

[54] **APPARATUS FOR SEALING THE ESOPHAGUS AND PROVIDING ARTIFICIAL RESPIRATION AND EVACUATING THE STOMACH**

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[52] U.S. Cl. **128/145.5; 128/276; 128/349 B; 128/351**

[51] Int. Cl.² **A61M 16/00**

[58] Field of Search **128/145.5, 145.6, 145.7, 128/142.4, 276, 277, 278, 351, 188, 349 B, 349 BV, DIG. 26**

[56] **References Cited**

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Attorney, Agent, or Firm—Wolf, Greenfield & Sacks

[57] **ABSTRACT**

Apparatus for use in artificial respiration and stomach evacuation comprising an elongated member and ventilation mask. The elongated member which is designed to be inserted into the esophagus and stomach has an expandable inflatable element which can be operated externally after insertion in order to close the esophagus to prevent inflation of the stomach or aspiration of the contents of the stomach into the respiratory system. The ventilation mask, which fits over the mouth and nose provides a seal against the patient's face when it is held in place. A ventilation opening in the mask allows air or oxygen to be directed through the mouth into the lungs for artificial respiration. The apparatus preferably includes a tubular fluid passageway in the elongated member with evacuation openings beyond the inflatable element to allow the contents of the stomach to be aspirated through the passageway and externally of the mask. Fluid can also be introduced into the stomach through the passageway.

