United States Patent

Cotabish et al.

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[45] **Apr. 11, 1972**

[54] EMERGENCY BREATHING APPARATUS

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[21] Appl. No.: **12,201**

[52] **U.S. Cl.** .....**23/281**, 23/221, 23/252 R, 128/202, 128/191 R, 128/142.6, 55/518

[51] **Int. Cl.** **B01j 7/00**

[58] **Field of Search**.....128/202, 142, 142.3, 191, 142.6, 128/142.7; 23/281, 252, 221; 55/518, 512, 515

[56] **References Cited**

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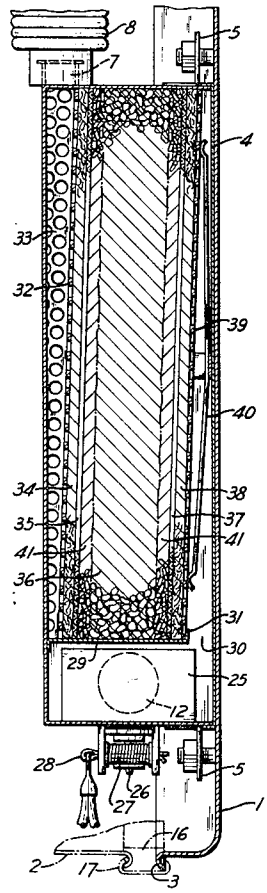
[57] **ABSTRACT**

In emergency breathing apparatus a case has a back section and a removable front cover section that are normally held together. Inside the case an air regenerating canister is secured to the back section and has a port in one end, to which a flexible breathing hose is connected. The opposite end of the canister is provided with an opening in each side, each of which is connected with an opening in one end of a breathing bag extending along that side of the canister. The hose and bags normally are folded within the case. The other ends of the bags are connected by means formed to extend around the back of the neck of a user of the apparatus to suspend the bags over his chest when they are removed from the case, with the canister between the bags.

5 Claims, 4 Drawing Figures



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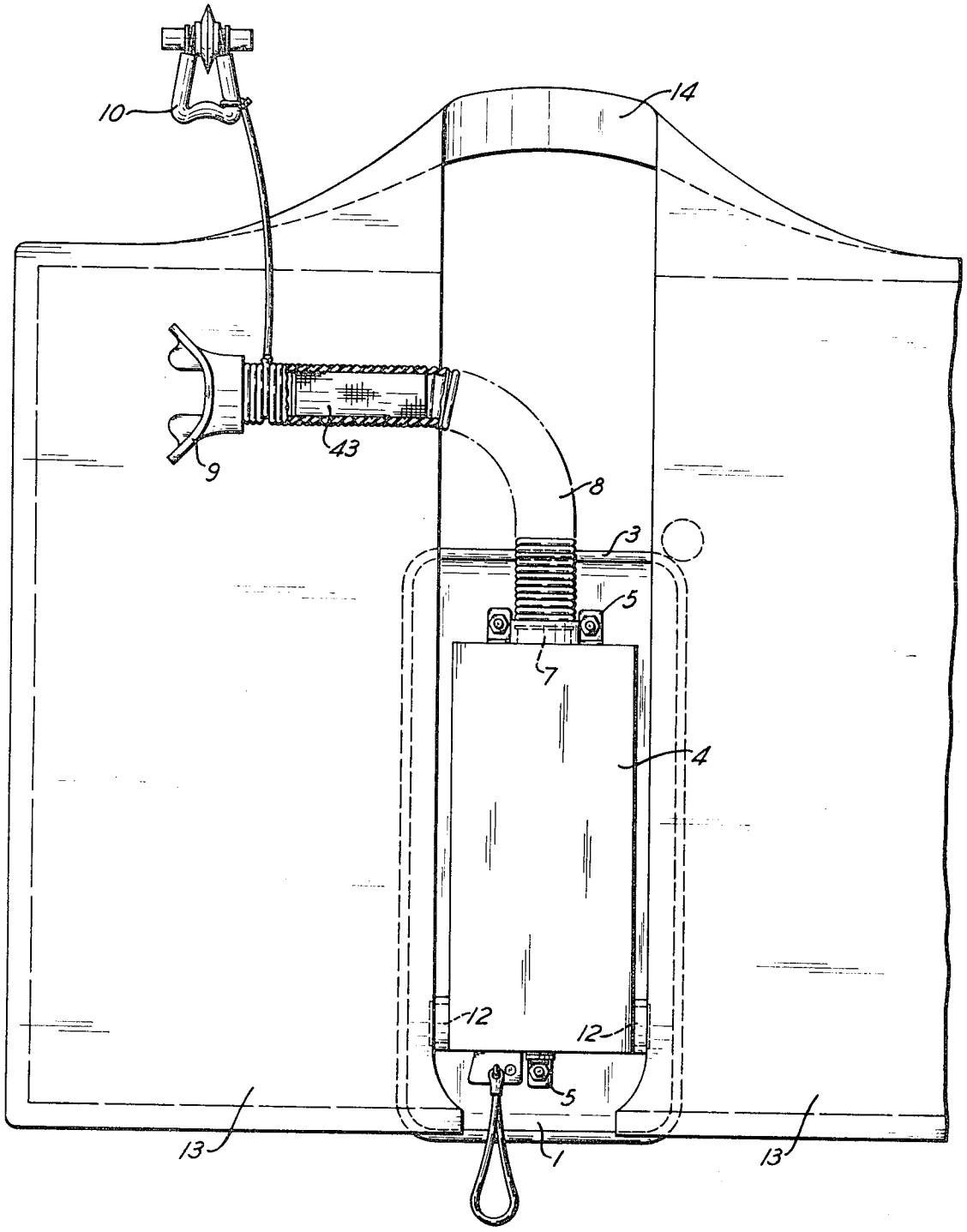

