

[54] **RESUSCITATOR**  
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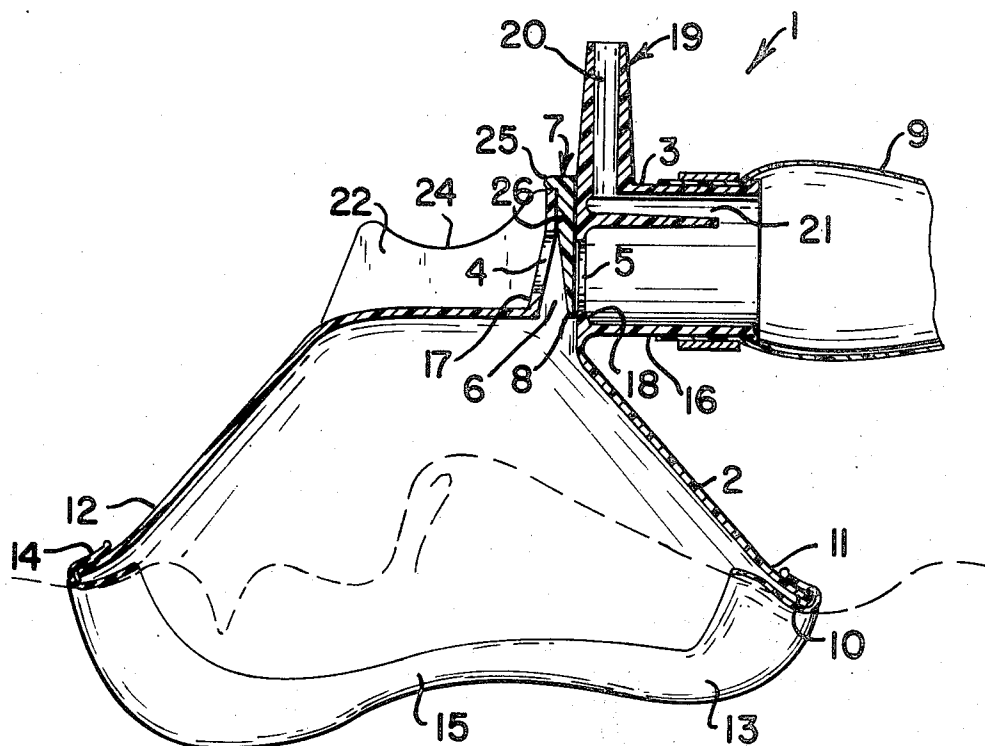
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[57] **ABSTRACT**

A respiratory assisting device for use to support and to re-establish substantially normal breathing when same has been halted or impaired as by immersion or other suffocatory circumstances and including a mask or face piece having an exhalation port in one end of a body member and an inhalation port within the body member and with an aperture between the ports and communicating with the mask and a valve member having a flap portion normally closing the inhalation port and movably to open the inhalation port and close the exhalation port in response to manual pressure on a gas bag mounted on the other end of the body member and which receives gas from a suitable source.

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4 Claims, 9 Drawing Figures



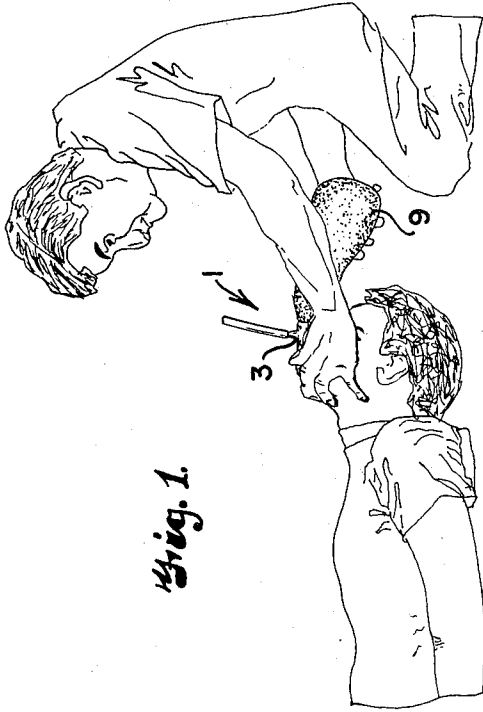


Fig. 1.

