

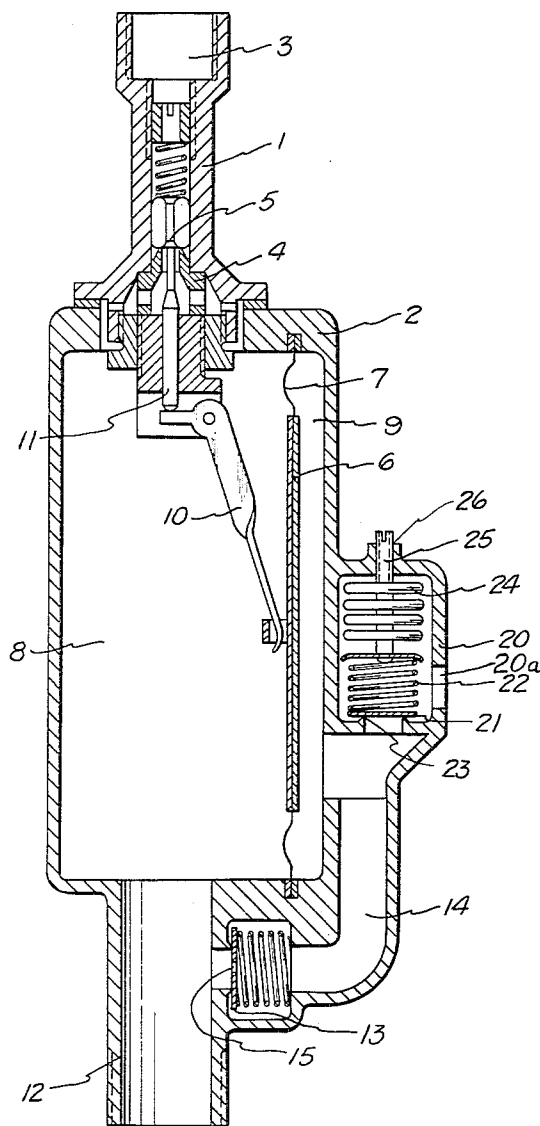
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LUNG-CONTROLLED RESPIRATION APPARATUS

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LUNG-CONTROLLED RESPIRATION APPARATUS

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2 Claims. (Cl. 137—64)

This invention relates to a lung-controlled respiration apparatus. In particular, the invention is directed to a high-altitude breathing apparatus.

This apparatus is composed of a housing containing an inner chamber and an outer chamber separated by at least one diaphragm forming a partition with the lung-controlled inner chamber communicating with the outer chamber through one or more check valves. Prior to this invention, the check valves opened in a direction from the inner chamber toward the outer chamber. During respiration, the apparatus is automatically switched from a vacuum to a pressure operation. Also, the control diaphragm has its side opposite the respiration inner chamber subject to the higher pressure. From the diaphragm, this pressure is transferred through a crank to a lung-controlled first valve to move it into open position. Consequently, this first valve, during a breathing intake, is at the higher pressure of the inner chamber, as is usual in the prior art. The respiration air or the oxygen is drawn in under an overpressure and not during a negative pressure.

Several pressure equalization nozzles are used in the apparatus so that it cannot change automatically from overpressure to negative pressure after it has been used. A small portion of the metabolic gas under pressure is constantly flowing through these nozzles, which are of such a small size that the pressure change during an intake breath cannot materially decrease.

An overload of the outer chamber or chambers, especially during irregular breathing, is prevented by fitting overload valves in the outer chamber. Again, the outer chamber is designed and proportioned so that it can be reached easily so that the opening resistance of the regulating valves can be easily adjusted. The overpressure regulating valve can be mounted, for example, in a short tube connecting the apparatus to the face mask, and to serve also as an exhaling exhaust valve.

The object of this invention is to improve upon the prior art apparatus by adjusting the overpressure and exhaust valve by the movable element of a spring-loaded aneroid.

