Oct. 25, 1949. C. T. MORROW 2,485,908

DIVING GEAR

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Fig. 1.

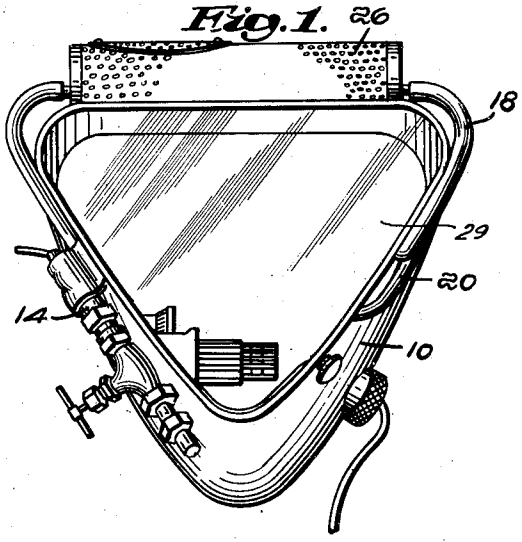


Fig. 2.

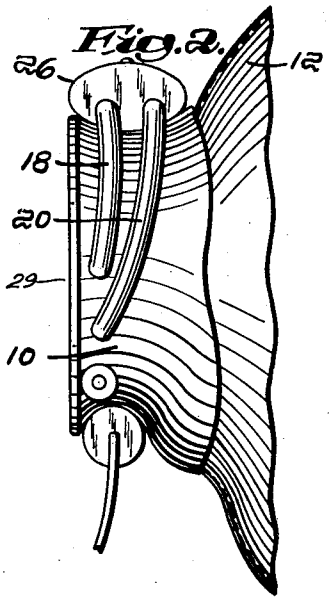


Fig. 3.

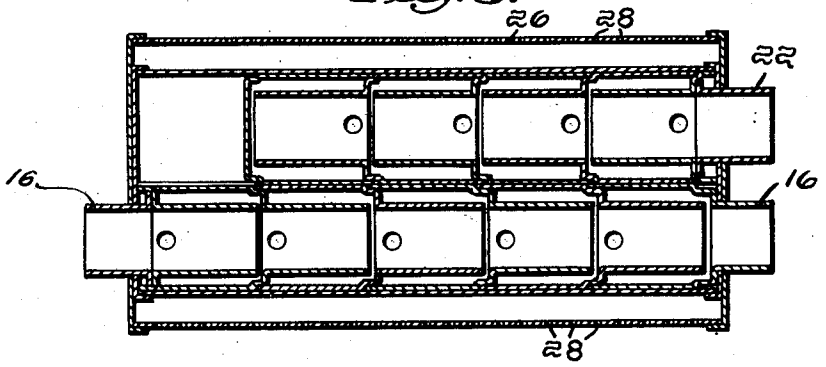
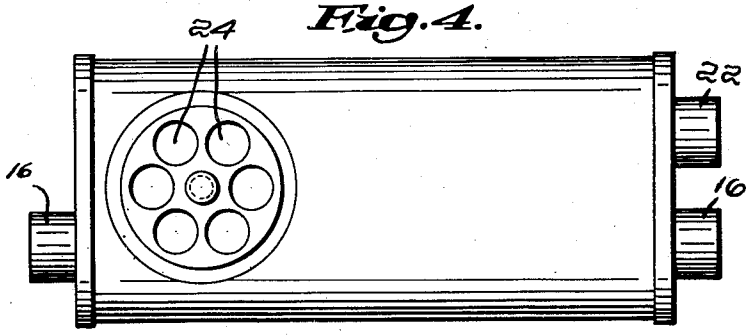


Fig. 4.



Inventor:
Charles T. Morrow
By William D. Hall
Attorney

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Fig. 5

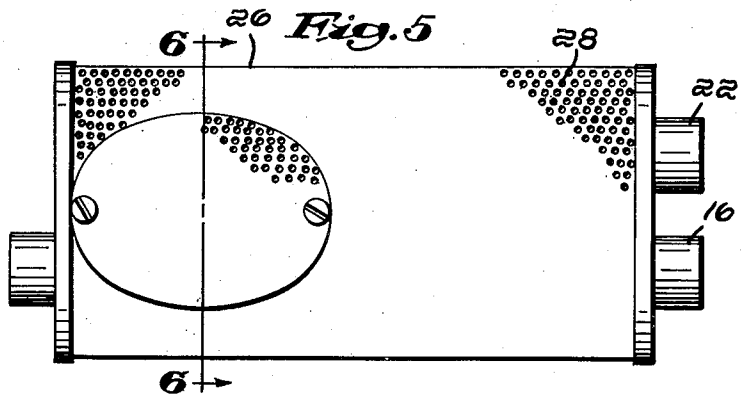


Fig. 6.

