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14. ABSTRACT

A respiratory system that is particularly suited to provide uncontaminated ventilation and oxygen needs of an aircrew during the ground and flight operations is disclosed. The respiratory system has provisions to provide for a continuous flow of air or oxygen during the failure mode conditions of the ventilator and oxygen generating systems supplying the respiratory system so that the aircrew is always provided with at least a flow of uncontaminated breathing fluid under all such failure mode conditions.

15. SUBJECT TERMS

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United States Patent [19]

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[45] **Date of Patent: Jul. 30, 1996**

[54] **RESPIRATORY SYSTEM PARTICULARLY SUITED FOR AIRCREW USE**

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[73] Assignee: **The United States of America as represented by the Secretary of the Navy**, Washington, D.C.

[21] Appl. No.: **310,539**

[22] Filed: **Dec. 5, 1994**

[51] **Int. Cl.**[6] **A62B 17/04**

[52] **U.S. Cl.** **128/201.24**; 128/204.26; 128/205.11; 128/205.24

[58] **Field of Search** 128/201.28, 204.26, 128/205.11, 205.24

[56] **References Cited**

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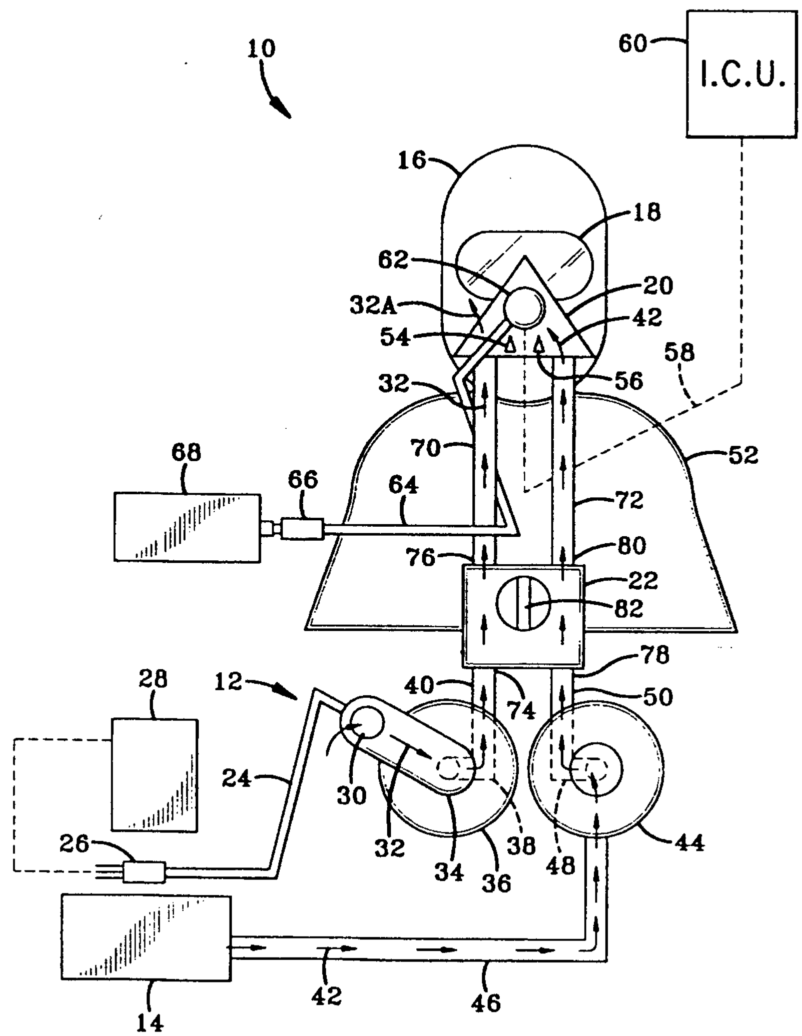
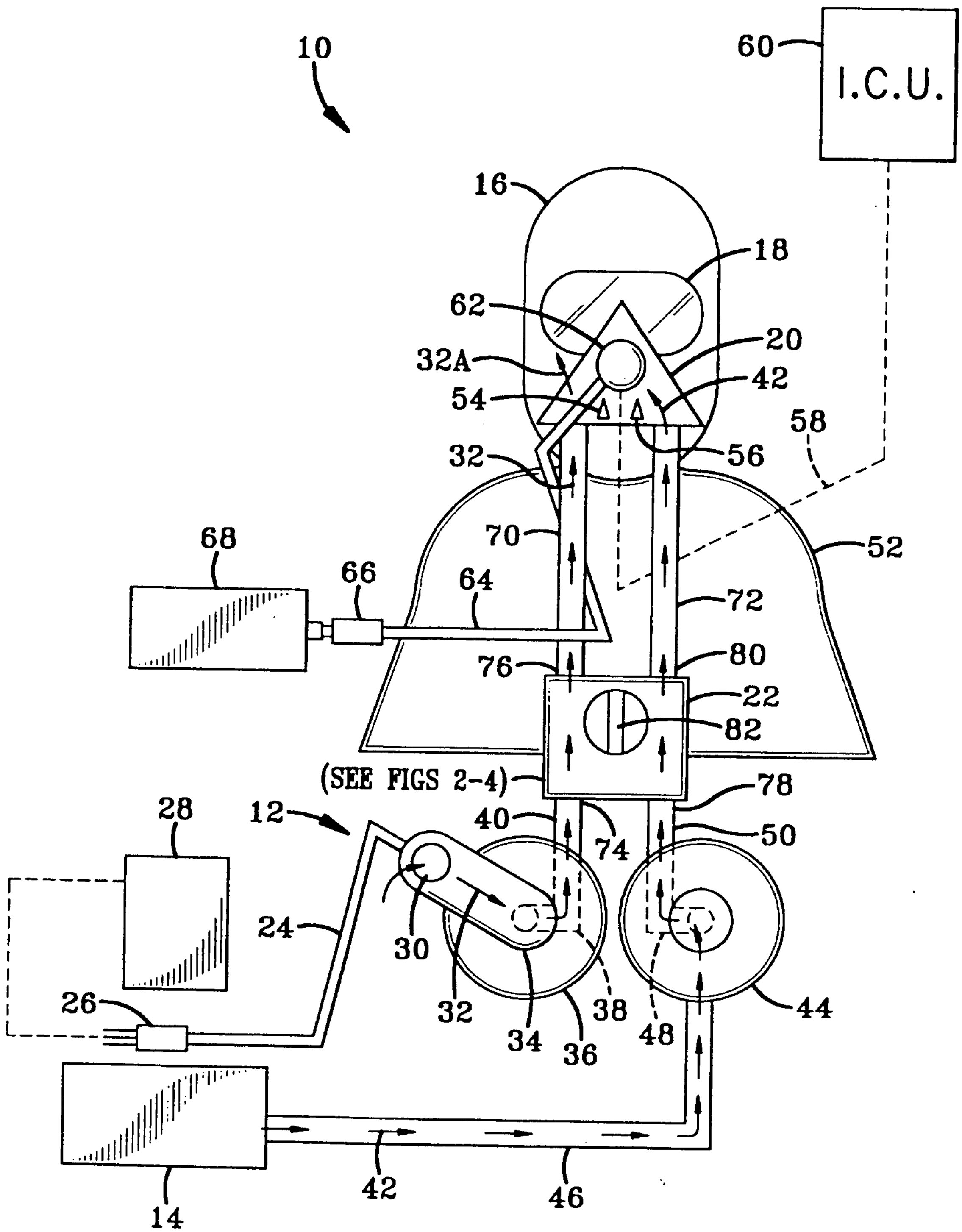
Attorney, Agent, or Firm—Susan E. Verona

