

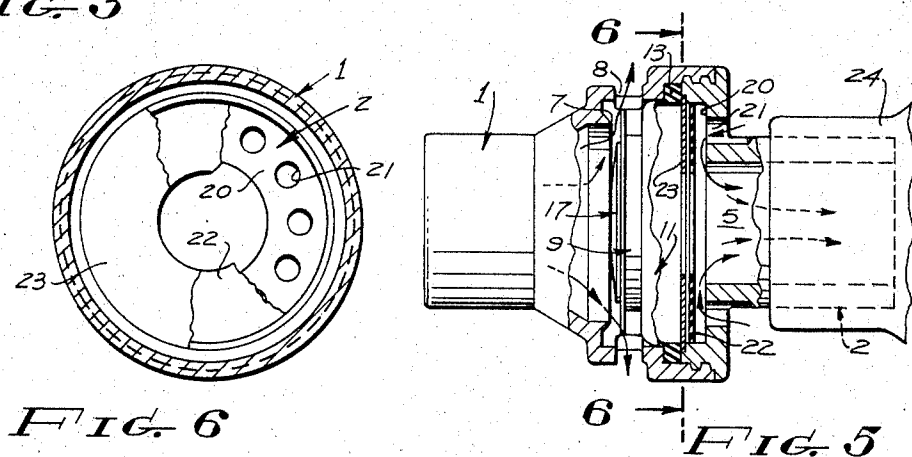
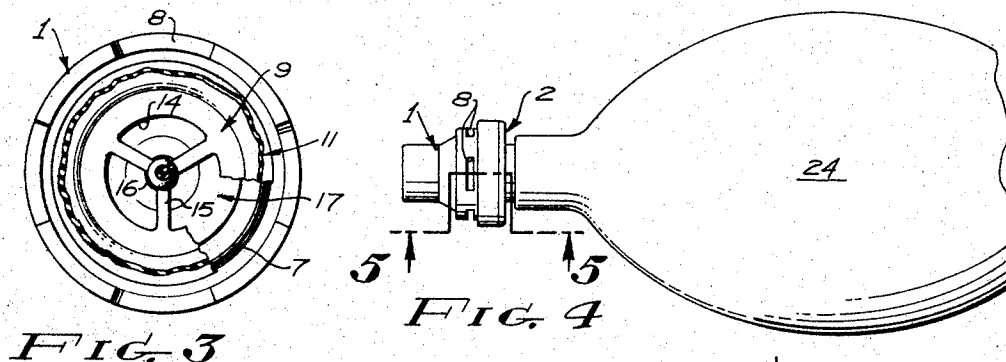
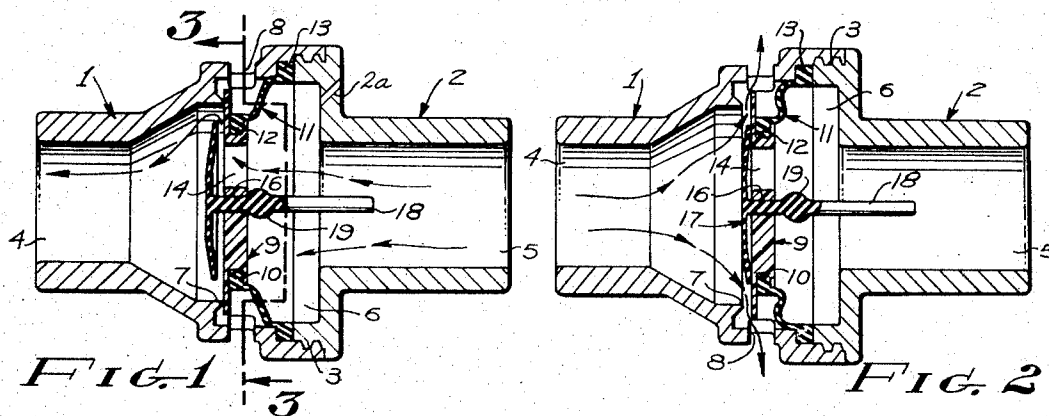
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BACKFLOW BYPASSING VALVE FOR BREATHING APPARATUS

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BACKFLOW BYPASSING VALVE FOR BREATHING APPARATUS

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2 Claims

ABSTRACT OF THE DISCLOSURE

A valve particularly adapted for resuscitation which permits the oxygen to be supplied at low positive pressure so that the patient in breathing out even under severe handicap may bypass the exhaled air and should there be any liquid discharge, the valve may be quickly disassembled and the internal valve elements be removed as a unit for cleaning or replacement; this being accomplished by a readily separable connection, between a valve housing and a cap and a valve unit clamped by the connection and comprising a flexible diaphragm supporting a lightweight valve disk which, in turn, carries a check valve. The valve housing having bypass ports at the patient side of the valve unit for discharge of exhaled air.

