United States Patent

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[54] **THORACOSTOMY DEVICE**
5 Claims, 3 Drawing Figs.

[52] **U.S. Cl.** **128/278,** 128/231, 128/350
[51] **Int. Cl.** **A61m 1/04**
[50] **Field of Search** ..... 128/278, 283, 295, 350, 145.7, 231—232, 247

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ABSTRACT: A thoracostomy device to remove air and fluid from the area of the lungs through an elastic bulb having an air chamber connected by a tube to the pleural cavity to draw fluid from the cavity through this tube into the chamber of the bulb. At the inlet end of the bulb, a one-way valve is provided which closes the end of the tube as the fluid is discharged from the opposite end of the bulb during successive expansion and contraction thereof and with the inner surface of the chamber tapering inward toward the periphery of the valve and the tube to prevent accumulation therearound. The discharge end of the bulb is connected with a second enlarged chamber through a tube which also has a one-way valve to control back pressure therethrough during the opening of the first-mentioned valve by action of the bulb. This second chamber also is in enlarged relation to the valve and tapers inward toward the valve and end of the inlet tube thereof to prevent material from accumulating thereon. The second chamber discharges through a tube to a suitable receptacle.

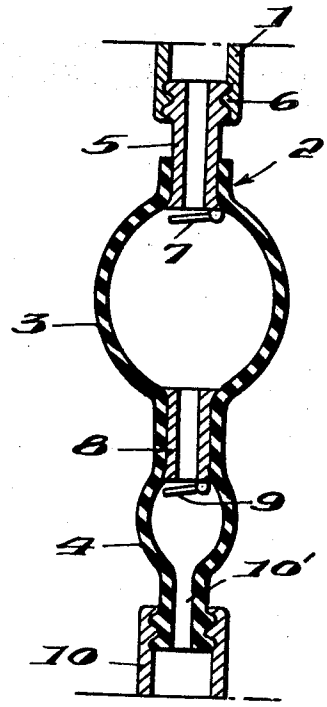


Fig. 1.

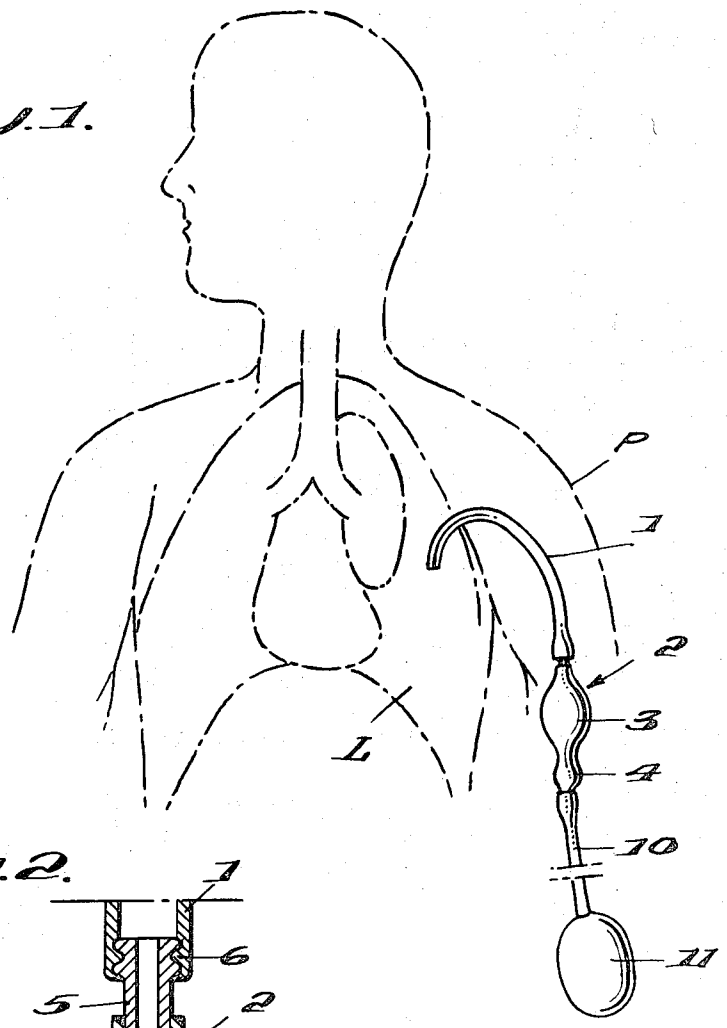


Fig. 2.