Fig. 1

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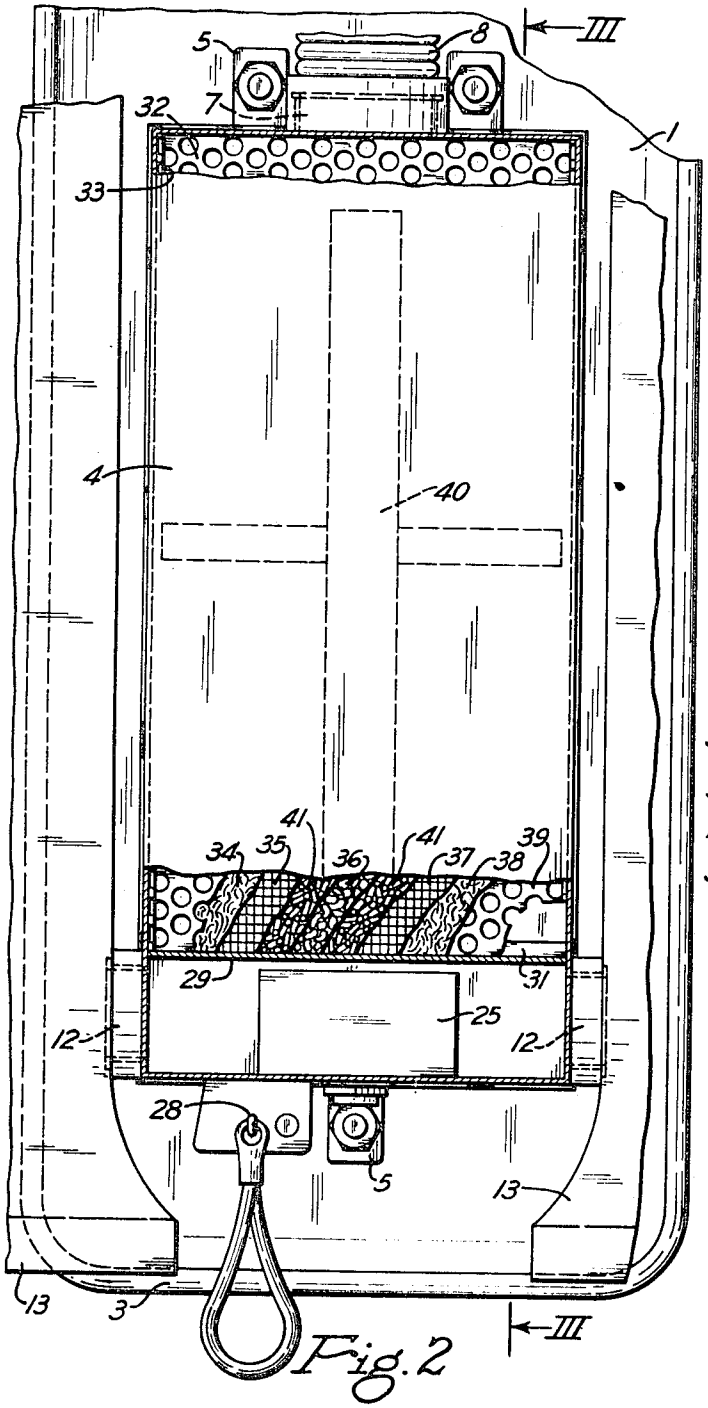