The overpressure and exhaust valve is connected to the aneroid so that, when the altitude change occurs at an increasing rate, the closing force exerted upon the overpressure valve is accordingly increased. This produces the advantage in that, during intake breathing, the desired overpressure has been changed in accordance with the pressure experienced at the particular altitude, and especially increased pressure changes experienced when the altitude is reduced. Also, as the altitude is increased, the overpressure for intake breathing is increased with a

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certain regularity. In accordance with another feature of the invention, the barometer aneroid supporting the spring-loaded overpressure and exhaust valve can be mounted for ready adjustment. This permits the advantage of being able to additionally manually regulate the closing force on the valve. The aneroid can be axially aligned with a threaded bolt which is mounted on the housing for the apparatus.

The means by which the object of the invention is obtained are described more fully with reference to the accompanying drawing, which shows a cross-sectional view through the apparatus.

As shown in the drawing, the pipe 1 receives the high pressure supply of metabolic gas which is then passed into the low pressure housing 2, there being a gas-type connection between pipe 1 and housing 2. The high pressure metabolic gas enters pipe 1 through fitting 3. In pipe 1 is mounted a valve seat 4 upon which rests the head of a spring-loaded valve 5. Sheet metal plates 6 reinforce a diaphragm 7 mounted in housing 2 and constituting a partition dividing the housing into an inner chamber 8 and an outer chamber 9. The diaphragm 7 forming a gas-type closure between the two chambers. A crank 10 in inner chamber 8 is connected between diaphragm 7 and valve stem 11 forming part of valve 5. During a period of breathing intake or inhalation, diaphragm 7 moves to the left and crank 10 lifts stem 11 and unseats valve 5 from seat 4. The metabolic gas then flows from pipe 1 into inner chamber 8 and through outlet tube 12 to the face mask of the user.

When the user exhales, the air passes through check valve 13 and into line 14 extending from outlet 12 of inner chamber 8 to outer chamber 9. This causes a rise of air pressure in outer chamber 9, the extent of the increase in pressure being determined by the resistance of exhaust valve 21. The next inhaled breath occurs when the previously exhaled air has caused the increase in pressure on diaphragm 7, as the air in chamber 9 cannot escape. The increase in pressure on diaphragm 7 causes crank 10 to open valve 4, and this opening occurs before the intake breath can produce a drop in pressure in inner chamber 8.

Check valve 13 has a small nozzle opening 15 which permits the increase in air pressure in outer chamber 9 to bleed off at the end of the respiration use of the apparatus. This permits the apparatus to return to its initial operating position.

A housing 20 having opening 20a to the atmosphere is joined to housing 2 and communicates with outer chamber 9. Check valve 21, serving as an exhaust valve, is mounted in this housing and is pressed by coil spring 22 upon valve seat 23. The opposite end of spring 22 is supported by the barometer aneroid 24. A bolt 25 is secured by threads 26 to housing 20 and adjustably supports aneroid 24. As the altitude is increased, aneroid 24 expands. Accordingly, the opening pressure of valve 21 is increased, and the pressure of the gas in inner chamber 8 is effectively raised for the intake breath period.

Manual adjustment of the aneroid 24 in order to change the opening pressure on valve 23 is accomplished by the turning of bolt 25, which can be provided with a handle to facilitate turning.

Having now described the means by which the object of the invention is obtained,

I claim:

1. A breathing apparatus for high altitudes comprising a housing, a flexible diaphragm mounted in said housing and forming an inner and an outer chamber in said housing, high pressure gas valve means having an inlet communicating with a source of high pressure gas supply and actuatably connected to said diaphragm and opening into said inner chamber, a gas outlet opening for a face mask in the inner chamber portion of the housing, a spring-loaded and aneroid controlled overpressure exhaled air exhaust valve communicating between said outer

chamber and the atmosphere, an air line between said exhaust valve and said gas outlet opening, and a check valve with a bleed opening mounted in said air line.

2. A breathing apparatus as in claim 1, further comprising an adjustable mounting joined to said spring-loaded and aneroid controlled overpressure and exhaust valve.

References Cited in the file of this patent**UNITED STATES PATENTS**

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