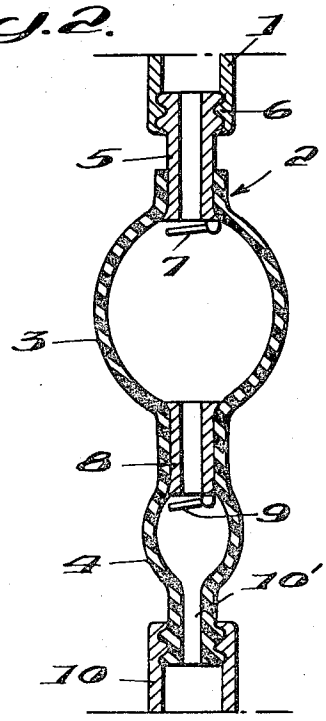
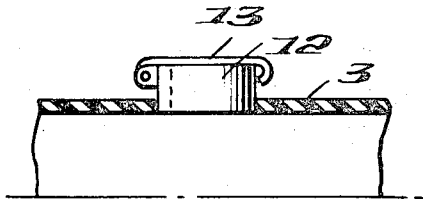


Fig. 3.



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THORACOSTOMY DEVICE

SUMMARY AND DESCRIPTION

This invention relates to improvements in thoracostomy devices of the character used in connection with chest tubes to remove air and fluid from the area of the lungs so as to assure that the lungs will expand and will not be collapsed in the event of chest wounds.

It is customary procedure to insert a tube into the chest of a person who has been injured in the chest area so that air or fluid can be aspirated or pushed out by the person on physical movements, by coughing, moving about, etc. Heretofore it has been the practice to attach a drainage or water pressure bottle to this tube so that fluid from the cavity can be drained therein, and with appropriate indications thereon, the amount of drainage can be determined.

Air can be removed from the lungs through the tube, but cannot enter the body so long as the bottle remains attached thereto. These bottles, usually of glass, are subject to breakage and, in that event, collapse of the lung is possible due to the entry of air through the tube.

When a patient is being moved, it has been customary procedure for the chest tube to be clamped off and thus sealed against the entry of air. The bottle can be moved along with the patient and reconnected when the patient is in a new location.

No satisfactory way has been provided heretofore for preventing the flow of air and fluid in one direction only through the tube and it is the object of this invention to accomplish that result.

In carrying out this object, I have provided a device with a plurality of chambers, two or more, arranged in tandem, and having means forming openings from one to another. One of the chambers is adapted to be connected with the tube leading to the chest cavity and another of the chambers is adapted to be connected with the bottle or other receptacle for the fluid and/or air. One-way valves, such as flap valves, are provided for the inlet openings of these receptacles or chambers so as to permit inlet of air or fluid therein, but to prevent discharge of the same through the same inlet.

Thus, the air or fluid can be drawn in one direction only through the device and be discharged into the bottle or receptacle with the tube effectively sealed off against backflow therethrough to prevent air leaking through the tube into the lungs.

This embodiment of the invention is illustrated in the accompanying drawings, in which:

FIG. 1. is a side elevation of the thoracostomy device shown applied to a drainage tube, illustrated diagrammatically in its inserted position in the lung area;

FIG. 2 is a longitudinal section therethrough; and

FIG. 3 is a detail cross section illustrating a modification.

The invention is illustrated in FIG. 1 in its relation to a patient, generally indicated at P, whose lung cavity, subject to drainage, is shown generally at L. Usually an incision is made in the chest area for the insertion of a drainage tube 1 which extends into the lung cavity L at one end and at the opposite end is connected with the thoracostomy device generally indicated at 2.