Fig. 2

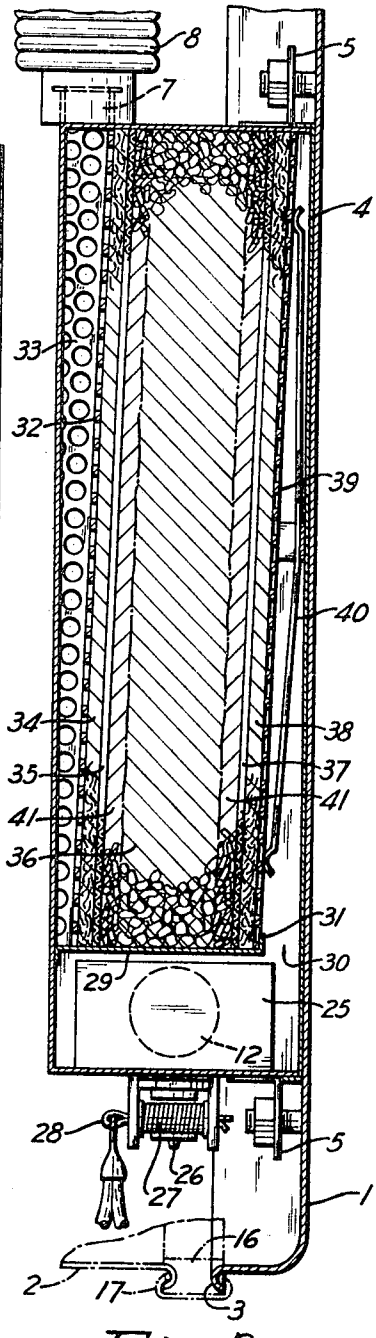

Fig. 3

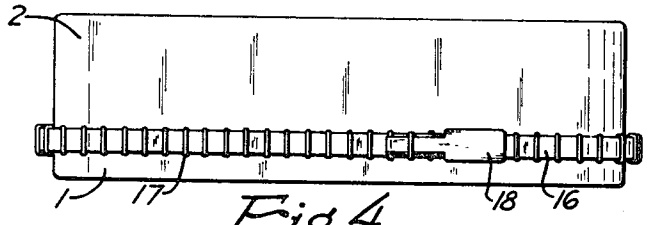

Fig. 4

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EMERGENCY BREATHING APPARATUS

It is among the objects of this invention to provide emergency breathing apparatus which is neat and compact, which is hermetically sealed, which can be opened quickly and easily and set in operation without delay, and in which breathing bags support an air regenerating canister.

