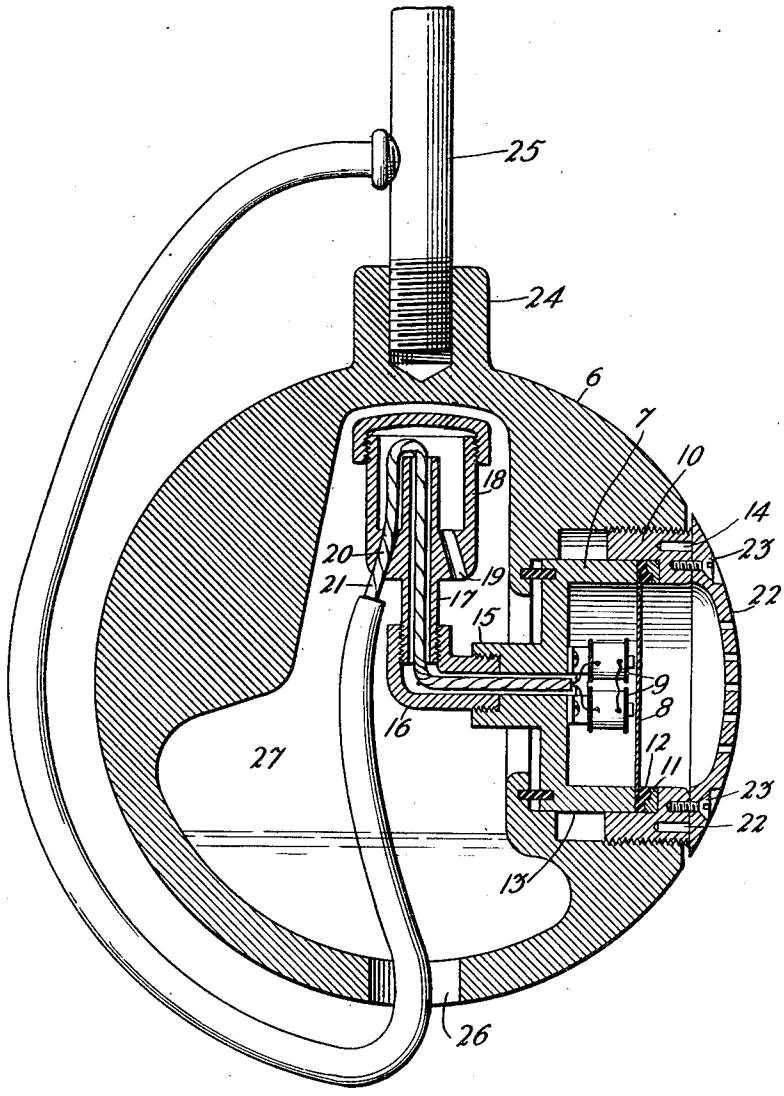
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C. R. MOORE

SUBMARINE SIGNALING

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CHARLES R. MOORE, OF WYOMING, NEW JERSEY, ASSIGNOR TO WESTERN ELECTRIC COMPANY, INCORPORATED, OF NEW YORK, N. Y., A CORPORATION OF NEW YORK.

SUBMARINE SIGNALING.

Application filed July 23, 1919. Serial No. 313,730.

To all whom it may concern:

Be it known that I, CHARLES R. MOORE, a citizen of the United States, residing at Wyoming, in the county of Essex, State of New Jersey, have invented certain new and useful Improvements in Submarine Signaling, of which the following is a full, clear, concise, and exact description.

This invention relates to submarine signaling and more particularly to an acoustic device for detecting or receiving vibrations set up in the water by submarine signaling apparatus or by the movement of a submarine vessel.

In devices used for the detection of faint under-water vibrations, it is customary to employ a diaphragm, one side of which is directly exposed to the water and, since these devices are often located at a considerable distance under the surface of the water, it is necessary to provide some means for compensating for the hydrostatic pressure exerted against the diaphragm. Otherwise the diaphragm would be bowed inward losing, to a certain degree, its sensitivity, and if used in connection with the ordinary type of microphone unit, packing and further loss in sensitivity would follow. Also unless some compensating means is provided, the constant change in head, due to the action of waves at the surface, would cause corresponding movements of the diaphragm making the device noisy and unsatisfactory for the detection of faint disturbances in the water.

It is therefore the object of the present invention to provide an acoustic device for the detection of under-water vibrations, such device being provided with means for compensating for hydrostatic pressure exerted directly upon the diaphragm. A further object is to provide a compensating means so arranged as to preclude the possibility of water entering the interior of the device to affect its operation.

To accomplish these objects in accordance with a feature of the invention, both sides of the vibration responsive element are subjected to the hydrostatic pressure, one side directly and the other side through a body of air imprisoned between it and the water, and means is provided to prevent the passage of spray or small particles of moisture into the space in which the air is imprisoned. In accordance with the invention, this is accomplished by interposing between the vibration responsive element and the surface of the water, a circuitous air passage which cooperates with the imprisoned air to form an effective water seal.

