United States Patent [19]

Swanson

[11] **3,924,637**

[45] **Dec. 9, 1975**

[54] **TRACHEOTOMY TUBE**

[76] Inventor: **Arthur H. Swanson,** 619 S. Cecelia, Sioux City, Iowa 55106

[22] Filed: **Dec. 23, 1974**

[21] Appl. No.: **535,427**

[52] **U.S. Cl.** **128/351**

[51] **Int. Cl.²** **A61M 25/00**

[58] **Field of Search** 3/1.3; 128/351

[56] **References Cited**

UNITED STATES PATENTS

3,263,684	8/1966	Bolton	128/351
3,844,290	10/1974	Birch et al.	128/351

FOREIGN PATENTS OR APPLICATIONS

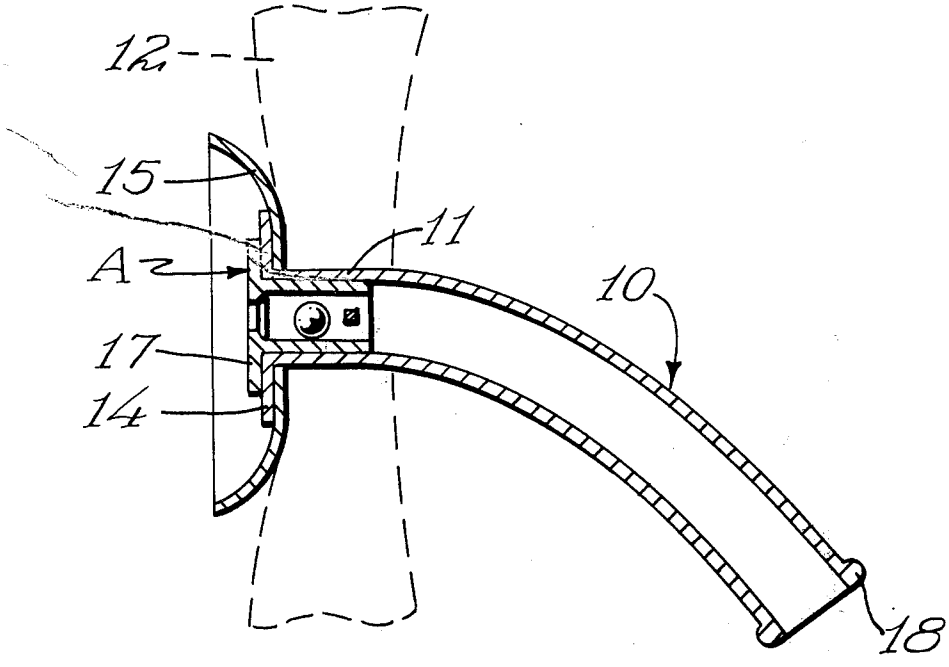
1,207,144	8/1959	France	128/351

Primary Examiner—Ronald L. Frinks

[57] **ABSTRACT**

Voice prosthesis for rehabilition of the voices of laryngectomes includes a tracheotomy tube extending through the neck into the trachea. This normally prevents the patient involved from speaking, as the air inhaled and exhaled may flow inwardly and outwardly through the tube. The present invention comprises a tracheotomy tube provided with a simple ball valve enclosed within the outer end of the tube which permits the patient to inhale air through the tube, and to close the tube to air being exhaled so that the air may be exhaled through the patient's larnyx, permitting the patient to speak.

