Dec. 27, 1955 J. MILLEN 2,728,901

FATHOMETER TRANSDUCER UNIT

Filed Nov. 12, 1952

Fig. 1.

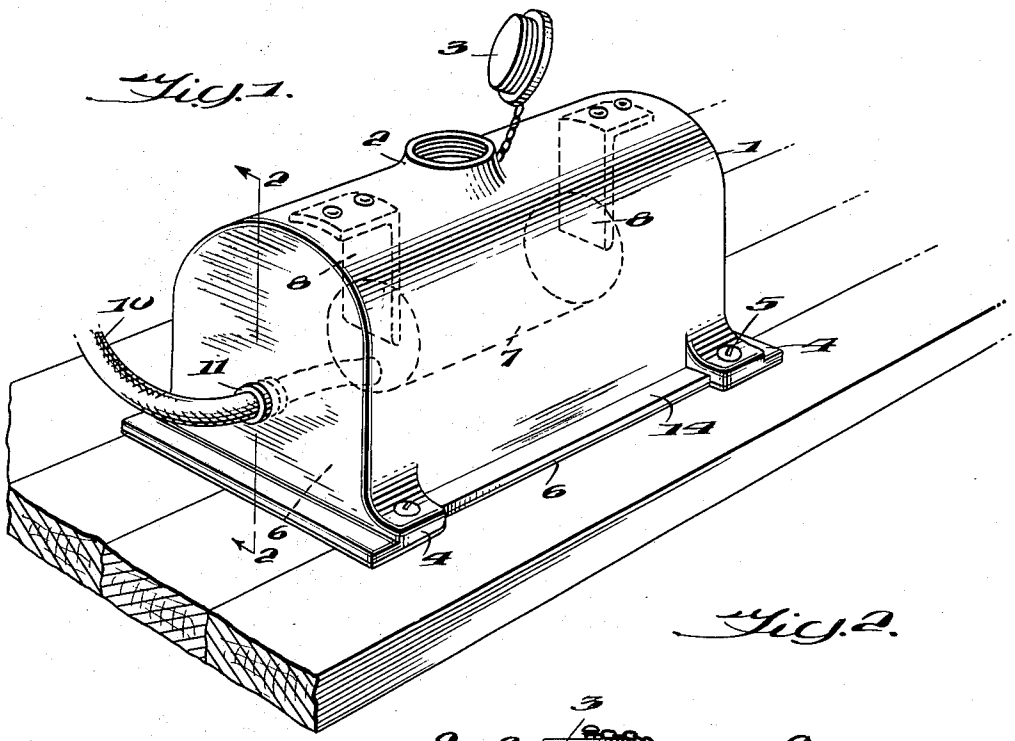
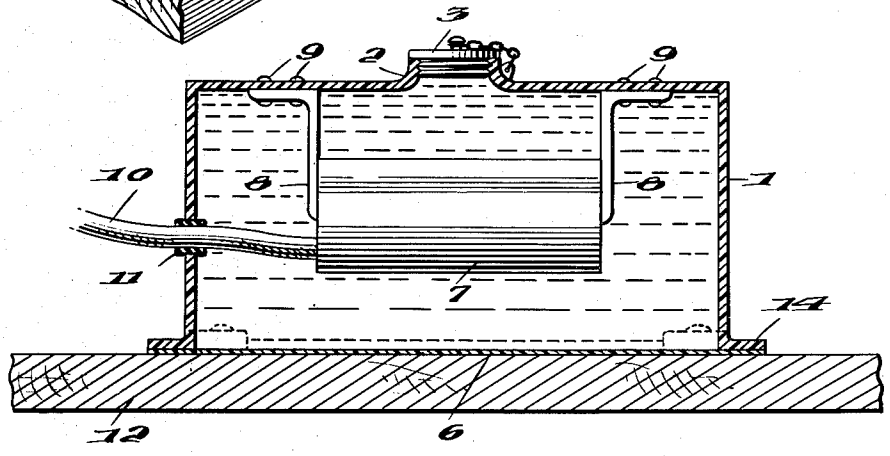


Fig. 2.