11 Claims, 3 Drawing Figures

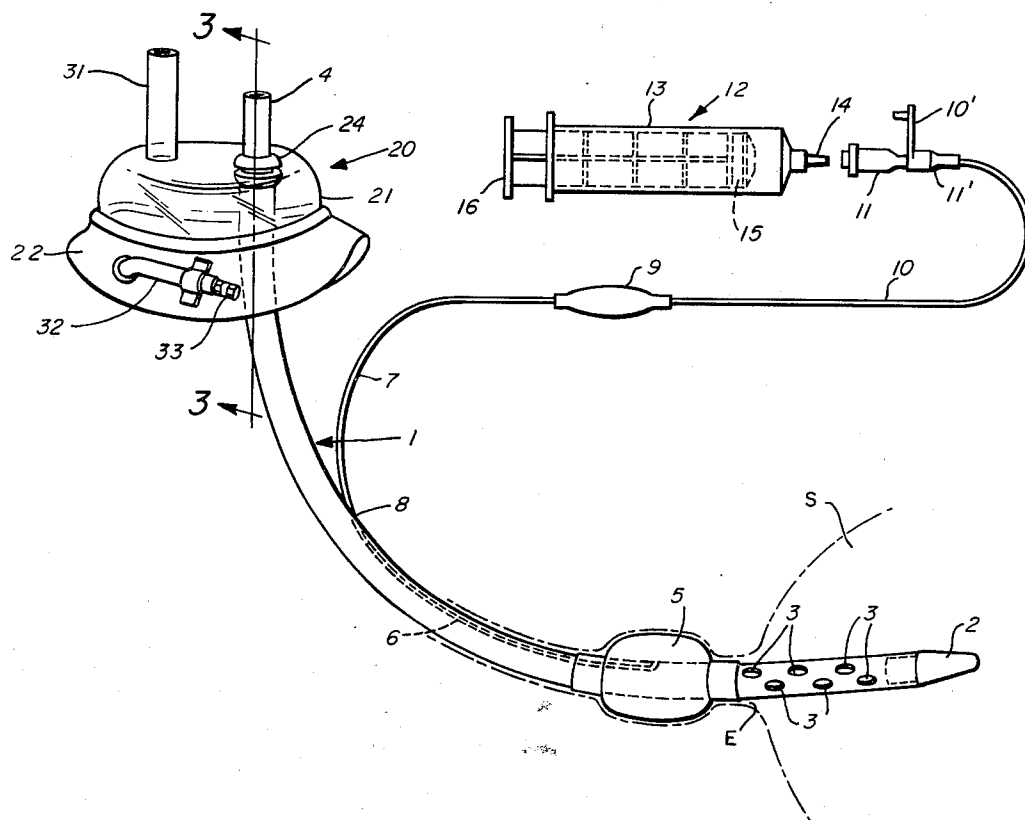


FIG. 1

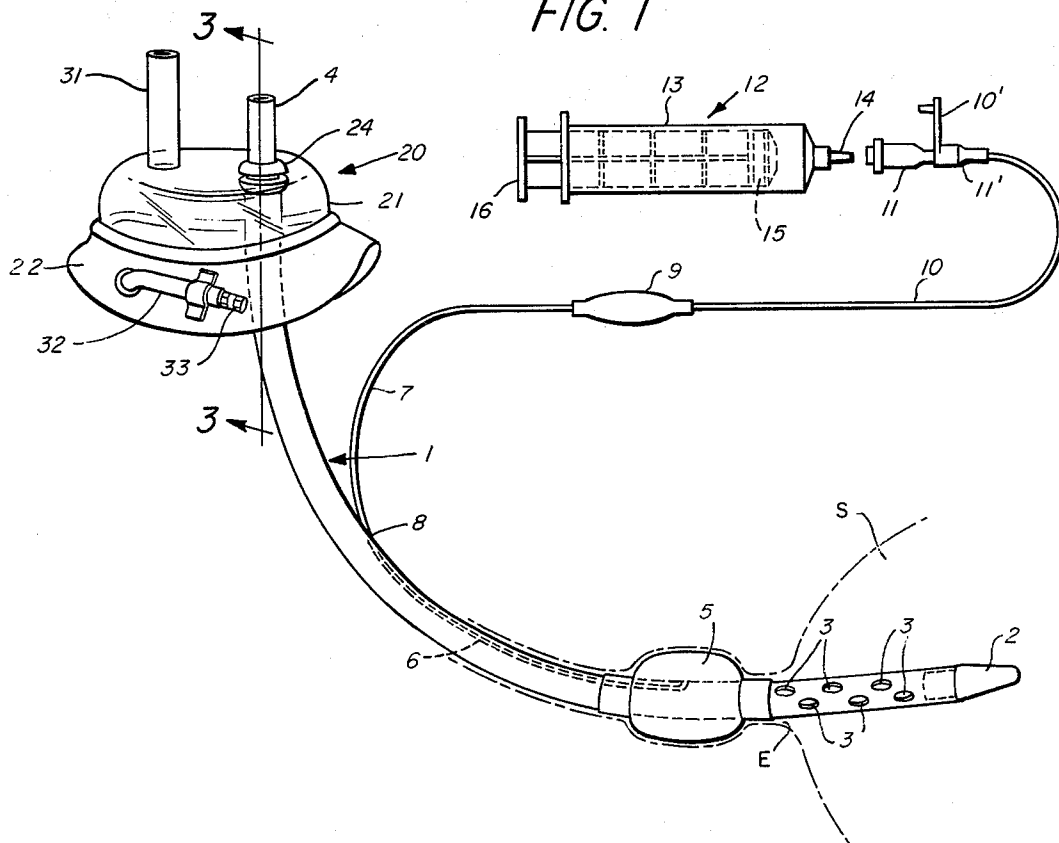


FIG. 2

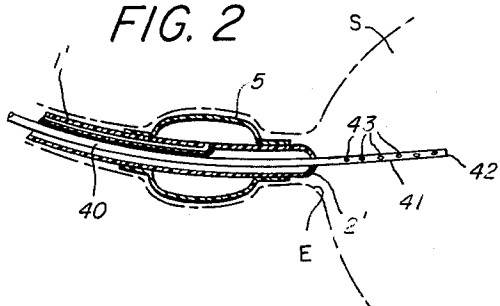
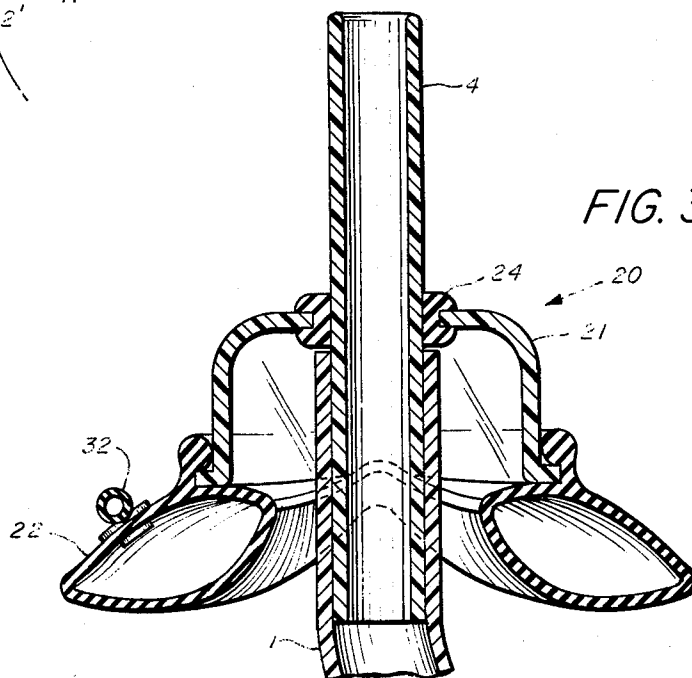


FIG. 3



APPARATUS FOR SEALING THE ESOPHAGUS AND PROVIDING ARTIFICIAL RESPIRATION AND EVACUATING THE STOMACH

INTRODUCTION

U.S. Pat. No. 3,683,909 dated Aug. 15, 1972 issued in the name of DonMichael et al describes the importance of the technique of "mouth-to-mouth" resuscitation performed either by a party exhaling directly into the mouth of the person to be revived or by the exhalation of air into an airway inserted into the mouth of the patient. This invention is a modification of the invention of that patent, and provides means for ventilating the patient's lungs and evacuating the stomach.

Unlike the apparatus of the DonMichael et al patent supra, in the present invention ventilation is provided by introducing air or oxygen into a mask that covers the nose and mouth and forms a seal against the face, from which it flows directly into the lungs without the aid of a duct or other special passage. A duct which extends into the esophagus from the mask does not carry the ventilating gas but rather serves to seal the stomach from the gas and prevent the stomach contents from backing up into the respiratory system. In the preferred form of this invention, the duct may also be used to evacuate the stomach and convey the contents to a point beyond the face mask, without interfering with ventilating procedure.

