

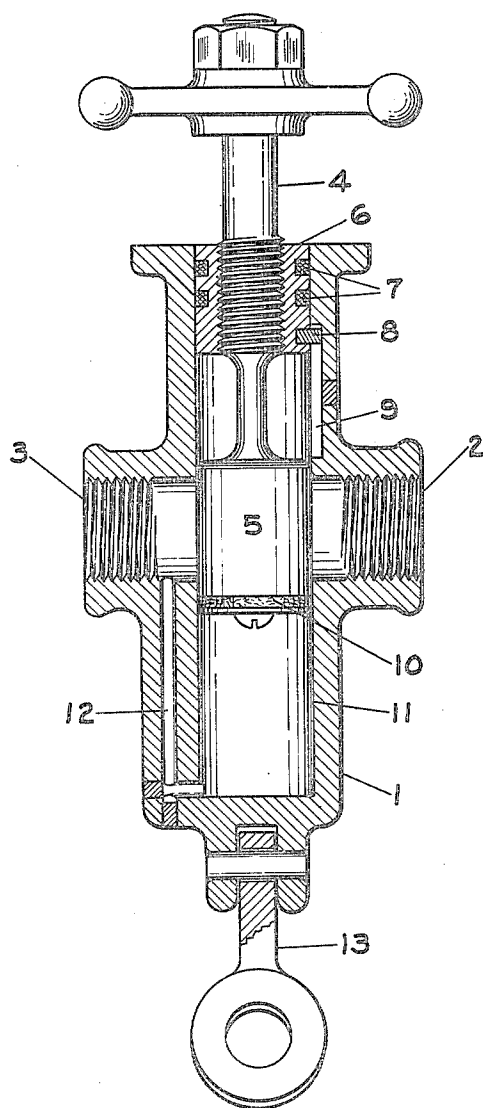
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AIR CONTROL VALVE

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AIR CONTROL VALVE

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This invention is concerned with improvements in a control valve, particularly such a valve adapted for use in connection with the air supply line to deep sea diving suits.

An object of the invention is to provide a control valve operable in the normal manner by the diver for controlling ingress of air to the diving suit.

A second object is to provide an improved valve having new and useful capabilities in addition to the normal function of manual control of air.

A further object of this invention is to provide a valve structure automatically operable to admit abnormally large quantities of air to a diving suit in event such abnormal quantity becomes necessary for any reason, such as puncture of the suit, or upon rapid descent.

The usual diving suit comprises a rigid helmet and a non-rigid suit of water-proof material. The suit is inflated under control of the diver, for purposes of maintaining the desired buoyancy. A constant ingress of air is maintained. This is controlled by a hand operated intake valve to supply sufficient air for respiration. An equal quantity of air is exhausted by a spring operated valve, generally located on the helmet, the tension of the spring being variable. By properly correlated adjustments of the intake and exhaust valves, it is possible to maintain suitable conditions of buoyancy and air supply for breathing.

A disadvantage of the ordinary equipment is that readjustments are necessitated frequently. For example, as the diver descends in the water, pressure upon the suit increases. Further, the diver is subject to "squeeze," if air pressure is lost from the suit, as by puncture. In addition, too much air will inflate the suit unduly, perhaps causing the diver to pop to the surface, with attendant ill effects. Therefore, the diver must constantly be on guard to tend the valves described.

Automatic valves have been tried with indifferent success, so far as I am aware. I propose to provide a valve which will give improved results in diving service, relieving the diver of much of the labor of adjustment necessary with the usual system, and freeing him for his more important duties.

The single figure of drawing is a representation of my improved valve showing partly in section, for purposes of better illustrating the invention.

As shown, the main portion of the valve comprises an elongated substantially cylindrical body

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with inlet opening 2 and outlet 3. Within this body is a cylindrical chamber 11 closed at one end and, in the embodiment shown, being of equal diameter throughout its length.