The device 2, according to the form shown in FIGS. 1 and 2, comprises a pair of bulbular chambers 3 and 4 which may be formed of one or more elastic sleeves and each capable of being squeezed for expelling the contents therefrom. The elastic chamber 3 has an inlet tube 5 connected therewith and which is also interconnected at 6 by a sealed connection with the drainage tube 1 so that fluid passing out of the lung area will be discharged through the tube 1 and the tube 5 into the chamber 3. A pivoted check valve 7 is mounted on the end of the tube 5 to close the passageway through the latter tube against the back flow of air or fluid therethrough to the lung area.

The chambers 3 and 4 communicate with each other through a tube 8. A one-way check valve 9 is mounted on the end of the tube 8 so as to permit freedom of flow of air or fluid through the tube into the chamber 4 but to prevent a backflow therethrough. The check valves 7 and 9 close into sealing relation with the ends of the respective tubes 5 and 8.

The discharge side of the chamber 4 is connected with a discharge tube 10 which, in turn, leads to a suitable receptacle, generally indicated at 11. This receptacle may be in the form of a water sealed bottle, plastic bag, inflated bag, or the like.

The inner walls of the chambers 3 and 4 are substantially spherical and taper uniformly at the opposite ends thereof to the adjacent ends of the tubes 5 and 8 and to the discharge tube 10' of the chamber 4. This eliminates sharp corners inside the chambers which would otherwise collect debris and organic matter or may build up from chest drainage, but the smooth slope of both chambers thus formed eliminates the collecting areas.

An inlet may be provided in the chamber 3 if found desirable, as indicated at 12 in FIGS. 3, for irrigation of the device by sterile saline solution to cleanse it of any drainage substance and to insure that the area around the one-way valves have no buildup which would interfere with their function. The inlet 12 should be provided with a tight cover, as indicated generally at 13, which can be locked securely closed or sealed with tape, except when the cover is opened for irrigation purposes.

The second chamber 4 is an added precaution against the danger of leakage of air through the drainage tube in the event of malfunction in the first chamber and it is also a precaution against bacteria entering the lung by leakage past the first chamber. Greater security is effected by two or more chambers than can be effected by one.

Moreover, as is illustrated in FIG. 2, the suction effect of the respective chambers can be different, thus using a stronger suction at chamber 3 than the mild suction obtained at chamber 4. This is especially important where the patient himself may be called upon to effect such drainage as, for example, when in transit, and this second chamber ensures that there would be no backup of drainage when this suction is created.

This device may be made of any suitable or desired material such as rubber, plastic or the like, or it may be made transparent, nonbreakable, or of a material that could be discarded after one use. However, the device is constructed so as to be capable of being cleaned and used repeatedly, being attached very simply to the end of the catheter and put into the pleural cavity. If no suction is needed, a plastic disposal bag could be attached to the end, which would also eliminate the use of the bottle.

While the invention has been illustrated and described in certain embodiments, it is recognized that other variations and changes may be made therein without departing from the invention set forth in the claims.

I claim:

1. A thoracostomy device comprising an elastic bulb having an air chamber therein with inlet and outlet ends, a tube extending to the inlet end and connected therewith and adapted to be connected with a pleural cavity, a one-way valve connected with said tube at the inlet end in position to prevent flow from said chamber through said tube, a second bulbular chamber having inlet and outlet ends, a second tube connecting the outlet end of the bulb with the inlet end of the second chamber, a one-way valve connected with said second tube at the inlet end of the second chamber in position to prevent backflow from said second chamber through said second tube to the first-mentioned chamber, each of said chambers having the sides thereof converging inwardly in a tapering direction around the respective valves toward the ends of the respective tubes, and means forming an outlet from the outlet end of the second chamber for discharging the fluid therefrom.

2. A thoracostomy device according to claim 1, wherein each of the chambers has an enlarged diameter relative to the tapering sides for freedom of flow of fluid around the respective valves and through said chambers.

3. A thoracostomy device according to claim 1, wherein each of the valves is a flap valve mounted on the inner end of the respective tube and opening into the chamber.

4. A thoracostomy device according to claim 1, wherein each of the chambers is formed of an elastic material capable of being squeezed for withdrawing fluid from the pleural cavity and discharging it successively through the chambers to the outlet means and without backflow to the pleural cavity.

5. A thoracostomy device according to claim 1, wherein the first-mentioned chamber has an opening in a side thereof for irrigation of the chamber, and means for closing and sealing said opening.