June 5, 1962 I. H. ROBERSON 3,037,497

PORTABLE ARTIFICIAL RESPIRATOR

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FIG. 1

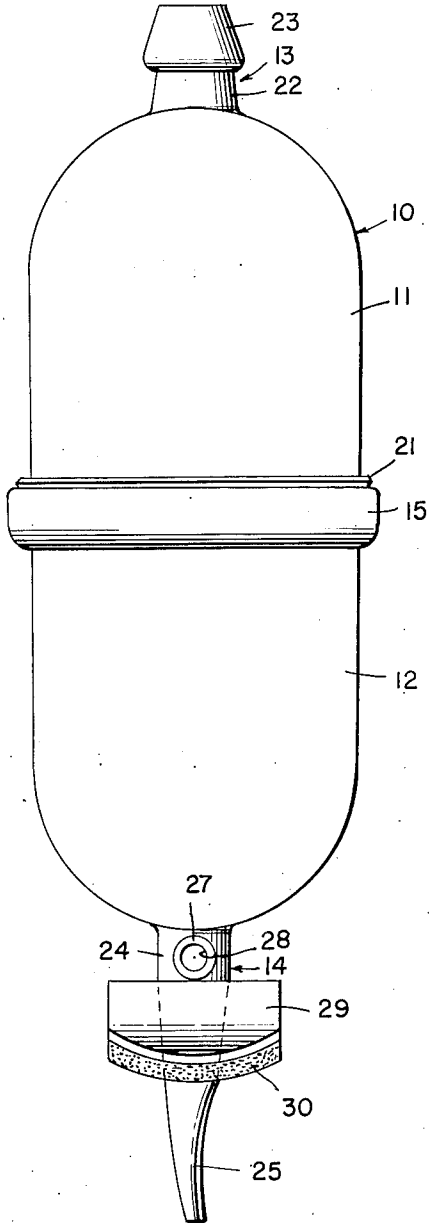
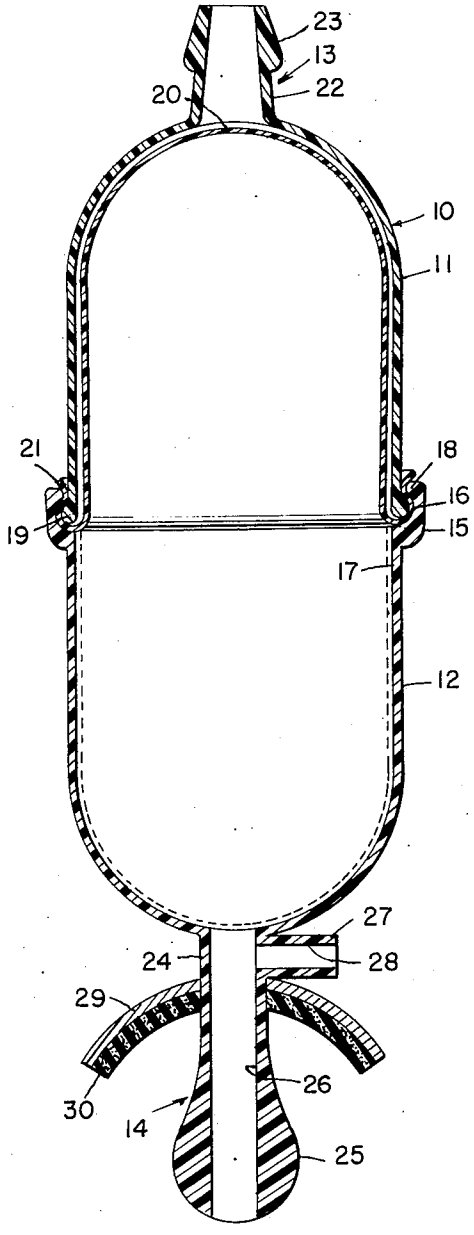


FIG. 2



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PORTABLE ARTIFICIAL RESPIRATOR

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This invention relates generally to resuscitation devices and pertains more particularly to a portable type of respirator operated entirely by the person administering the artificial respiration.

A very effective way to administer artificial respiration is by directly inflating the patients lungs orally. Naturally, this is somewhat unsanitary if the respiration is directly from mouth to mouth and loses somewhat of its effect due to the fact that the air expelled from the lungs of the person administering the respiration is not of as high oxygen content as would be fresh air. It is, therefore, of primary concern in connection with this invention not only to provide an artificial respiration device which is portable and which requires no source of power for operating it other than the person administering the artificial respiration but also to provide a device which is sanitary and which assures the administering of fresh air to the person being resuscitated.