[57] **ABSTRACT**

A respiratory system that is particularly suited to provide uncontaminated ventilation and oxygen needs of an aircrew during the ground and flight operations is disclosed. The respiratory system has provisions to provide for a continuous flow of air or oxygen during the failure mode conditions of the ventilator and oxygen generating systems supplying the respiratory system so that the aircrew is always provided with at least a flow of uncontaminated breathing fluid under all such failure mode conditions.

10 Claims, 5 Drawing Sheets

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(SEE FIGS 2-4)
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FIG-1

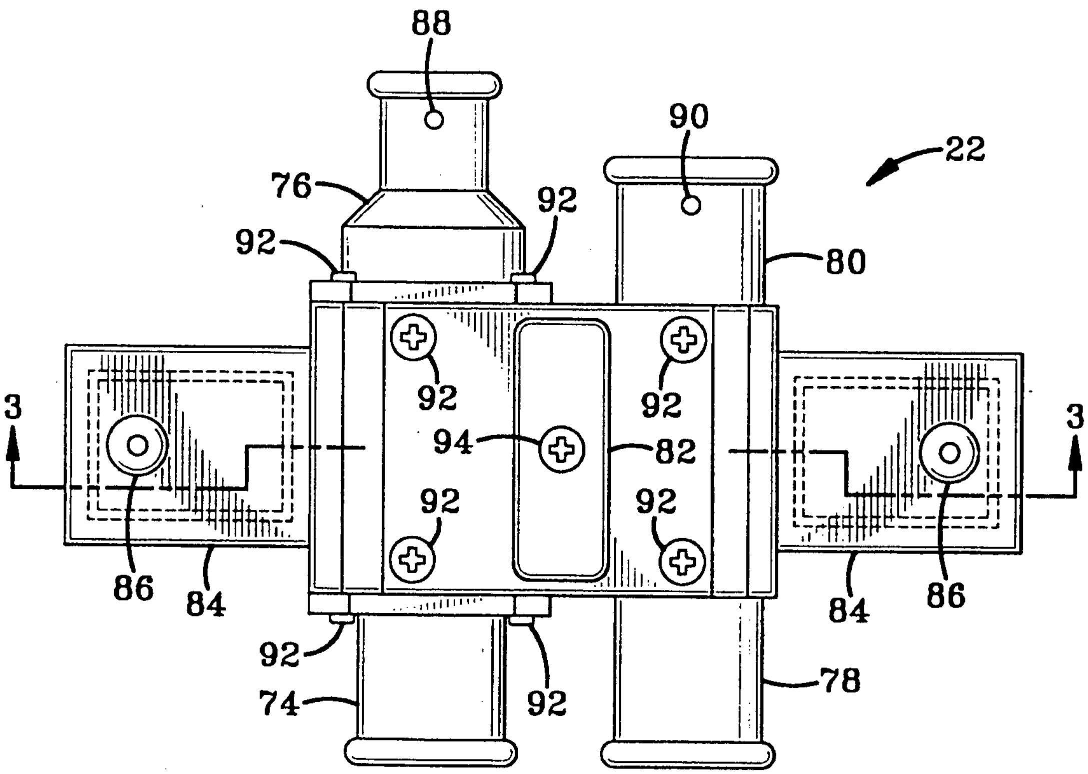
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FIG-2

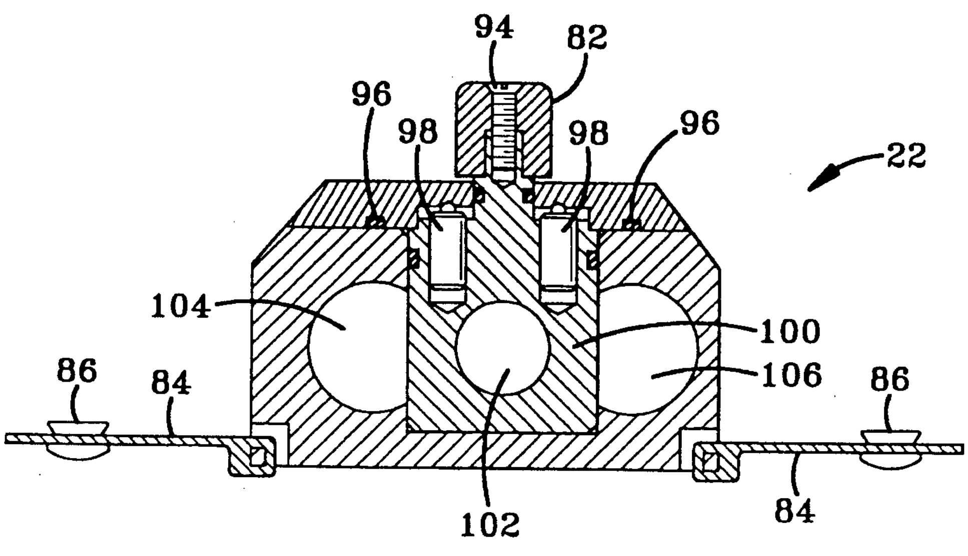
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FIG-3

