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Sinks et al.

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[54] **DIVERS BUOYANCY VEST**

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[52] **U.S. Cl.** **9/313**, 128/142

[51] **Int. Cl.** **B63c 9/08**

[58] **Field of Search** ..... 9/342, 334, 335, 336, 337, 9/338, 339, 340, 341, 311, 333, 312, 313, 314, 315, 316; 137/493.9, 493.1; 128/145 R, 145 A, 142, 142.2, 142.3

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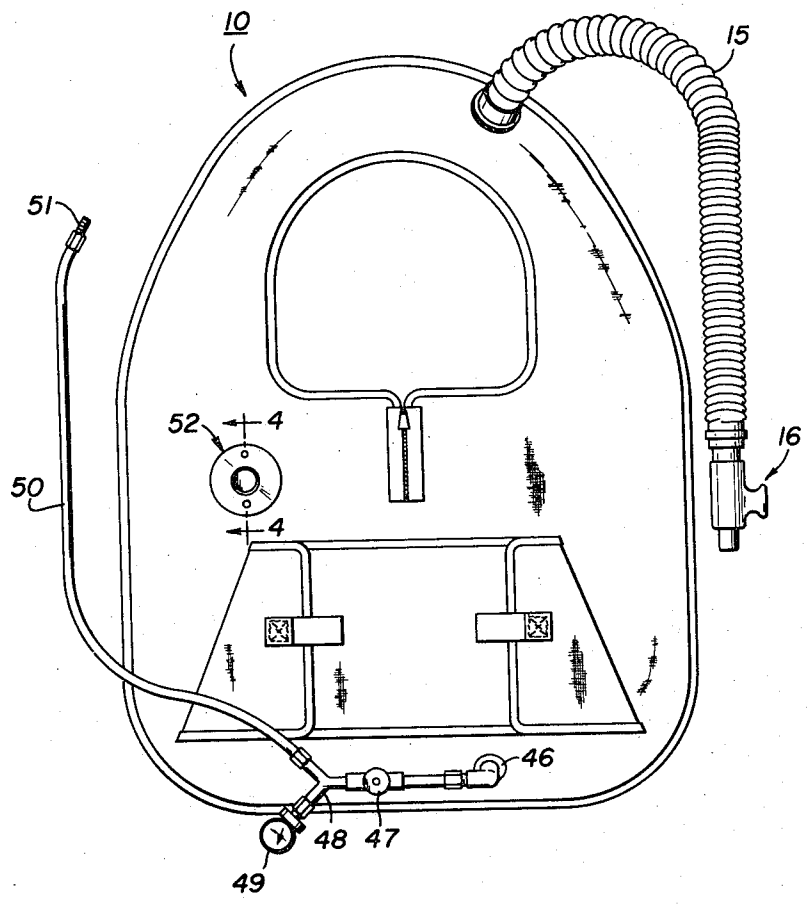
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Assistant Examiner—Donald W. Underwood
Attorney, Agent, or Firm—Edmond T. Patnaude

[57] **ABSTRACT**

A diver's buoyancy vest is provided with separate compartments for respective inflation with CO_2 gas and with air from either a pressurized air tank or from the lungs of the diver, the air pressure in the latter compartment being controllable by means of a pair of purge valves and the former being controllable by a separate purge valve mounted in the vest.