Another object of this invention is to provide a relatively small and self-contained respirator assembly whereby artificial respiration may be administered quickly and effectively with a minimum of skill on the part of the operator.

A further object of this invention is to provide a respirator assembly which is extremely compact in form and construction, thus being economical while yet at the same time being completely and fully effective for the purposes intended and desired.

Another object of this invention is to provide an artificial respiration device in the form of a relatively small cylinder divided interiorly into separate compartments by a flexible diaphragm and each having exterior communication to the atmosphere so that air expelled through and into the device on one side of the diaphragm will correspondingly expel air from the other side of the diaphragm without communication between the two chambers.

A further object of this invention is to provide an artificial respiration device in conformity with the preceding object wherein one side of the diaphragm has an auxiliary fresh air inlet which is manually controlled to permit fresh air always to be drawn into that corresponding side of the diaphragm for expulsion through a patient's mouth into the lungs thereof.

A further object of this invention is to provide an artificial respiration device comprising essentially an elongate chamber having its interior divided into isolated chambers by means of a flexble diaphragm, one of the chambers having an air inlet opening thereinto in the form of a mouth piece so that a person administering the respiration may breathe directly into the chamber for moving the diaphragm to displace air from the other chamber, and wherein the other chamber is provided with an outlet in the form of a tongue depressor and having fresh air inlet means manually controlled to assure the entrance of fresh air into the chamber associated with the patient's mouth piece.

Another object of this invention is to provide an artificial respirating device in conformity with the immediately preceding object wherein the tongue depressor mouth piece for the patient is provided with a cushioned plate surrounding the same and of generally arcuate form so as to seal the patient's mouth opening about the mouth piece.

As this invention may be embodied in several forms without departing from the spirit or essential characteristics thereof, the present embodiment is therefore illustrative and not restrictive, and since the scope of the invention is defined by the appended claims, all changes that fall within the metes and bounds of the claims or that form their functional as well as conjointly cooperative equivalents are therefore intended to be embraced by those claims.

In the drawing:

FIG. 1 is a side elevational view of the respirating device constructed in accordance with this invention and showing the external details thereof; and

FIG. 2 is a longitudinal section taken through the assembly shown in FIG. 1, and illustrating details of its internal construction as well as further details of external construction thereof.

Referring at this time more particularly to FIG. 1, the self-contained and portable respirator assembly shown therein is indicated generally by the reference character **10** and will be seen to include a pair of complementary half sections **11** and **12** forming together an elongate cylinder-like member. For purposes of economy, the cylinder halves may be made of synthetic resin plastic material. The upper section **11** is provided with a mouth piece indicated generally by the reference character **13** and the lower section **12** is provided with a tongue depressor assembly indicated generally by the reference character **14**.

As can be seen most clearly in FIG. 2, the upper and lower sections **11** and **12** are separable. For this purpose, the lower section **12** may be provided with an annular rim **15** at the open end thereof, which rim or bead has its inner surface provided with a circumferentially extending groove **16** formed between the inner wall surface **17** of the lower section and an inwardly projecting rib **18** on the inner side and at the upper extremity of the rim or bead **15**. The rib **18** defines an internal diameter which is just slightly greater than the external diameter of the upper section **11** which it surrounds.

The upper section **11** is provided at its lower extremity or open end thereof with an enlarged bead portion **19** whose external diameter is greater than the internal diameter of the rib **18** previously described so that when the two parts are interengaged in the manner shown in FIG. 2, a locking action, preventing separation between the sections, is achieved.

A flexible air separator diaphragm, indicated generally by the reference character **20**, is held in place within the device through the coupling interaction between the upper and lower sections **11** and **12**. For this purpose, the marginal edge portion **21** of the diaphragm or air separator is threaded or sandwiched between the interlocking parts of the upper and lower sections and the dimensional characteristics of the interengaged portions of the upper and lower sections are so constructed as to pinch the marginal edge of the diaphragm or air separator therebetween to form a fluid tight seal thereat. Thus, the interior of the assembly is divided essentially into two chambers, one on each side of the air separator or diaphragm.

The air separator or diaphragm assembly itself is of configuration similar to the finger of a glove and is, of course, formed from air impermeable flexible material such as rubber or polyethylene or similar material. The air separator is large enough so that its volume is actually greater than the volume of either of the section halves **11** and **12**. The purpose of this will be presently apparent.

