May 19, 1959 E. SOVINSKY ET AL 2,887,104

MASK TO MASK RESUSCITATOR

Filed March 12, 1958

Fig. 1

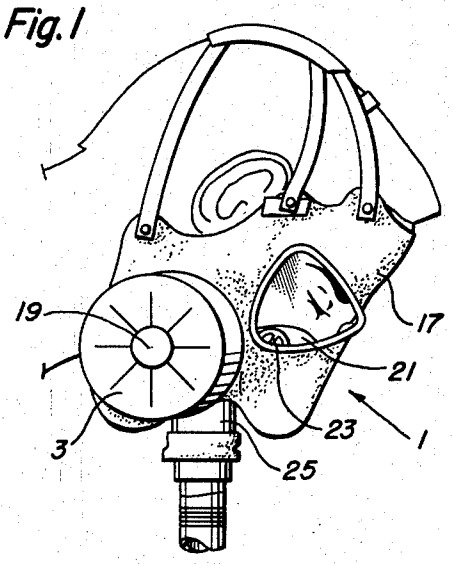

Fig. 4

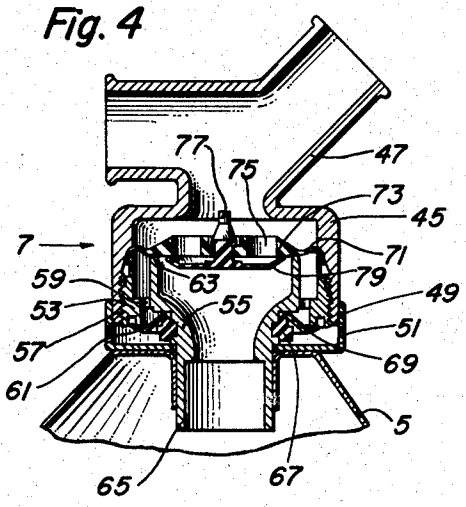

Fig. 2

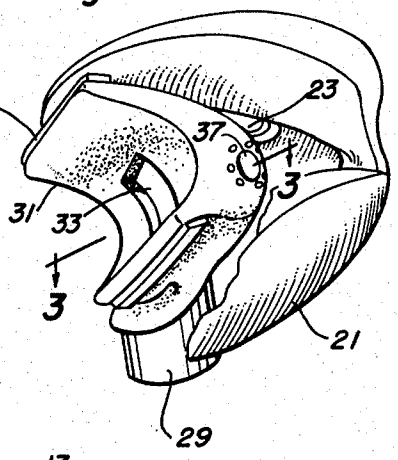

Fig. 3

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MASK TO MASK RESUSCITATOR

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Application March 12, 1958, Serial No. 721,071

3 Claims. (Cl. 128—29)

(Granted under Title 35, U.S. Code (1952), sec. 266)

This invention herein described may be manufactured and used by or for the Government of the United States of America for governmental purposes without the payment to us of any royalty thereon.

This invention relates to a resuscitator particularly adapted for use in a contaminated atmosphere. It constitutes an improvement on that described and claimed in application Serial No. 721,073 filed March 12, 1958 by Elwyn S. Brown et al. for "Mask-to-Mask Resuscitator."

In the treatment of victims of poison gases, particularly the so-called "nerve gases," it is frequently necessary to resort to some type of artificial respiration or resuscitation. Since the resuscitation must be carried out promptly, the method must be such that it can be carried out in a contaminated atmosphere while both the casualty and the operator are protected. The apparatus employed should be light, simple, and easily transported.

One previously known method is termed "mouth-to-mouth resuscitation." It consists in the operator blowing exhaled air into the mouth of the casualty. Our apparatus makes possible a variation of this method, which we term "mask-to-mask" resuscitation. The operator inhales through a canister and gas mask. He then exhales into the lungs of the patient. Finally, the patient exhales to the atmosphere. Our apparatus makes possible for the operator to carry out this cycle for extended periods of time and insure that the casualty receives air of adequate oxygen content. In common with the apparatus of the Brown et al. application, our arrangement provides for re-breathing by the operator of part of his exhaled air to maintain the carbon dioxide concentration in his lungs sufficiently high to prevent difficulty due to hyperventilation.

