UNDERWATER BREATHING APPARATUS PROVIDED WITH A SNORKEL

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Fig. 1.

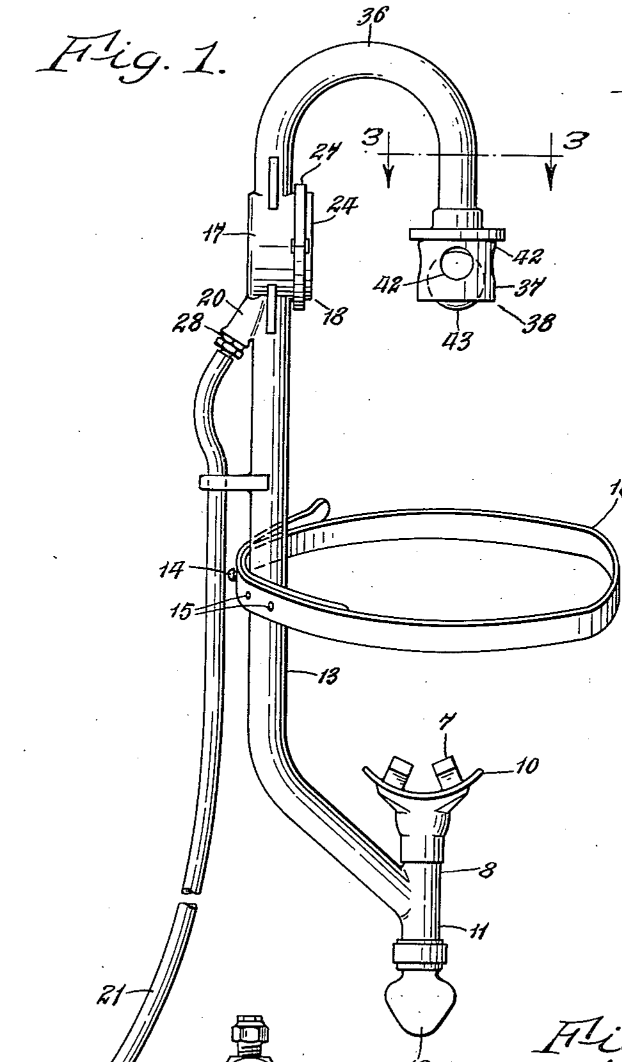

Fig. 2.

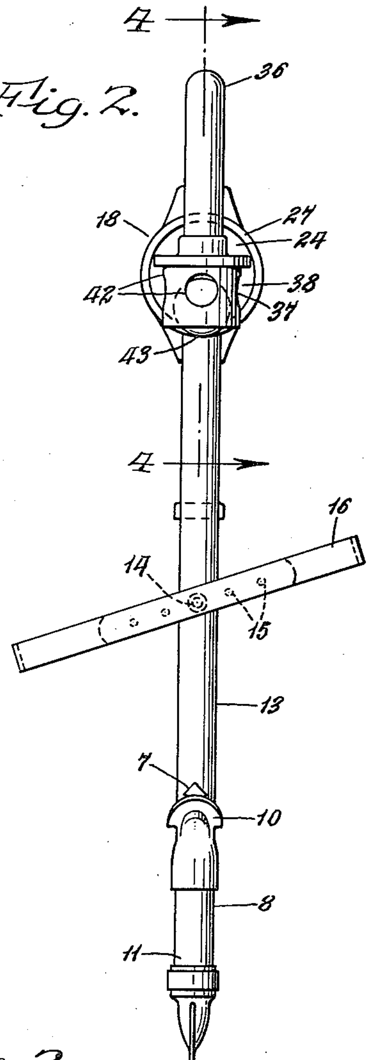

Fig. 3.

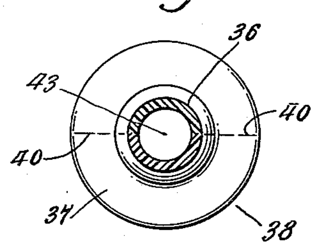

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Fig. 4.