BRIEF FIGURE DESCRIPTION

FIG. 1 is a side view, partly in section, of a device constructed in accordance with this invention and suggesting its use in place in the esophagus;

FIG. 2 is a fragmentary view of a modification of this invention; and

FIG. 3 is a cross sectional view taken along section line 3—3 of FIG. 1.

DETAILED DESCRIPTION OF INVENTION

The apparatus illustrated in FIG. 1 contains a main tube 1, formed of a synthetic plastic material having some rigidity, but also a degree of flexibility. The tube is somewhat curved to ease its insertion through the mouth of the patient, over the tongue and into the esophagus and stomach. Guide tip 2 provided on the inner or leading end closes that end of the tube, and has a rounded blunt nose that eases the insertion of the tube into the patient. Near the inner end of the tube the wall of the tube is formed with a number of apertures 3 spaced along its length and around its peripheral wall. When the apparatus is in place, these apertures are disposed inside the stomach and provide ports through which the contents of the stomach can enter the tube 1. (This is suggested in FIG. 1 wherein the apertures 3 are shown disposed in the stomach S.)

A sleeve 4 fits tightly within and extends beyond the other outer end of tube 1 and is made of a hard synthetic plastic material such as polypropylene. The sleeve 4 inter alia serves as a bite tube which prevents the tube 1 from being collapsed by the patient's teeth when the tube extends through the mouth.