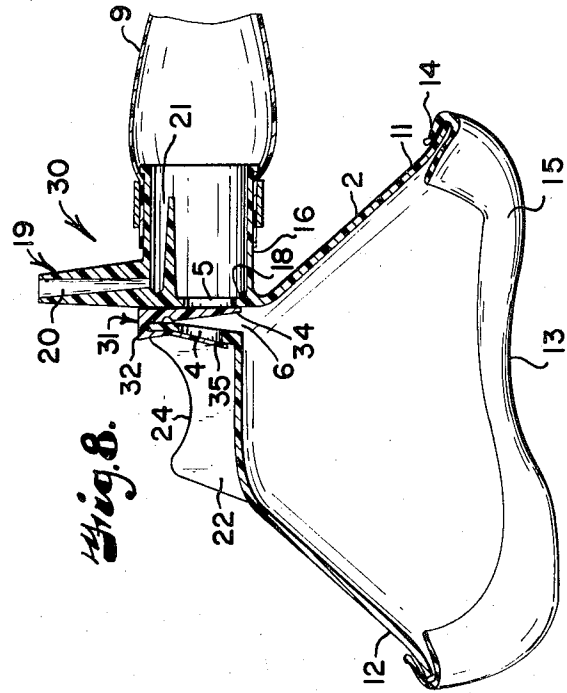


Fig. 8.

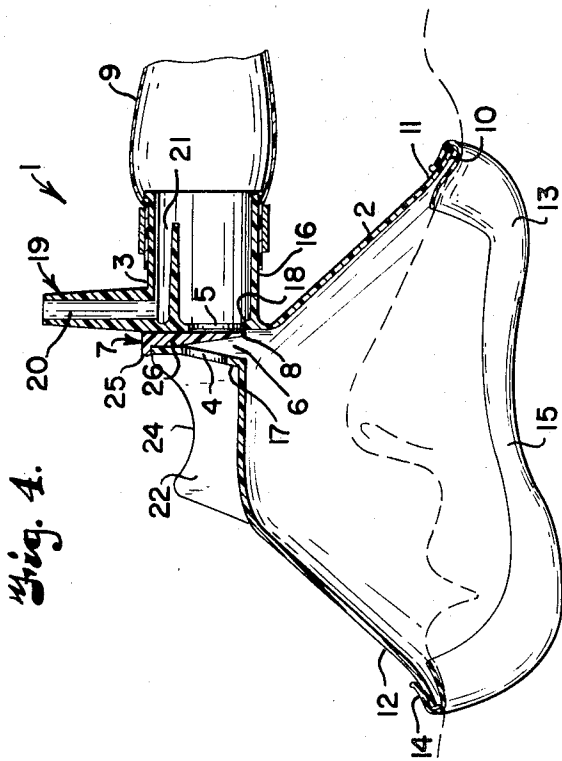


Fig. 4.

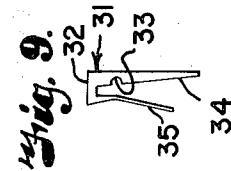


Fig. 9.