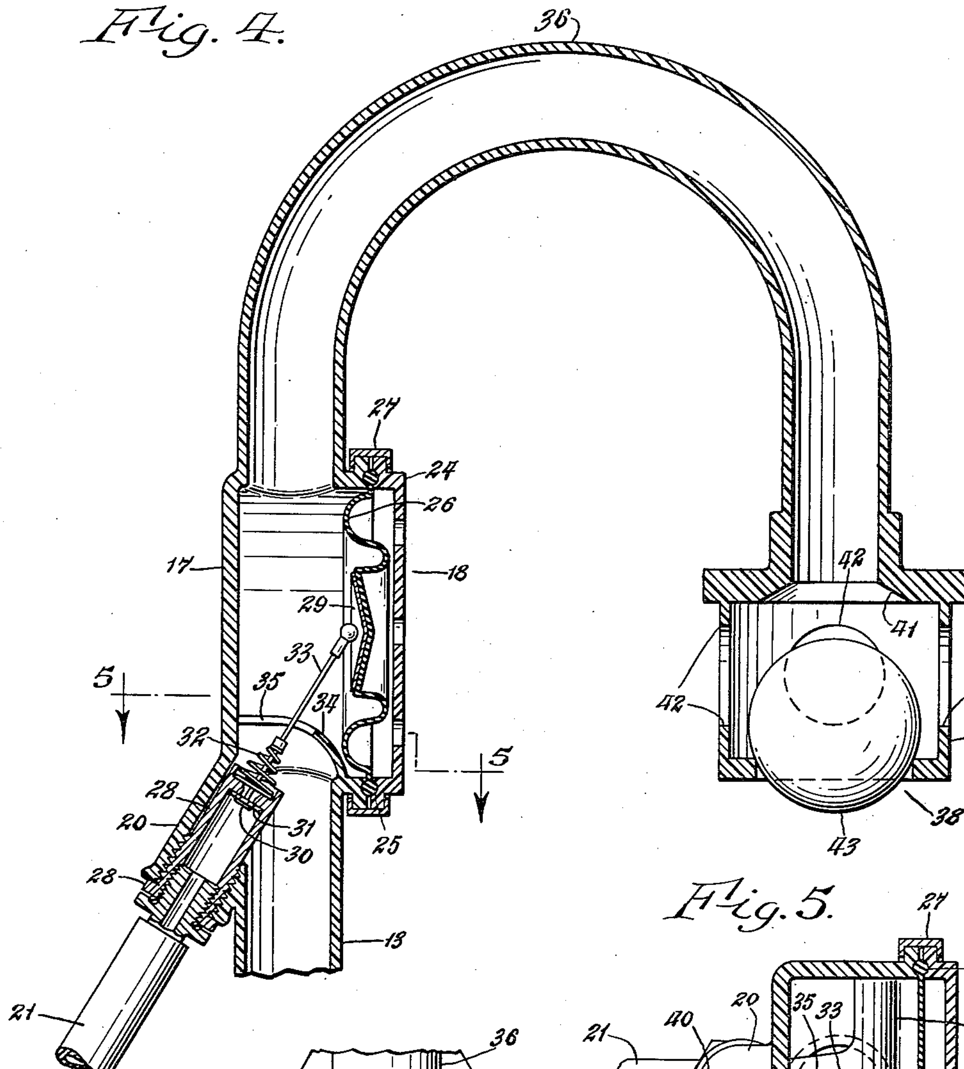
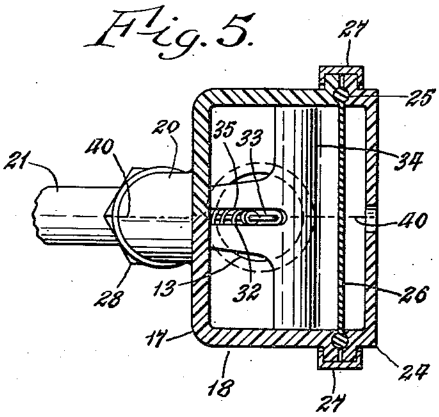


Fig. 5.



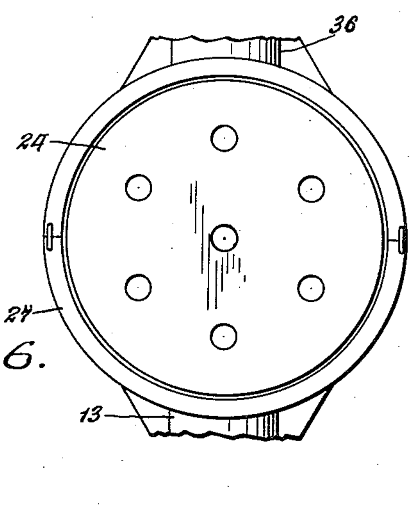


Fig. 6.

