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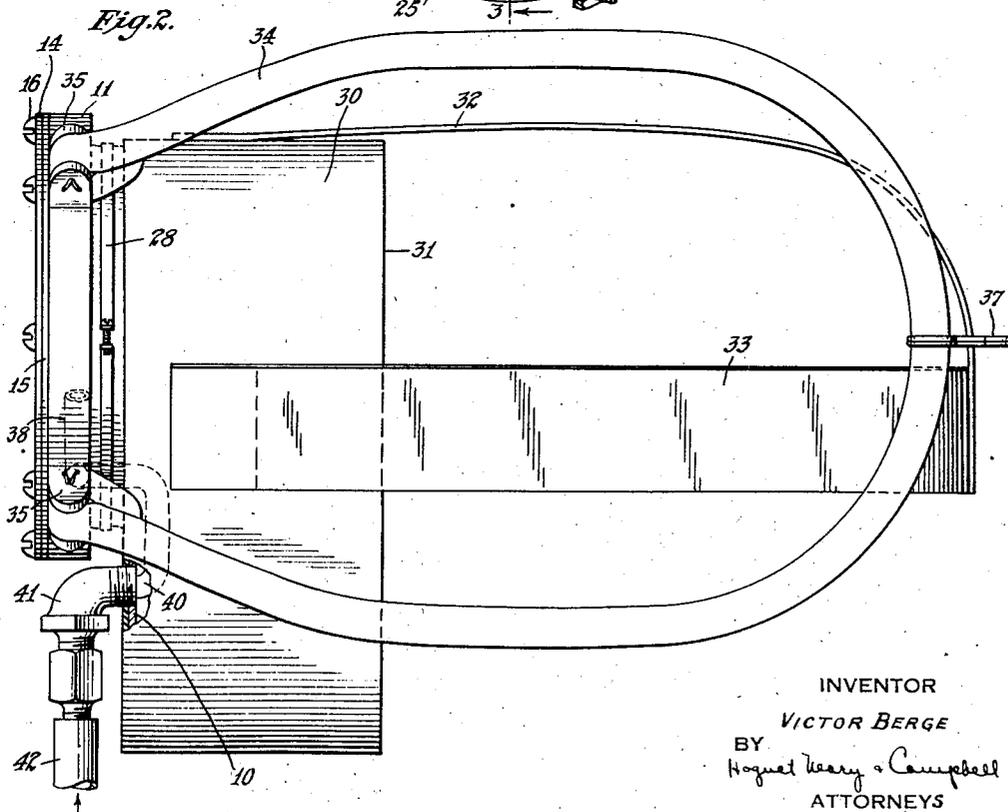
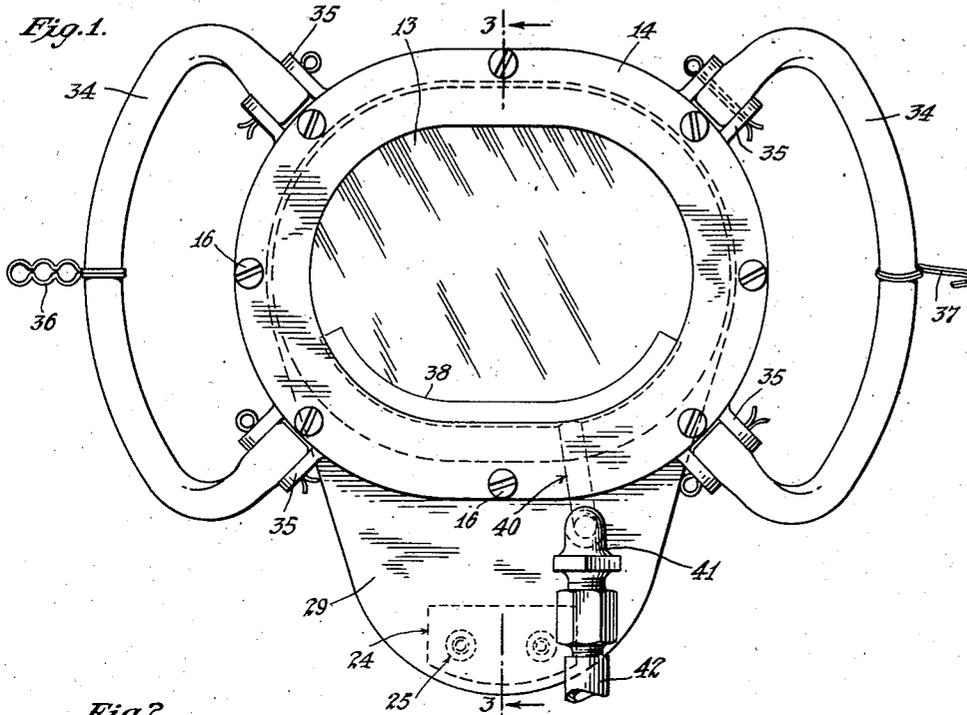
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DIVING MASK AND APPARATUS

