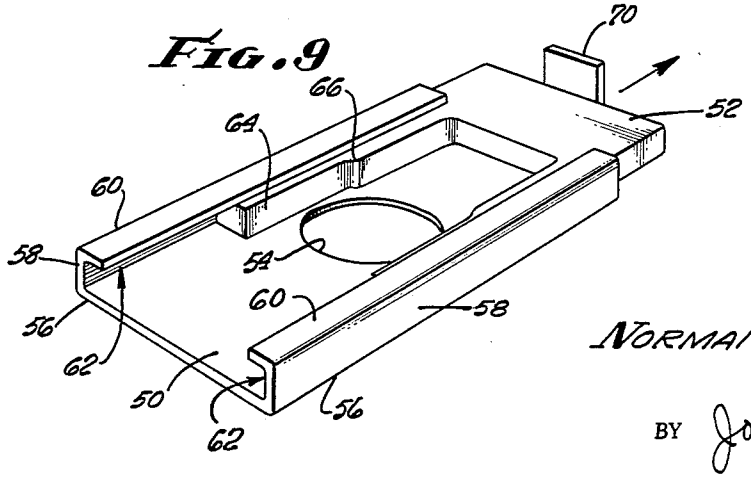


FIG. 9.



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TRACHEOSTOMY TUBE

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Filed May 27, 1963, Ser. No. 283,436
3 Claims. (Cl. 128—351)

This invention relates to improvements in a tracheostomy tube used for breathing by patients through an opening, surgical or otherwise, in the trachea, and which also permits simultaneously or otherwise, the administration of gases or other vaporized medications to patients through the tracheostomy tube.

Current tracheostomy tubes are made out of metal and have several parts requiring periodic removal and insertion, all to the great discomfort of the patient. For example, typical conventional tracheostomy tubes require the use of a stylet to provide a smooth surface and to prevent the edges of the end of the conventional metal tracheostomy tubes from cutting into the inside membrane of a patient's trachea upon insertion. Thus, the stylet must be used for the insertion of the conventional tracheostomy tube. During all the time that the tracheostomy tube, with a stylet inside, is being inserted into a patient's trachea, the patient is unable to breathe through the tracheostomy tube, since the stylet completely blocks the passage of air through the tube and thus blocks the passage of air through the trachea.

Further, each stylet is made in a size tailored to fit a particular size of tracheostomy tube. Thus, once a tracheostomy tube is being used, a stylet of the proper size must be kept immediately available for use in case of reinsertion of the tracheostomy tube in situations where the tracheostomy tube may be inadvertently dislodged. It is customary practice to tape a stylet of the proper size to the patient or to his hospital bed to make sure that this vital component is readily available to reintroduce a tracheostomy tube should the tube become dislodged from the patient. Such a dislodgement might very well be a disaster to the patient.

Another disadvantage of the conventional tracheostomy tube is the handicap to surgeons because such tubes are readily plugged up while in use over a period of time. Therefore, periodic removal and reinsertion is required of such tracheostomy tubes. Additional disadvantages of conventional tracheostomy tubes are that such tubes must be re-sterilized each time before being used and that such tubes are conventionally made from metals and are inflexible. Consequently, considerable trauma is caused by such tubes to the fragile tissues of the trachea and surrounding areas of the body.

It is therefore, an object of this invention to provide a tracheostomy tube which prevents any obstruction of the breathing of a patient while the tube is being inserted or removed.

Another object of this invention is to provide a tracheostomy tube which dispenses with the need of an occluding stylet, which may be easily misplaced, for insertion of a tracheostomy tube, and which permits the patient to breathe while the tube is being inserted or removed.

A further object of this invention is to provide a tracheostomy tube which may be made of a relatively soft material, such as a plastic, instead of metal, which will considerably reduce trauma to body tissues of the patient.

A still further object of this invention is to provide a tracheostomy tube which is disposable and need be used only once, thereby dispensing with the necessity of repeated sterilization of conventional tracheostomy tubes.

A still further object of this invention is to provide a tracheostomy tube which may be manufactured at relatively little cost and is easy to assemble and to use.

A still further object of this invention is to provide a tracheostomy tube which permits the administration of gases or other vaporized medications while the patient is otherwise breathing through the tracheostomy tube.

These and other objects will be more readily understood by reference to the following description and claims, taken in conjunction with the accompanying drawings forming a part hereof, in which

FIG. 1 is a side elevational view of an embodiment of my invention showing the inner cannula member partly inserted into the outer cannula member.

FIG. 2 is a view similar to FIG. 1 but showing the inner cannula member fully inserted into the outer cannula member so that the flexible leaves are fully expanded at the end of the outer cannula member and in a locked position, with hook members.

FIG. 3 is an enlarged section of FIG. 2.