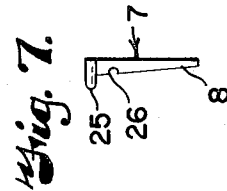
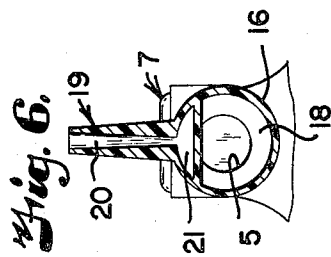
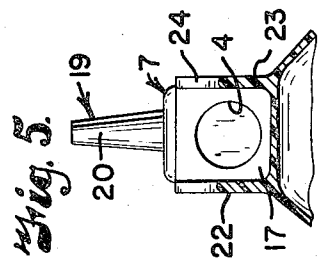
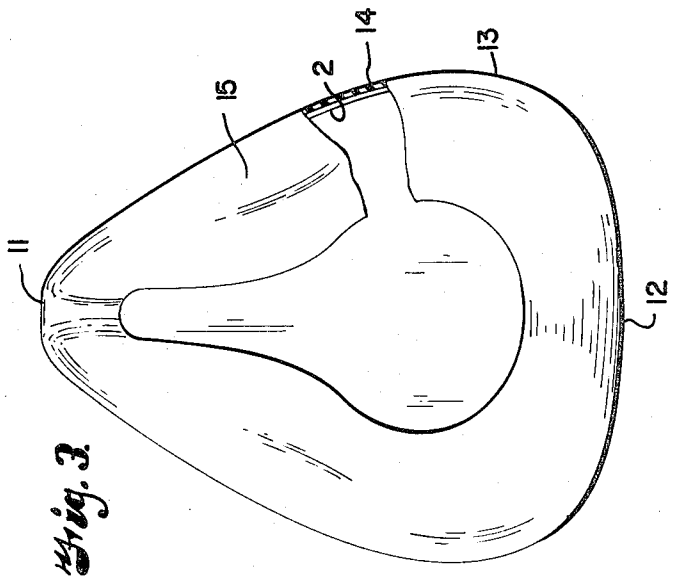
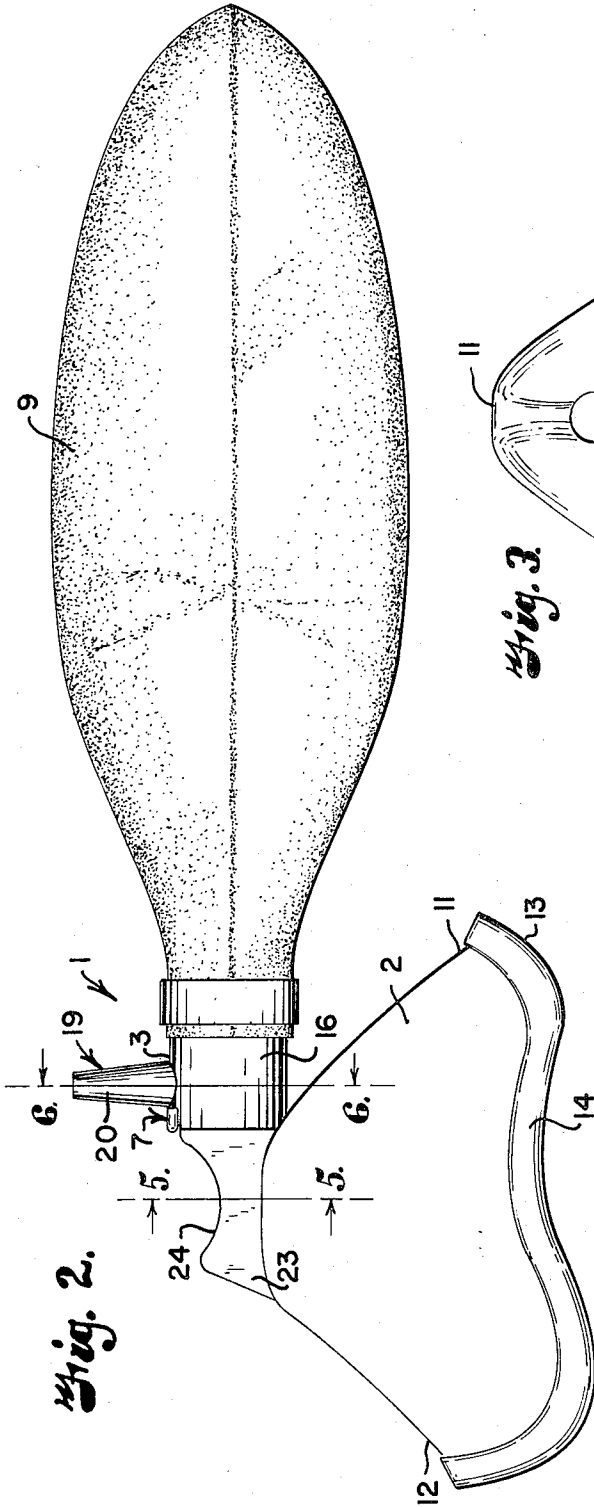


Fig. 7.