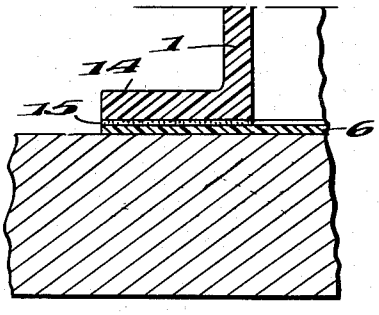


Fig. 3.

INVENTOR
JAMES MILLEN,

BY Parry & Miller

ATTORNEYS

United States Patent Office 2,728,901 Patented Dec. 27, 1955

2,728,901

FATHOMETER TRANSDUCER UNIT

James Millen, Malden, Mass.

Application November 12, 1952, Serial No. 319,809

2 Claims. (Cl. 340—5)

This invention relates to a method and means of facilitating the installation of fathometer transducers in the hulls of small vessels.

The transducer of the fathometer which may be a piezoelectric transmitter-receiver element, has customarily been mounted on the external surface of the hull of a vessel with the leads running through water-tight glands provided in the hull. Such an installation, of course, involves dry-docking of the vessel with attendant expense and inconvenience. It was subsequently found that reasonably satisfactory performance of the transducer can be obtained in wood hull vessels with said unit mounted inside the hull completely submerged in the bilge water, where the thickness of the hull planking is not much in excess of one inch. With no air space between the transmitter-receiver unit and the water-soaked hull planking, the loss of energy transmitted to the outside water will be reduced to a minimum. Where there is insufficient bilge water to permit complete submersion of the transducer, the practice is to construct a well inside the hull of the vessel to receive the unit. While this eliminates the necessity of drydocking, it is nevertheless costly and inconvenient, requiring the services of a ship's carpenter and tying up of the vessel.

It is an object of this invention to facilitate the installation of the transducer of a fathometer on small wood planked vessels such as yachts, fishing boats and the like, whereby the installation may be accomplished without tying up the vessel, without altering the hull, and without having to employ the services of a craftsman.

Furthermore, it is an object of the invention to provide a self-contained transmitter-receiver unit containing the transducer which is readily attached to the inside of the planking on the hull of a small vessel.

Another object of the invention is to provide a method of installing the transducer that may be practiced without having resort to any specialized equipment or to the services of a craftsman.

The invention is illustrated in a preferred embodiment in the drawings, wherein—

Fig. 1 shows a perspective of the self-contained transmitter-receiver unit for a fathometer;

Fig. 2 is a longitudinal sectional view of such unit taken on the line 2—2 of Fig. 1; and

Fig. 3 illustrates the mode of attaching the plastic diaphragm to the housing.

The transmitter-receiver unit of this invention, containing the transducer which may be of the piezoelectric type, comprises an open bottom outer housing 1, provided at the top with a suitably formed threaded opening 2 and a screw cap 3 to seal the opening. Located at each corner of the housing, and integral therewith, is an attaching lug 4 with a screw-receiving bore for a purpose to be described. The housing is most conveniently molded or cast as a single piece with the screw cap being attached thereafter. The housing may be made from a plastic material that is adapted to be molded or cast. Such materials include plastics of the acrylate, methacrylate,

phenol-formaldehyde and polyvinyl chloride groups which additionally possess substantial physical strength.

The side walls of the housing 1 are each integrally formed with a laterally extending flange 14 on the outside thereof. The undersurface of the flanges and the bottom ends of the side walls define a substantially planar surface. A thin plastic diaphragm 6 is attached to the underside of the housing 1 in the aforementioned plane, thereby closing the housing at its underside. As will be apparent, the diaphragm 6 must make a waterproof seal with the side walls and flanges on the housing. This may be accomplished as shown, in Fig. 3, by attaching the diaphragm to the housing 1 with cement 15 that makes a waterproof joint.