The preferred embodiment of the invention is illustrated in the accompanying drawings, in which

FIG. 1 is a front view of the apparatus in operative condition;

FIG. 2 is an enlarged fragmentary front view of the apparatus, showing the canister partly in section;

FIG. 3 is a longitudinal section taken on the line III—III of FIG. 2; and

FIG. 4 is a reduced side view of the closed case.

Referring to the drawings, a rectangular case is formed from a shallow back or base 1 and a deep cover 2. These are provided with side walls surrounded by outwardly extending flanges 3 (FIG. 3) at their free edges. Inside the case and spaced from its side walls there is a rectangular canister 4 containing a carbon dioxide absorbing and oxygen producing chemical, such as potassium superoxide. The canister is provided with end lugs 5, by which it is secured to the base, from which the canister extends well into the cover as indicated by dotted lines in FIG. 3.

As shown in FIG. 1, one end of the canister, which is the upper end when it is in use, is provided with a combined inlet and outlet port 7, to which one end of a flexible breathing hose 8 is connected. The other end of the hose is provided with a mouthpiece 9 and a nose clip 10. The opposite end of the canister is provided in its side walls with openings that are connected by short tubular fittings 12 to the lower parts of a pair of breathing bags 13. The upper ends of these bags are integrally connected by a band 14 that will extend around the back of the neck of the user of this apparatus to suspend the bags over the chest. The hose and the breathing bags normally are folded into the case in the spaces between the canister and the case.

In order to seal the case so that the chemical in the canister will not deteriorate, a flexible sealing gasket 16 is disposed between the case flanges in engagement with them, as shown in FIGS. 3 and 4. The case is held closed, with the gasket clamped between the flanges, by quick release means, such as a clamping wire 17 (FIG. 4) that surrounds the gasket. The wire is bent in a more or less zig-zag fashion to form two rows of longitudinally spaced loops that extend inwardly over the case flanges and press them toward each other. The two rows of loops have to be sprung apart somewhat in order to apply them to the case, so they press the flanges toward each other and tightly against the gasket. It will be seen that in order to open the case, the clamping wire must be removed. This is done by pulling outwardly on one end of it to strip it away from the case flanges. For this purpose a pull tab 18 may be fastened to one end of the wire. It is obvious that the case can be opened in only a matter of seconds and the breathing bags hung around the neck, whereupon they will support the canister in upright position between them, and the canister will support the back portion of the case against the chest. Of course, the cover of the case is laid aside or discarded.

Another feature of this invention is that in spite of the use of a small case the canister inside of it is very efficient for its small size because it is so constructed and arranged that it provides for a large cross-sectional flow area through the chemical for low breathing resistance. It also is provided with an oxygen candle to immediately generate oxygen before the potassium superoxide starts to function. As shown in FIGS. 2 and 3, the candle 25 rests on the bottom of the upright canister housing and is ignited in the usual way by a primer that is struck by a pivoted firing pin 26 (FIG. 3) moved by a spring 27 when a safety pin 28 is pulled. Immediately above the candle there is a partition or shelf 29 that extends from side to side of the canister and that is attached to its front wall as well as its sides to divide the canister into a tall upper chamber and a short lower chamber. The canister is provided at the back with a passage 30 past the partition to connect the two chambers. This may be done by openings in the partition, or by spacing it from the back of the canister housing, in which case the rear edge of the shelf is turned up to form a flange 31.

Fittings 12 for the breathing bags are at the opposite sides of the lower chamber containing the candle. Port 7 is is in the front of the top wall of the canister.