Above apertures 3 in tube 1 and around the outside of the tube is an inflatable cuff 5 which is sealed at both ends to the outer surface 6 of the tube. The cuff is in effect an expandable, resilient, tubular wall formed of a synthetic rubber or like material. A small bore channel 6 is formed in the wall of the tube 1 and extends

from the inflatable cuff and within the wall of the tube toward its outer end and emerges from tube 1 at point 8 and is continued as a separate tube 7. The other end of tube 7 is connected to an inflatable pressure indicator 9 in turn connected to a connecting piece 10 which carries a valve 11. The valve in turn is connected to a pump member 12 in the form of a syringe.

The pump comprises a hollow cylinder 13 having a tubular stem 14 that connects to the valve 11 and a piston 15 controlled through a finger actuator 16 to which the piston is attached. Insertion of stem 14 opens valve 11 and permits air to be forced from the pump through duct 6 into the inflatable cuff 5. The pressure indicator 9 expands as the inflatable cuff expands, and its deflation warns the operator of the deflation of the cuff and that the entrance E of the esophagus is open to the stomach. Disconnecting the pump from the valve may automatically close the valve and preserve the air pressure in the cuff. The valve 11 may also be removed from the fitting 11' at the end of connecting piece 10, and plug 10' may be used to close the fitting.

A ventilation mask 20, which is designed to fit over the nose and mouth of the patient comprises a cup-shaped section 21 formed of a synthetic clear plastic material such as poly carbonate and a detachable inflatable collar 22 that typically may be formed of a synthetic rubber or like material. The cup-shaped section 21 of the mask contains a circular opening into which sleeve 4 can be inserted. The opening is provided with grommet 24 which maintains a tight seal about the sleeve when the sleeve is inserted.

The cup section of the mask also carries a duct 31 that may be integral with or otherwise permanently fixed to the mask and through which air can be introduced for ventilating the lungs. The duct 31 is of course open to the inside of the mask for this purpose. The rubber collar 22 of the mask assembly is a small inner tube-like structure. It fits tightly on and around the plastic cup section of the mask and can be inflated through tube 32 connected to a metal coupling 33. The inflatable collar provides a seal with the face of the patient when the mask is held in place against the face without an undue force being applied.

When using the apparatus the main tube 1 is inserted through the patient's mouth into the esophagus and stomach with the inflatable cuff 5 collapsed. With the tube inserted to a depth wherein the cuff is near the end of the esophagus, pressure is then applied by the pump to force air into the cuff to inflate it. In this manner the patient's respiratory system is closed off from his stomach, and the evacuation openings 3 in the tube 1 will be inside the stomach. The sleeve 4 on the end of the tube may be inserted into the mask opening either before or after the tube is inserted into the patient. The rubber collar 22 of the mask 20 will also be inflated to form a seal about the cup of the mask on the face. With the tube and mask in place the lungs may be ventilated through tube 31 either from the mouth of an attendant or with some standard equipment. The air introduced through the mask by means of tube 31 passes into the lungs via the patient's mouth and/or nose and trachea as in normal breathing. Inflated cuff 5 prevents the ventilating air from entering the stomach as the entry E from the esophagus is sealed.

The openings 3 in the tube enable the stomach to be evacuated without any risk of the stomach contents entering the lungs. And this may be done either indepen-

dently of or simultaneously with the lung ventilating function. In the preferred form the sleeve 4 is removable from the mask so that the mask can be removed from the patient's face without withdrawing tube 1 to enable an indotracheal tube to be inserted or for aspiration.

In FIG. 2 a modification of this invention is shown wherein the means for evacuating the stomach is in the form of a removable inner duct 40 that extends from the sleeve 4 throughout the length of tube 1' and out the closed end 2' of the tube. A self sealing opening may be provided at end 2' to allow the duct to extend through it and into the stomach. The inner end 41 of duct 40 would be open as at 42 and have additional side ports 43 to receive the stomach contents.

