United States Patent [19]

Birch et al.

[11] **3,844,290**

[45] **Oct. 29, 1974**

[54] **TRACHEOTOMY DEVICE**

[76] Inventors: **Arthur I. Birch,** 6178 S. Windemere, Littleton, Colo. 80102; **Darrell E. Brown,** 4994 E. Geddes Ct., Littleton, Colo. 80122

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[52] **U.S. Cl.** **128/351,** 128/145

[51] **Int. Cl.** **A61m 25/00**

[58] **Field of Search** ..... 128/351, 145 A, 147

[56] **References Cited**

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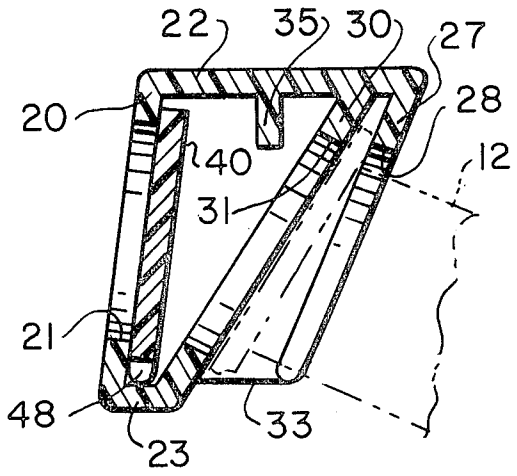
Primary Examiner—Lucie H. Laudenslager

Attorney, Agent, or Firm—Richard D. Law

[57] **ABSTRACT**

A removable housing, fitting on a tracheotomy tube, includes an upright, flat type valve for freely and easily opening and closing the tracheotomy tube during breathing and physical exertions by the patient.