Plastic cements are most satisfactory for securing the diaphragm to the housing, the cement being made especially for the particular plastics employed for the housing and the diaphragm. For example, with a molded styrene housing a toluol base cement may be employed. There are proper cements available for each of the well known plastic materials which result in practically a weld of the material and thus form extremely satisfactory watertight joints.

The diaphragm 6 is made from a thin plastic sheet material of film thickness that is very flexible and readily conforms to an adjacent surface upon being pressed thereagainst. For example, the diaphragm may be cut from a polyethylene sheet that measures .002" to .010" in thickness. It is desirable that the diaphragm have ultrasonic wave transmission characteristics very closely approximating those of sea water, but this is not absolutely necessary, the diaphragm being so thin that its transmission characteristics are of little relative importance. An alternative arrangement of the diaphragm and the housing is to cement the diaphragm to the inside wall of the housing. In this embodiment the diaphragm is made large enough so that it may be extended upwardly on the inside walls of the housing and cemented at the top. This construction is especially advantageous in that the unit will be water-tight, irrespective of whether there is produced a water-tight joint between the diaphragm and the housing. In addition to the polyethylene sheet mentioned above, other plastics in the polystyrene, methyl methacrylate, vinyl chloride acetate resins and cellulose acetate butyrate groups and certain of the polyesters may be satisfactorily used for the diaphragm.

The transducer 7, which is illustrated as being of the piezoelectric transmitter-receiver type, is suspended in the interior of the housing 1 by brackets 8 depending from the top thereof. The brackets may be secured to the housing by rivets 9 or the like. Cable 10 carries the leads from the element 7 to conventional recording means. An opening is provided in the side of the housing to admit the cable 10, the opening being made watertight by a gland 11.

In practice the housing 1 is attached to the planks 12 inside of the vessel by wood screws 5 passing through the bores of lugs 4, bringing the diaphragm into intimate contact with the planking of the vessel. The housing is filled with either sea or fresh water through opening 2 and the cap 3 is screwed shut to seal the unit. Thus the piezoelectric transmitter-receiver element is completely submerged in the water, and the weight of the water bearing on the very thin flexible diaphragm 6 has the effect of pressing said diaphragm against the planking of the vessel and insuring the maintenance of the requisite surface-to-surface contact between the diaphragm and the planking.

The housing may alternatively be filled with castor oil or the like, the advantage of this being to eliminate the possibility of corrosion of the transducer 7 and the other parts within the housing 1.

In operation the transducer 7 produces ultra-sonic waves which travel from the vessel through the water and back to the vessel. Uninterrupted transmission of the signal is accomplished in the transducer unit of this invention by the provision of a path for the signal that is of substantially the same impedance as the sea water. This path comprises the water or other fluid within the housing in which the transducer is immersed, and the very thin flexible plastic diaphragm 6, the latter having transmission characteristics closely approximating that of water. Neither does the planking of the vessel interfere with the transmission of the signals, the wood possessing the inherent characteristic of consonance whereby it will respond to the signals.

The invention has been illustrated and described in a preferred embodiment thereof, but may be practiced as well in other modifications within the scope thereof. It is therefore not intended that the invention be limited except as set forth in the claims.

I claim:

1. In a device of the class described, a substantially rigid housing having a transducer element carried therein and secured to a wall thereof, said housing being closed at the bottom by a thin and flexible diaphragm sealingly engaging said housing so as to effect an integral leak-proof unit therewith, and wherein said device may be placed on a non-planar surface with said diaphragm deforming into substantially complete contiguity with said surface when said housing is water filled to effect downward deforming pressure thereon.

2. A device as set forth in claim 1, wherein said diaphragm comprises a polyethylene sheet .002" to .010" in thickness.

References Cited in the file of this patent

UNITED STATES PATENTS

1,002,903	Davison	Sept. 12, 1911
1,394,483	Fessenden	Oct. 18, 1921
1,883,433	Williams	Oct. 18, 1932
2,545,101	Meunier	Mar. 13, 1951

FOREIGN PATENTS

592,728	Great Britain	Sept. 26, 1947