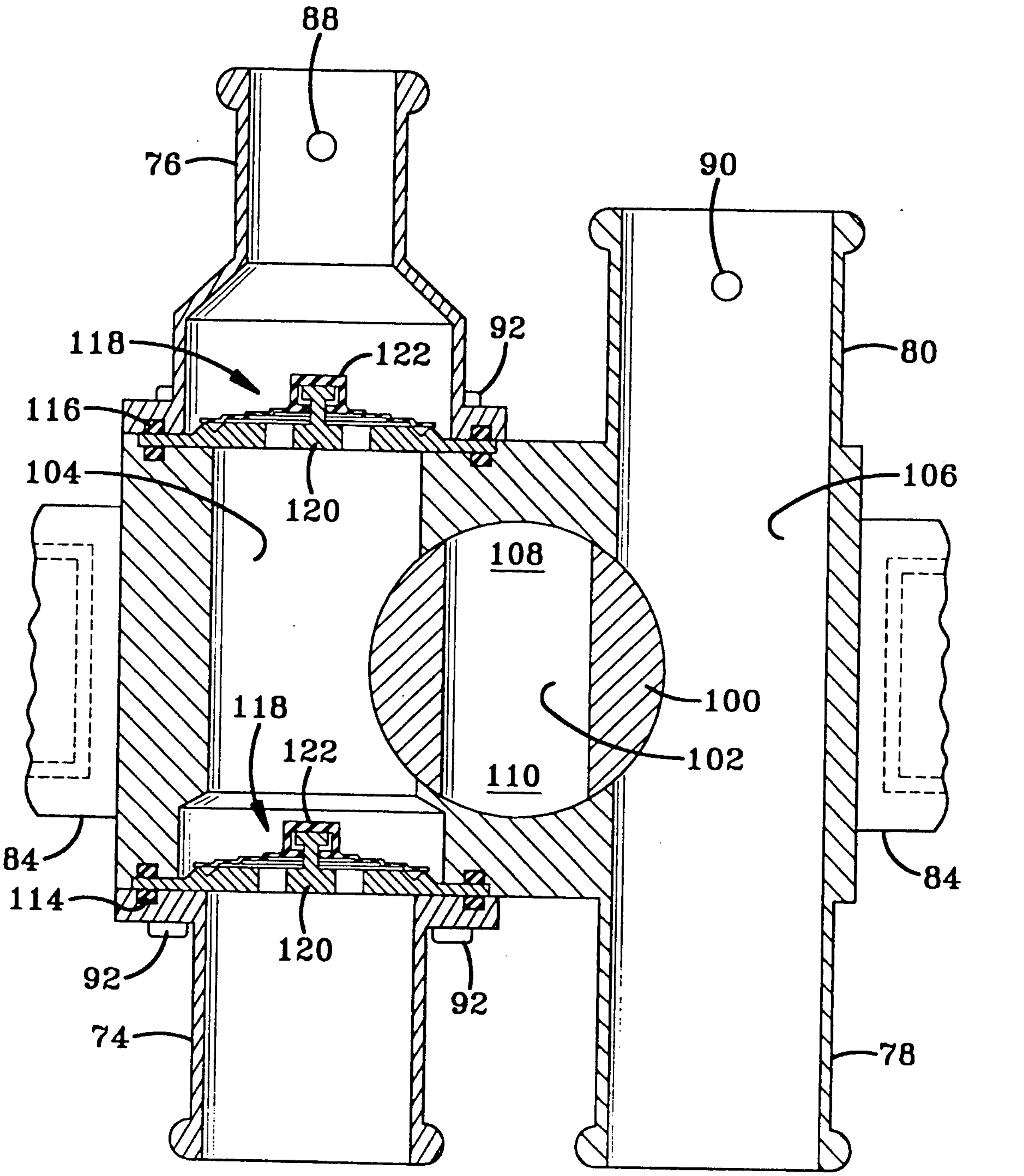
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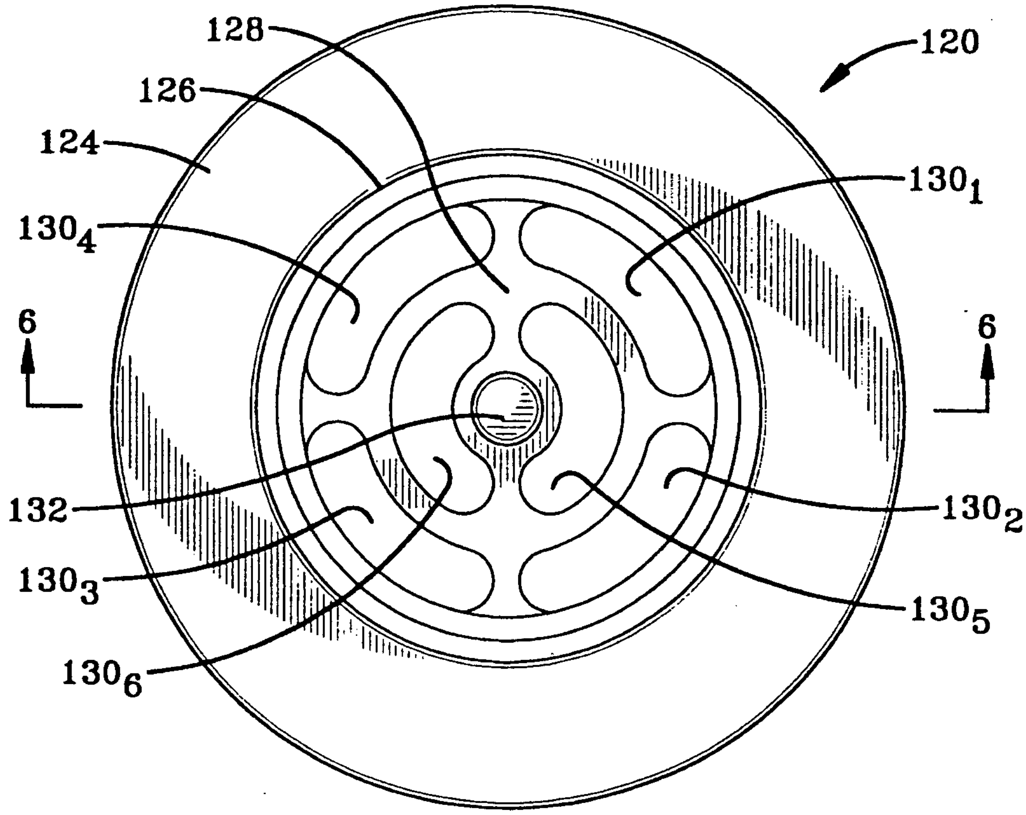
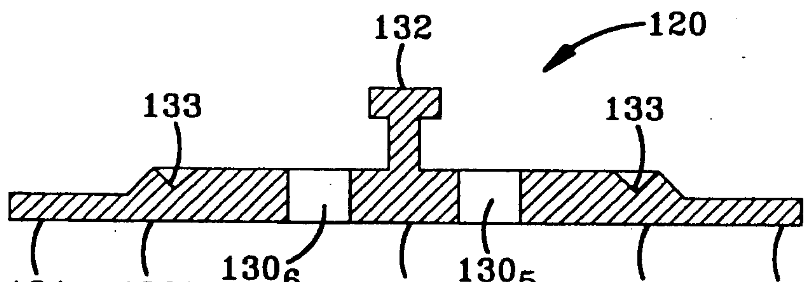
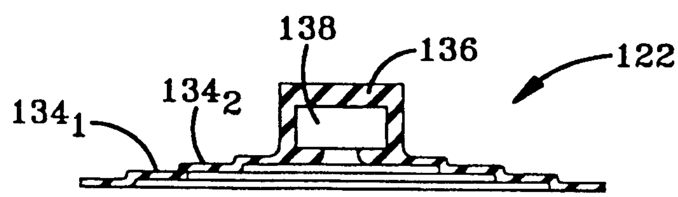
FIG-4