This invention relates to backflow bypassing valves for breathing apparatus and included in the objects of this invention are:

First, to provide a valve structure which is so arranged that oxygen, air or other mixtures of breathing gasses are readily admitted to the patient with a minimum of pressure drop across the valve, and fluids backflowing to the valve from the patient are prevented from contaminating or diluting the supply, but instead are bypassed to atmosphere.

Second, to provide a backflow bypassing valve structure which is adapted to be used with breathing apparatus such as disclosed in Patent No. 2,988,085 issued June 13, 1961, the backflow bypassing valve structure being interposed between the patient and the breathing apparatus.

Third, to provide a backflow bypassing valve structure which is adapted for mouth-to-mouth type of resuscitation; that is, the valve structure may be placed between the mouth of the patient and the mouth of the party applying resuscitation.

Fourth, to provide a backflow preventing valve structure which is also adapted for use in conjunction with a resuscitating bag or bladder.

Fifth, to provide a backflow bypassing valve structure which, although particularly suited for resuscitating, is also adapted for use with gas masks, underwater breathing means and the like.

With the above and other objects in view as may appear hereinafter, reference is hereby directed to the accompanying drawings in which:

FIGURE 1 is a longitudinal sectional view of the valve shown in position for flow of oxygen or breathable gaseous mixtures to a patient or user.

FIGURE 2 is a similar sectional view showing the position of the valve during backflow from the patient or user.

FIGURE 3 is a sectional view taken substantially through 3-3 of FIGURE 1.

FIGURE 4 is a side view of the valve which incorporates an additional valve element, the valve being shown in conjunction with a resuscitating bladder.

FIGURE 5 is a partial side view partial longitudinal sectional view thereof taken through 5-5 of FIGURE 4.

FIGURE 6 is a transverse sectional view thereof taken substantially through 6-6 of FIGURE 5.

The backflow bypassing valve includes a tubular valve body 1 and a cap 2 joined together by a screwthread connection 3. The body and cap form a housing structure. The valve body is provided with a patient or user port 4 and the valve cap is provided with a supply port 5. The two ports are in coaxial relation.

Between the ports the valve body and cap are enlarged to define a valve chamber 6. The end of the valve chamber nearest the patient or user port 4 is provided with an annular valve seat 7 preferably defining a sharp edge. Between the valve seat 7 and the screwthread connection 3, the valve body is provided with one or more radially directed backflow discharge openings 8.

The valve seat 7 is engaged by a valve disk 9 preferably formed of plastic material. At its side directed toward the supply port 5, the valve disk is provided with a radially outwardly directed channel 10.

An annular diaphragm 11 is provided which includes a bead 12 at its inner periphery sealingly fitted in the channel 10 and a bead 13 at its outer periphery clamped between the valve body 1 and cap 2. The diaphragm 11 is formed of a highly flexible elastomer which is also relatively thin so that the force required to move the valve disk 9 is minimized.

Radially inwardly from the channel 10 the valve disk is provided with a set of complementary ports 14 formed by radial webs 15 joined to a central perforated hub 16. The side of the valve disk facing the outer port 4 is covered by a backflow check valve 17 which is formed from a relatively thin disk of a highly flexible elastomeric material. The valve is provided with a central stem 18 which extends through the hub 16 and is provided with an enlargement 19 so as to retain the check valve in place. The check valve, being sufficiently flexible readily opens the flow of fluid from the supply port 5 to the outer port 4.

Operation of the backflow bypassing valve as illustrated in FIGURES 1, 2 and 3 is as follows:

When the patient or user inhales or when air, oxygen or other breathable gases are supplied under suitable pressure through the supply port 5, the check valve 17 opens as shown in FIGURE 1, while the valve disk 9 remains closed.

The air or breathable gas or gaseous mixture is supplied periodically and between the supplied periods, the user or patient exhales, causing the check valve 17 to close and the valve disk 9 to open, permitting flow from the user or patient to be discharged through the backflow openings 8.

The backflow bypassing valve may be incorporated in a demand regulator valve or other breathing apparatus or be interposed between such apparatus and the patient.

One type of breathing apparatus is disclosed in the aforementioned Patent No. 2,988,085. When so used, a small bleed hole 2a, indicated in FIGURE 1 is provided in or adjacent the supply port 5 so that the pressure at the supply port may exhaust to atmosphere during the period which the patient or user is exhaling.