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2 Sheets-Sheet 1



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DIVING MASK AND APPARATUS

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4 Claims. (Cl. 128-142)

The present invention relates to equipment for use in protecting persons from the injurious effects to which the surrounding atmosphere might otherwise subject them, and embodies, more specifically, an improved mechanism by means of which the wearer of the mechanism may be protected at all times in his breathing.

The invention relates particularly to apparatus for use by the military and naval forces in connection with the landing of troops from air, surface or undersurface craft, through diving and underwater approach, and has particular use in connection with underwater escape from submerged crafts as well as in dive bombing where protection against atmospheric changes is necessary or desirable.

Many devices have been suggested heretofore as a protection against the effects of submersion or exposure to injurious gases, but certain difficulties have existed in connection with the use thereof, either because the devices do not provide the necessary protection or because they are cumbersome or hamper freedom of movement of the wearer, or because they impair the efficiency and functioning of the wearer. In accordance with the present invention it is proposed to provide a mechanism of the above character wherein complete freedom of action is provided for the wearer and wherein the normal functioning of the wearer is not impaired to any substantial degree.

A further object of the invention is to provide a device of the above character wherein the wearer is provided with an adequate supply of air regardless of the condition of the atmosphere or the degree of submersion while wearing the device.

A further object of the invention is to provide a mechanism of the above character wherein a device may be applied and removed with facility and conveniently carried or stored during periods of non-use.

A further object of the invention is to provide a mechanism of the above character wherein the air pressure within the device and available to the wearer for breathing is adjusted automatically to compensate for varying external conditions.

A further object of the invention is to provide a mechanism by means of which the wearer may have a desired degree of buoyancy and may selectively control his buoyancy and air supply to enable him to sink or submerge as desired.

The foregoing and other objects are attained by providing a mask having the properties here-

inafter described in detail in connection with the accompanying drawings, chief of which reside in a construction by means of which the mask may be applied to the face of the wearer to exclude the external atmosphere or water in submersion, at the same time being relatively light and easy to use so that the wearer may receive the necessary supply of air for breathing and yet remain relatively free and unimpeded in his movements.

The structure includes, more specifically, an improved reinforcement by means of which the mask may be effectively supported against the face of the wearer without disturbing the latter, and, at the same time, with ability to withstand considerable pressure without annoyance.

The foregoing objects are further obtained by providing valve mechanism for controlling the pressure of air supplied to the mask automatically in accordance with the pressure of the external surroundings or atmosphere.

Reference will now be made to the accompanying drawings for a more detailed description of the invention, wherein:

Fig. 1 is a view in front elevation, showing a mask constructed in accordance with the present invention.

Fig. 2 is a view in side elevation showing the mask of Fig. 1.

Fig. 3 is a view in section, taken on the line 3-3 of Fig. 1 and looking in the direction of the arrows.

Fig. 4 is a view in front elevation, partly broken away and in section, showing the diaphragm operating mechanism for the control valve.

Fig. 5 is a view in section, taken on the broken line 5-5 of Fig. 4 and looking in the direction of the arrows.

