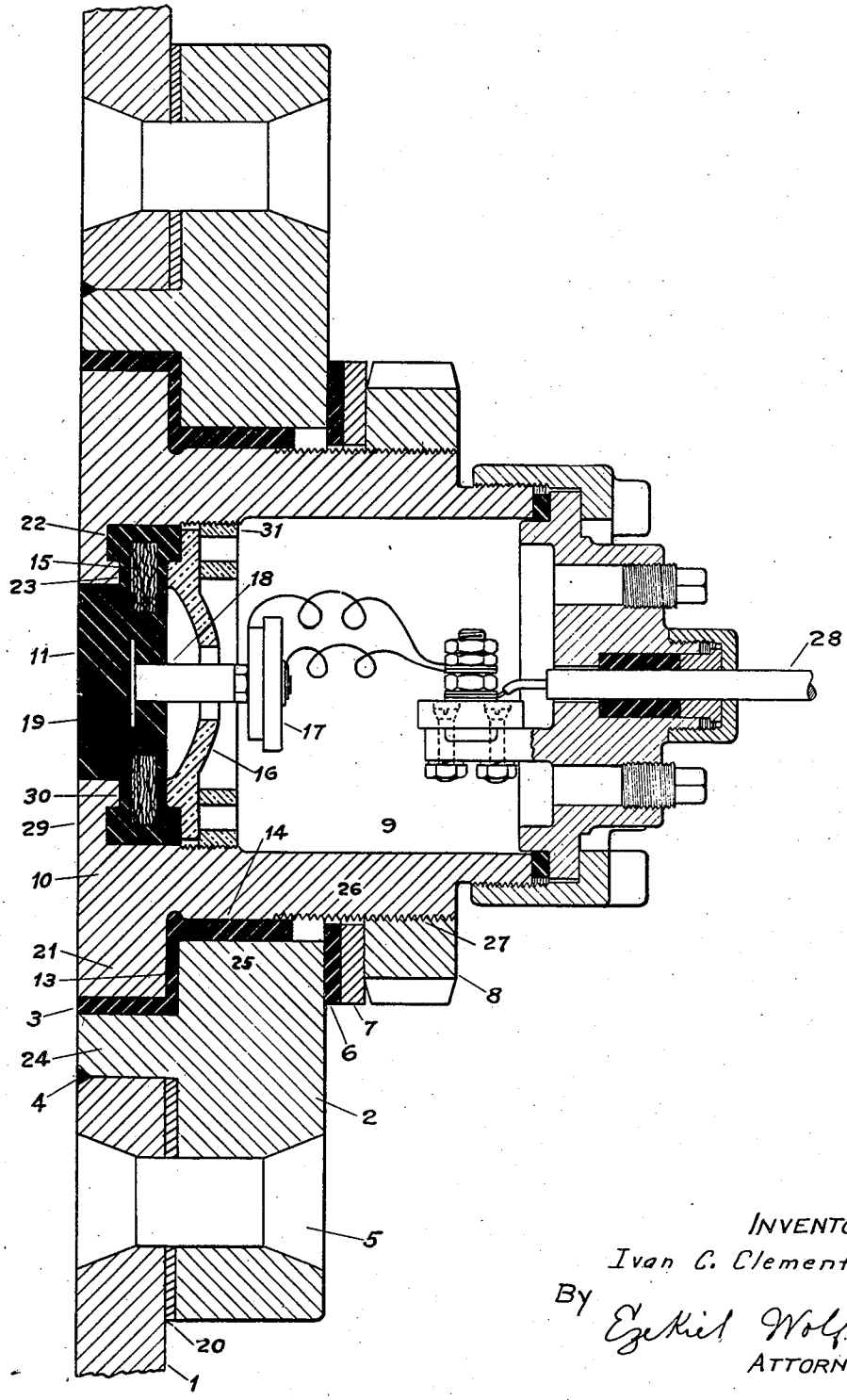
May 2, 1933. I. C. CLEMENT 1,906,446

SOUND RECEIVING APPARATUS

Filed Oct. 31, 1929



INVENTOR
Ivan C. Clement
By Ezekiel Wolf
ATTORNEY

Patented May 2, 1933

1,906,446

UNITED STATES PATENT OFFICE

IVAN C. CLEMENT, OF GREENWOOD, MASSACHUSETTS, ASSIGNOR TO SUBMARINE SIGNAL COMPANY, OF BOSTON, MASSACHUSETTS, A CORPORATION OF MAINE

SOUND RECEIVING APPARATUS

Application filed October 31, 1929. Serial No. 403,825.

The present invention relates to subaqueous sound receiving devices, and more particularly to such devices which are mounted in the skin of a vessel.

To provide a good so called skin mounted instrument there are usually two factors, among others, which demand careful consideration. The device must be rugged; it must be possible to install it in a vessel and be certain that it will stand up under severe weather conditions without breaking down or leaking and produce good results for a long period of time without excessive tests, examinations or repairs. The device must also be free from acoustic vibrations.

