March 6, 1956 J. ANKLIN 2,737,177

LIFE-RESTORING APPARATUS

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Fig. 1

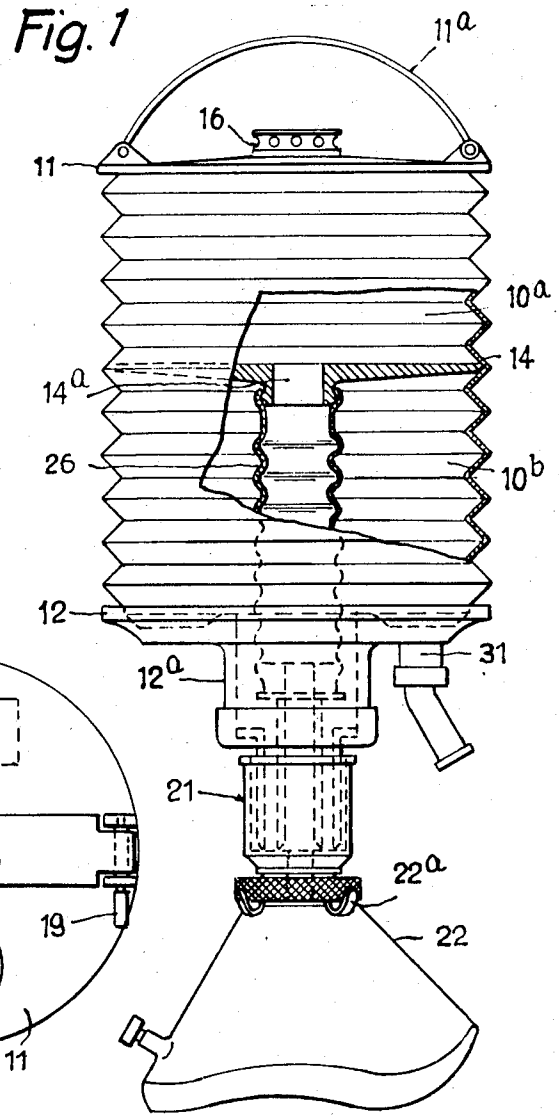
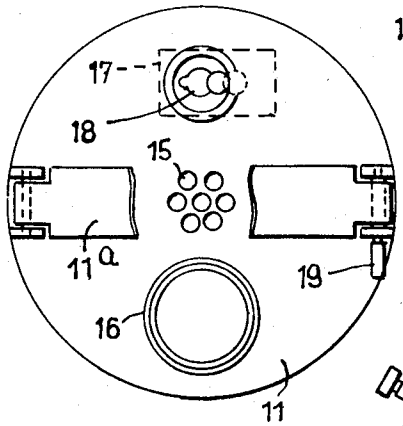


Fig. 2



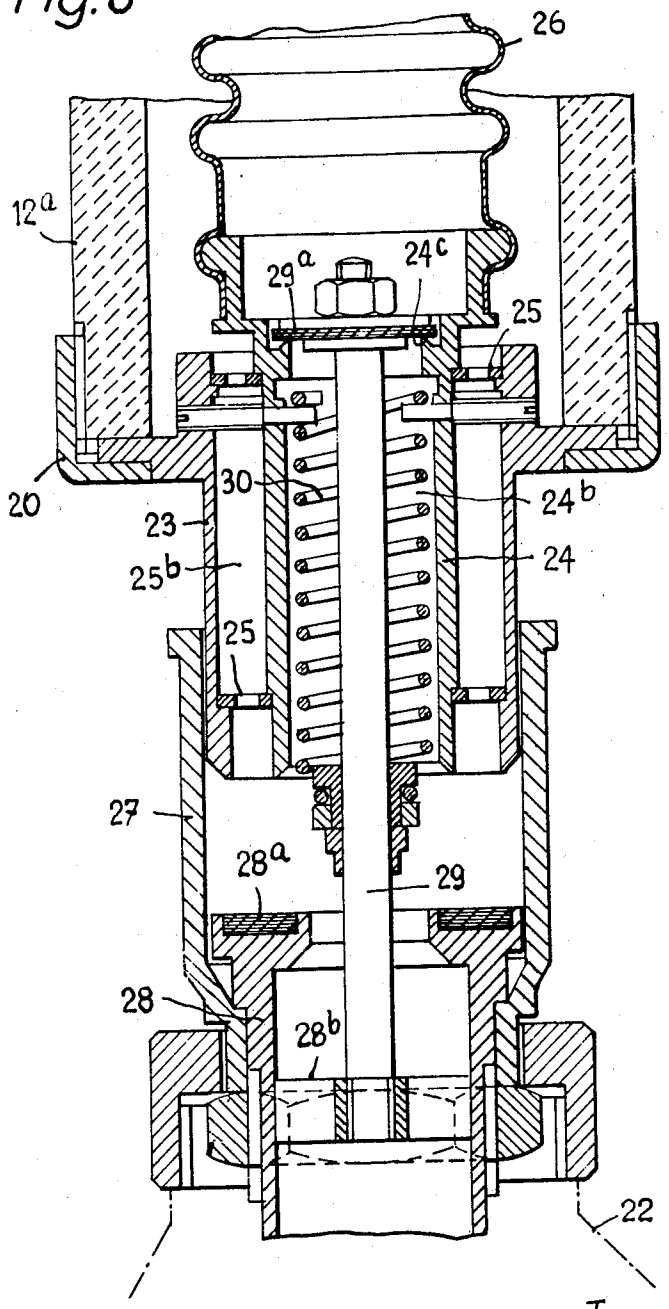
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Fig. 3