10 Claims, 9 Drawing Figures



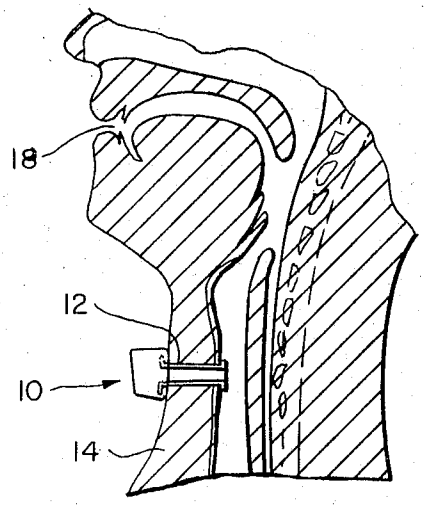


Fig_ 1

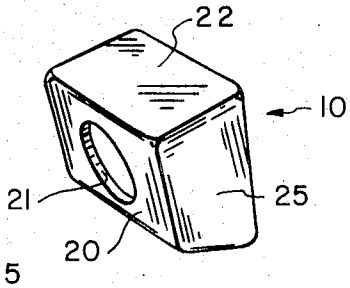


Fig_ 2

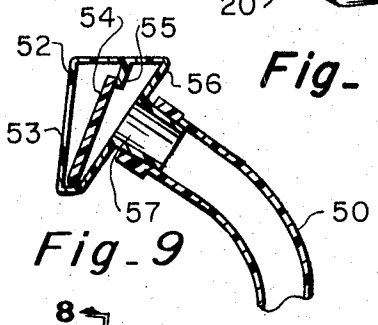


Fig_ 9

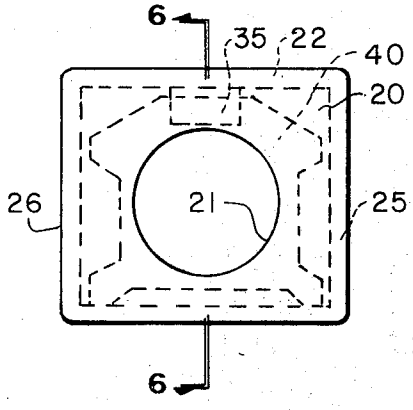


Fig_ 3

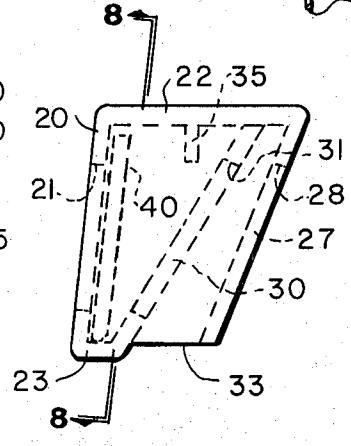


Fig_ 4

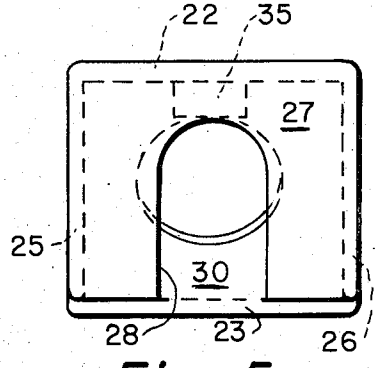


Fig_ 5

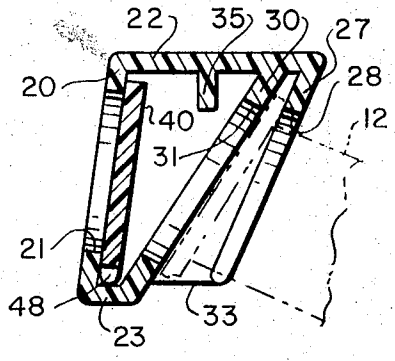


Fig_ 6

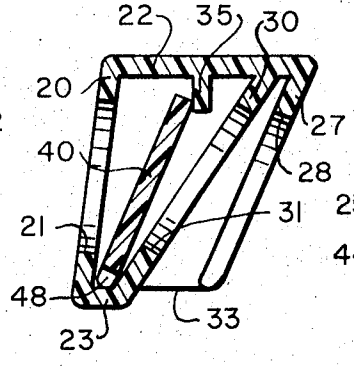


Fig_ 7

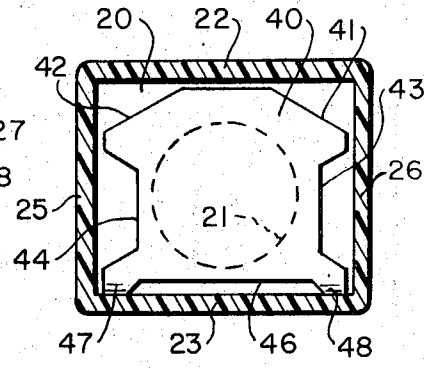


Fig_ 8

TRACHEOTOMY DEVICE

For certain pathological complications, a surgical remedy opens up the throat of the patient above the bronchi providing a by-pass to an obstruction for breathing. In many cases such an obstruction does not otherwise prevent or hinder speaking except for loss of air over the vocal chords. A metal or a plastic tube may be installed in the opening to maintain the incision open and unhindered. The operation provides an auxiliary air passage for the patient's breathing but not speaking. The use of the tracheotomy tube does not permit talking (unless closed) and does not permit the exerting of a force against the patient's diaphragm for various physical exertions. With an open tube, a patient may use a finger to close it so as to expel air over the vocal chords permitting talking, or to exert pressure on the diaphragm and thereby permit the use of patient's muscles throughout his body.

One disadvantage of a tracheotomy tube is the inability of the patient to expel secretions in a normal manner from the lungs by coughing, unless the tube is closed by a person's finger. Also, breathing through the tube tends to expel moisture which wets the patient's clothes, particularly neck wear.

The tracheotomy tubes used heretofore have been unsatisfactory in many instances, and the known devices for valving the tubes have, likewise, been found unsatisfactory for many purposes. Particularly it is important to maintain the tube and the closure means clean, and in some instances sterilized. The complicated valving devices of the art were a hindrance to cleanliness and to positive action under the light pressure of a patient's breathing.

According to the present invention there is provided a light weight, easily cleaned tracheotomy tube closure device. The closure device operates on minimum air pressure for fast and easy action providing positive opening and positive closing of the tube. The device is small and easily hidden under neck garments. The device may be made of any material which is inert to human tissue and which can be easily cleaned or sterilized.

It is, therefore, among the objects and advantages of the present invention to provide a positive acting tracheotomy tube closure device easily operated by a person's normal breathing.

Another object of the invention is to provide a tracheotomy tube closure device having a generally upright flat valve, with a gravity hinge at its bottom for positive action under very light breathing of a patient.

Yet another object of the invention is to provide a tracheotomy tube closure device which is easily attached or detached from a tracheotomy tube. The means by which the closure device is attached is dependent upon the type of tube being used.