FIG–5



FIG–6



FIG–7

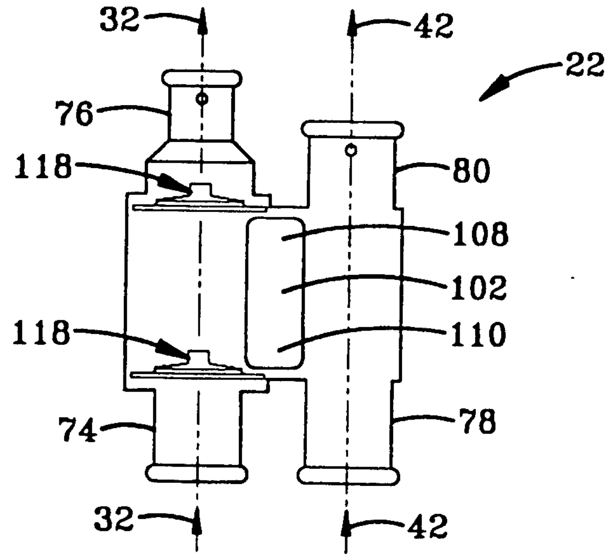


FIG-8A

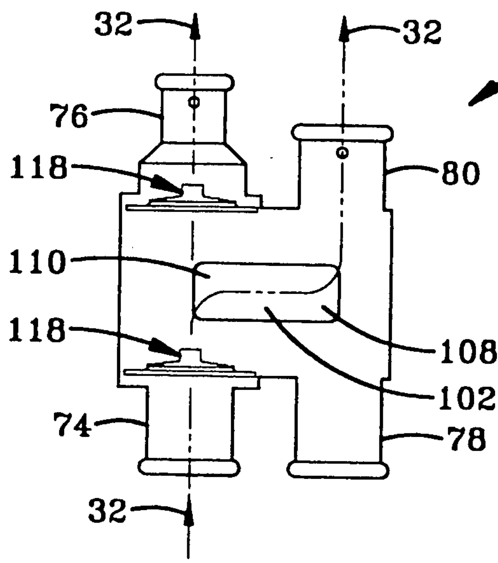


FIG-8B

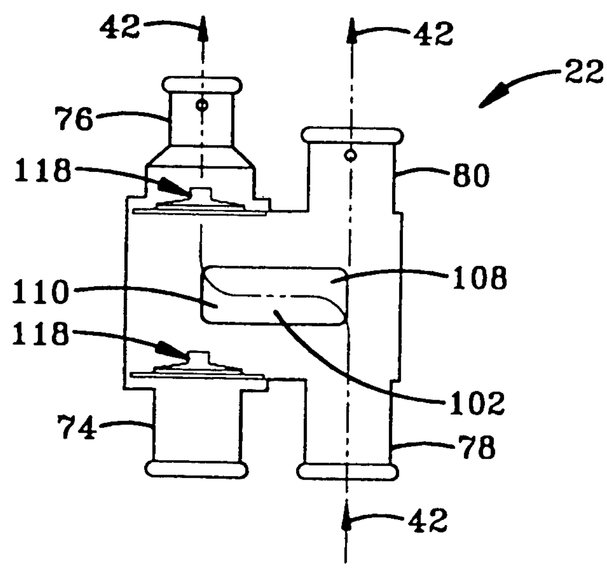


FIG-8C

RESPIRATORY SYSTEM PARTICULARLY SUITED FOR AIRCREW USE

STATEMENT OF GOVERNMENT INTEREST

The invention described herein may be manufactured and used by or for the government of the United States of America, for governmental purposes, without the payment of any royalty thereon or therefor.