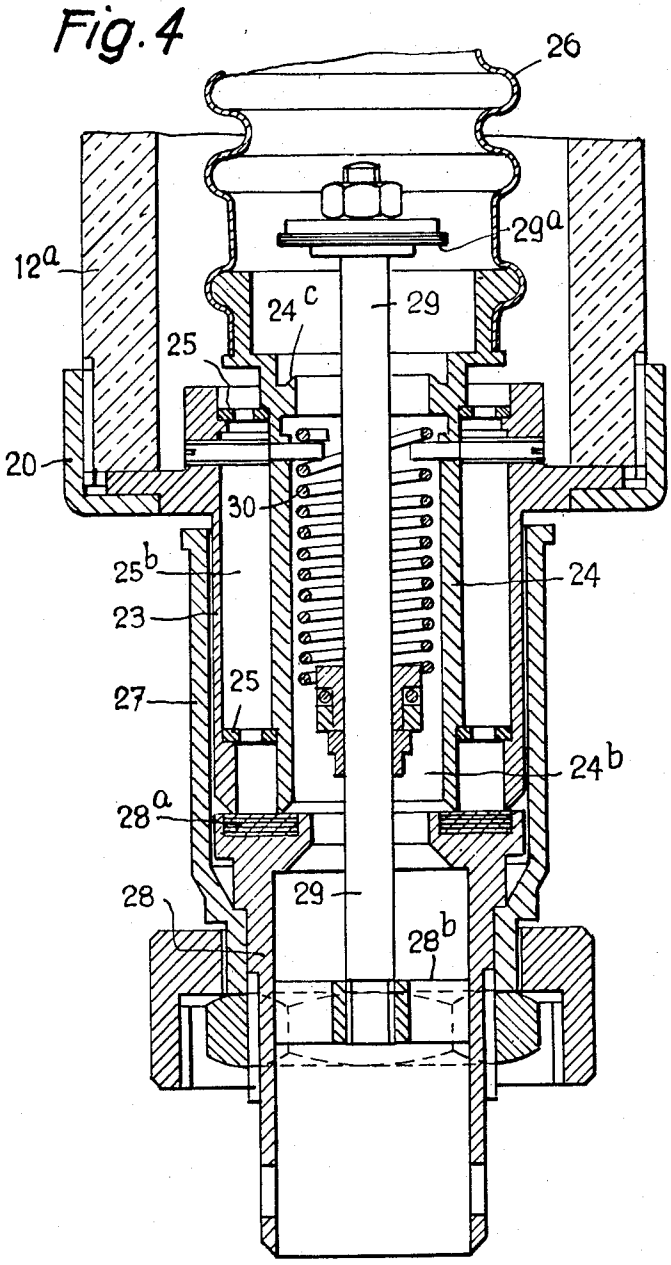
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Fig. 4



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LIFE-RESTORING APPARATUS

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5 Claims. (Cl. 128—29)