A still further object of the invention is to provide a simple tracheotomy tube closure device with a minimum of operating parts and with a valve closure having minimum movement.

These and other objects and advantages of the invention may be readily ascertained by referring to the following description and appended illustrations, in which:

FIG. 1 is a cut-away, side elevational view of a tracheotomy tube closure according to the invention illustrating its use;

FIG. 2 is a perspective view of a tracheotomy tube closure, according to the invention;

FIG. 3 is a front elevational view of the device of FIG. 2;

FIG. 4 is a side elevational view of the device of FIG. 2;

FIG. 5 is a rear elevational view of the device of FIG. 2;

FIG. 6 is a side elevational view of the device of FIG. 3, in section, taken along section lines 6—6 of FIG. 3;

FIG. 7 is a cross sectional view of the device of FIG. 3 taken along the section lines 6—6 but showing the closure valve in full open position; and

FIG. 8 is a cross sectional view of the device of FIG. 4 taken along section line 8—8; and

FIG. 9 is a cross-sectional view of a modified attachment means of a closure device, according to the invention, on a tracheotomy tube.

In the device illustrated in FIGS. 1 and 2, a tracheotomy tube closure, shown in general by numeral 10, is arranged to seat over a tracheotomy tube 12 which passes through the patient's throat wall 14 and inserted surgically. The tube 12 communicates with the trachea or upper throat and the exterior thereof. The tube 12 permits breathing by the patient without the use of a person's mouth 18, since the tube is a by-pass around the mouth and the upper throat.

The tracheotomy tube closure 10 includes a general outer housing having a front section 20 with a bore 21 passing therethrough, a closed top 22 and a short bottom section 23. Sides 25 and 26 support a rear wall 27 having a slot 28 therein. A sloped inner wall or partition 30 having an opening therethrough 31 depends from the top wall 22 and the lower wall 23. The inner wall is therefore biased between the front wall 20 and the rear wall 27. A wedge shaped space remains between the rear wall 27 and the sloped wall 30 with an open bottom 33, into which the slot 28 opens. The open bottom 33 and the slot 28 provide means for mounting the unit on a tracheotomy tube.

Depending internally from the upper wall 22 is a short valve stop 35 positioned centrally, on a lateral basis, and adjacent the diagonal wall 30. Mounted between the forward wall 20 and the diagonal wall 30 is a valve closure member or valve 40, shown in FIG. 8, with the two upper corners cut away leaving diagonal edges 41 and 42. Side notches 43 and 44 are arranged to provide for the passage of air around the valve. A bottom notch 46, also, permits passage of some air around the bottom of the valve. The bottom edges 47 and 48 are rounded so as to seat on the lower wall 23, and to easily pivot in the space between the stop 35 and the front wall 20. As shown in FIGS. 6 and 7, the valve closure member 40 pivots from a position adjacent the wall 20 closing the opening 21 to a position against the stop 35 where the opening 21 is wide open. The stop prevents the valve from seating against and closing the opening 31 in the sloped wall 30.

As illustrated in FIG. 6, the tracheotomy tube with a flanged outlet is arranged to seat in the slot 28 with the flanged end adjacent the wall 30 of the closure device and the divergent walls pressing down on the flange of

the tube 12 causing the housing to seat tighter on the tracheotomy tube.

When the valve is in use, as shown in FIG. 1, the housing for the closure member is generally upright with the valve closure member 40, also, in a generally upright position. In this generally upright position, the closure member is delicately balanced and very little pressure inwardly or outwardly from the tube 12 will cause easy fast movement of the closure member.

To provide a rust-proof, easily cleanable unit, the housing and valve closure member should be made of one of the light weight plastics, such as methacrylates, polyethylenes, polypropylenes, various vinyl polymers and copolymers, and many such similar plastics. With a light weight plastic valve closure 40 in the balanced position, movement of the closure is accomplished by very light air pressure from the breathing of the patient. Any exertion by the patient or any back pressure exerted by the patient attempting to talk causes a very small amount of air to move against the member 40 pushing it against the wall 20, closing the opening 21, and permitting the patient to either expel air over the vocal chords for talking or with a closed mount to exert pressure against the diaphrahm for physical exertion. For breathing in, on the other hand, very slight suction on the tube 12 moves the closure member 40 back against the stop, and air freely passes through the opening 21 around the closure member and into the tube 12 through the opening 31. During breathing out the slight air pressure against the closure member pushes it against the opening and the patient may breathe out through the mouth or nose as may be desired. Thus no breathing of moist air outwardly through the device is accomplished, and the patient's clothing around the neck and throat remains dry.