These and other features of the invention may be more clearly understood by reference to the accompanying drawing which is a sectional view of a detecting device embodying the invention.

Referring now to the drawing, there is disclosed a spherical housing 6, of bronze or other suitable metal which will resist the action of the salt water and having a hollow interior of considerable cross-section at the lower portion. In this housing is mounted a current-varying device which, in the embodiment of the invention disclosed, takes the form of an electromagnetic element of the type of the usual telephone receiver comprising a cup 7, a diaphragm 8, and magnet coils 9—9. Since a device of this type is well known in the art, it is thought that no detailed description of its operation is necessary. While in the structure described, a telephone receiver is shown as the current-varying device, it is of course obvious that this element could be replaced by some other type of current-varying device, such for example as a microphonic element or a condenser transmitter, without in any way departing from the spirit of the invention. A clamping ring 10 provided with threads adapted to engage corresponding threads in the housing is provided with a shoulder portion which engages a metal ring 11 which in turn bears against a ring 12 of soft rubber resting directly upon the perimeter of the diaphragm. The lower portion of the cup 7 is provided with an annular recess portion in which is fitted a gasket 13 consisting of a ring of soft rubber adapted to rest in a similar recess in the housing member. Spanner holes 14—14 are provided to permit screwing the ring 10 tightly in place, thereby compressing the soft rubber ring 11 and the gasket 13 to prevent the entrance of water. The hollow hub portion 15 of cup 7 is provided with threads adapted to engage similar threads in an elbow 16, the other end of which is also threaded to engage the hollow stem 17 of the splash dome 18. Perforations 19 and 20 are provided in the lower portion of the dome, as shown,

to permit the entrance of air from the interior of the housing and also to provide space for the leading-in wires 21. In order to protect the diaphragm from mechanical injury, a perforated cap 22 is secured to the clamping ring 11 by means of the screws 23—23. The upper portion of the housing is provided with a boss 24 which is threaded to engage corresponding threads in a pipe 25 by means of which the device is suspended in the water. At the lower part of the housing, an opening 26 is provided to allow the entrance of water as the device is submerged and to provide a means for bringing in the conducting cable. As the water enters the housing, the air in the chamber 27 is compressed an amount corresponding to the hydrostatic pressure which is exerted on the outside of diaphragm 8. Since the air in chamber 27 is free to flow through the perforation 19 into the splash dome 18, and thence through the hollow tube 17, elbow 16 and hub 15 to the chamber containing the electromagnets 9, it is apparent that the pressure acting on the outer side of the diaphragm is at all times equalized by the air pressure acting on the other side. The splash dome 18 provides a circuitous path for the air equalizing the pressure at the rear of the diaphragm and prevents the entrance of water into the chamber in which the telephonic unit is mounted.

What is claimed is:

1. In apparatus for the detection of under-water vibrations, a hollow casing adapted to be submerged, said casing being provided with an opening, placing the interior of the casing into direct communication with the surroundng water, means within said casing including a diaphragm responsive to vibrations to vary the electrical characteristics of a circuit, means communicating between the interior of said casing and the inner side of the diaphragm to permit compensating for the hydrostatic pressure acting on the diaphragm, and additional means for preventing water from reaching the current-varying means.

2. In apparatus for the detection of under-water vibrations, a hollow casing adapted to be submerged, means located in the wall of said casing for varying the electrical characteristics of a circuit, said means including a diaphragm having one side in direct contact with the water, means for compensating for the hydrostatic pressure acting on the diaphragm, and a splash dome adapted to prevent water from reaching the current-varying device.

3. In apparatus for the detection of under-water vibrations, a hollow casing adapted to be submerged, said casing being provided with an opening, placing the interior of the casing into direct communication with the surrounding water, an electromagnetic unit mounted in the side wall of the casing and having its diaphragm in direct contact with the water, means for preventing the entrance of water to the inner side of the diaphragm, and additional means communicating between the interior of said casing and the inner side of the diaphragm for equalizing the pressure on either side of the diaphragm.

4. In apparatus for the detection of under-water vibrations, a hollow sphere adapted to be submerged, said sphere being provided with an opening, placing its interior into direct communication with the surrounding water, a device mounted in the side wall of the sphere for varying the electrical characteristics of a circuit, said device including a diaphragm having one side in direct contact with the water and the other side connecting by means of a circuitous path to the hollow portion of said sphere, whereby the hydrostatic pressure acting on the outer side of the diaphragm is counterbalanced by the pressure of air on the inner side of the diaphragm and additional means for preventing water from reaching the inner side of the diaphragm.

5. In apparatus for the detection of under-water vibrations, a vibration responsive element having one side directly exposed to hydrostatic pressure and the other side through a body of air imprisoned between it and the water, and a splash dome so mounted as to prevent the passage of small particles of water through the imprisoned air to the vibration responsive element.

In witness whereof I hereunto subscribe my name this 24th day of July, A. D., 1919.

CHARLES R. MOORE.