The present invention concerns a life-restoring apparatus which can be operated by hand for providing artificial respiration to a casualty (e. g. by drowning, gas-poisoning etc.) with a cylindrical bellows having an inlet and outlet valve, and a mask connected therewith, to be placed over the face of the patient. Previously-known apparatus of this kind is so constructed, that it functions as a pressure pump, by means of which fresh air is pumped into the lungs of the patient in the normal rhythm of breathing. The emptying of the lungs follows through the inherent elasticity of the thorax muscles. This collapse of the thorax however produces at a maximum 50% expiration and is very dependent on the constitution of the patient (fat, thin, old, young). In order to bring about the most effective revival possible, it is of great importance, that the revival commences with the act of exhalation, because in that way not only will there be the quickest possible emptying of the lungs, but because by the repeated drawing in with the apparatus without the application of fresh air the Hering-Breauer's breathing reflex is very rapidly achieved. This vago-phrenicus-reflex, released in the maximum expiration position of the diaphragm, is the best stimulant for restarting the independent breathing of the patient. Furthermore by the subsequent alternate inhalation and exhalation the complete lung-content is changed. This complete aeration of the lungs prevents the movement in and out of the same quantity of air between the apparatus and lungs which has previously often been noted and through which in time there arises an accumulation of carbon dioxide.

It is now an object of the invention, to achieve this result. According to the invention the bellows of the apparatus is divided by a dividing wall, into two compartments, which are provided with communicating channels arranged concentrically, the inner of which connects the compartment remote from the mask and the outer of which connects the other compartment with the said mask, check-valves being so disposed in the channels that by means of the alternate suction and expulsion of the bellows these valves function alternately and the bellows compartment in communication with the outer channel acts as a suction chamber whilst the other bellows compartment acts as a pressure chamber, so that the breathing organs of the patient can be both pumped out and supplied with fresh air.

In the accompanying drawing an embodiment by way of example of this invention is shown.

Fig. 1 is an elevation view of the life-restoring apparatus with a part shown in section;

Fig. 2 is a plan view of Fig. 1;

Figs. 3 and 4 show on an enlarged scale, a part of the apparatus at two different positions of operation.

The life-restoring apparatus according to Figs. 1 to 4 has a cylindrical bellows **10**, whose compartment is closed by two end discs **11** and **12**. The end disc **11** is provided with a handle **11***a*. In the central section of the bellows **10** a dividing wall **14** is provided which divides it into an upper and a lower bellows compartment **10***a* or **10***b*.

The wall **14** has a central connecting piece **14***a*. In the end disc **11**, an inlet valve **15**, a pressure relief valve **16** and an opening **18** which can be closed by means of a hand-operated slide **17** are provided. **19** indicates a connection fitting in communication with the bellows compartment **10***a*, through which if desired oxygen can be supplied to the said bellows compartment **10***a*. The end disc **12** has a tube-like projection **12***a*, to which is fitted by means of a cap nut **20** a valve device, shown in full at **21** in Figs. 3 and 4, to which is connected a funnel shaped mask **22**, to be placed over the face of the patient. The end disc **12** is furthermore provided with an outlet valve **31**.

The valve device **21** has two tubular bodies **23** and **24**, which are maintained concentrically to each other by means of two apertured spacer rings **25**. The outer tubular body **23** has an external flange, by which it is fitted to the tube-like extension **12***a* by means of the nut **20**. The tubular body **24** is connected at its end facing the bellows **10** to the connecting piece **14***a* of the dividing wall **14** by means of a bellows tube **26**. The tubular body **23**, on the other hand, is in slideable engagement with a guide sleeve **27** and can be pushed to and from therein. In the lower end piece of this guide bearing **27** where it narrows a connecting pipe **28** is mounted which opens into the narrow part of the funnel-like mask **22**, which is provided at its upper end with a flat sealing ring washer **28***a*. This sealing ring washer forms a check-valve together with the two tubular bodies **23** and **24**. A valve stem **29** extending upward is fitted in the connecting pipe **28** by means of a crossbar **28***b* which stem, at its upper end, supports a valve disc **29***a*, which cooperates with the valve-seating **24***c* formed in the upper end section of the tubular body **24**. A tension spring **30** is fitted to the valve stem **29** and is anchored at its lower end to the valve stem and at its upper end to the tubular body **24**. This spring serves to keep the check valve formed by the valve-disc **29***a* and the valve seating **24***c* in an open position.