1  
RESUSCITATOR

The present invention relates to resuscitators and more particularly to resuscitators of the type which are hand operated, readily portable, and effective for emergency use.

Manual resuscitators are in common use in hospitals, clinics, ambulances, and at many other locations and are particularly adapted to support and re-establish respiration. Patients requiring such assistance in supporting or re-establishing respiration include those with pulmonary or cardiopulmonary arrests caused by drowning, electrocution, poisoning stroke, patients with repressed or obstructed respiration and the like.

Manual resuscitators heretofore used employ a rather complex valving arrangement and relatively expensive masks and housings for the valving arrangement. Most of the prior art manual resuscitators feature self-inflating flexible or pliable bags in combination with a rather complex valving arrangement. Upon compressing the bag with one hand, the air or gas from the bag is forced through the valve mechanism via a mask or airway into a patient's lungs. Upon releasing the hand from the bag, the patient exhales automatically through an exhalation port and ambient air sometimes enriched with oxygen enters the bag due to its self-inflating characteristics.

When the prior art resuscitators are used for different patients there is a danger of cross infection. Such resuscitators may be autoclaved or sterilized, however, this is a costly and time consuming operation and takes the resuscitator out of service during such cleaning or sterilizing thereby requiring that reserve units be available during such cleaning and sterilizing procedures. Facilities to autoclave and sterilize such resuscitators are not normally available in many places where resuscitators are used, such as in ambulances, nursing homes, first aid stations, and the like. Prior art resuscitators are relative high in cost due to the relatively complex design.

The principal objects of the present invention are: to provide a resuscitator or respiratory assisting device particularly adapted to overcome the above mentioned disadvantages; to provide such a resuscitator which is capable of instantaneous administration of one hundred percent oxygen to a patient; to provide such a resuscitator which is of simple design and thereby of economical construction; to provide such a resuscitator which is relatively economical and disposable after use to thereby eliminate the danger of cross contamination or infection; to provide such a resuscitator which is adapted to be operated with oxygen or air from any suitable source, such as compressed gas cylinders, commonly available hospital piping systems, liquid oxygen devices, chemical oxygen generators, and the like; to provide such a resuscitator which is only a very small fraction of the cost of prior art resuscitators and which substantially increases patient safety particularly in hospitals, nursing homes, and the like because several resuscitators may be located at all patient locations rather than one prior art resuscitator at a central location; to provide such a resuscitator which is disposable thereby eliminating costly and time consuming cleaning by autoclaving, sterilizing, and the like; to provide such a resuscitator which is economical to manufacture, particularly well adapted for the proposed use, and which is disposable after use.

2

Other objects and advantages of this invention will become apparent from the following description taken in connection with the accompanying drawings wherein are set forth by way of illustration and example certain embodiments of this invention.

The drawings constitute a part of this specification and include exemplary embodiments of the present invention and illustrate various objects and features of the resuscitator.

FIG. 1 is a perspective view of a resuscitator embodying features of the present invention and shown in use.

FIG. 2 is a side elevational view of the resuscitator.

FIG. 3 is a bottom plan view of the resuscitator.

FIG. 4 is a longitudinal sectional view through the resuscitator and showing the face of a person in broken lines.

FIG. 5 is a transverse sectional view through the resuscitator and taken on line 5—5, FIG. 2.

FIG. 6 is a transverse sectional view through the resuscitator and taken on line 6—6, FIG. 2.

FIG. 7 is a fragmentary side elevational view of a valve member for use with the resuscitator.

FIG. 8 is a longitudinal sectional view through a modified resuscitator.

FIG. 9 is a fragmentary side elevational view of a modified valve member.