BACKGROUND OF THE INVENTION

The present invention relates to a respiratory system for providing chemical and biological (CB) protection, ventilation, and delivering oxygen to a user and, more particularly, to a respiratory system that provides CB protection, ventilation, and delivers oxygen to an aircrew and that is self-contained and portable, and has provisions for providing either a flow of oxygen or a flow of air during the failure conditions of the ventilation and oxygen supplying systems.

Respiratory systems that provide CB protection, ventilation, and deliver oxygen to an a aircrew during ground and flight operations normally comprise a hood and mask assembly that cover the head and neck and has an optically clear face piece that covers the eyes of the aircrew. Such known respiratory systems suffer a drawback by requiring aircraft modifications, and by lacking provisions to accommodate for failure mode conditions of the ventilation and oxygen systems supplying the respiratory system, and by requiring multiple steps to select various operating modes. More particularly, these known respiratory systems do not provide continuous self-contained operation and allow the aircrew to be deprived of a flow of oxygen in the event of a failure of the oxygen supplying system or to be deprived of a flow of air in the event of a failure of the ventilator system. It is desired that means be provided for a continuous self-contained operation and to allow either a flow of air or a flow of oxygen to be delivered to the aircrew during the failure conditions involving either the oxygen or ventilation supply systems.

SUMMARY OF THE INVENTION

The present invention is directed to a CB protective, respiratory system which is self contained and portable, and has means for supplying either a flow of air or a flow of oxygen during the failure mode conditions of the oxygen and ventilation systems supplying the respiratory system.

The respiratory system comprises means for supplying a flow of oxygen, means for supplying a flow of air, a manifold, a hood, a mask, and fluid coupling means. The manifold has first, second, third and fourth ports, with the first and third serving as input ports and the second and fourth serving as output ports. The first and second ports each have a one-way flow valve. The manifold has a switch with means for carrying a duct that is selectable to establish fluid communications between the first and fourth ports and between the second and third ports. The hood covers the head and neck of the user, whereas a transparent window, carried by the hood, is arranged in the general region of the eyes of the user. The mask covers the mouth and nose of the user. The fluid coupling means couples the first port to the means for supplying a flow of air, the third port to the means for supplying a flow of oxygen, and both the second and fourth ports to the mask.

Accordingly, it is an object of the present invention to provide a respiratory system which is self contained and portable and that supplies either a flow of air or a flow of oxygen to a user during any of the failure mode conditions of the oxygen and ventilation systems supplying the respiratory system. The delivery of either the flow of air or the flow of oxygen to the respiratory system is selectable by a single switch that is conveniently located relative to the user.

It is a further object of the present invention to provide means that maintains the pressure of the hood under all conditions and that prevents the waste of oxygen in the event of ventilator system failure.

Still further, it is an object of the present invention to provide an aircrew with uncontaminated breathable air during an oxygen supply system failure.

Other objects, advantages and novel features of the invention will become apparent from the following detailed description when considered in conjunction with the accompanying drawings therein.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a schematic illustrating the interrelationship of the primary elements related to the present invention.

FIG. **2** is a plan view of the manifold of the present invention.

FIG. **3** is a view, taken along line **3–3** of FIG. **2**, illustrating further details of the manifold of FIG. **2**.

FIG. **4** is a view, in section, illustrating still further details of the manifold of FIG. **2**.

FIG. **5** is a top view of the valve seat which accommodates a flapper-type, one-way flow valve related to the present invention.

FIG. **6** is a view, taken along line **6—6** of FIG. **5**, illustrating further details of the valve seat of FIG. **5**.

FIG. **7** is a view, in section, of the flapper valve related to the present invention.

FIG. **8** is composed of FIGS. **8**(A), (B), and (C) primarily illustrating the switchable duct of the manifold that is used to accommodate for failures of the ventilation and oxygen supply systems.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

With reference to the drawings, wherein the same reference numbers indicate the same elements throughout, FIG. **1** illustrates a schematic of a respiratory system **10** of the present invention. The respiratory system **10** provides ventilation and delivers oxygen to a user, such as an aircrew, at sufficient pressures and flow rates, so that the aircrew may perform their needed tasks during both ground and flight operations. More importantly, and as will be described, the respiratory system **10** provides fluid communications in the form of a flow of air, or in the form of a flow of oxygen, during failure mode conditions of the ventilation or oxygen systems supplying the respiratory system **10**. Also, the respiratory system **10** provides a self contained and portable ventilator system. The respiratory system **10** comprises a ventilator system **12** that supplies a flow of air, an oxygen supply system **14** that supplies a flow of oxygen, a hood **16** that carries a transparent window **18**, a mask **20**, and a manifold **22**.

The ventilator system **12** is self contained and portable, which is meant to mean that the system is man mounted, provides all necessary modes of operation without reconfiguration of the fluid couplings and does not require significant aircraft modifications. The ventilator system **12** comprises an electric cord **24** having a connector **26** at one of its ends which is mated to a battery **28** that may be either of the chargeable or non-chargeable type. The battery **28** provides the electrical power to excite a fan blower **30** that creates a flow of air **32** which is directed by a plenum **34** into a filtering canister **36**. A hose coupling adaptor **38** receives the flow of air **32** from the canister **36** and directs the flow of air **32** to the manifold **22** by way of fluid coupling means **40** which preferably is of a hose type coupling device that mates with complementary provisions of the device to which it is being connected. These hose type fluid coupling means are preferably used for all florid coupling means of FIG. **1** to interconnect the separated elements shown therein. As seen in FIG. **1**, the flow of air **32** is directed from the manifold **22** to the mask **20** and a portion thereof, that is, flow of air **32A**, is directed, relative to and into the hood **16**. The hood **16** and mask **20** have separate chambers with the mask **20** being sealed on the face and holding pressures that are higher than those of the hood.

The oxygen supply system **14** comprises a regulator, sometimes referred to as an oxygen regulator, which is connected to a source of oxygen such as liquid oxygen, gaseous oxygen, or some other oxygen generation system commonly found aboard an aircraft. The oxygen regulator **14** supplies a flow of oxygen **42** that is routed to a filtering canister **44**, by means of fluid coupling means **46**. A hose coupling adaptor **48**, accepts the flow of oxygen **42** from the canister **44** and directs the flow of oxygen **42** to the manifold **22** by way of fluid coupling means **50**. As seen in FIG. **1**, the flow of oxygen **42** is directed from the manifold **22** into the mask **20**.