Our apparatus includes refinements which render it more effective in actual use in the field than shown in the Brown et al. application referred to above.

In the drawings:

Figure 1 is a side elevation of the apparatus as a whole.

Figure 2 is a perspective view from the inside showing the mouthpiece in relation to the nosecup of the operator's mask.

Figure 3 is a sectional view taken on line 3—3 of Figure 2.

Figure 4 is an enlarged section on line 4—4, Fig. 1, showing the valve structure.

Our resuscitator comprises essentially an operator's gas mask 1 having a canister 3, a casualty's oronasal mask 5, a three-way valve 7 and a separate canister 9. Flexible tubes 11 and 13 connect valve 7 to mask 1 and canister 9, respectively. A flexible hood 15, preferably of transparent plastic, covers the head and neck of the casualty and the outlet ports of valve 7.

The operator's mask 1 is a conventional gas mask from which the usual outlet valve has been removed. It includes facepiece 17 and canister 3, having inlet opening 19. Within facepiece 17 is the conventional nosecup 21, which is provided with inlet valves 23 and which communicates with outlet tube 25.

One of the important features of our device is the mouthpiece 27. This mouthpiece includes a stiffened tubular shank 29 and a flexible rubber hollow body 31 having a blowing opening 33. The mouthpiece body 31 is provided with an air inlet valve which comprises a thin rubber disk 35 held in place by a resilient rubber plug 37 and covering perforations 39.

Associated with canister 3 is a conventional one-way inlet valve (not shown) which is mounted on the facepiece 17.

Oronasal mask 5 is formed of rigid material, preferably a transparent plastic and carries on its lower edge an inflatable flexible rubber tube 41 to insure a good seal with the face of the patient. Hood 15 is provided with a drawstring 43 which is drawn about the neck of the casualty.

The valve 7 is shown in detail in Fig. 4. It includes an outer housing 45 having a Y-connection 47. The two free ends of the Y are connected to flexible tubes 11 and 13.

The lower end of housing 45 is covered by a cap 49 which is pierced by air outlet perforations 51.

An inner housing formed of an outer ring 53 and an inner ring 55 is joined to outer housing 45 by threads 57. These rings are joined by a flange pierced by outlet openings 59. Outer ring 53 terminates at its lower end in an outer valve seat 61 while inner ring 55 terminates at its upper end in inner valve seat 63. Inner ring 55 terminates at its lower end in shank 65 which is tightly joined to oronasal mask 5.

An outer valve is mounted on inner ring 55 and engages outer valve seat 61, thus covering air outlet openings 59. The outer valve is formed of a heavy elastic rubber ring 67 which embraces inner ring 55 and, integral therewith, a thin resilient rubber valve disk 69 which engages outer valve seat 61.

Within housing 45 is an inner valve. This valve comprises a valve disk 71 of thin, resilient rubber clamped at its periphery between outer housing 45 and outer ring 53, and, integral therewith, a thickened central portion 73 pierced by holes 75. Inner valve disk 71 engages inner valve seat 63, while the thickened central portion 73 forms a central valve seat.

A central valve is carried on the under side of thickened central portion 73. It comprises a resilient rubber plug 77 which fits tightly in an opening in thickened central portion 73 and an integral resilient valve disk 79 which engages the central valve seat and covers holes 75.

Operation

The casualty is placed on his back and his mouth is held open by any suitable means. A throat tube may be inserted to insure patency. Hood 15 is placed over his head and drawstring 43 is drawn about the neck to about the same tightness as a necktie. The operator then places oronasal mask 5 over the mouth and nose of the casualty. The following cycle of steps then begins.

