

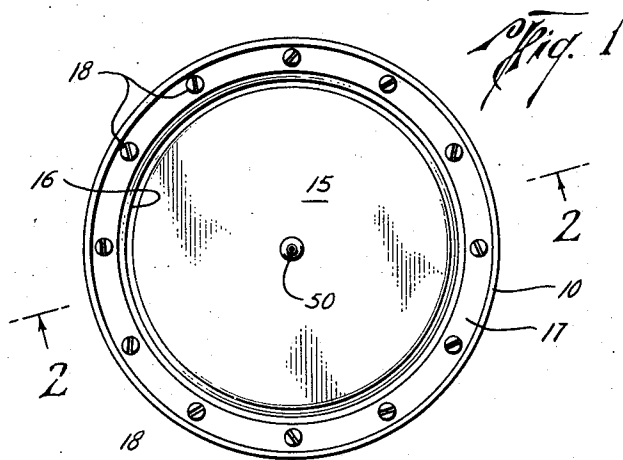
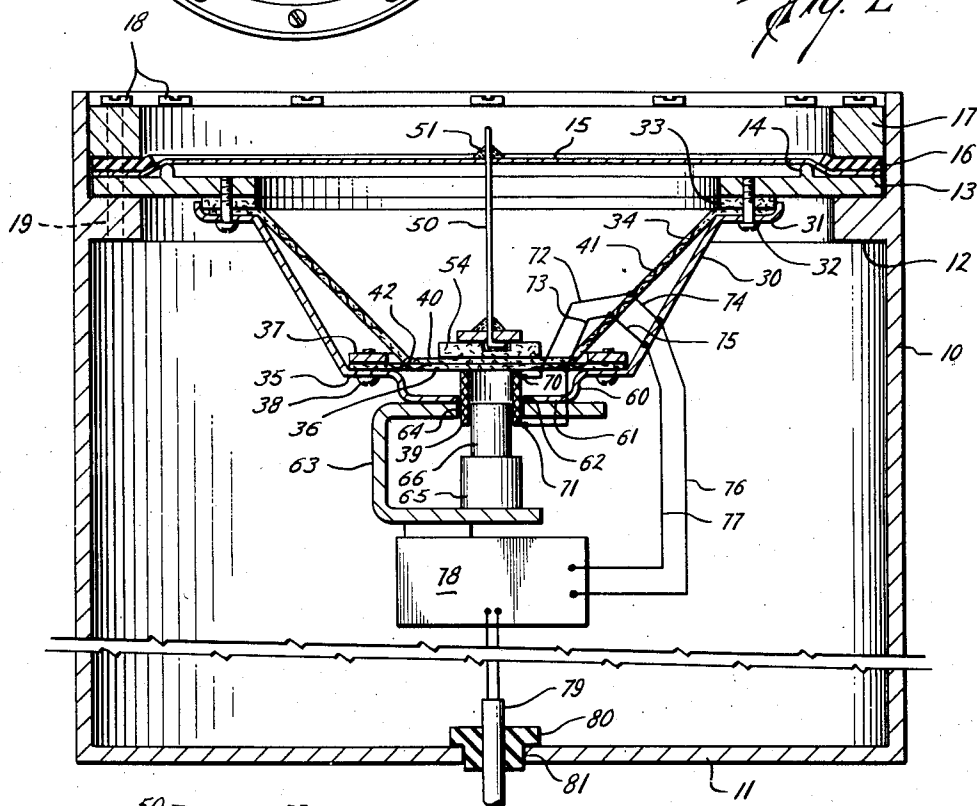
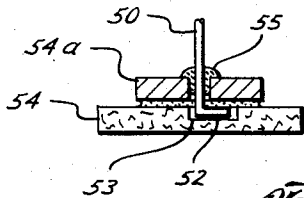
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MICROPHONE

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2,900,453

MICROPHONE

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3 Claims. (Cl. 179—115.5)

This invention pertains to electroacoustic transducers, and more particularly to a microphone adapted for use with a device for monitoring sound signals from a foghorn placed on navigational hazard such as an offshore oil well.

It is an object of the invention to provide a microphone that will be selectively responsive to foghorn sounds.

It is a further object of the invention to provide a microphone that will be waterproof, corrosion resistant, and rugged enough to withstand exposure to the elements and rough handling such as are to be expected in the intended monitoring service.

Another object of the invention is to provide such a microphone that will be of moderate size.