The hood **16** comes into contact with a vest **52** worn by the user, or aircrew, and covers and isolates the entire head and neck of the user from external environments. The hood **16** carries the transparent window **18**, which is arranged in the general region of the eyes of the user, and preferably comprises a polycarbonate material. The hood **16**, as well as the other components exposed to the environment, such as the transparent window **18**, mask **20**, manifold **22** and vest **52** are preferably resistant to permeation by chemical and biological agents, fuels, oils, lubricants, or perspiration; while at the same time, these materials are preferably compatible with 100% oxygen.

The mask **20** comprises a breathing compartment (not shown but known in the art) that includes separate ventilation/exhalation valves **54** and **56**. The mask **20** further comprises the necessary valves, hoses and interface devices to provide the user with fluid communications with the filtered-blown flow of air **32** from the ventilating system **12** and with the filtered-blown flow of oxygen **42** from the oxygen regulator **14**.

The mask **20** has provisions, generally indicated by phantom line **58**, such as a microphone to establish voice communications with an intercom unit (ICU) **60** which is preferably lightweight and battery powered. The mask **20** preferably further comprises an adaptor **62**, and fluid coupling means **64** having a connector **66** on one of its ends that is coupled to a drink facility **68**. The drink facility **68** provides hot and/or cold liquids that are delivered to the aircrew, via elements **62**, **64** and **66**. The mask **20** further comprises devices, such as hose connectors, so as to accept one end of each of the fluid coupling means **70** and **72** that have their other end connected to the manifold **22**.

In general, the manifold **22** has a first port **74**, a second port **76**, a third port **78**, and a fourth port **80**, with the first and third ports **74** and **78**, respectively, serving as input ports and the second and fourth ports **76** and **80**, respectively, serving as output ports. The first and second ports **74** and **76**, respectively, have a one-way flow valve. The manifold **22** further comprises a switch handle **82**, having means for carrying a duct that is selectable to establish fluid communications between the first and fourth ports **74** and **80**, respectively, and between the second and third ports **76** and **78**, respectively. The selectability allows for the respiratory system **10**, in particular manifold **22**, to allow the aircrew to transition between operational modes by a single motion of the selector switch so as to accommodate for failure conditions of the ventilator system **12** or of the oxygen regulator **14** in a manner to be described with reference to FIG. **8**. The manifold **22** may be further described with reference to FIG. **2**.

FIG. **2** illustrates the manifold **22** as preferably having an "H" shaped configuration and as being a four-port, crossover valve. The H-manifold **22** comprises a webbing **84** that carries a button-socket arrangement **86** which is used to mate with a complementary button-socket arrangement (not shown) carried by the vest **52** of FIG. **1**. The complementary button arrangements are situated on the H-manifold **22** and the vest **52** so that the user, such as the aircrew, has easy and convenient access to the switch handle **82** to transition between ground and flight operational modes, and to respond to the failure conditions of the ventilator system **12** and the oxygen regulator **14**.

As seen in FIG. **2**, the second port **76** has a pin **88**, whereas the fourth port **80** has a pin **90**. The H-manifold **22** further comprises a plurality of screws **92** that are used to join together various components thereof. A screw **94** is used to connect the switch handle **82** to the manifold **22** that may be further described with reference: to FIG. **3**, which is a view taken along line **3**—**3** of FIG. **2**.

FIG. **3** illustrates, in cross-section, a face seal O-ring **96** and two plungers **98**. The plungers **98** are inserted into a shaft **100** which also has to the switch handle **82** connected thereto via the screw **94**. The shaft **100** carries a duct **102** which is switchable between chambers **104** and **106** respectively related to and interposed between the first and second ports **74** and **76**, and between the third and fourth ports **78** and **80**. The duct **102** is switchable by the rotation of shaft **100** which, in turn, is preferably rotated by the clockwise movement of the switch handle **82** and provides a detent action when switched. The shaft preferably provides ease of motion, but should provide adequate resistance such that, in conjunction with the detent feature, inadvertent actuation of the valve is prevented. The duct **102** may be further described with reference to FIG. **4** which is a view, in section, of the manifold **22** of FIG. **2**.

FIG. **4** illustrates that the duct **102** comprises a first end **108** and a second end **110** which are preferably placed into chambers **106** and **104** by the clockwise rotation of the switch handle **82** of FIGS. **1-3**. FIG. **4** further illustrates the first port **74** as having fastening means **112** and an O-ring **114**, whereas the second port **76** is further illustrated as having an O-ring **116**. The O-rings **114** and **116** mate with flapper-type, one-way flow valve **118** respectively situated in the first (**74**) and second (**76**) ports and each of which comprises a lower (as viewed in FIG. **4**) valve seat **120** and an upper flapper valve **122**. The flapper-type, one-way flow valve **118**, in particular, the valve seat **120** may be further described with reference to FIG. **5** which is a top view thereof.

The valve seat **120** comprises three members, **124**, **126** and **128**, each preferably having a circular shape, and all arranged to have an abutting relationship as shown in FIG. 5. The circular member **128** is dimensioned and configured to provide a plurality of passageways 130_1, 130_2, 130_3, 130_4, 130_5, and 130_6, wherein the passageways 130_1, 130_2, 130_3 and 130_4 are near the outer edge of member **128** and the passageways 130_5 and 130_6 are near the inner edge of member **128**. The member **128** carries a flapper valve mounting stem **130** which may be further described with reference to FIG. **6**, which is a view taken along line **6—6** of FIG. **5**.

As seen in FIG. **6**, the flapper valve mounting stem **132** is preferably T-shaped in cross-section and is situated at the central region of the member **128**. Further, FIG. **6** illustrates that the circular member **126** preferably has a cutout **133** formed therein. Further still, the T-shaped stem **132** is interposed between the inner passageways 130_5 and 130_6. The valve seat **120** of FIGS. **5** and **6** cooperates with the flapper valve **122** of FIG. **7** during the operation of the flapper-type, one-way flow valve **118**.