8 Claims, 6 Drawing Figures



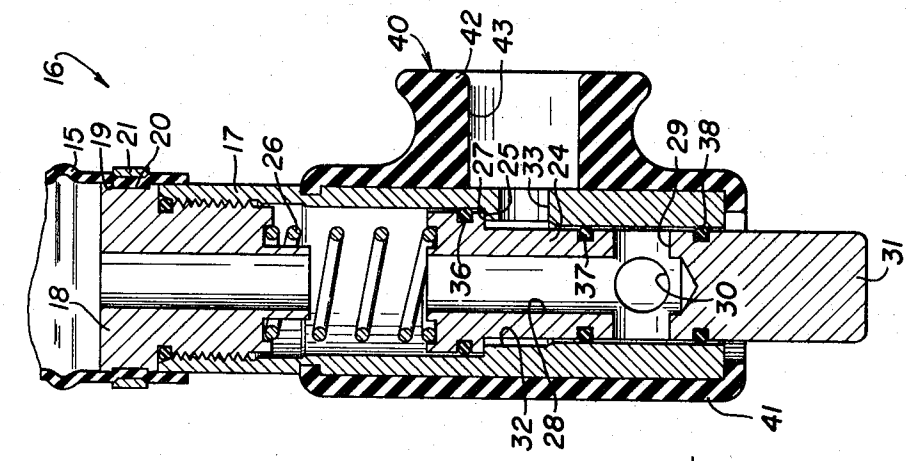


FIG. 3

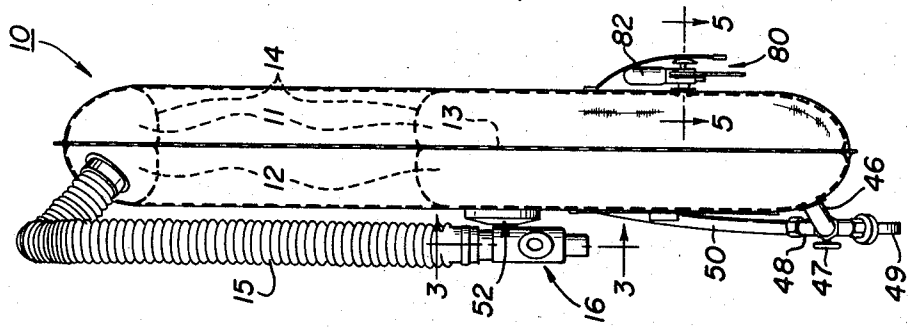


FIG. 2

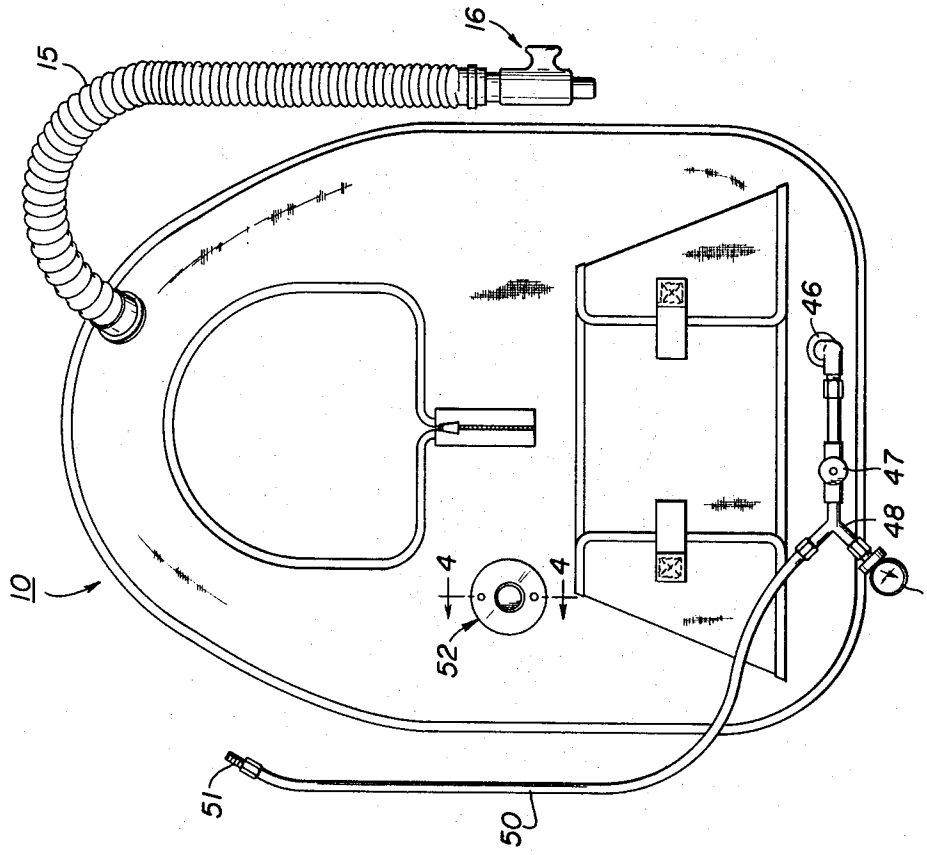


FIG. 1

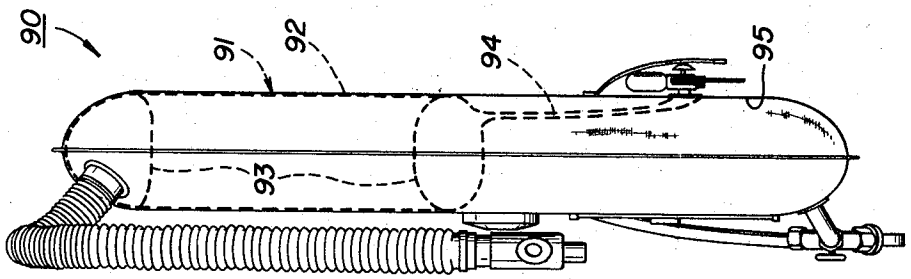


FIG. 6

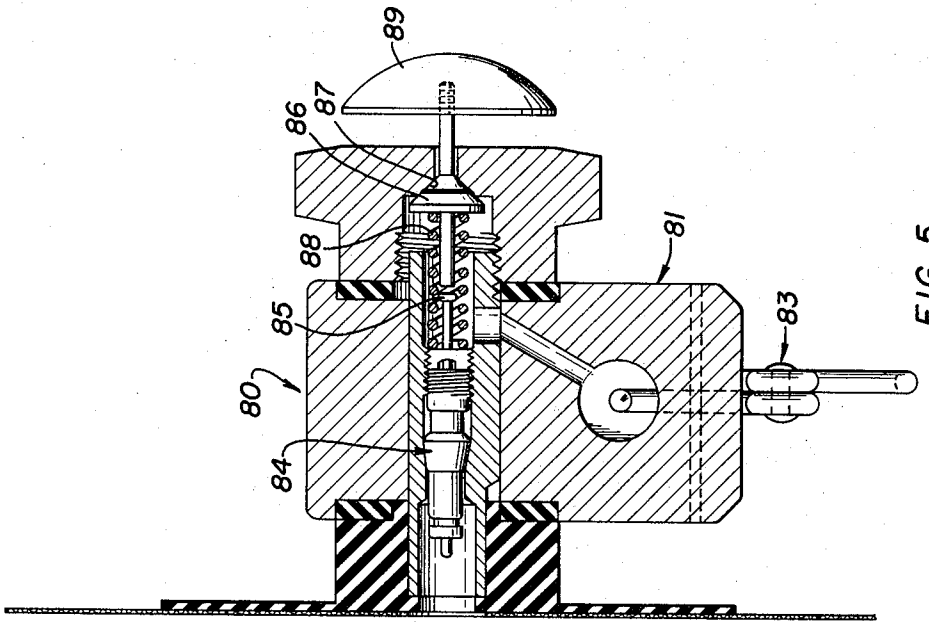


FIG. 5