Slidably mounted in this cylindrical chamber is an internally threaded plug 6 restrained from rotation by means of a key 8 which cooperates with a slot 9 cut into the wall of the chamber.

Passing through plug 6 is a threaded shaft 4 having a handle on the upper end and on the lower end a valve body 5 fitting closely in cylinder 11. Packing rings 7 are provided on plug 6 and packing gasket 10 is provided on valve body 5 for the obvious purpose of securing fluid-tight fit of plug 6 and valve body 5 in chamber 11. The threaded fit between shaft 4 and plug 6 will be such as to prevent passage of fluid, a gland being provided if desired. Ring 13 is provided for convenience in securing the valve to the suit.

Valve body 5 is so proportioned and constructed as to completely close communication between inlet 2 and outlet 3 when desired. In the figure the valve is shown closed. For purpose of establishing communication between inlet and outlet the shaft 4 may be rotated clockwise in the plug 6. The screw thread upon shaft 4 will advance the valve body 5 to cause admission above valve body 5 of such quantity of air as is desired.

In operation, inlet 2 may be connected to the airline supplying the diver with air for breathing. Outlet 3 will be in communication with the suit. In normal operation, on preparation for descent, the valve will be opened by turning the handle to establish a suitable flow of air to the suit. As descent progresses it may be desirable to admit additional air to the suit to overcome the increased pressure of the water.

It will be noted that plug 6 will be acted upon by the water pressure, and since the valve is carried by the diver the pressure acting upon the plug increases as the diver descends. Pressure of the air within the suit is communicated to the end surface of valve body 5 through the opening 12 from outlet 3. Thus, the air within the suit, when it equals the pressure of the water without the suit, will exert upon the valve body 5 a pressure equal to that exerted by the water upon the plug 6, since their cross sectional areas are the same.

If for any reason the air pressure within the suit becomes less than the water pressure, the entire valve assembly including shaft 4, plug 6 and valve body 5 will be forced in such a direction as to increase the opening from 2 to 3, thus

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allowing a greater quantity of air to enter the suit. Such an emergency might be caused by puncture of the suit, or it may be desirable to allow this automatic action to take care of increased air requirements merely upon descent in a normal course of operation.

When air has been established in the suit at a pressure slightly greater than that of the water outside the valve body will be forced outward until stopped by the key 8 in slot 9. There will thus be reestablished the original adjustment of the valve whereby air continues to flow at a reduced but constant rate.

It is to be noted that emergency, as well as normal, operation, is under control of the diver. Any situation demanding quick supply of a large amount of air may be met by pressure on the valve handle in the direction to increase the opening. Similarly the valve may be manually closed.

None of the above mentioned manipulations affects the original setting of the valve body 5 relative to plug 6 and whenever the plug is returned to the position shown in the figure the setting is retained.

Changes in arrangement are, of course, permissible. For example, the chamber need not be cylindrical, though that is an eminently satisfactory shape. For other shapes there might be a rotatable mounting of valve body 5 on shaft 4. Plug 6 and valve body 5 may be of different cross sectional areas.

The invention herein described may be manufactured and used by or for the Government of the United States of America for governmental purposes without the payment of any royalties thereon or therefor.

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I claim:

1. In a valve assembly designed for use on a diving suit, a casing having a straight tubular chamber provided with transversely aligned inlet and outlet ports between its ends, one of said ends being in constant communication with said outlet port but otherwise being closed, and its other end being fully open; a piston type valve slidable axially of said chamber and of sufficient length to close said ports when in position to do so, said valve having an externally threaded stem extending outwardly through the other end of said chamber for manual control; and an internally threaded sleeve fitted to said stem and slidable in said other end of the chamber, whereby said valve is adjustable relative to said sleeve and is also movable as a unit with said sleeve.

2. In the valve assembly defined in claim 1, cooperative means on said sleeve and said casing permitting reciprocation of said valve but preventing withdrawal of the sleeve from the casing.

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