The mouth piece **13** has a neck portion **22** communicating with the interior of the section **11** and terminates in an enlarged rim portion **23** so that the mouth piece may be comfortably placed within a person's mouth.

At the opposite end of the device, on the lower extremity of the section **12**, the tongue depressor assembly **14** will be seen to include a neck portion **24** terminating in a flattened, slightly arcuate head **25**, there being a passageway **26** extending axially through the tongue depressor communicating with the interior of the section **12**. An air inlet tube **27** is provided for the purpose of by-passing the passageway **26** through the tongue depressor, the tube **27** having a passageway **28** intersecting the passageway **26** adjacent its juncture with the section **12**. The tongue depressor **14** is also provided with an arcuate plate **29** joined with the neck **24** thereof and being provided with resilient material **30** such as foam rubber or the like on the concave face thereof.

In use, the tongue depressor **14** is placed in the patient's mouth, the flattened head **25** thereof being used to depress the patient's tongue and hold it firmly in place during the respirating procedure. The person administering the respiration places the mouth piece **13** in their mouth and expels air into the section **11**, displacing the diaphragm or air separator **20** from the full line position shown in FIG. 2 to the dotted line position shown therein. This movement of the diaphragm expels air from the interior of the device through the tongue depressor **14** inflating the patient's lungs. During this period, the person administering the respiration places one of their fingers over the end of the tube **27** preventing escape of the air through the tube and assuring that the expelled air will be directed into the patient's mouth. Of course, the plate **29** and the resilient material **30** are pressed lightly against the patient's mouth to prevent air escaping from around the tongue depressor.

The next step in the cycle of operations is to remove the finger from the tube **27** permitting the patient's lungs to expel air through the tube while at the same time the person administering the respiration maintains sufficient pressure against the diaphragm or air separator **20** so as to prevent its moving from the dotted line position shown in FIG. 2. As soon as the patient's lungs have expelled the air, the person administering the respiration breathes in, thus drawing the diaphragm back to the full line position shown in FIG. 2, his fingers still being out of contact with the tube **27** permitting fresh air to be drawn into the device through the tube. The person administering the respiration may then take a quick breath of fresh air and repeat the cycle of operations, doing so in a rhythmic manner as long as is required and necessary.

As previously mentioned, the air separator or diaphragm **20** is of slightly larger volume than either of the sections **11** or **12**. The reason for this is to permit the same to be easily displaced between the full and dotted line position shown in FIG. 2 without requiring stretching of the diaphragm which would require, of course, the expenditure of additional effort on the part of the operator.

The diaphragm or air separator **20** positively assures at all times that the patient and operator do not breathe the same air and permits, through the medium of the air inlet tube **27**, the charging of the device with fresh air for expulsion into the patient's lungs, thus not only assuring sanitary conditions but also assuring effective operation since the fresh air will have a much higher oxygen content than that expelled from the operator's lungs.

I claim:

1. A portable artificial respirator comprising an elongate body having opposite end sections frictionally fitted together to form a chamber within the body, an air impermeable air separator of finger-like form having the periphery of its open end sandwiched between and sealingly engaged by the frictionally fitted portions of the end sections, said air separator being of a volume slightly greater than the volume of either end section and being flexible so as to permit the separator to flop back and forth within the body between opposite extremities thereof, a mouth piece provided with a passageway communicating with the interior of said body at one end thereof for discharging air into the device on one side of the air separator, a tongue depressor provided with a passageway communicating with the interior of said body on the opposite side of said air separator and at the opposite end thereof for expelling fresh air orally into a patient's lungs, a manually controllable air inlet having a passageway communicating with the interior of said body on the same side of said air separator as said tongue depressor, and a sealing plate fitted around said tongue depressor to sealingly engage against the mouth of a patient to prevent the escape of air.

2. A portable artificial respirator comprising a hollow body having an air chamber therein, a flexible air impermeable air separator fixed within said body and being movable therewithin to opposite extreme positions to sweep the chamber in the body, a mouth piece rigid with said body and a tongue depressor substantially oppositely disposed with respect to the mouth piece, each having passageways communicating with the interior of the body but on opposite sides of said air separator, a manually controllable auxiliary air inlet having a passageway communicating with said body on the same side of said air separator as the tongue depressor, and an arcuate sealing plate assembly fixed to said mouth piece for engaging the patient's mouth and preventing the escape of air therefrom.