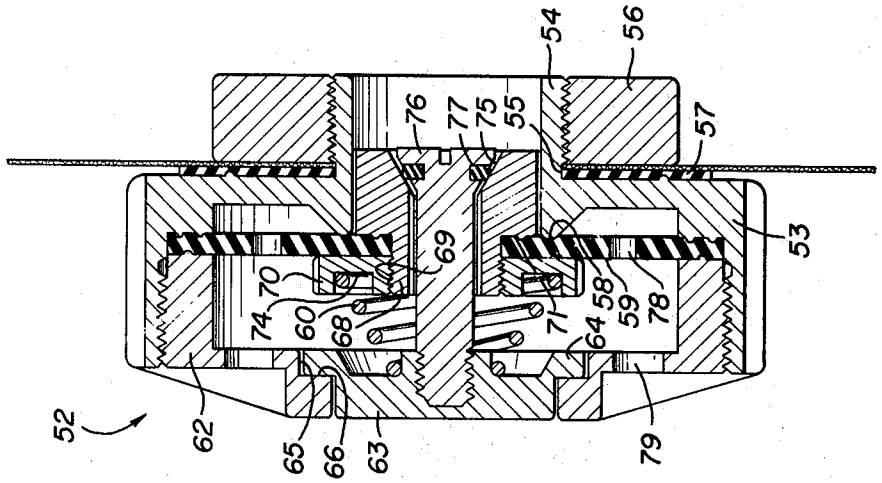


FIG. 4

DIVERS BUOYANCY VEST

The present invention relates in general to inflatable vests of the type used by SCUBA divers, and it relates more particularly to a buoyancy vest which is quickly inflatable in case of emergency from a CO_2 cartridge carried by the vest.