Still another object of the invention is to provide such a microphone that will be highly sensitive to the expected foghorn signals.

A further object of the invention is to provide such a microphone that is inexpensive to manufacture.

Other objects and advantages of the invention will become apparent from the following description of a preferred embodiment of the invention, reference being made to the accompanying drawing wherein:

Figure 1 is a plan view of a microphone embodying the invention;

Figure 2 is a section taken on line 2—2 of Figure 1; and

Figure 3 is an enlarged view of a portion of the apparatus shown in Figure 2.

Referring to Figures 1 and 2, the microphone comprises a cup shaped brass housing having a hollow cylindrical side wall 10 and a flat bottom 11. An annular internal supporting flange 12 is disposed near the top of the housing below the upper edge thereof. A tension ring 13 disposed on top of flange 12 carries an upstanding annular rib 14 integral therewith. A sheet brass diaphragm 15 is stretched across rib 14. An annular neoprene gasket 16 is disposed above the outer periphery of the diaphragm. Compression ring 17 is disposed on top of gasket 16. A plurality of screws 18 extend through holes in ring 17, gasket 16, diaphragm 15 and ring 13 into threaded holes 19 in flange 12. Tightening screws 18 draws diaphragm 15 tighter over rib 14 of tension ring 13 and increases the tightness of the diaphragm whereby the diaphragm may be tuned to different fundamental frequencies. Gasket 16 makes a waterproof seal between the diaphragm and housing providing a waterproof chamber inside where the other elements of the microphone are mounted.

Diaphragm 15 is made of fairly thick material, e.g. 0.006 inch, so that it can be resonate at a low frequency, e.g. 150 cycles per second and still be of a fairly smaller diameter, e.g. about seven inches. The thick diaphragm also provides a rugged wall closing the upper end of the housing to protect the other parts of the microphone inside the housing.

A sheet metal frame has a conical side wall 30 and an

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outturned peripheral flange 31, the flange 31 being secured to the underside of ring 13 by screws 32. Between flange 31 and ring 13 is held a cardboard ring 33. A paper cone 34 is glued to the underside of ring 33. At the small end of conical side wall 31 of the frame is an in-turned flange 35. A flexible disc 36 of impregnated cloth or paper or the like is held at its periphery between flange 35 and a metal ring 37, there being screws 38 to clamp ring 37 to flange 35. Disc 36 forms a spider or support for electric coil 39 which is glued or otherwise secured concentrically to disc 36. Disc 36 is also glued to the disc shaped portion 40 at the small end of cone 34. Cone 34 and spider disc 36 combine to form an exceptionally rugged and stable supporting means for coil 39. Both this cone and spider are corrugated as shown at 41, 42 to increase flexibility in the direction of the cone axis without sacrificing radial stability of the coil support.

Coil 39 is coupled to diaphragm 15 by means of a beryllium copper wire 50 which may have a diameter of .020 inch. One end of the wire protrudes through a hole in the diaphragm and is soldered thereto at 51 forming a watertight connection. As best shown in Figure 3, the other end of wire 50 has a portion 52 extending at right angles thereto which is held in a recess 53 in a fibre disc 54 cemented to spider disc 36. An apertured metal disc 54 through which wire 50 extends is cemented to the top disc 54 to retain end portion 52 of the wire in recess 53. Also, wire 50 is soldered to metal disc 54a at 55. The foregoing coupling means insures a substantially 100% effective coupling between diaphragm 15 and coil 39 so far as the fundamental vibrations of diaphragm 15 are concerned, in which the center of the diaphragm moves in the direction of the axis of the wire. At the same time the wire is inefficient in transmitting diaphragm vibrations of other frequencies in which the center of the diaphragm oscillates about axes in the plane of the diaphragm. The double support for the coil including the cone and spider further desensitizes the system to such harmonic modes of vibration of the diaphragm. Three factors thus combine to render the microphone selectively responsive to the expected foghorn signal:

- (a) Tuned diaphragm
- (b) Wire coupling
- (c) Dual coil support

Likewise, the strong brass diaphragm, wire, and dual coil support provide an exceptionally rugged construction.