FIG. **7** illustrates the flapper valve **122**, which is comprised of a resilient material, such as rubber, and has a plurality of step portions 134_1 and 134_2. The flapper valve **122** of FIG. **7** is further arranged relative to the valve seat **120** so that its dome portion **136**, in particular a slot portion **138** carried by the dome portion **136**, is in correspondence with the stem **132** of the valve seat **120**. The slot **138** is dimensioned so as to allow the insertion of stem **132** therein and free movement of the stem **132** within slot **138**. The slot **138** is further preferably dimensioned so as to not allow the stem **132**, except for its base, to come into direct contact with the slot **138**. The operation of the flapper-type, one-way flow valve **118** comprising the valve seat and flapper valve **120** and **122**, respectively, of FIGS. **4–7** may be further described with reference to FIG. **8**.

FIG. **8** is composed of FIGS. **8**(A), **8**(B), and **8**(C) each of which schematically illustrates the location of one flapper-type, one-way flow valve **118** arranged at the first port **74** so as to serve as an input port one-way flow valve, and the other flapper-type, one-way flow valve **118** arranged at the output port **76** so as to serve the output port one-way flow valve. FIG. **8**(A) also illustrates the location of the duct **102**, controlled by the switch handle **82** (not shown), and the flapper-type, one-way flow valves **118** during the flight, non-failure, mode of operation of an aircraft and the respiratory system **10**. FIG. **8**(B) illustrates the location of the duct **102** and the flapper-type, one-way flow valves **118** during the ground mode of operation of the aircraft and respiratory system **10** and also during the failure mode of the oxygen regulator **14**. FIG. **8**(C), illustrates the location of the duct **102** and the flapper-type, one-way flow valves **118** during the failure mode of the ventilator system **12**.

As seen in FIG. **8**(A), each of the first, second, third and fourth ports **74**, **76**, **78** and **80** define a region and the duct **102** is located in the central region of the manifold **22** so as not to interfere with the flow of air **32** supplied by the ventilator system **12** nor with the flow of oxygen **42** supplied by the oxygen regulator **14**. As further seen in FIG. **8**(A), the flow of air **32** passes through the manifold **22** in straight-like manner and, similarly, the flow of oxygen **42** also passes through manifold **22** in a straight-like manner. Further, this passage of oxygen **42** and the means which provide this passage should be preferably dimensioned to prevent the cross-flow dilution of the pure oxygen supply. This non-disruptive passage is accomplished by the operation of each of the flapper-type, one-way flow valves **118** that responds to a pressure differential to provide for an open position to establish fluid communications between the first port **74** and the second port **76**. More particularly, the flapper-type, one-way flow valve **118**, arranged in the first inlet port **74**, provides an open position when the pressure of the fluid entering the region of the first port **74** is greater than the pressure of the fluid exiting the region of the first port **74**. In other words, if the flow of air **32** is flowing into the input port **74**, the flapper valve **122** (see FIG. **7**) lifts away from the valve seat **120** (see FIG. **5**) to allow the flow of air **32** to flow through passageways $130_1 \ldots 136_6$ so as to provide for the open position. Similarly, the flapper-type, one-way flow valve **118**, arranged in the output the port **76**, provides an open position when the pressure of the fluid (flow of air **32**) entering the second port region is greater than the pressure of the same fluid (flow of air **32**) exiting its second port region. Again, the flapper valve **122** lifts away from the valve seat **120** to provide the open position. The input and output one-way flow valves **118** operate in unison to provide a flow of air **32** to the mask **20** of FIG. **1**. Further, as seen in FIG. **8**(A), the manifold **22** does not interfere with the flow of oxygen **42** so that it passes with minimal drop in pressure during typical flow conditions to the mask **20**. The operation of the manifold **22** in response to an oxygen regulator **14** failure may be further described with reference to FIG. **8**(B).

As seen in FIG. **8**(B), the duct **102** is positioned by the clockwise rotation of the switch handle **82** (not shown) so that end **110** of duct **102** is interposed so as to intercept the flow of air **32** and to direct a portion of such flow of air **32** to the second end **108** of duct **102** so that there is a fluid communication path provided between the first port **74** and the fourth port **80** as shown in FIG. **8**(B). It should be noted that the non-diverted portion of the flow of air **32** not intercepted by duct **102** passes to the output port **76**. Accordingly, even though an oxygen regulator **14** failure may have occurred, the present invention provides for the switching of the duct **102** to allow the ventilated flow of air **32** to be delivered to both the hood **16** and mask **20**, thereby, temporarily providing the aircrew with uncontaminated breathable air in spite of the failed oxygen supply. The response provided by the manifold **22**, in particular the switchable duct **102**, to a ventilator system **12** failure may be further described with reference to FIG. **8**(C).

As seen in FIG. **8**(C), the duct **102** is positioned by the clockwise rotation of switch handle **82** (not shown) so as to intercept the flow of oxygen **42** that enters the third port **78** and providing fluid communication between the third port **78** and the second port **76**. For such positioning, the hood **16** and the mask **18** is provided with a flow of oxygen **42** for both its air and oxygen fluid communication paths. For the operation shown in FIG. **8**(C), the flapper-type, one-way flow valve **118**, located in the first input port **74** is in a closed condition, thereby, preventing any of the oxygen that is entering the third port **78** from flowing into the failed ventilator system **12** of FIG. **1** by way of the input port **74**. Such prevention is accomplished by the valve seat **120** and the flapper valve **122** (see FIGS. **4–7**) mating with each other and closing off the passageways $130_1 \ldots 130_6$ due to the interaction of the step portions 134_1 and 134_2. This mating is accomplished because the pressure of the fluid entering into the first port **74** is less than the pressure existing in the remainder of the first port **74**. More particularly, because of the presence of the flow the oxygen **42** in the confines of the manifold **22** that includes the region on top (as viewed in FIG. **8**(C)) of the flapper valve **122** of the flapper-type, one-way flow valve arranged in port **74**, the pressure on top of the flapper valve **122** exceeds that of the pressure being sensed by the valve seat **120**, so as to provide a downward force onto the valve seat **120**, thereby, causing a merger or closure between the valve seat and flapper valve **120** and **122**, respectively. It should be noted that the switch handle **82** (not shown) need only be rotated in one direction, preferably clockwise, to accommodate for both of the failures shown in FIGS. **8**(A) and **8**(B). This one-switch, one-position advantageously reduces the amount of effort required by the aircrew to respond to a fault condition and reduces the possibility of error.