BACKGROUND OF THE INVENTION

In addition to being used by divers in cases of emergency, inflatable vests are also commonly used to control the buoyancy of the diver and his equipment by partially inflating the vest with air from the tank or by blowing into the vest. Moreover, the air in an inflated vest may be used for temporary breathing when necessary. Since the prior art vests include a single chamber inflatable by either CO_2 gas or air, there is the danger that the diver may inadvertently breath from a vest inflated with CO_2 gas.

Another problem associated with emergency breathing from the prior art type vest is that a substantial amount of water may be trapped in the mouthpiece and blown into the diver's lungs when he initially inhales from the vest. It would, therefore, be desirable to provide a mouthpiece and associated valve structure which substantially reduces the amount of water held therein.

When the vest is used as a buoyancy compensator, it is desirable that the diver be able to control the volume of gas in the vest. In the prior art vests, a relief valve is provided near the mouthpiece, but such valves have been difficult to operate because they are located at the distal end of a flexible tube. It would, therefore, be desirable to provide a more simply operable control valve mounted directly on the vest.

SUMMARY OF THE INVENTION

Briefly, an inflatable buoyancy vest embodying the present invention comprises two separate compartments respectively inflatable with CO_2 gas and with air. The air compartment is inflatable through a novel mouthpiece and control valve or from the air tank through a precision flow control valve. An automatic relief valve is provided to prevent over-inflation of the vest and incorporates a manually operable relief valve permitting the diver to control the buoyancy of the vest.

BRIEF DESCRIPTION OF THE DRAWINGS

Further objects and advantages and a better understanding of the invention may be had from the following detailed description taken in connection with the accompanying drawings, wherein:

FIG. 1 is a front view of an inflatable buoyancy vest embodying the present invention;

FIG. 2 is a side view of the vest of FIG. 1;

FIG. 3 is an enlarged cross-sectional view taken along the line 3—3 of FIG. 2 showing the details of the mouthpiece and associated purge control valve;

FIG. 4 is an enlarged cross-sectional view taken along the line 4—4 of FIG. 1 showing the details of the blow-off valve;

FIG. 5 is an enlarged, cross-sectional view showing the details of the CO_2 cartridge and purge valve assembly; and

FIG. 6 is a side view of another buoyancy vest embodying the present invention.

DETAILED DESCRIPTION OF THE INVENTION

Referring now to the drawings and particularly to FIGS. 1 and 2 thereof, an inflatable buoyancy vest **10** comprises a pair of internal compartments **11** and **12** separated from one another by an imperforate partition **13.** The compartment **11** is at the rear of the vest and is adapted to be inflated with CO_2 gas while the compartment **12** at the front of the vest is adapted to be inflated with air. Both of the compartments **11** and **12** are generally ring-shaped to extend around an opening **14** which fits around the neck of the diver.

In order to permit controlled inflation and deflation of the compartment **12,** a flexible tube **15** is suitably connected thereto near the top of the vest for disposition behind the diver's neck and a mouthpiece and control valve assembly **16** is mounted over the distal end of the tube **15.** As best shown in FIG. **3,** the assembly **16** includes a tubular body member **17** in one end of which is mounted a sleeve **18** having an end portion **19** disposed at the end of the body member **17.** An annular groove **20** is provided in the end portion **19** for receiving the adjacent portion of the tube **15** into which the sleeve and associated end of the body member **17** are inserted. A clamp **21** compresses a portion of the tube **15** into the groove **19** to hold the assembly on the tube **15.** A valve sleeve **24** is slidable in the bore of the body member **17** and has an external annular shoulder **25** which is biased by a coil spring **26** against an internal annular shoulder **27** on the body member **17.** An axial bore **28** extends part way through the sleeve **24** and a pair of transverse holes **29** and **30** extend through the sleeve in communication with the bore **28.** As shown in FIG. **3,** the lower end of the sleeve **24** extends from the body member **17** to provide a manually actuatable button **31** for moving the sleeve **24** inwardly to align the transverse holes **29** and **30** with an annular chamber **32** with which a transverse opening **33** in the side of the body member **17** communicates. A pair of O-ring gaskets **36** and **37** are mounted in spaced apart annular grooves in the sleeve **24** for sealing the interior of the valve assembly from the opening **33** when the valve sleeve **24** is in the normally closed position as shown in FIG. **3.** A third O-ring gasket **38** is mounted in an external annular groove in the valve sleeve **24** near the outer end of the body member **17** for sealing the outer end of the valve assembly. An elastomeric mouthpiece **40** has a tubular body portion **41** which fits over the body member **17** and an integral mouth receiving portion **42** which extends from the side of the body portion **41** and is provided with a central bore **43** aligned with the hole **33.**