In this embodiment, the inflation cuff and mask are the same as that in the embodiment of FIG. 1, and they are not here shown in detail.

From the foregoing description those skilled in the art will appreciate that modifications may be made of this invention without departing from its spirit. For example, while in each of the embodiments shown means are provided for evacuating the stomach or introducing fluids into the stomach without interfering with lung ventilation, it will be understood that the means may be omitted if the device is to be used only for lung ventilation. In that case, the inflated cuff will prevent regurgitation and gastric distention.

Because modifications may be made of this invention without departing from its spirit, we do not intend to limit the scope of this invention to the two embodiments illustrated and described. Rather, the scope of this invention is to be determined by the appended claims and their equivalents.

What is claimed is:

1. Apparatus for medicinal purposes comprising an elongated solid, tubular member constructed and arranged to be inserted into the esophagus and having outer and inner ends, an expandable element carried by the member in the vicinity of its inner end, means for causing the element to expand so as to form an effective seal isolating the stomach from the lungs of a patient, a face mask including a cup-shaped section having a collar means about the periphery thereof for providing a seal with the face of a patient; said elongated tubular member extending through said cup-shaped section in the vicinity of its outer end, and an opening through said cup-shaped section defining a ventilating passageway passing to the inside of the mask for introducing ventilating gas therein which may pass through the nose and/or mouth and trachea to the patient's lungs.
2. Apparatus as defined in claim 1 in which the elongated member has a port adjacent to the outer end of the member and a port located adjacent to the inner

end and contains a duct which provides fluid communication between the ports.

3. Apparatus as defined in claim 1, in which the expandable element comprises an inflatable cuff.

4. Apparatus as defined in claim 3 further characterized by a channel in the elongated member and connected to the cuff and through which the cuff may be inflated.

5. Apparatus as claimed in claim 1 in which the outer end of the elongated member is connected to a sleeve in turn removably mounted in and extending through the mask.

6. Apparatus as defined in claim 1 in which an inflatable collar is secured to the edge of the mask to form a seal between the mask and the patient's face.

7. Apparatus as claimed in claim 1 further characterized by a ventilation tube in communication with the opening in said mask for providing mouth to mask ventilation.

8. Apparatus for medical purposes comprising, an elongated member constructed and arranged to be inserted into the esophagus and having outer and inner ends, an expandable element carried by the member in the vicinity of its inner end, means for causing the element to expand so as to form an effective seal isolating the stomach from the lungs of a patient,

a face mask connected to the elongated member in the vicinity of its outer end with said face mask having means for forming a seal with the face of a patient,

an opening through the mask to the inside thereof for introducing ventilating gas therein which may pass through the nose and/or mouth and trachea to the patient's lungs,

said elongated member being tubular with a port adjacent to the outer end of the member and a port located adjacent to the inner end and containing a duct which provides fluid communication between the ports,

a second opening in the mask through which the tubular member extends, and said port adjacent the outer end of the tubular member lying outside said mask.

9. Apparatus as defined in claim 8 further characterized by a ventilation tube in communication with the opening in said mask for providing mouth to mask ventilation, said tube being open to the inside of the mask.

10. Apparatus as defined in claim 2 further characterized by said duct being an integral part of the tubular member.

11. Apparatus as defined in claim 2 further characterized by said duct being a separate member that extends out the ports and has openings in its inner end for communicating with the interior of the stomach.

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UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,905,361 Dated Sept. 16, 1975

Inventor(s) John R. Hewson and Roy H. Hewson

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Column 1; line 6, correct "U.S. Pat. No. 3,683,909" to
read --U.S. Pat. No. 3,683,908--.

Column 1; line 58, change "polypropelene" to read --polypropylene--.

Column 2; line 28, change "mark" to --mask--.

Signed and Sealed this

third Day of *February* 1976

[SEAL]

Attest:

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Attesting Officer

C. MARSHALL DANN
Commissioner of Patents and Trademarks