It should now be appreciated that the practice of the present invention provides for a respiratory system **10** having a manifold **22** that includes a single switch handle that is operated so as to respond to the failure conditions of the ventilator system **12** or to the oxygen regulator **14** so as to provide a user with either a flow of uncontaminated air or a flow of oxygen both of the fluid communication paths related to the ventilator and oxygen supply systems.

Although the hereinbefore given description of the respiratory system **10** was primarily directed to its use during ground and flight operations for the aircrew, it should be appreciated that the principles of the present invention are equally applicable to other commercial applications that require a respiratory system to provide a flow of either a current of air or a current of oxygen to individuals during the failure conditions related to ventilator or oxygen supply systems.

Many modifications or variations of the present invention are possible in view of the above disclosure. It is, therefore, to be understood, that within the scope of the appended claims, the invention may be practiced otherwise as specifically described.

What we claim is:

1. A respirator system for a user comprising:

(a) means for supplying a flow of oxygen;

(b) means for supplying a flow of air;

(c) a manifold having a first, second, third and fourth ports with the first and third ports serving as input ports and the second and fourth ports serving as output ports, said first and third ports and said second and fourth ports having fluid communication respectively therebetween, said first and second ports each having a one-way flow valve, said manifold having a switch with means for carrying a duct that is selectable to break said fluid communications between said first and third ports and between said second and fourth ports and establish fluid communications between said first and fourth ports and between said second and third ports;

(d) a hood and a mask with the hood having a transparent window, said hood covering a head and neck of a user with the transparent window being arranged in the general region of eyes of a user, said mask covering a user's mouth and nose; and

(e) fluid coupling means for coupling said first port to said means for supplying a flow of air, said third port to said means for supplying a flow of oxygen, and both said second and fourth ports to said mask.

2. The respiratory system according to claim **1**, wherein said means for supplying a flow of air is self contained and portable.

3. The respiratory system according to claim **1**, wherein each of said one-way flow valves of said manifold comprises:

(a) a valve seat having a plurality of passageways spaced apart from each other and a stem that extend from a surface of said valve seat; and

(b) a flapper valve of a resilient material and having a plurality of stepped portions, said flapper valve having a slot therein that is in correspondence with said stem of said valve seat and is dimensioned so that said stem may move therein.

4. The respiratory system according to claim **1**, wherein said means for carrying said duct comprises a shaft having a grippable handle connected at one of its ends, said handle being rotatable so as to establish said fluid communications between said first and fourth ports and between said second and third ports.

5. A respirator system comprising:

(a) means for supplying a flow of oxygen;

(b) means for supplying a flow of air;

(c) a manifold having first, second, third and fourth ports each defining a respective region and with the first and third ports serving as input ports and the second and fourth ports serving as output ports, said first and third ports and said second and fourth ports having fluid communication respectively therebetween, said first and second ports each having a one-way flow valve, each of said one-way flow valves being responsive to a pressure differential and respectively providing an open position to establish fluid communications between said first and second ports when the pressure of the fluid entering the first port region is greater than the pressure of the fluid exiting said first port region and the pressure of the fluid entering the second port region is greater than the pressure of the fluid exiting the second port region, said manifold having a switch with means for carrying a duct that is selectable to break said fluid communication between said first and third ports and between said second and fourth ports and establish fluid communications between said first and fourth ports and between said second and third ports;

(d) a hood and mask with the hood having a transparent window, said hood covering a head and neck of a user with the transparent window being arranged in the general region of eyes of a user, said mask covering a user's mouth and nose; and

(e) fluid coupling means for coupling said first port to said means for supplying a flow of air, said third port to said means for supplying a flow of oxygen, and both said second and fourth ports to said mask.

6. The respiratory system according to claim **5**, wherein said means for supplying a flow of air is self contained and portable.

7. The respiratory system according to claim **5**, wherein said hood, said mask and said manifold each comprises a chemically impervious material.

8. A respiratory system comprising:

(a) means having operative and inoperative conditions for supplying a flow of oxygen;

(b) means having operative and inoperative conditions for supplying a flow of air;

(c) a manifold having first, second, third and fourth ports each defining a respective region and with the first and third ports serving as input ports and the second and fourth ports serving as output ports, said first and third ports and said second and fourth ports having fluid communication respectively therebetween, said first and second ports each having a one-way flow valve, each of said one-way flow valves being responsive to a pressure differential and respectively providing an open position to establish fluid communications between said first and second ports when the pressure of the fluid entering said first port region is greater than the pressure of the fluid exiting said first port region and the pressure of the fluid entering the second port region is greater than the pressure of the fluid exiting the second port region, said manifold having a switch with means for carrying a duct that is selectable to break said fluid communication between said first and third ports and between said second and fourth ports and establish fluid communications between said first and fourth ports and between said second and third ports;

(d) a hood and mask with the hood having a transparent window, said hood covering a head and neck of a user with the transparent window being arranged in the general region of eyes of a user, said mask covering a user's mouth and nose; and

(e) fluid coupling means for coupling said first port to said means for supplying a flow of air, said third port to said means for supplying a flow of oxygen, and both said second and third ports to said mask,

wherein said duct is selectable to establish fluid communication between said first and fourth ports when said means for supplying a flow of oxygen is in its inoperative condition and said duct is selectable to establish fluid communication between said second and third ports when said means for supplying a flow of air is in its inoperative condition.

9. The respiratory system according to claim **8**, wherein said means for supplying a flow of air is self contained and portable.

10. The respiratory system according to claim **8**, wherein said transparent window comprises a chemically impervious material.

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