1 Claim, 3 Drawing Figures



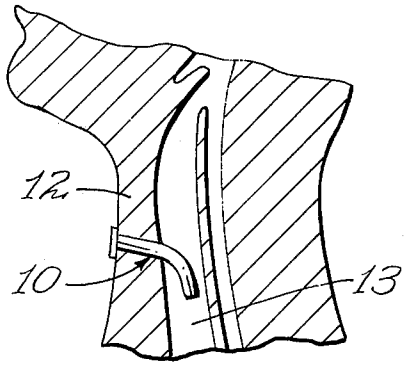


FIG. 1

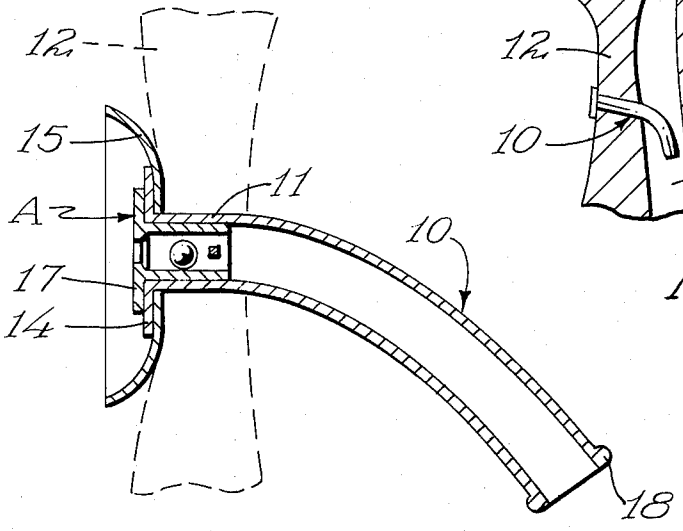


FIG. 2

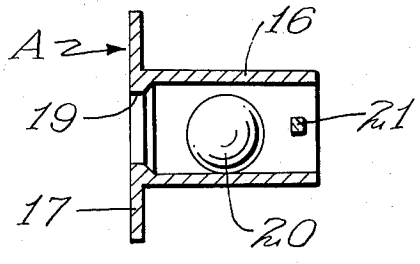


FIG. 3

TRACHEOTOMY TUBE

This invention relates to an improvement in Tracheotomy Tube and deals particularly with a simple attachment designed to frictionally fit within the outer end of the tracheotomy tube to provide a one way valve which permits the intake or inhalation of air through the tracheotomy tube, but which acts as a valve to close the tube during exhalation so that the exhaled air may pass through the patients larynx, permitting the patient to speak without difficulty.

BACKGROUND OF THE INVENTION

Numerous devices have been produced to help one speak. For example U.S. Pat. No. 3,066,674 issued Dec. 4, 1962 to Capra shows a speech facilitating attachment for a throat tube which includes an elongated conduit connected to the outer end of the tracheotomy tube and having a valve **15** at its lower end resting upon the chest of the patient. While this device provides a one way valve, the device is uncomfortable to wear, and tends to twist the tracheotomy tube upon movement of the body to one side or the other.

U.S. Pat. No. 3,137,229 issued June 16, 1964 to Tabor, shows a straight tube extending from the exterior of the neck to the trachea and projecting outwardly from the body. This device also provides a one way valve at the outer end of the tube comprising a diaphragm valve of very thin flexible sheeting designed to open when air is inhaled, and to close when air is exhaled from the trachea to permit the patient to speak. However, the valve is positioned in forwardly spaced relation to the body, interferring with the insertion and removal of clothes from the body and providing a rather unsightly projection which will cause pain to the patient in the event it is touched in a manner to cause movement of the portion of the tube extending through the neck.

U.S. Pat. No. 3,683,931 issued Aug. 15, 1972 to Thomas et al. shows an attachment for a patient which includes a valve chamber located between two external T connections, one of which may be connected to a supply of treated air. While this device may be useful to a patient in a hospital, the weight of the exterior portions including the valve would make the structure unwieldy for a patient which is ambulatory.

U.S. Pat. No. 3,747,127 issued Jan. 24, 1973 to Taube includes a rather complicated mechanism including a flap valve having two connections extending into the body of the patient. It is the applicant's purpose to provide an extremely simple attachment which may be applied to tracheotomy tubes which are of common form, and which will be no more prominent than the outer end of the tracheotomy tube itself. This attachment includes a simple one way valve, and may be readily removed and sterilized whenever desired.

SUMMARY OF THE INVENTION

A feature of the present invention lies in the provision of a tracheotomy tube of standard form which is inserted in the neck of the patient in the usual manner to terminate just outwardly of the skin so that it is relatively unnoticeable to others. Such tubes are usually provided with a peripheral flange at their outer ends, and are provided with a washer which is inwardly at the flange to hold the device in proper position. The applicant experienced breathing difficulties, and such a tube

was inserted in his neck to permit the inhalation and exhalation of air through the tube. The applicant's problem is such that he can exhale through the larynx and mouth but difficulty is experienced in the inhalation of air. Since the insertion of the tracheotomy tube, the applicant has found that he is unable to speak unless he closes the outer end of the tracheotomy tube during the speaking process. In order to solve this difficulty, the applicant made an attachment for the outer end of the tracheotomy tube which comprises merely a sleeve designed to frictionally fit within the cylindrical outer end of the tracheotomy tube, and which is provided with a peripheral flange at its outer end designed to bear against the flange at the outer end of the tracheotomy tube and to limit the insertion of the attachment. Inwardly of the external flange the applicant provides a valve seat against which a valve ball may engage. After the ball has been inserted in the tube, a cross member is provided extendingly diametrically across the inner end of the sleeve. This cross member is designed to limit the inward movement of the valve ball when it is disengaged from the valve seat, and to limit the movement of the valve ball between its closed position and its open position, thereby limiting the amount of air which is exhaled through the tube before the valve is fully closed.

This arrangement has a number of definite advantages. In the first place, there is often a tendency for mucous to collect in the throat as well as other bronchial secretions. Normally these secretions tend to collect in the tracheotomy tube, particularly when the patient coughs. By closing the tracheotomy tube during the exhalation of air, most of the mucous deposited in the tube is eliminated. However, one of the reasons why diaphragm valves or membrane valves of the type used in most of the previous constructions are not used lies in the fact that such mucous may well interfere with the normal operation of a diaphragm valve. On the other hand, the applicant's attachment is made so that the ball is of sufficiently less diameter than the sleeve which supports it so that nothing of this type would normally interfere with the movement of the ball within the sleeve. Furthermore, in view of the fact that the sleeve frictionally fits within the end of the tube, the applicant's attachment may be removed in its entirety, and may be washed or sterilized as it contains only the sleeve, the ball, and the cross pin, all of which may be made of a material such as stainless steel, silver, or even certain types of plastic which may be subjected to sterilizing temperatures.