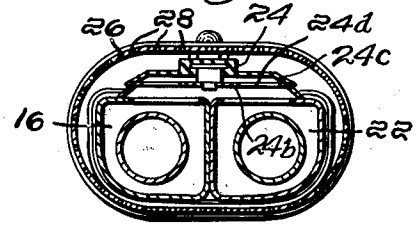


Fig. 7.

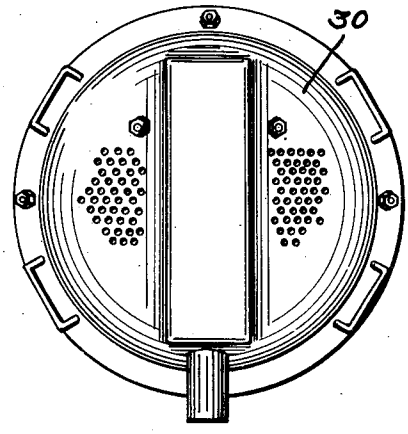
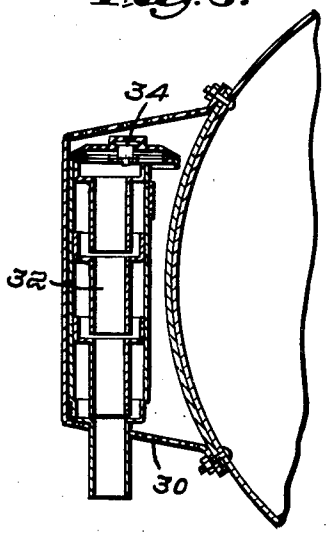


Fig. 8.



Inventor:
Charles T. Morrow
By William D. Hall.
Attorney

Patented Oct. 25, 1949

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UNITED STATES PATENT OFFICE

2,485,908

DIVING GEAR

Charles T. Morrow, Cambridge, Mass., assignor to the United States of America as represented by the Executive Secretary of the Office of Scientific Research and Development

Application March 26, 1946, Serial No. 657,287

1 Claim. (Cl. 128—142)

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This invention relates to diving gear and more particularly to underwater masks or helmets furnished with communication equipment.

Masks suitable for shallow-water diving have been designed, making use of a flexible rubberized material fastened to a rigid metal frame carrying an observation panel. In using a microphone with a device of this character, it has been found that air supplied through an input valve creates an undesirably high noise level. Likewise, the exhausting of the air also creates troublesome noise and vibration developing especially from the formation of relatively large bubbles at the outside of the mask. Also, the air exhausting from a diving helmet creates an excessive amount of noise at the diver's ears and at any microphone used within the helmet.

Some objects of the invention, therefore, are to improve communications in helmets of the character referred to, to devise means for silencing noise arising in connection with the input of air into a mask and also exhausting of air from a mask or helmet, and to devise means for reducing the size of the exhaust bubbles. Other objects and novel features will appear from the following description.

In the accompanying drawings:

Fig. 1 is a front-elevational view of a mask for shallow-water diving;

Fig. 2 is a fragmentary side-elevational view;

Fig. 3 is a cross-sectional view of silencing means of the invention as applied to a mask;

Fig. 4 is a plan view illustrating the housing for the silencer with exhaust valve seat.

Fig. 5 is a plan view showing the perforated outer casing;

Fig. 6 is a cross-sectional view; and

Figs. 7 and 8 illustrate a modification of the invention.

The improved mask construction of the invention comprises muffler means connected into the input air supply line of the helmet together with a second muffler which is connected into the exhaust line leading from the helmet. The two mufflers are of substantially conventional design and are combined side by side in a single housing mounted at the top of the helmet frame. In addition, the exhaust air, after passing through the muffler, is caused to pass through an outer casing which is perforated with tiny holes to cause the escaping air to form relatively small bubbles. The relatively small bubbles create less noise and vibration in passing away from the helmet.

Referring to the drawings, 10 denotes a frame

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edged with rubber which is secured against the bare face or against a diving-dress hood 12 formed of flexible water-repellent material and fragmentarily indicated in Fig. 2 of the drawings. The frame 10 is adapted to carry a window or observation panel 29 for the diver. Air pumped into the helmet is controlled by a hand-operated valve 14 which is connected to a muffler member 16 extending transversely along the top of the frame 10. The muffler is of conventional design well known to those skilled in the art, and involves the usual tubular conduit provided with a plurality of separated slots through which sound passes and is thus dissipated (Fig. 3). For a description of the construction and operation of conventional types of mufflers, see pages 238 and 239 of "The Gasoline Automobile," by Elliot et al., published by the McGraw-Hill Book Company, Inc., copyrighted 1939; and pages 260, 261 and 262 of "Elements of Automotive Mechanics," by Joseph Heitner et al., published by the D. Van Nostrand Company, Inc., copyrighted 1943. Air coming from the muffler 16 is led into the helmet through a tubing 18 as indicated in Fig. 1. There is thus obtained substantial reduction in noise from air passing from the input valve 14 and into the mask.