Referring more in detail to the drawings:

As required detailed embodiments of the present invention are disclosed herein, however, it is to be understood that the disclosed embodiments are merely exemplary of the invention which may be embodied in various forms. Therefore, specific structural and functional details disclosed herein are not to be interpreted as limiting but merely as a basis for the claims and as a representative basis for teaching one skilled in the art to variously employ the present invention in virtually any appropriate detailed structure.

In the disclosed embodiments of the present invention, the reference numeral 1 generally designates a resuscitator or respiratory assisting device for use to support and to re-establish substantially normal breathing when same has been halted or impaired, as by immersion or other suffocatory circumstance. The resuscitator includes a mask or face piece 2 with a tubular body member 3 mounted on the mask or face piece 2 and having an exhalation port 4 in one end of the body member 3 and an inhalation port 5 within the body member 3 and with an aperture 6 between the ports 4 and 5 and communicating with the mask 2. A valve member 7 is mounted on the body member 3 and has a flap portion 8 normally closing the inhalation port 5 and movable to open the inhalation port 5 and close the exhalation port 4 in response to manual pressure on a gas bag 9 mounted on the other end of the body member 3 and which receives gas from a suitable source. The gas bag 9 is merely flexible or pliable and not self-inflating.

The mask or face piece 2 may be of any suitable shape, however, the illustrated mask 2 has a wall defining a cavity of a size to enclose and surround the nose and mouth of a person receiving artificial respiration. The wall has a peripheral portion 10 adapted to sealingly engage the face of a person and to enclose the mouth and nose thereof. In the illustrated device, the peripheral portion 10 defines a relatively narrow por-

tion 11 at one end which is adapted to engage the bridge of the nose and a wide portion 12 adapted to surround the mouth and engage the chin, as is conventional for resuscitator masks.

It is desirable to provide a substantially air or gas tight seal around the peripheral portion 10 of the mask or face piece 2, therefore, a flexible seal member 13 is mounted on the peripheral portion 10 of the mask or face piece 2 and includes a mounting portion 14 in engagement with a marginal edge portion of the wall defining the mask 2 and a flange portion 15 extending inwardly from the peripheral portion 10 of the mask or face piece 2. The flange portion 15 is engageable with the face of a person and effects sealing engagement therewith. The flange portion 15 also permits the resuscitator 1 to be adjustable to conform to the face of small children and adults. The flange portion 15 is preferably a thin member having sufficient flexibility to conform to the configuration of the face of the person and the flange portion 15 preferably has sufficient width to effect engagement with a sufficient area of the face to effect sealing engagement therewith.

The body member 3 is mounted on the mask or face piece 2 and may be formed integral therewith. The body member 3 is illustrated as a generally tubular member having a side wall 16 with an end wall 17 at one end thereof and having the exhalation port 4 therein. The inhalation port 5 is illustrated as being defined by portions 18 extending inwardly from the side wall 16 of the body member 3 and positioned in close proximity to the exhalation port 4. The inhalation port 5 is positioned on one side of the aperture 6 and the end wall 17 is positioned on the other side of the aperture 6.

The aperture 6 is positioned in the side wall 16 of the body member 3 and provides for communication for gas between the body member 3 and the mask 2 during inhalation and between the mask 2 and the exhalation port 4 during exhaling by the person.

It is desirable to provide means for communicating a suitable source of gas, such as oxygen, with the gas bag 9. Therefore, a tubular gas passage 19 is mounted on the side wall 16 of the body member 3 and has a first portion 20 extending from the body member 3 and positioned intermediate the ends of the side wall 16. The first portion 20 of the gas passage 19 is illustrated as being substantially normal or perpendicular to the side wall 16 and a second portion 21 of the gas passage 19 extends from the first portion 20 and substantially normal to the first portion and substantially parallel with the side wall 16 of the body member 3 and the second portion 21 has one end thereof opening in facing relation with the other end of the body member 3 and the gas bag mounted thereon for direct flow of gas from the source and into the gas bag 9 through the body member 3.