FIG. 4 is an end view of my invention as shown in FIG. 1 illustrating the leaf members with air spaces between.

FIG. 5 is an enlarged section similar to FIG. 3 showing an alternate means of locking my invention in the locked position and fully inserted.

FIG. 6 is a view similar to FIG. 5 showing my invention in an unlocked position.

FIG. 7 is another enlarged section similar to FIG. 3 showing another means of locking my invention in the locked position.

FIG. 8 is a section taken on line 8—8 of FIG. 7.

FIG. 9 is a perspective view of the locking means shown in FIG. 7 in the unlocked position.

FIG. 10 is an elevational view partly in section showing a modification of my invention equipped with a conduit for passage of gases.

With reference to the drawings, the tracheostomy device 10 has an inner cannula member 12 with a bore 14 which is insertable into the bore 16 of outer cannula member 18. Both the inner and outer cannula members are curved in accordance with the inside contour of a person's trachea.

The inner end 20 of the inner cannula member 12 terminates in an orifice 22 having approximately the same diameter as the bore 14 of the inner cannula member 12. The outer end 24 of the inner cannula member 12 is provided with a flange 26 which is slightly convex.

The inner end 28 of the outer cannula member 18 is formed into the shape of a cone with flexible leaves 30 and interspaces 32. The outer end 34 of the outer cannula member 18 is provided with a flange 36 which is slightly convex to correspond to the flange 26 of the inner cannula member and is slightly larger than the flange 26.

The inner cannula member 12 is sufficiently long so that when it is inserted as far as it can go into the outer cannula member 18 so that flange 26 touches flange 36, the inner end 20 of the inner cannula member 12 bears against leaves 30 and spreads them apart in a distended or expanded position. Upon removal of the inner cannula member 12, the leaves 30 return to their original position forming a cone as shown in FIG. 4 of the drawings.

When it is desired to lock the inner cannula member 12 in place after being fully inserted into the outer cannula member 18, my invention provides several alternate types of lock mechanisms suitable for this purpose.

One suitable lock mechanism comprises a modification of flange 26 which is provided with hooks 38 projecting downward from the lower surface of the flange 26. The flange 36 is formed with corresponding hooks 40 projecting upwards to engage with hooks 38 when the inner cannula member 12 is inserted fully into the outer can-

nula member 18, thereby locking the inner cannula member 12 in place.

Another locking means comprises a wing nut securing the inner cannula member 12 in place. In this modification, the outer circumference of the outer end 34 of the outer cannula member 18 is provided with threads 42. These threads 42 mesh with corresponding threads 44 contained inside a wing nut 46. The wing nut 46 has an inner annular lip 48 at its top which presses against the outer end of the inner cannula member 12 and keeps it in position when the wing nut 46 is screwed down the outer end of the outer cannula member 18.

A further alternate locking means of the tracheostomy device is a breech lock mechanism consisting of a platform 50 and a breech member 52. The outer end of the outer cannula member 18 is formed into the platform 50 which has an orifice 54 registerable with the bore 16 of the outer cannula member 18. The two longer parallel sides 56 of the top surface of the platform 50 are formed into longitudinal lips 58 with overhangs 60 to define a channel 62.

The breech member 52 has two projecting arms 64 which are slidable along the channel 62. The projecting arms 64 are provided with shoulders 66 which correspond to grooves 68 cut into the outer circumference of the outer end of the inner cannula member 12. A tab handle 70 formed at the base of the breech member 52 provides a means for easily moving the breech member in and out of locking position. When the breech member is inserted into channel 62 and pushed into locking position, shoulders 66 are pushed against grooves 68, thereby producing a friction fit which maintains the inner cannula member 12 in place inside the outer cannula member 18.

My invention also provides a means for easily administering various gases or vaporized medications to a patient through his trachea, while at the same time permitting the patient to breathe air normally through the bore of the inner cannula member 12. Preferred means for doing this are provided for by modifying either the inner cannula member 12 or the outer cannula member 18 with a conduit 72 formed in the walls of either member and running lengthwise from one end to the other.

As shown in FIG. 10, the conduit 72 is illustrated in the wall of the inner cannula member 12. The conduit 72 terminates at the outer end of the inner cannula member 12 with a bead 74, preferably without a neck, which provides a connection to a conventional rubber tube 76 leading to a conventional source of various gases contained in a cylinder under pressure. The other end of the conduit 72 terminates in a hole 78.

All of the various parts making up the tracheostomy device, including the various locking mechanisms, may be made out of any suitable material, preferably plastics of suitable types such as polyethylene, polypropylene, nylon, or polystyrene. Such materials as fiberglass or hard rubber are also suitable. Flexible metallic alloys made of metals such as aluminum, tantalum, or other suitable metals, may also be used.