In order to orally inflate the vest **10,** the diver places the mouthpiece **42** in his mouth, depresses the button **31** and blows into the vest. Between breaths, he releases the button **31** to close the valve and prevent deflation of the vest. In order to purge air from the compartment **12** the button **31** is simply depressed while the mouthpiece **40** is out of the diver's mouth. The extent to which the button **31** is depressed controls the rate of flow of air from the vest. Where necessary, the diver may breath from the vest compartment **12** through the mouthpiece **40.** When so using the vest, only a very small amount of water will be blown into the diver's mouth when the button **31** is initially actuated, that being the water in the bore **43** and the hole **33.**

The compartment 12 may also be inflated with air fron the tank carried on the back of the diver. For this purpose, and as best shown in FIG. 1, an internally threaded fitting 46 is sealably mounted to the front of the vest near the left-hand bottom with a passageway therethrough communicating with the compartment 12. A quick disconnect, manually operated needle valve 47 is threadedly connected to the fitting 46. A Y-fitting 48 is connected to the valve 47 and a pressure gauge 49 is connected to one branch thereof. A flexible tube 50 is connected to the other branch and has a fitting 51 at the distal end for connection to the first stage regulator at the air tank (not shown). In order to inflate the vest from the air tank, the diver simply opens the valve 47 to admit the desired amount of air into the vest. The valve 47 is a precision type valve enabling a controllable low flow rate of the high pressure air from the tank. The quick disconnect feature of the valve 47 permits rapid scuttling of the tank, and check valves are incorporated in the separable parts thereof to prevent deflation of the vest when the valve 47 is disconnected therefrom.

In order to prevent over-inflation of the compartment 12 with a consequent rupturing of the vest, a safety relief blow-off valve 52 is mounted in the front of the vest. As shown in FIG. 4, the valve 52 includes a body 53 of generally cup-shaped configuration having a tubular portion 54 extending into the compartment 12 through an opening 55 in the front wall of the vest. The tubular portion 54 is externally threaded to receive a nut 56 which holds the valve 52 assembled to the vest. An hermetic seal is effected by an annular gasket 57.

An annular valve seat 58 is provided at the inner end of the tubular portion 54 and an elastomeric valve disc 59 is biased against the seat by a spring 60. Considered in greater detail, the valve disc 59 is held in place by means of an internal nut 62 which is threaded into the body 53 over the disc, and a manually actuatable purge button 63 is biased outwardly by the spring 60. An external, annular flange 64 on the purge button fits in an internal annular groove 65 in the nut 62 and rests against an annular seat 66 thereon. A sleeve 68 has an externally threaded portion 69 and a nut 70 is threaded thereon to sealably compress the disc 59 against an annular shoulder 71 on the sleeve. The nut 70 has an annular groove 74 receiving the inner end of the spring 60. The sleeve 68 has a conical valve seat surface 75 against which an outwardly flared valve steam 76 is adapted to seat. The stem 76 is resiliently biased into the closed position by the spring 60. As shown, a gasket 77 is carried by the stem for engagement with the seat 75.

In order to controllably purge the air from the compartment 12, the purge button 63 is depressed to move the valve stem 76 inwardly to unseat the gasket 77 from the seat 75. When the pressure in the compartment 12 exceeds a predetermined value as determined by the spring 60, the sleeve 68 and the disc 59 automatically move outwardly to unseat the gasket 77 from the seat 75 and also to unseat the valve disc 59 from its seat 58, whereupon air exits the vest through a plurality of openings 78 in the disc and a plurality of openings 79 in the nut 62.

Refer now to FIG. 5 wherein is shown the details of a CO_2 emergency inflation and purge valve 80 mounted on the back of the vest 10 as shown in FIG. 2. The valve 80 includes a body member 81 into which the neck of a CO_2 cartridge 82 is threaded. When the seal in the cartridge neck is ruptured by a suitable trigger mechanism 83, CO_2 gas flows into the vest through a conventional check valve 84 having an outwardly biased actuating stem 85 which, when moved inwardly or to the left as shown in FIG. 5 opens the check valve to permit deflation of the vest compartment 11. A conical purge control valve member 86 is biased into a closed position against an annular seat 87 by a spring 88 and a button 89 is attached thereto for operation by the diver when he desires to purge the CO_2 compartment. As shown in FIG. 2, a flap is positioned over the cartridge 82 and the valve assembly 80 to protect the diver from possible irritation caused by direct contact with the cartridge or with the CO_2 gas exitting the valve assembly around the button 89.