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3,051,170
UNDERWATER BREATHING APPARATUS PROVIDED WITH A SNORKEL

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Filed Apr. 23, 1956, Ser. No. 579,867
3 Claims. (Cl. 128—142)

This invention relates to a breathing apparatus which can be used either above the surface of the water, or just under the surface of the water, or completely immersed in the water. In particular, the invention relates to an underwater breathing apparatus which employs either a source of compressed breathing fluid (such as compressed air) or, alternatively, employs ambient air received thru a snorkel valve.

The principal object of the invention is to enable a swimmer to breathe ambient air whenever possible, but to automatically supply him with compressed air from an air storage tank whenever the supply of ambient air is cut off by the automatic action of the snorkel valve. Other objects of the invention and practical solutions thereof are described in the following description and are illustrated in the accompanying drawings wherein:

FIG. 1 is a diminutive, perspective view of the complete breathing apparatus.

FIG. 2 is a diminutive, side elevation thereof with the air hose and air tank removed.

FIG. 3 is a horizontal section (slightly enlarged compared to FIGS. 1 and 2) thru the communicating pipe 36, taken on line 3—3, FIG. 1.

FIG. 4 is a fragmentary, vertical, medial section thru the upper part of the breathing apparatus, taken on line 4—4, FIG. 2.

FIG. 5 is a horizontal section thru the demand regulator 18, taken on line 5—5, FIG. 4.

FIG. 6 is a fragmentary, side elevation of the demand regulator 18.

This invention will be described exactly as it is illustrated, but it is to be understood that the scope of the invention is to be measured solely by the fundamentally novel features of the invention and/or by the breadth of the appended claims.

The soft rubber mouthpiece 7 is adapted to fit between the teeth of the swimmer, and to either receive breathing air from a plastic mouth tube 8, or to discharge foul air thereinto. This mouthpiece 7 is provided with a soft rubber arcuate flange 10 which is adapted to comfortably rest against the outer surfaces of the swimmer's lips, and thereby to prevent the mouthpiece 7 from being pushed down the swimmer's throat. The lower end of said mouth tube 8 constitutes a plastic liquid trap 11 which is adapted to collect whatever water or other liquid accidentally gets into the mouth tube 8. Whenever sufficient liquid is trapped in said liquid trap 11, and when, at the same time, there is sufficient air pressure in the mouth tube 8, this undesired liquid is vented thru a conventional rubber, ejector valve 12 which is similar in construction to one of the very common forms of exhalation valves.

Breaching upwardly and laterally from said mouth tube 8, and then bending substantially vertically, is a plastic breathing duct 13 which is shown in the drawings as being vertical but which in actual use is inclined to

the vertical approximately 10° from the position shown in FIG. 2 as indicated by the angle of the head band or strap 16. The central outer part of this breathing duct is integrally provided with a plastic stud 14 which is adapted to receive any pair of adjustment holes 15 which are formed in the flexible head band or strap 16. The latter is adapted to encircle the swimmer's head, just above his ears, and the adjustment feature is to take care of swimmers' heads of different sizes.

Formed integrally at the upper end of the plastic, breathing duct 13 is an integral, demand regulator casing 17 which forms the chief component of a demand regulator 18. The present invention can be used with a regulator which is not of the demand type, but the highest efficiency of operation is obtained when a regulator of the demand type is employed.

This regulator 18 is provided with an integral, inlet tube 20 which receives compressed air from a flexible hose 21 whose outer end is attached to a combined shut off valve and reduction valve or pressure regulator 22. The latter is supplied with air under very high pressure from an air storage tank 23. The latter is adapted to be strapped to the swimmer's waist by means which are not shown.

The demand valve casing 17 is provided with a perforated, plastic cover 24 which is rendered liquid-tight with respect to the casing 17 by the provision of a rubber ring 25 of circular cross section which is formed integrally on the circular periphery of a rubber diaphragm 26. The latter is stiffened with the usual, sheet-metal, pressure plate 29 which is cemented coaxially to the inner face of said diaphragm 26. The cover 24 is pressed tightly against the casing 17 by a clamping ring 27, which is approximately U-shaped in cross section, but has the inner faces of its two, inwardly-extending flanges of bevelled shape so that, when said clamping ring 27 is circumferentially drawn tight, the bevels on its flanges tightly press the cover 24 coaxially inwardly against the casing 17.