In the operation of my tracheostomy device, the outer cannula member 18 with or without the inner cannula member 12 inserted, is inserted into an opening in a patient's trachea. In the case where the inner cannula member 12 is not in place, the outer cannula member 18 is inserted to its full length through the patient's trachea. Since the outer cannula member 18 is made of a relatively soft material as compared to a rigid metal, namely, a suitable plastic, this insertion considerably reduces trauma to the patient. The cone shaped inner end of the outer cannula member 18 slips into place very easily, due to the fact that the material used to construct the outer cannular member 18 is of a relatively soft and flexible nature. Thus, very little if any trauma is caused to the body tissues of the patient in the use of my invention.

After the outer cannula member 18 is in place, the inner cannula member 12 is then inserted into the outer cannula member 18 throughout its full length until the inner end of the inner cannular member 12 bears against the inner end of the outer cannula member 18. This causes the leaves 30 to expand to approximately the full diameter of the outer cannula member 18 at its inner end. In this manner, a maximum air passageway is provided for breathing by the patient. Of course, the outer cannula member 18 may be inserted together with the inner cannula member 12 only partly inserted in the outer cannula member 18. After the outer cannula member 18 is in place, then the inner cannula member 12 may be inserted fully to expand the leaves 30 as mentioned before.

After the leaves 30 have been expanded as mentioned, the inner cannular member 12 is then locked into place if desired by use of the various locking means previously described. At all times, the inner cannula member 12 is removable without disturbing the position of the outer cannula member 18. When the inner cannula member 12 is removed, the leaves 30 of the inner end of the outer cannula member 18 return to their original positions, without causing any obstruction of the bore 16 of the outer cannula member 18. Thus, the outer cannula member 18 may be removed also without the need for a stylet which is used by conventional tracheostomy tubes at the present time. In this way, at all times, the patient is able to breathe through his trachea using my tracheostomy device with minimal discomfort compared to presently existing tracheostomy tubes.

Further, the conduit 70 may be connected by the beads 72 to a source of gas such as oxygen or whatever gas is to be administered very easily. This may be done without any discomfort to the patient, who continues to breathe through the bore 14 of the inner cannula member 12 while at the same time receiving gas through the conduit 70. This feature is entirely absent in conventional tracheostomy tubes.

Although I have described my invention in detail with reference to the accompanying drawings illustrating preferred forms of my invention, it is understood that numerous changes in the details of construction and arrangement of parts may be made without departing from the spirit and scope of the invention as hereinafter claimed.

I claim:

1. A tracheostomy tube for insertion into an opening of a patient's trachea comprising, an outer cannula member having a curvature permitting said cannula member to conform to the downward inner contour of the trachea after insertion, said cannula member terminating in flexible leaf members forming a cone-shaped inner end with interspaces between the leaf members to permit breathing of the patient through the tracheostomy tube while it is being inserted, and an inner cannula member slidably inserted into the outer cannula member and having its inner end when fully inserted bearing against said leaf members to expand them to a maximum diameter equal to the diameter of the inner end of the outer cannula member.

2. A tracheostomy tube for insertion into an opening of a person's trachea comprising, an outer cannula member having a curvature permitting said cannula member to conform to the downward inner contour of the trachea after insertion and having a cone-shaped inner end terminating in flexible leaves with interspaces for breathing and having threadings around its outer circumference at its outer end, an inner cannula member slidably inserted into the outer cannula member and having a longitudinal conduit in the circumference of its inner wall for passage of gas, and a wing nut member having an inner annular lip at its top and threading in its inner circumference which meshes with the threading of the outer cannula member to maintain the inner cannula member in position when fully inserted.

3. A tracheostomy tube for insertion into an opening of a person's trachea comprising, an outer cannula member having a curvature permitting said cannula member to conform with the inner contour of the trachea after insertion and having a cone-shaped inner end terminating in flexible leaves and with interspaces for breathing and formed at its outer end into a platform with parallel lips defining a channel, an inner cannula member slidably inserted into the outer cannula member and having a conduit for passage of gas formed longitudinally in its inner wall, and with grooves cut into the outer circumference of its outer end, a breech member slidable within said channel and having two projecting arms with shoulders producing a friction fit with said grooves when the breech member is pushed into locking position to maintain the inner cannula member in place when fully inserted.

References Cited by the Examiner

UNITED STATES PATENTS

1,624,716	4/27	Cerbo	128—7
2,786,469	3/57	Cohen	128—351
3,057,350	10/62	Cowley	128—214

FOREIGN PATENTS

137,632	5/60	Russia.

OTHER REFERENCES

Lancet: "Adaptation of the Chevalier Jackson Tracheostomy Tube," Dec. 23, 1961, p. 1388, 128—351.

RICHARD A. GAUDET, *Primary Examiner.*