Referring to FIG. 6, a vest 90 is provided with a separate bladder 91 disposed within an air compartment 95 therein. The bladder has a generally ring-shaped portion 92 which surrounds the neck opening 93 of the vest and a tubular portion 94 connecting to the CO_2 cartridge assembly. The vest 90 is used in the same manner as the vest 10.

While the present invention has been described in connection with particular embodiment thereof, it will be understood that those skilled in the art may make many changes and modifications without departing from the true spirit and scope thereof. Accordingly, the appended claims are intended to cover all such changes and modifications as fall within the true spirit and scope of the present invention.

What is claimed is:

1. An inflatable buoyancy vest for divers, comprising
a flexible, hollow vest,
first and second mutually separate inflatable compartments in said vest,
first means for inflating said first compartment with CO_2 gas,
said first means including a holder attached to said vest for retaining a CO_2 cartridge,
second means for inflating said second compartment with air,
a manually operated control valve connected to said second compartment for purging air therefrom,
said control valve including
a first outwardly facing annular valve seat,
a first valve member movable against said seat,
a tubular member fixed to said first valve member and having an internal valve seat surface,
a second valve member axially mounted within said tubular member for movement against said valve seat surface, and
a spring urging said first and second valve members into sealing engagement with the respective valve seats.

2. An inflatable buoyancy vest according to claim 1, wherein
said first valve member is a flexible disc.

3. An inflatable buoyancy vest according to claim 2 wherein said control valve further including
a body having an opening therein aligned with said tubular member,
an actuating button secured to said second valve member and disposed in said opening, and
an internal abutment on said body for retaining said button therein against the force exerted thereon by said spring.

4. An inflatable buoyancy vest for divers, comprising
a flexible, hollow vest,
first and second separate and independent inflatable compartments in said vest,
first means for inflating said first compartment only with CO_2 gas,
said first means including a holder attachment to said vest for retaining a CO_2 cartridge,
second means for inflating said second compartment only with air,
a manually operated control valve connected to said second compartment for purging air therefrom,
said control valve including
a tubular body member having an opening in the side thereof,
a valve member slidable in said body member between a first position closing said opening and a second position communicating said opening to said second compartment,
spring means biasing said valve member into said first position,
a depressible manual actuator extending from one end of said tubular member for moving said valve against the force of said spring to said second position, and
a mouthpiece fitted over said body member and having a portion aligned with said opening for reception in the mouth of a diver.

5. An inflatable buoyancy vest according to claim 4, comprising
a flexible tubular member connected between said second compartment and said control valve.

6. An inflatable safety vest for use by a scuba diver carrying a reservoir of compressed air for use in underwater breathing, said vest having a neck receiving opening, the improvement comprising
first and second separate and independent inflatable compartments in said vest,
a conduit including a manually operable valve connected between said first compartment and said reservoir for inflating only said first compartment from said reservoir with air,
a flexible conduit having a mouthpiece at one end and connected at the other end to said first compartment,
said flexible conduit being sufficiently long to permit the mouthpiece to be placed in the mouth of the diver wearing said vest,
a manually operable valve connected in said flexible conduit for controlling the supply of air between said mouthpiece and said first compartment to permit said diver to orally inflate said first compartment and to breath air from said first compartment,
means including a CO_2 cartridge carried by said vest for inflating said second compartment only with CO_2 gas, and
manually and automatically operated purge valve means carried at the front of said vest substantially below said neck receiving opening to release air from said first compartment upon manual actuation or when the pressure within said first compartment exceeds the ambient pressure by a predetermined value.

7. An inflatable buoyancy vest according to claim 6, wherein
one of said first and second compartments is a bladder disposed in the other of said compartments.

8. An inflatable buoyancy vest according to claim 7 further comprising
a fitting on said vest connected to said first compartment,
said manually operable flow control valve connected to said fitting, and
said conduit including a flexible hose for connecting said manually operable flow control valve to a first stage regulator on said reservoir.

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