It is desirable to provide means on the mask or face piece 2 or on the body member 3 to be held or gripped by an operator, therefore, a pair of laterally spaced and preferably substantially parallel ribs 22 and 23 are formed on the mask or face piece 2 and extend from the end wall 17 of the body member 3 and the exhalation port 4 therein. The ribs 22 and 23 each have a generally concave recess 24 in the outer edge thereof which is adapted to be engaged by a thumb or index finger of an operator to hold the mask in engagement with the face of a person receiving respiratory assistance

and to substantially eliminate closing of the exhalation port 4 by an operator.

The valve member 7 has a portion movable between the ports 4 and 5 to thereby control gas flow into the mask or face piece 2 for inhalation and exhalation flow from the mask or face piece 2. The illustrated valve member 7 has a mounting portion 25 supported on the side wall 16 of the body member 3 and the flap portion 8 of the valve member 7 is positioned within the body member 3 and is in position normally closing the inhalation port 5 and is movable between the portions 18 and the end wall 17. A connecting portion 26 is positioned between the mounting portion 25 and the flap portion 8 and is of reduced thickness to thereby permit movement of the flap portion 8.

It is preferable that the flap portion 8 remain in engagement with the portions 18 defining the inhalation port 5 except when manual pressure is applied to the gas bag 9 or when gas pressure within the gas bag 9 exceeds a selected pressure. Therefore, one side of the mounting portion 25, connecting portion 26, and flap portion 8 are coplanar thereby creating sufficient surface tension for maintaining a closing bias against the portions 18 defining the inhalation port 5.

In using a resuscitator constructed as illustrated and described, a suitable source of a selected gas, such as oxygen, is connected to the first portion 20 of the gas passage 19 for flow of the gas through the gas passage 19 and from the body member 3 into the gas bag 9 to thereby expand same. The gas bag 9 is manually compressed or collapsed, thereby forcing the flap portion 8 to move from the inhalation port 5 to the exhalation port 4 in response to the increased pressure within the gas bag 9 and thereby permit flow into the mask or face piece 2 for inhaling of the gas by the person. When the person exhales the flap portion 8 returns to the position closing the inhalation port 5 and the breath of the person flows outwardly through the exhalation port 4 and between the ribs 22 and 23. During the exhalation flow, the gas bag 9 is being refilled with gas to thereby be ready to be collapsed again manually for the inhalation portion of a person's breathing cycle.

FIGS. 8 and 9 illustrate a modified respiratory assisting device 30 particularly adapted for use as an inhalation device for use by patients breathing on their own and is particularly adapted for persons requiring one hundred percent (100 percent) oxygen wherein the person may breathe only the gas from the bag 9 rather than breathing air drawn into the mask 2 through the exhalation port 4. The mask or face piece 2, body member 3, gas bag 9, and gas passage 19 are substantially similar to the resuscitator 1, however, a modified valve member 31 is used in the modified respiratory assisting device 30.

The modified valve member 31 includes a mounting portion 32 supported on the side wall 16 of the body member 3. The mounting portion 32 is substantially similar to the mounting portion 25 of the valve member 7. A connecting portion 33 is of reduced thickness and is positioned between the mounting portion 32 and a first flap portion 34 within the body member 3 and normally closing the inhalation port 5. The first flap portion 34 is movable between the portions 18 and an interior surface of the end wall 17 in response to flow of gas through the inhalation port 5. The connecting portion 33 and the first flap portion 34 are substantially similar to the connecting portion 26 and the flap por-

tion respectively of the valve member 7. The modified valve member 31 includes a second flap portion 35 extending from the mounting portion 32 and normally engaging an exterior surface of the end wall 17 and closing the exhalation port 4. The second flap portion 35 is movable away from the exterior surface of the end wall 17 to open the exhalation port 4 by flow of gas outwardly from the mask or face piece 2 and through the aperture 6 and exhalation port 4. The second flap portion 35 is normally biased to engage the exterior surface end wall 17 and thereby maintain the exhalation port 4 closed except during outward flow of exhaust breath or exhaling by the patient.