In the present invention, both of these aims are accomplished to a remarkable degree, due to the particular construction employed.

In the prior art, it has been common practice to use rubber insulation for acoustic damping, but such insulation has not always been used in the manner to accomplish the best possible acoustic damping. This is probably due to the fact that the sound device was clamped in such a manner that stresses were set up by bending which caused extraneous vibrations. Such extraneous vibrations may be set up where the clamping is accomplished through fastening at two points to the ship's skin. If the vibration of the structures at these two points is not in the same phase and does not possess substantially the same amplitude, there are liable to be some extraneous vibrations present. In making the present invention, I discovered this difficulty and have made a construction in which this effect is entirely remedied, at the same time acoustically insulating the entire sound receiving unit as a whole.

This construction also provides excellent means for maintaining a watertight installation which remains watertight.

In the present construction, I also provide a special type of diaphragm, particularly adapted for skin mounted construction because of its mechanical and acoustic properties.

Further objects and aims of the present invention, as well as advantages over the prior art, will be more fully understood from a consideration of the following description of the embodiment of the same in connection with the drawing showing a sectional view of the device.

In the drawing, the ship's skin is represented as 1. A hole is cut in the skin in which is mounted the heavy ring 2 having as an integral portion a cylindrical neck 24 fitting within the edge of the hole. The ring 2 is riveted to the ship's skin or plate by the rivets 5 and is made tight by a gasket 20 or calking between the plating and the ring. To further secure the ring 2, it is welded at 4 to the ship's skin. The ring 2 is formed with an inwardly extending flange 25, the purpose of which will be discussed more fully later.

The hydrophone unit 9 is inserted from the outside of the vessel and must, therefore, be installed when the ship is in dry dock. It is formed of a cylindrical shell 26 with an outwardly extending flange portion 21, the outer face 10 of which forms a continuous surface with the ship's skin and the hydrophone diaphragm 11. About the rim of the outer flange 21 is placed a sound insulating shell 3 and between the inner face of the flange 21 and the inwardly extending flange 25 is the insulating element 13, while between the cylindrical wall 26 and the flange 25 is the insulating element 14. These acoustic insulating elements are preferably one piece and are put over the shell of the hydrophone unit from the back end. In this manner they are securely and firmly held in position.

The shell 26 is threaded on the outer side at 27 to receive a threaded collar 8, which clamps the unit securely to the inwardly extending flange 25. Between the collar 8 and the flange 25 is the insulating ring 6 and the clamping ring 7. It will be noted that the hydrophone unit is clamped to the heavy ring 2 by straight pressure clamping and compression of the flange of the ring itself without forces such as bending or torsion being present. The clamping is effected between parallel surfaces substantially in an

alignment perpendicular to the diaphragm surface.

The end of the hydrophone unit is closed by suitable water-tight mechanism through which the cable 28 is conducted to the microphone 17.

The diaphragm 11 of the hydrophone is made of soft rubber and sits in a seat formed by the inwardly extending flange 29 and the shoulder 30. On the outside it is flush with the skin of the ship and is held in this position by being cemented to the metal and by the clamping pieces 16 and 31. The clamping element 16 rests against the narrow neck of the diaphragm and pressure is exerted upon it by the ring 31, threading in the inner side of the shell 26. The diaphragm 11 is formed with a heavy outer edge, a thinner neck 23 and a thick center portion. It may be molded and has set therein a ring insert 15, preferably made of some hard fibrous material. The element 16 and the construction of the seat for the diaphragm are so formed that this insert takes up practically the entire neck area and therefore prevents any cold flow of rubber between the clamping surfaces. In this manner, the joint is maintained watertight and has no tendency to leak after a time. In addition, the insert strengthens the diaphragm and prevents certain detrimental frictional losses.

The microphone button 17 is mounted on a stem 18 which is molded with a plate in the diaphragm.

The whole structure is one adaptable for a skin mounted installation and because of the construction almost entirely eliminates transmission of ship's sounds from the hull or skin to the sound receiver.

This is in part accomplished, it is believed, because of the suspension of the unit entirely on the heavy inertia ring and because of the manner of clamping the unit to the ring.

Having now described my invention, I claim:

1. In a sound receiving device a casing having an inwardly extending flange on one side forming a seat, a rubber diaphragm setting on said seat, said diaphragm having a narrow neck portion, a ring of fibrous material moulded in the neck portion of said diaphragm and extending a short distance into the diaphragm proper and means for clamping the diaphragm in its neck portion to said seat.

2. In a sound receiving device, a diaphragm of soft rubber having an outer ring portion, a narrower neck portion adjacent thereto and a diaphragm proper portion having its surface projected forward of the neck portion to make said portion substantially thicker than the neck portion and a ring of fibrous material positioned in the neck portion and extending partly into the outer ring and partly into the diaphragm portion on either side of the clamping surface.

In testimony whereof I affix my signature.

IVAN C. CLEMENT.