The backflow bypassing valve may also be used for the purpose of "mouth-to-mouth" breathing. In this case, the port 4 may be inserted in the patient's mouth or connected to a mask covering the patient's mouth. The person supplying air to the patient inserts the supply port 5 into his mouth or inserts a tube connected therewith in his mouth and periodically breathes into the valve to expand the lungs of the patient and then opens the supply port to permit the patient to exhale through the discharge openings 8.

To facilitate such use of the valve an additional valve means may be provided in the cap 2 as illustrated in FIGURES 4, 5 and 6.

Still further, a resuscitator bladder may be employed which may be provided with an intake valve to permit the bladder to fill between the periods of supply of air or the like to the port 5. Preferably, however, such intake valve is incorporated in the backflow bypassing valve as illustrated in FIGURES 4, 5 and 6. With this arrangement, the cap 2 is provided with a valve seat face 20 directed toward the diaphragm 11.

The valve seat face is provided with a ring of intake ports 21 and is covered by an annular valve disk 22 formed of an elastomer.

The disk 22 is held in place by a retainer ring 23 which may be clamped with the diaphragm 11 between the parts of the screwthread connection 3. A resuscitator bladder 24 is fitted over the supply port 5.

With this arrangement, the resuscitator bladder is squeezed to force air through the backflow bypassing valve to the patient. The internal pressure being higher under this condition than the external pressure, and with a slight bias on the disk 22, the ports 21 are closed. When the squeezing pressure on the bladder is relieved, an internal negative pressure is created, causing air to be drawn in through the ports 21 while simultaneously the patient exhales through the backflow discharge openings 8.

I claim:

1. A backflow bypassing valve for breathing apparatus, comprising:

- (a) a housing structure including a housing and a cap joined by a readily separable screw connection, said cap having an inlet opening adapted for connection to a demand regulator, said housing having an outlet opening, side openings, and an annular valve seat facing toward said cap, said cap having an equalizer port;
- (b) a rigid, one piece valve disk having a peripheral flange engageable with said valve seat, an outwardly facing annular groove adjacent said flange, and a check valve seating surface coplanar with said flange defining a flow port through said disk;
- (c) a check valve cooperating with said seating surface to control flow through said disk flow port;
- (d) and an annular diaphragm having an inner margin received in said groove and an outer margin clamped between said housing and cap, said diaphragm constituting the sole support for said valve disk and check valve to permit ready movement of said valve disk away from said valve seat in response to minimal excess back pressure thereby to permit free back flow through said side openings;
- (e) said diaphragm, valve disk and check valve forming a valve unit movable in response to pressure differentials on opposite sides thereof between a first position in which said valve disk flange engages said valve seat to prevent backflow communication between said outlet opening and said side openings, and said check valve is open to permit flow from said

inlet opening through said outlet opening; and a second position in which said valve disk flange is unseated to permit backflow from said outlet opening through said side openings, and said check valve is closed to prevent backflow from said outlet opening through said disk flow port;

- (f) said equalizer port providing continuous communication between the inlet side of said valve unit and ambient atmosphere to permit bleeding of air, thereby to permit movement of said valve unit to its second position;
 - (g) said valve unit being freely removable from said housing on disconnection of said housing and said cap.
2. A backflow bypass valve for breathing apparatus, comprising:
- (a) a housing structure including an inlet port adapted for connection to a demand regulator, an outlet-inlet adapted for connection to a patient, a valve seat at said outlet-inlet facing said inlet port, a valve chamber between said valve seat and said inlet port, side openings communicating with said valve chamber, an equalizer port providing continuous communication between said chamber and ambient atmosphere;
 - (b) a valve unit, dividing said chamber and separating said side openings from said equalizer port;
 - (c) said valve unit including a flexible diaphragm having a central opening, an apertured rigid valve disk secured in said central opening and sealed to the margins thereof, said valve disk having a peripheral flange engageable with said valve seat, and a check valve carried by said valve disk controlling flow through said disk apertures;
 - (d) said valve unit being responsive to pressure from a demand regulator to cause said flange to engage said valve seat and said check valve to open thereby to supply breathable gas to a patient;
 - (e) said valve unit being responsive to back pressure to close said check valve and move said flange away from said seat to open communication to ambient air through said side openings when the pressure at said inlet port approaches ambient air pressure due to outflow through said equalizer port.

References Cited

UNITED STATES PATENTS

2,887,104	5/1959	Sovinsky et al.	128—145.5
2,947,314	8/1960	Bloom	137—512.2 X
3,083,707	4/1963	Seeler	128—147 X
2,876,785	3/1959	Huxley	137—63 X
2,954,793	10/1960	Seeler	137—512.2
3,242,921	3/1966	Seeler	128—145.5

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