The quick closing action of the device causes the tracheotomy tube to become pressurized almost instantly whenever breath is exhaled. This instanteous pressurization prevents secretions from entering the tracheotomy tube and valve, thereby maintaining the device clean and free from moisture and secretions.

Different types of tracheotomy tubes have different external end configurations, and the closure device is easily adapted to fit the various types. For example, the device of FIGS. 3 – 8 show a modification for a flanged tube. As illustrated in FIG. 9, a closure device includes a front wall 52 having an aperture 53 (similar to wall 20), an upright valve member 54, a stop 55 and a rear wall 56. A depending, tapered tube 57 communicates with the interior of the valve housing. The tube 57 is arranged to be inserted in the end of a tracheotomy tube 50, which is mounted through the throat of the patient. The taper makes the tube 57 seat securely in the tracheotomy tube and be held there for normal activities of the patient.

The device of FIG. 9 is used in the same manner as that of the other modifications. The device is held in an upright position by the tracheotomy tube, so that the valve member is balanced for quick and easy movement on light air pressure.

The unit may be made in several sizes depending upon the size of the tracheotomy tube and the size of the user. For an adult, however, a housing about one inch wide and three-quarters of an inch thick at the top provides an excellent size permitting free breathing for an adult patient even under moderate exertion. A half inch diameter opening through the front wall will permit sufficient air to pass through the unit to satisfy the requirements of the patient. Also, the wedging arrangement securely holds the unit on the tracheotomy tube, but it may be easily removed for cleaning.

For tracheotomy tubes of differing design which may not have an outer flange, a tapered bayonet type attachment may be used as in FIG. 9. The function of the valve is universally adaptable to all tracheotomy tubes, only the method of attachment varies.

We claim:

1. A tracheotomy tube valve assembly for use with a tracheotomy tube inserted in the throat of an individual, the assembly comprising

a. an enclosed, hollow housing means having an inlet means and an outlet means, the housing means includes means to mount said housing means to the exterior end of said tracheotomy tube whereby the outlet means is connected to said tube for passage of air,

b. closure means having a flat, rigid, closure member positioned unattached within said housing means, said closure member being arranged to move about one edge from an open position where the closure member is completely spaced from the inlet means to a closed position where said closure member lies against said inlet means and prevents reverse air flow out of said inlet means during exhalation by said individual, and

c. means for passing air around said closure member so that air will freely pass during inhalation from the inlet means to the outlet means when the closure member is in the open position.

2. A tracheotomy tube closure assembly according to claim 1 wherein said closure member pivots about its bottom edge.

3. A tracheotomy tube closure assembly according to claim 1 wherein said closure member is thin and lightweight.

4. A tracheotomy tube closure assembly according to claim 1 wherein said means for passing air around said closure member includes a plurality of cut-outs along its edge.

5. A tracheotomy tube closure assembly according to claim 5 being further characterized by stop means in said housing means limiting movement of said closure member toward the tracheotomy tube maintaining the same open.

6. A tracheotomy tube closure assembly according to claim 6 wherein said housing means and said closure member are formed of plastic.

7. A tracheotomy tube valve assembly comprising a generally rectangular housing having front and rear walls, side and top walls and a partial bottom wall; a sloping inner wall extending from said bottom wall toward said rear wall and connected to said top wall forming first and second chambers; said first chamber having an opening in said front wall and an opening in said sloping wall; said second chamber having an open bottom and a slot in said rear wall communicating with said open bottom; a flat closure member pivotally mounted generally upright in said first chamber and pivotal from its bottom edge and arranged to close said opening in said front wall; said closure member having air passage means therearound in said first chamber when out of contact with said front wall; and stop means in said first chamber arranged to prevent said

closure means from closing said opening in said sloping wall.

8. A tracheotomy tube valve assembly according to claim 7 wherein said housing is generally rectangular in cross-section and said closure member is generally rectangular and of a size to maintain its position in all attitudes of said housing.

9. A tracheotomy tube valve assembly according to claim 7 wherein the bottom edge of said closure member is rounded forming a pivot point therefore.

10. A tracheotomy tube valve assembly according to claim 7 wherein said second chamber is wedge shaped seating securely on a tracheotomy tube.

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