When using the above described life-restoring apparatus the mask **22** is placed over the face of the patient who is preferably in a prone position and it is fixed to the head of the patient by means of a strap hooked over a hook **22***a*. The opening **18** which can be closed by the hand-operated slide **17** is first opened and in consequence the upper bellows compartment **10***a* is made ineffective. Upon drawing up the bellows **10** (Fig. 3) the tubular bodies **23** and **24** forming the movable part of the said check-valve are raised against the action of the spring **30** from the sealing-ring washer **28***a* forming the valve-seating. At the same time the valve-seating **24***c* is pressed against the valve-disc **29***a*. In consequence the harmful contents of the respiratory organs of the patient are sucked into the lower bellows compartment **10***b* through the mask **22** and through the annular channel **25***b* formed by the two tubular bodies **23** and **24**. This bellows compartment therefore functions as a suction chamber, through whose action the respiratory organs of the patient are pumped out. The way leading through the tubular body **24** to the upper bellows compartment **10***a* is thus blocked by the check-valve **24***c*, **29***a* which is in a closed position. Upon depressing the bellows **10** (Fig. 4) the check-valve **23**, **24**, **28***a* is now closed and the contents of the lower bellows compartment is ejected through the outlet valve **31** into the atmosphere. After a few strokes, i. e. as soon as the respiratory organs are sufficiently pumped out, the opening **18** is closed. Upon drawing up the bellows **10** fresh air is now sucked through the inlet valve **15** into the upper bellows compartment. In this way the path from the upper bellows compartment **10***a* through the tube **26** and the tubular body **24** is blocked by the check-valve **24***c* and **29***a*. If the bellows

10 is now depressed, then this fresh air is driven through the channel 24*b* formed by the tubular body 24 from the upper bellows compartment 10*a* through the mask into the respiratory organs of the patient. The relief-pressure valve 16 limits the pressure at which the fresh air is supplied to the patient, to protect his lungs from the danger of an excessive pressure. If desired the fresh air can be enriched with oxygen via the connection fitting 19. The upper bellows compartment thus acts as a pressure chamber, through whose action fresh air can be pumped into the respiratory organs of the patient. The above described life-restoring apparatus thus combines a suction and a pressure pump, to which two check-valves are fitted working alternately during the drawing out and compression of the bellows, so that the two pumps on their part function alternately and the patient's respiratory organs can in consequence be pumped out as well as being supplied with fresh air.

What I claim is:

1. A manually operable life-restoring apparatus for giving artificial respiration to a casualty, comprising a cylindrical bellows having end discs closing each end, a dividing wall having an aperture therein dividing said bellows into two compartments, said end disc closing one of said compartment having an inlet valve and a pressure relief valve, the end disc closing the other of said compartments having an outlet valve and a tubular extension thereon, an outer tubular body on the end of said tubular extension, a guide sleeve slidably engaging the outside of said outer tubular body, a connecting pipe on the end of said guide sleeve, a mask adapted to fit over the face of the casualty connected to said connecting pipe, an inner tubular body within said outer tubular body, a bellows tube connecting said inner tubular body with the compartment remote from said mask through the aperture in said dividing wall, a check valve between said inner tubular body and said bellows tube and a check valve between said outer tubular body and said connecting pipe, said check valves functioning alternatively upon drawing out and compressing the bellows, said bellows compartment connected to said outer tubular member through said tubular extension serving in operation as a suction chamber and said other bellows compartment serving as a pressure chamber, whereby the respiratory organs of a casualty can be pumped out and supplied with fresh air.

2. A manually operable life-restoring apparatus as claimed in claim 1 in which said end disc having an inlet valve and a pressure relief valve has an aperture therein, and a manually operable slide to open and close said aperture, whereby the bellows compartment closed by said end disc may be put out of action during operation.

3. A manually operable life-restoring apparatus as claimed in claim 1 in which the check valve between said outer tubular body and said connecting pipe comprises a sealing member on said connecting pipe and a valve seat on the end of said outer tubular body and the end of said inner tubular body adjacent thereto, whereby the passage between the inner and outer tubular bodies is sealed off from said connecting pipe when said bellows is compressed.

4. A manually operable life-restoring apparatus as claimed in claim 1 in which the check valve between said inner tubular body and said bellows tube comprises a valve stem fitted in said connecting pipe and extending through said inner tubular body, a sealing member on the end of said valve stem adjacent said bellows tube, and a valve seat on the end of said inner tubular body adjacent said bellows tube, whereby said bellows tube is sealed off from said inner tubular body when the bellows is extended.

5. A manually operable life-restoring apparatus as claimed in claim 4 in which said check valve between said inner tubular body and said bellows tube has a coiled spring within said inner tubular body, one end of said spring being attached to the inner tubular body adjacent said check valve and the other end of said spring being attached to said valve stem adjacent said connecting pipe.

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