Exhaust air passes out through the side of the frame 10 through the tubing 20, which leads to a second muffler member 22, as may be seen in Figs. 4, 5, and 6. The muffler 22 is located closely adjacent to the muffler 16, surrounded by a housing in the manner indicated. Air passing therethrough escapes by means of a conventional exhaust valve 24 commonly employed in underwater helmet equipment. Valve 24 may comprise a rigid member 24*a* and a flexible member 24*c*. The rigid member 24*a* contains a number of openings or perforations 24*b*. The flexible member is usually made of rubber or similar material. During operation, when the mask is in use below the surface of the water, the flexible member or flap flutters between an open and closed condition. That is, when the water pressure external to the mask exceeds the air pressure within the mask, the flexible member is forced against the rigid member thus forming a water-tight seal; when the air pressure within the mask exceeds the external water pressure, as happens to be the case during exhalation, air is forced from within the mask through perforations 24*b*, forcing the flexible edges of member 24*c* open and discharges into the water. Valve 24 may also be of the type described by Asari in United States Patent No. 2,168,695.

As the exhaust air leaves the valve **24**, it passes into an outer chamber defined by a casing member **26** which is of oval cross-section and which extends around the housing in the manner indicated in Fig. 4. The casing **26** is perforated to provide a multiplicity of tiny openings **28** through which air coming from the exhaust valve **24** is allowed to escape in the form of tiny bubbles. The small apertures are effective in maintaining the size of the bubbles at a minimum. These bubbles as they pass away from the helmet produce much less noise and vibration than occurs when relatively large bubbles are formed and allowed to pass by the side of the mask. It should also be observed that the muffler **22** is interposed between the helmet chamber and the exhaust valve **24**, an arrangement which excludes the sound of exhausted air from passing back to the earphones in the helmet; the combined effect of reducing noise from input air, exhausted air, and bubble formation, makes possible more efficient communication without distortion or other difficulties resulting from the microphone being displaced relative to the mouth of the operator. The arrangement of the two mufflers within a single housing provides a compact and efficient mounting which is particularly suitable for the metal frame common to masks of the character described. Release of bubbles in the manner described is carried out at the highest point along the frame, thus preventing obstruction of view by the stream of bubbles.

It is intended that various modifications of the invention may be resorted to, both in the shape and design of the muffler mountings and in the means for small bubble formation. As illustrative of one other such modification of the invention, I have illustrated in Figs. 7 and 8 an exhaust silencer for exhausting bubbles at the back of the head or other part of the body of the diver, as will appear from an inspection of the figures referred to. Essentially, the modification consists in a housing **30** which is somewhat cup-shaped and adapted to be secured in the flexible material of the helmet in some convenient manner. The cup-shaped member may, if desired, be provided with a sponge rubber mounting for better fit and comfort features, or a diving dress, if used with the silencer, may be made to contain a sponge rubber cushion. The silencer may be mounted on the diver by the same straps that hold the mask in position, or by other means may be fastened on the outside of a diving helmet.

Mounted in the housing **30** is a muffler member **32** connecting with exhaust valve **34**. The exhaust outlet is connected to the front of the mask by a conduit such as a length of rubber hose (not shown). Openings are provided in the housing in the manner already noted to cause the exhaust air to pass away in the form of tiny bubbles. Location of the muffler unit at the back of the head tends further to decrease noise effects and to prevent obscuring of the vision by the exhaust air bubbles. A separate muffler may be used if necessary for the intake air.

While I have shown the preferred embodiment of my invention, various other modifications may be resorted to, in keeping with the spirit of the invention as defined by the appended claims.

Having thus described my invention, what I claim is:

A helmet for shallow-water diving, comprising a hood, a frame member secured to the hood, said frame member including an observation panel, means for supplying air into the helmet through a control valve, a first muffler means for silencing noise arising from air moving through the valve member, an exhaust valve for releasing exhaled air, a second muffler means for silencing the exhaust air, a perforated casing for housing said first and second muffler means, said perforated casing secured to said frame member, whereby said exhaust air on being released from said exhaust muffler passes through said perforations to effect the formation of small bubbles in the water.

CHARLES T. MORROW.

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