Use of the modified respiratory assisting device 30 is substantially similar to use of the resuscitator 1 except that the patient may not breathe normal atmosphere and may breathe only gas from the gas bag 9. The gas bag 9 would fill during the exhalation phase and deflate during the inhalation phase of the patient's breathing. Inhalation flow is effective to maintain the second flap portion 35 in position.

What I claim and desire to secure by Letters Patent is:

1. A resuscitator comprising:
  - a. a mask having a gas supply portion and a peripheral portion, said supply portion including a first wall attached directly to said peripheral portion and containing an inhalation port and a second wall attached directly to said peripheral portion and adjacent to said first wall and containing an exhalation port, said peripheral portion defining a chamber adapted to receive a mouth and nose of a person;
  - b. said first and second walls defining an aperture therebetween opening directly into said chamber;
  - c. said supply portion having a gas receiving body adjacent said inhalation port and communicating therewith;
  - d. means connected to said gas receiving body and operative to selectively deliver gas through said inhalation port and aperture directly into said chamber; and
  - e. a valve member in said aperture and normally closing said inhalation port and movable within said aperture to close said exhalation port in response to a flow of gas through said inhalation port.
2. The resuscitator as set forth in claim 1 wherein:
  - a. said gas supply portion includes a pair of finger contracting ribs spaced apart on either side of said exhalation port and extending outwardly therefrom.
3. A resuscitator comprising:
  - a. a mask having a peripheral portion adapted to sealingly engage a face of a person and to enclose a mouth and a nose of the person;
  - b. a tubular body member on said mask, said body member having spaced portions and a port to the exterior in one of said portions;
  - c. a gas inlet adjacent the other portion of said body member for communicating a source of gas to said body member;
  - d. a flexible gas bag having one end thereof mounted on the other portion of said body member and adapted to be expanded by gas from said gas source;

- e. a second port within said body member and spaced from said first named port;
- f. said body portion between the ports having communication with the interior of the mask;
- g. valve means in said body member normally closing said second named port and movable between said second named port and said first named port for substantially closing same to thereby control gas flow into said mask for inhalation and exhalation flow from said mask respectively;
- h. said valve means comprising:
  1. a mounting portion supported on said body member;
  2. a first flap portion within said body member and normally closing said second port and movable between said first named port and said second port;
  3. a connecting portion of reduced thickness between said mounting portion and said first flap portion; and
  4. a second flap portion extending from said mounting portion and normally closing said first named port, said second flap portion being adapted to be moved to open said first named port by flow of gas outwardly from said mask and through said first named port.
4. A resuscitator comprising:
  - a. a mask having a wall having a peripheral portion adapted to be in sealing engagement with a face of a person and to enclose a mouth and a nose of the person;
  - b. a tubular body member mounted on said mask and having a side wall and an end wall at one end of said body member;
  - c. a tubular gas passage mounted on said body member and having one end thereof within and adjacent the other end of said body member for communicating a source of gas to said body member;
  - d. a flexible gas bag having one end thereof open and mounted on the other end of said body member and adapted to be expanded by gas from said gas passage;
  - e. a first port in the end wall of said body member;
  - f. portions extending inwardly from said side wall of said body member and defining a second port, said second port being positioned in close proximity to said first port;
  - g. said body member between the ports having communication with the interior of said mask;
  - h. valve means in said body member and normally closing said second port and being movable between said end wall of said body member and said portions defining said second port for closing said first port and said second port respectively to thereby control gas flow through said second port for inhalation and flow through said first port during exhalation;
  - i. said valve means comprising:
    1. a mounting portion supported on said side wall of said body member and having opposite sides;
    2. a first flap portion having opposite sides and being within said body member and normally closing said second port and movable between the end wall of said body member and said por-

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tions defining said second port for closing same respectively;

- 3. a connecting portion of reduced thickness between said mounting portion and said first flap portion, said connecting portion having one side thereof substantially coplanar with one side of said mounting portion and one side of said first

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flap portion; and

- 4. a second flap portion extending from said mounting portion and normally closing said first port, said second flap being moved to open said first port by flow of gas outwardly from said mask and through said first port.

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