Screwed into the inlet tube 20 is a tubular sleeve 28 at whose inner end is arranged a demand valve 30 provided (preferably integrally, as shown) with an annular row of outwardly-projecting, centering or guide tongues 31, which slidably engage the bore of said sleeve 28 and act to center the demand valve 30. This demand valve 30 is of the tilt type and is adapted to be opened by the diaphragm 26 whenever the pressure upon the inner face of the latter is less than the ambient pressure in the regulator cover 24. Whenever the diaphragm 26 is not causing a tilting of the demand valve 30 to a more or less fully opened position, said demand valve is resiliently held in its closed position by a conical, compression spring 32 whose narrow end is attached to the stem 33 of said demand valve. To prevent the compressed air which rushes thru the demand valve 30 from blowing directly against the inner face of the diaphragm 26, an integral arcuate deflector 34 is provided in the casing 17, the same being formed to provide a central slot 35 which very loosely embraces the stem 33 of the demand valve.

Integrally secured to the upper part of the demand regulator casing 17 is a semi-circular, communicating tube 36 whose distal end is integrally connected to the cylindrical, plastic cage 37 of a snorkel valve 38. This cage 37, together with the communicating tube 36, regulator casing 17, inlet tube 20, deflector 34, breathing duct 13, mouth tube 88 and its liquid trap 11 are all constructed to two symmetrical, plastic components which are connected together on their inner flat faces 40, either by the use of a plastic cement or fused together by heat and pressure. This constrution materially reduces the production cost of the breathing apparatus.

The plastic, snorkel valve cage 37 is provided with the usual plastic valve seat 41 and lateral openings 42. Said valve seat 41 is adapted to be engaged by a buoyant sphere or ball 43 so as to prevent ambient water from passing up into the communicating tube 36 whenever the snorkel valve 38 is immersed in water.

Operation

When the swimmer is either above the water or is only partly immersed in the water (with his eyes and forehead just below the surface of the water), the ball 43 of snorkel valve 38 is in its lower or open position as shown in FIGS. 4, 1 and 2. Under these conditions the pressure on both sides of diaphragm 26 is the same and hence conical spring 32 closes the demand valve 30 and the swimmer both inhales and exhales thru the snorkel valve 38, altho under some conditions he may also exhale water and/or foul air thru the rubber, ejector valve 12.

When the swimmer moves down lower in the water and thereby causes the buoyant ball 43 of snorkel valve 38 to float against its seat 41, the demand regulator 18, being at the same level as said snorkel, starts into operation because its diaphragm 26 is now exposed on its outer face to the ambient water. Under these conditions the swimmer gets compressed air, from the demand valve 30, whenever he inhales and, when he exhales, he forces the foul air out thru the snorkel valve 38 which closes automatically when he stops exhaling. Then, when the swimmer rises to the point where the demand regulator 18 and snorkel valve 38 are both simultaneously above water, the demand valve 30 against closes and he inhales ambient air thru the snorkel valve 38 and also exhales therefrom. If the snorkel valve 38 should be under water

while the demand regulator 18 is above water, the inhalation vacuum in said regulator will supply him with compressed air thru the demand valve 30. If, on the other hand, the snorkel valve 38 is above the water and the demand regulator 18 is under water, he may breathe some ambient air in thru the snorkel valve, but most of his inhaled air will come from the demand valve 30.

I claim:

1. An underwater breathing apparatus adapted to be used by a swimmer and comprising: a substantially straight breathing duct adapted to be connected to the lungs of a swimmer and to be positioned substantially vertically when in operative position; a mouthpiece tubularly connected to the lower end of said breathing duct; a regulator connected with the upper end of said breathing duct and adapted to supply breathing fluid thereto; a communicating tube positioned above and connected with said regulator; and a snorkel valve connected with said communicating tube and positioned at approximately the same vertical level as said regulator when said breathing duct is in substantially operative position.

2. As in claim 1 with the regulator of the demand type.

3. As in claim 1 with means for attaching the breathing duct to the head.

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