Resting on the front of shelf 29 is the lower end of an inclined perforated metal plate 32, the upper end of which is directly behind the port 7. This plate is spaced from the front of the canister housing by integral downwardly tapered side flanges 33 that engage the front wall. Immediately behind the plate there is a thin mat 34 of filtering material and then a screen 35. Behind the screen there is the bed of potassium superoxide 36 and then another screen 37, another filter mat 38, and another perforated metal plate 39 resting on the back of the shelf. This plate is held in inclined position, spaced from the back of the canister, by means of a spring 40 compressed between it and the back wall. It also is desirable to provide molecular sieves 41 between the chemical bed and the screens. The sieves absorb moisture to reduce or prevent over production of oxygen and thereby extend the life of the chemical bed. Also, if the chemical absorbs too much moisture it may soften and run and tend to clog the filters, which would increase the breathing resistance. The molecular sieves help to prevent this from happening.

Air exhaled into the canister through the hose can flow down to shelf 29 and thus enter the chemical bed through the large area of plate 32. The air, with carbon dioxide removed from it and enriched with oxygen, leaves the chemical through the entire area of plate 39 and then flows downwardly behind the shelf and into the breathing bags. With such a large area of the chemical exposed to the air, breathing resistance is held to a minimum during both exhalation and the return inhalation, even though the canister must be kept small to fit in the case.

Since considerable heat is generated in the canister by the chemical reaction, it is desirable to provide means for cooling the air being inhaled. This can be done by trapping moisture from the exhaled breath and then returning that moisture to the inhaled air to cool it. The returned moisture also humidifies the dry air. Suitable means for accomplishing this purpose is a roll of metal screen 43 placed in a section of the breathing hose, as shown in FIG. 1, where it is held in place by frictional engagement with the hose. Exhaled air passing through the screen roll deposits moisture on it, but during inhalation this moisture is picked up by the incoming dry air which is thereby humidified and cooled due to evaporation of the trapped moisture.

This small, self-contained breathing apparatus remains sealed and operative until the case is opened. It is quickly hung in place without the use of straps or other fasteners. The canister occupies the space between the breathing bags and projects only a short distance forward from the chest. Yet, due to its construction and the way in which it is suspended, it has considerable capacity and effectiveness.

We claim:

1. An air regenerating canister comprising a rectangular housing having front and back walls connected by side walls and end walls, the housing being provided with an inlet-outlet port in one end and with an opening in each side wall adjacent the opposite end of the housing, a transverse partition in the housing extending from side to side thereof adjacent said openings but between them and said port, the partition extending rearwardly from said front wall to form a short chamber between said openings that is defined by said partition and front and back and side walls and the nearest end wall, a long chamber being formed by the rest of the housing between the partition and said port, the housing being provided at the back with a passage past said partition for connecting said chambers, an air purifying and oxygen producing chemical bed in said long chamber between said passage and port, at least the major portion of said bed being spaced from said front and back walls, the space in front of the bed com-

municating with said port and the space behind the bed communicating with said passage, an oxygen candle in said short chamber, and manually operable means outside of said housing for igniting the candle.

2. An air regenerating canister according to claim 1, said inlet-outlet port being adjacent the front wall of the housing, the canister including a perforated plate in said long chamber engaging said partition and inclined backwardly therefrom to a point behind said port, the plate having tapered side flanges spacing it from the front wall, a filter mat engaging the back of the plate, a first screen engaging the back of the mat, a second screen spaced behind the first screen with said chemical bed between them, a filter mat behind the second screen, an inclined perforated plate engaging said partition behind the second mat, and a spring between the back plate and the back wall of the housing and pressing the back plate forward.

3. An air regenerating canister according to claim 2, the canister also including molecular sieves between said chemical bed and screens.

4. An air regenerating canister according to claim 1, said inlet-outlet port being adjacent the front wall of the housing and opening into the adjacent end of the space between the chemical bed and said front wall, the canister including perforated means holding said bed spaced from the font and back walls.

5. An air regenerating canister according to claim 1, said inlet-outlet port being adjacent the front wall of the housing and opening into the adjacent end of the space between the chemical bed and said front wall, the canister including perforated plates substantially coextensive with the front and back of said bed, one of said plates having side flanges spacing it from the adjacent canister wall facing that plate, and resilient means compressed between the other plate and the canister wall facing it and urging them apart.

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