An added feature to the present invention resides in the fact that the device is virtually unnoticeable when in place. In view of the fact that the sleeve is frictionally engaged against the flange and sleeve at the outer end of the tube, the only part of the device which is visible is normally the flange at the outer end of the sleeve and the washer. As this washer normally rests flush against the flange at the end of the tube, the device is normally not noticeable when in place. The device is held in place by a ribbon tied about the neck connected to the washer much in the manner shown in U.S. Pat. No. 3,263,684 issued Aug. 2, 1966 to Bolton.

A further feature of the present invention resides in the fact that the applicant's attachment is useful not only to persons having operations in which the tracheotomy tube is inserted, but also to the numerous persons in which a tracheotomy tube has been inserted. In view of the simplicity of the device, it can produced at

an extremely low cost of production as the device, includes a total of three parts. In forming the device, it is only necessary to produce the sleeve having a flange at one end, to drill a retaining hole through the tube diametrically through the inner end of the tube, to insert the valve ball, and to insert a retaining pin to hold the ball in place. This is normally done when the sleeve is produced. Thus the entire device may be produced for a fraction of the cost of most of the devices of the prior art, and are obviously much easier to apply, remove, wash, or to sterilize. As a result, the advantage of the applicant's structure over those of the prior art are readily apparent.

These and other objects and novel features of the present invention will be more clearly and fully set forth in the following specification and claims.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a diagrammatic sectional view through the neck of an individual showing in general the location of the tracheotomy tube.

FIG. **2** is a sectional view through the tracheotomy tube showing the attachment therein.

FIG. **3** is a sectional view through the attachment itself.

DESCRIPTION OF THE PREFERRED EMBODIMENT

The trachea tube is indicated in general by the numeral **10,** and may be of any suitable or conventional shape. Usually the tubes have a generally cylindrical entrance portion **11** which extends through the neck **12** of the patient and the other end terminates in the trachea **13.** The tube **10** preferably includes a slightly beaded lower end **18** so that it will not harm the walls of the trachea. The tube **10** is usually provided with a peripheral flange **14** at its outer end. The tube is surrounded by a washer **15** which encircles the tube adjacent the flange. All of the structure described to this point is conventional, and is of the common type applied when the patient is having a sufficiently difficulty in breathing to warrant the necessary operation.

The invention comprises an attachment A which is best indicated in FIG. **3** of the drawings. The attachment A includes a sleeve **16** which is substantially cylindrical in form, and which is of proper outer diameter to fit frictionally within the cylindrical inner diameter of the end **11** of the tube **10.** As shown, the sleeve **16** is provided with a peripheral flange **17** at one end thereof. Inwardly of the flange **17** is provided an inwardly extending slightly tapered flange **19** which is shaped to provide a seat for the valve ball **20.** A cross member **21** may extend diagonally across the sleeve **16** at any desired point from the flange **19** so that the valve ball is limited in its inward movement. Obviously, the closer the cross member **21** is to the flange **19,** the lesser distance is provided for the ball **20** to move.

When the attachment A is inserted in the outer end of the tracheotomy tube **10,** air may be inhaled through the tube in the normal manner. However, as air is exhaled, it moves the ball **20** against the seat **19** forming a one way valve and preventing the exhalation of air therethrough.

Obviously, the attachment may be readily removed when not needed or desired. In view of the fact that the sleeve **16** fits frictionally within the end of the tube **10,** it may be inserted or removed with equal ease. As long as the attachment is in place, it prevents the exhalation of air through the tube **10,** but causes no interference with the inhalation of air.

In accordance with the Patent Statutes, I have described the principles of construction and operation of my Tracheotomy Tube, and while I have endeavored to set forth the best embodiments, I desire to have it understood that obvious changes may be made within the scope of the following claims without departing from the spirit of my invention.

I claim:

1. A voice prosthesis for the rehabilitation of the voices of laryngecgectomees including:

a tracheotomy tube adapted for connection between the outer atmosphere and the trachea, the outer end of the tube adapted to be terminating adjacent the outer surface of the neck and open to atmosphere,

a flange on said tube adapted to engage the outer surface of the neck,

an attachment including a sleeve frictionally fitted into the outer end of the tracheotomy tube,

a flange at one end of said sleeve to limit insertion of said sleeve into said tube,

a ball within said sleeve of smaller diameter than the inner diameter of said sleeve,

a valve seat inwardly of said flange on said sleeve against which said ball may seat to prevent the outward flow of air through said tube, and

means at the inner end of said sleeve limiting inward movement of said ball within said sleeve when said ball is unseated from said seat.

* * * * *