Fig. 6 is a view, showing the present invention as worn when in use.

Fig. 7 is a detail view, showing the manual control valve for controlling the flow of air from the source of supply under pressure to the mask or inflatable device.

Referring to Figs. 1, 2 and 3, the mask will be seen to include a front plate 10, having an enlarged flanged portion 11, provided with an interior rabbet 12. Within this rabbet a glass plate 13 is received, being held in position by means of a retaining flange 14 and a gasket 15, as clearly shown in Fig. 3. Screws 16 may be provided to secure the flange and plate in position.

The front plate 10 is provided with a rearwardly extending flange 17 to serve as a reinforcement for a flexible supporting member 18.

The supporting member 18 may be formed of rubber and flanged over at 19 to be retained behind the glass plate 13 and in the rabbet 12. The supporting member 18 follows the shape of the flange 17 and engages against the forehead of the wearer along the downwardly curved line 20 in Fig. 3. Adjacent the lower portion of the supporting member 18, the rearward curving edge engages the cheek bones of the wearer at 21 in Fig. 3 and is cut away at 22 to permit air to flow from the interior of the space 22' behind the window 13 to the space 23 immediately adjacent the mouth and nose of the wearer.

A rubber or other flexible pedestal 24 is removably secured to a button 25 formed on the plate 10 and is recessed at 26 to receive the chin of the wearer and thus provide a chin support for the mask.

About the flange 17, a flexible shroud of rubber or other material 27 is provided. It is clamped by means of a clamp 28 in the position shown in Fig. 3 and is formed with a front covering portion 29 and a rearwardly extending continuous flange member 30 that tapers into a thin and highly flexible continuous edge portion 31 that is adapted to lie against the adjacent portion of the face of the wearer. This thin edge portion serves as a continuous flap valve in cooperation with the face of the wearer to permit air to be exhausted from the mask and yet to prevent the entrance of water or fluid from the exterior of the mask. In this way, the face is effectively protected from the external medium and the wearer is enabled to breathe with comfort regardless of such external medium.

In order that the mask may be maintained in position, a top strap 32 and side straps 33 are secured to the flange 30 and set over the head as shown in Fig. 6. Additional securing means in the form of flexible bands 34 may be provided, these bands being secured to brackets 35 formed on the flange portion 11 of the front plate 10. A suitable fastener 36 and 37 may be provided to secure the bands together at the back of the head as illustrated in Fig. 6.

Air is supplied to the mask by means of a curved conduit 38 having a plurality of apertures 39 to direct the air upwardly over the rear surface of the glass window 13. Air is supplied to this conduit by means of a conduit 40, connected to a fitting 41 that is supplied with air under pressure from a flexible conduit 42. By introducing the air through the apertures 39, moisture is prevented from forming over the rear surface of the glass window 13, thus avoiding obstructing the vision of the wearer.

A source of air is provided under pressure in a container 43, this container being connected through a flexible conduit 44 to a fitting 45 carried by a valve casing 46. The casing is formed with an inlet manifold 47 and an outlet manifold 48 connected to a fitting 49 that is connected to the flexible conduit 42. A valve 50 is provided within the casing 46 to normally prevent communication between the manifolds 47 and 48, the valve being mounted on a valve stem 51 that is carried by a diaphragm 52 in a diaphragm chamber 53. The diaphragm is maintained in position by a retaining plate 54 having apertures 55 formed therein.

As shown in Fig. 6, the valve casing 46 is carried on a belt 47, being secured thereto by means of a looped supporting arm 48 (Fig. 5). Since the valve casing is located adjacent the waist of the wearer, when the wearer is submerging, the

water pressure to which the diaphragm will be subjected will be greater than that adjacent the head and this increasing pressure will serve to open the valve more fully to supply a greater air pressure to the mask to balance the external water pressure. This relieves the face from undue pressures and enables the user to breathe comfortably under all conditions.