3. A portable artificial respirator comprising an elongate body having opposite end sections frictionally fitted together to form a chamber within the body, an air impermeable air separator of finger-like form having the periphery of its open end sandwiched between and sealingly engaged by the frictionally fitted portions of the end sections, said air separator being of a volume slightly greater than the volume of either end section and being flexible so as to permit the separator to flop back and forth within the body between opposite extremities thereof, a mouth piece provided with a passageway communicating with the interior of said body at one end thereof for discharging air into the device on one side of the air seperator, a tongue depressor provided with a passageway communicating with the interior of said body on the opposite side of said air separator and at the opposite end thereof for expelling fresh air orally into a patient's lungs, a manually controllable air inlet having a passageway communicating with the interior of said body on the same side of said air separator as said tongue depressor, a sealing plate fitted around said tongue depressor to sealingly engage against the mouth of a patient to prevent the escape of air, the concave side of said sealing plate being lined with resilient material such as foam rubber.

4. A portable artificial respirator comprising a hollow body having an air chamber therein, a flexible air impermeable air separator fixed within said body and being movable therewithin to opposite extreme positions to sweep the chamber in the body, a mouth piece rigid with said body and a tongue depressor substantially oppositely disposed with respect to the mouth piece, each having passageways communicating with the interior of the body but on opposite sides of said air separator, a manually controllable auxilairy air inlet having a passageway communicating with said body on the same side of said air separator as the tongue depressor, an arcuate sealing plate assembly fixed to said mouth piece for engaging the patient's mouth and preventing the escape of air therefrom, the concave side of said sealing plate being lined with resilient material such as foam rubber.

5. A portable artificial respirator comprising an elongate body having opposite end sections frictionally fitted together to form a chamber within the body, an air impermeable air separator of finger-like form having the periphery of its open end sandwiched between and sealingly engaged by the frictionally fitted portions of the end sections, said air separator being of a volume slightly greater than the volume of either end section and being

flexible so as to permit the separator to flop back and forth within the body between opposite extremities thereof, a mouth piece provided with a passageway communicating with the interior of said body at one end thereof for discharging air into the device on one side of the air separator, a tongue depressor provided with a passageway communicating with the interior of said body on the opposite side of said air separator and at the opposite end thereof for expelling fresh air orally into a patient's lungs, a manually controllable air inlet having a passageway communicating with the interior of said body on the same side of said air separator as said tongue depressor, a sealing plate fitted around said tongue depressor to sealingly engage against the mouth of a patient to prevent the escape of air, said air inlet being in the form of a tube joined to the base of said mouth piece.

6. A portable artificial respirating device comprising a pair of generally similar open ended sections, one of said sections at the open end thereof being provided with a female socket portion and the other of said sections at the open end thereof being provided with a male plug portion, the male and female portions being dimensioned for frictional interengagement, a finger-like air impermeable air separator disposed within the device and having the marginal edge thereof at the open end sandwiched between the male and female portions to thus effect a positive but removable frictional fit between the male and female portions and at the same time sealingly engaging the air separator to isolate the opposite ends of the body formed by the sections on either side of the air separator, a mouth piece projecting from the closed end of one section and a tongue depressor projecting from the closed end of the other section, each having an air passageway communicating with the interior of the device but on opposite sides of said air separator, an auxiliary air inlet tube communicating with the interior of the device on the same side of said air separator as does

said tongue depressor, said air inlet tube being joined to the base of said tongue depressor and having an open free end of a dimension to be sealed by an operator's finger, an arcuate sealing plate fixed to the base of said tongue depressor with the concave side thereof facing away from the associated end section, and such concave face thereof being lined with resilient material to effect sealing engagement with a patient's mouth.

7. A portable artificial respirator comprising a hollow body having opposite ends, a flexible air impermeable air separator fixed within said body and dividing the same into a first and a second chamber and being movable in the body to opposite extreme positions in the chambers, a mouthpiece rigid with said body at one end of the latter and having a passageway communicating with the first chamber, an elongate member extending from the other end of the body oppositely to the mouthpiece and having a free end portion of a form suitable for use as a tongue depressor, said elongate member having an unrestricted passageway therethrough whereby open communication may be maintained at all times between the interior of the second chamber and the atmosphere exteriorly thereof, and an auxiliary air inlet having a passageway communicating with said second chamber, and an arcuate plate surrounding the elongate member at a location inwardly of said tongue depressor portion, with the concave side of the plate directed toward the free end of said portion to engage against and of a size to cover the lips of a mouth into which the tongue depressor portion of the elongate member is introduced.

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