Beyond flange 35 frame 30 extends axially a short distance at 60 and then inward radially at flange 61 which ends in an aperture 62 closely surrounding coil 39. A V-shaped yoke 63 of magnetic material having in one arm thereof an aperture 64 concentric with aperture 62 is spot welded to flange 61. A cup 65 of magnetic material is secured to other arm of the yoke. Disposed with cup 65 is a cylindrical permanent bar magnet 66 extending inside coil 31 flush with the apertured arm of the yoke. The permanent magnet cup, and yoke and the annular air gap between the end of the permanent magnet and the aperture in the yoke form a magnetic circuit. There is just sufficient clearance between the coil and the permanent magnet core inside it and the apertured portion of the yoke outside it to allow the coil to move freely in the magnetic field, the air gap to generate electric currents in response to movements of the diaphragm in the direction of the coil axis.

The ends 70, 71 of the coil are connected in the spider disc 36 to the ends of flexible wires 72, 73, which in turn are connected in cone 34 to flexible wires 74, 75, which are connected in the frame 30 to wires 76, 77 leading to impedance matching audio frequency transformer 78 mounted on the yoke 63. An insulated cable 79 extends from transformer 78 through a rubber

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grommet 80 or other watertight sealing means around aperture 81 in the bottom 11 of the cup shaped housing of the microphone.

The air chamber formed by the cup shaped housing serves the dual purpose of providing protection for the principal parts of the transducer against the weather and mechanical blows and at the same time providing sufficient air volume to prevent substantial damping of the diaphragm, this latter factor being especially important where the diaphragm is expected to respond strongly to sounds of low frequency.

The overall construction of the apparatus is particularly well adapted to inexpensive manufacture and easy maintenance. The wire 50 extends through the diaphragm 15 to the exterior of the microphone and is soldered thereon the outside so that in assembling or disassembling the microphone it is only necessary to free this soldered connection to enable the diaphragm to be assembled with or disassembled from the remainder of the microphone. On the other hand, the diaphragm and transducer can be handled as a unit if desired since by unscrewing screws 18 the entire internal assembly can be lifted along with ring 13.

While a preferred embodiment of the invention has been shown and described many modifications thereof can be made by one skilled in the art without departing from the spirit of the invention, and it is desired to protect by Letters Patent all forms of the invention falling within the scope of the following claims.

I claim:

1. An electroacoustic transducer comprising a cup shaped housing, an annular rib, means supporting said rib at the mouth of the housing, a diaphragm supported by said rib and having its outer periphery extending radially beyond said rib, means securing the periphery of said diaphragm to said housing, the last said means being adjustable to tune said diaphragm to a desired frequency, means mounted in said housing and including relatively movable portions for generating electricity in response to motion of one of said portions relative to the other of said portions, and a wire connecting one of said portions of the last said means to the center of said diaphragm.

2. An electroacoustic transducer comprising a cup shaped housing, an annular rib, means supporting said

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rib at the mouth of the housing, a diaphragm supported by said rib and having its outer periphery extending radially beyond said rib, means securing the periphery of said diaphragm to said housing, the last said means being adjustable to tune said diaphragm to a desired frequency, magnetic circuit means in said housing having an annular air gap and producing a magnetic field across said annular air gap, an electric coil, means supporting said coil concentrically in said air gap for oscillatory axial movement therein while restraining said coil against transverse motion therein, said supporting means comprising a first flexible peripherally supported disc and a second smaller disc concentric therewith connected at its periphery with a flexible cone, said cone being supported at its end opposite said disc, said discs being centrally connected to each other and supporting one end of said coil, and a wire connecting said supporting means to said diaphragm.

3. An electroacoustic transducer comprising a hollow cylindrical housing of rust resisting metal, a closure for one end of said housing, said closure being made of rust resisting metal, a flexible diaphragm of rust resisting metal closing the other end of said housing, a metal frame disposed inside of said housing and secured to said housing, said frame having a central opening therethrough concentric with said housing, a magnetic yoke secured to said frame, said yoke having an aperture therein concentric with said opening, a permanent bar magnet having one end magnetically connected to said yoke and its other end disposed in said aperture forming an annular air gap, a flexible disc secured to said frame over said opening, an electric coil carried by said disc extending into said air gap for axial movement therein, and a wire connecting said disc and the center of said diaphragm, said housing and end closure being watertight to provide a weather resisting rugged protective means surrounding the other above enumerated portions of the transducer.

References Cited in the file of this patent

UNITED STATES PATENTS

1,862,552 Schlenker ----- June 14, 1932

FOREIGN PATENTS

442,485 Italy ----- Nov. 23, 1948