In order that a mechanism may be provided for affording a desired buoyancy to the wearer, a manually operated valve 56 is provided to direct air under pressure from the conduit 44 to a conduit 57 connected to an inflatable device 58 that may be secured to the belt 47. The valve mechanism is shown in Fig. 7 and includes a case 59 that may be secured to the belt 47 and is in communication with the conduit 44 so that air may be passed directly through the conduit to the diaphragm operated valve in the casing 46. The casing is also in communication with the conduit 57 and is formed with a valve plug 60 that is manually operable and is formed with channels 61 and 62. Channel 62 is adapted to establish communication between the conduit 44 from the pressure chamber 43 and the conduit 57 in order to inflate the mechanism 58. Channel 62 is also adapted to establish communication between the conduit 57 and a relief port 63 in order to permit the air within the device 58 to be discharged so that the device may be deflated.

The channel 61 establishes communication between the two portions of the conduit 44 when the inflatable device 58 is deflated, and these various operations may be conveniently controlled by the user of the mechanism as will be readily understood.

From the foregoing, it will be apparent that this invention provides a mechanism that may be utilized in military service to land troops from air, surface, or underwater craft. The apparatus also provides an effective device for submarine escape operations as well as for use in dive bombing and other aerial operations wherein protection of the above character is advantageous.

The apparatus is further useful in connection with the fighting of fires of all types, particularly where the organized fighting of incendiary attacks may be required.

While the invention has been described with specific reference to the accompanying drawings, it is not to be limited save as defined in the appended claims.

I claim:

1. A mask having a rigid front plate provided with a transparent window in an upper portion thereof, a flexible supporting member projecting inwardly from said upper portion adapted to engage the forehead and cheeks of the wearer and having a recess therein for receiving loosely the nose of said wearer, a rigid flange on said front plate overlying a portion of said member for limiting flexation of said member, a chain-engaging element on said front plate, a flexible shroud encircling said front plate and extending rearwardly beyond said supporting member for engagement with the face of the wearer, said shroud having a thin flexible edge forming with the face a valve permitting escape of air and preventing entry of fluids, and means adjacent said window for introducing air into said mask and directing it against said window.

2. A mask having a rigid front plate of substantially pear-shaped outline including a wider portion and a narrower portion, a transparent

window in said wider portion of said front plate, a substantially oval flange encircling said window projecting from one side of said front plate, a flexible face-engaging member within and extending outwardly beyond said flange and reinforced thereby, said member having a notch for receiving loosely the nose of the wearer, a chin-engaging element at the narrower portion of said face plate, a shroud secured to and projecting from the periphery of the front plate, said shroud enclosing and extending beyond said face-engaging member and said chin-engaging element and having a thin, flexible edge engageable with the face of the wearer to act as an air escape valve, and means for introducing air into said mask.

3. A mask having a rigid front plate of substantially pear-shaped outline including a wider portion, and a narrower portion, a transparent window in said wider portion of said front plate, a substantially oval flange encircling said window and projecting from one side of said front plate, a flexible face-engaging member within and extending outwardly beyond said flange and reinforced thereby, said member having a notch for receiving loosely the nose of the wearer, a chin-engaging element at the narrower portion of said face plate, a shroud secured to and projecting from the periphery of the front plate, said shroud

5 enclosing and extending beyond said face-engaging member and said chin-engaging element and having a thin, flexible edge engageable with the face of the wearer to act as an air escape valve, and an air inlet conduit adjacent to said window for directing air against said window and supplying air to said mask.

10 4. A mask having a rigid front plate of substantially pear-shaped outline including a wider portion, and a narrower portion, a transparent window in said wider portion of said front plate, a flexible member encircling said window and projecting from one side of said face plate and having a free edge engageable with the forehead and cheeks of the wearer to support said front plate in spaced relation to the face of the wearer, said member having a notch for receiving loosely the nose of the wearer, a chin-engaging element at the narrower portion of said face plate, a shroud secured to and projecting from the periphery of the front plate, said shroud enclosing and extending beyond said face-engaging member and said chin-engaging element and having a thin, flexible edge engageable with the face of the wearer to act as an air escape valve, and means for introducing air into said mask.

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