a. The operator inhales through his mouth and nose. A negative pressure is created in mask 1, flexible tubes 11 and 13, Y-connection 45, and canisters 3 and 9. The central valve disk 79 is held in the position shown in Fig. 4, closing holes 75 and preventing air flow into Y-connection 45 from oronasal mask 5 or the exterior. Air flows into the mask 1 through canister 3 and also through canister 9, tube 13, Y-connection 45, flexible tube 11, outlet tube 25 and mouthpiece 27. Air from canister 3 enters nosecup 21 through inlet valves 23. If the pressure is less inside than outside of mouthpiece 27, air enters through perforations 39, preventing collapse.

b. The operator exhales by blowing into mouthpiece

27. Valve disk 35 closes perforations 39 in the mouthpiece. The mouthpiece is distended, forming a tight seal against the operator's lips. Inner valve disk 71 seats on inner valve seat 63 and central valve disk 79 is forced away from its seat, opening holes 75. Air then flows into oronasal mask 5 and thence to the casualty's lungs, distending them.

At the beginning of step (*b*) the entire system is filled with fresh purified air. That in tube 11 is first forced into the casualty's lungs, followed by the operator's exhaled air.

c. The operator stops exhaling and the casualty exhales due to the elasticity of the lungs. Central valve disk 79 closes while inner valve disk 71 and outer valve disk 69 are moved away from their valve seats 63 and 61, respectively, allowing the casualty's exhaled air to enter hood 15, where it creates a slight superatmospheric pressure and eventually escapes around the casualty's neck.

Step (*c*) may occur simultaneously with step (*a*) of the next cycle. At the end of step (*b*) tubes 11 and 13 are filled with the operator's exhaled air. When step (*a*) is repeated, this exhaled air mingles with the fresh air drawn in through canister 3. Breathing this mixture of exhaled and fresh air produces a carbon dioxide concentration in the lungs sufficient to prevent excessive symptoms of hyperventilation, while the simultaneous use of canisters 3 and 9 gives a lower breathing resistance than would be the case if all the air were inhaled through canister 9. Moreover, mask 1 is constructed in such a manner that air drawn in thru canister 3 flows over the inner surfaces of the eyepieces, preventing fogging. The resistance to flow of canister 3 is adjusted, e.g., by insertion of apertured plugs or disks in inlet opening 19, to secure the desired distribution of flow between canisters 3 and 9. The major flow should be through canister 9.

The mouthpiece 27 has been found to be a highly desirable feature. It sometimes requires considerable pressure to force air into the lungs of the unconscious casualty. Without the mouthpiece such pressure is difficult to attain and the attempt to do so may cause separation of the mask from the operator's face with resultant leakage. The hollow form of the mouthpiece is highly desirable since internal pressure causes it to seat tightly against the operator's lips.

The hood 15 adds to the protection of the casualty. Since a slight superatmospheric pressure of uncontaminated air is maintained, the possibility of leakage of contaminated air into oronasal mask 5 is greatly lessened.

Due to the provision of tube 13, the canister 9 may be positioned in any convenient location. For example, it can be attached to the operator's belt.

While we have described one embodiment of our invention in detail, it will be obvious that various changes are possible. We therefore wish our invention to be limited solely by the scope of the appended claims.

We claim:

1. A mask-to-mask resuscitator comprising: an operator's mask, said mask comprising a facepiece, an air purifying canister on said facepiece, an outlet tube on said facepiece, and a mouthpiece in said facepiece in communication with said outlet tube, said mouthpiece being so constructed and positioned as to press against the lips of the wearer of said mask; an oronasal casualty's mask, a valve mounted on said casualty's mask, a flexible tube connecting said outlet tube and said valve, said valve being so constructed as to admit air from said flexible tube to said oronasal mask when the pressure is higher in said flexible tube than in said oronasal mask and to discharge air from said oronasal mask to the exterior when the pressure is higher in said oronasal mask than in said flexible tube, and a second canister in communication with said flexible tube adjacent said valve.

2. A resuscitator as defined in claim 1 and further comprising a hood covering said valve and adapted to surround the head and neck of the casualty.

3. A resuscitator as defined in claim 1, wherein said mouthpiece comprises a hollow body of resilient material having a blowing opening in position to engage the lips of the wearer and a one-way valve so constructed as to admit air to the interior of said hollow body.

References Cited in the file of this patent

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