

Aug. 27, 1940.

A. J. HUGHES

2,212,604

APPARATUS FOR DEPTH MEASUREMENT BY ECHO RECEPTION METHODS

Filed Nov. 12, 1937

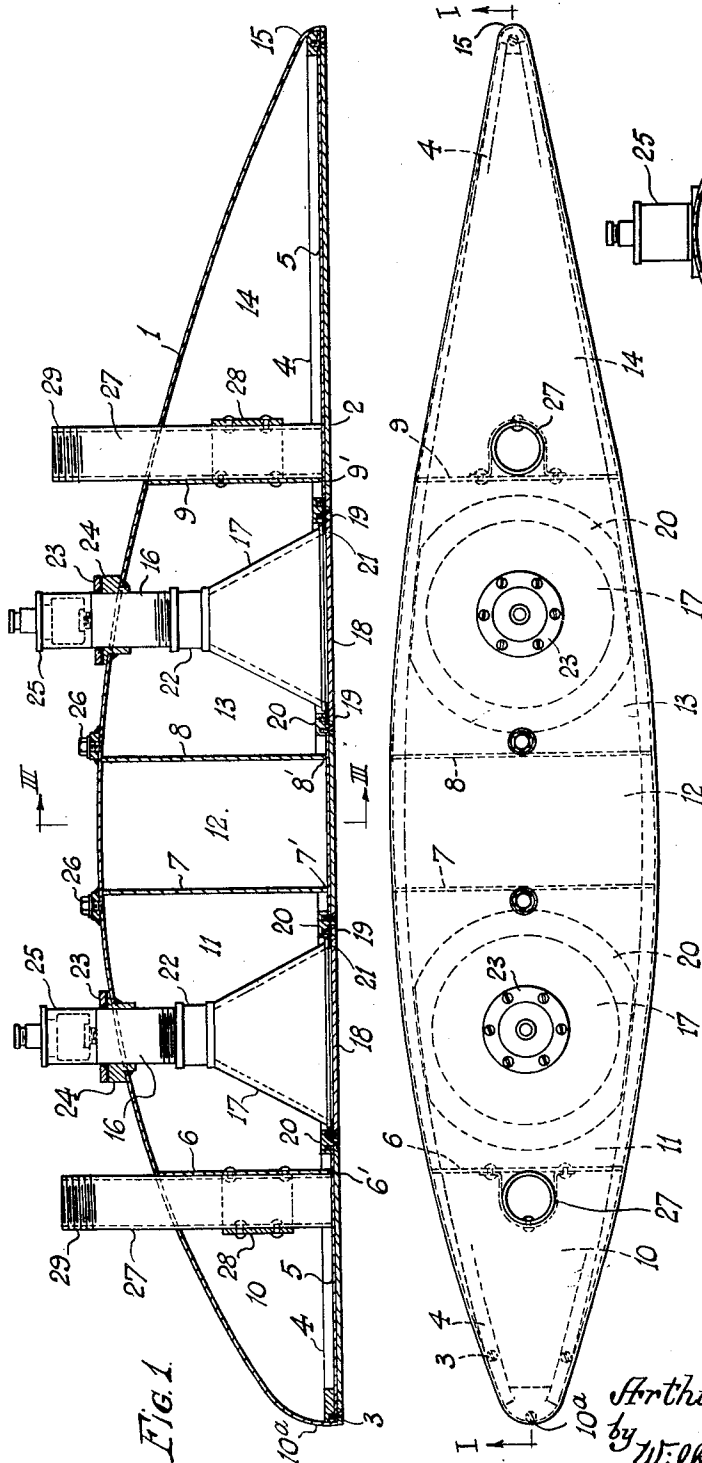


FIG. 1.

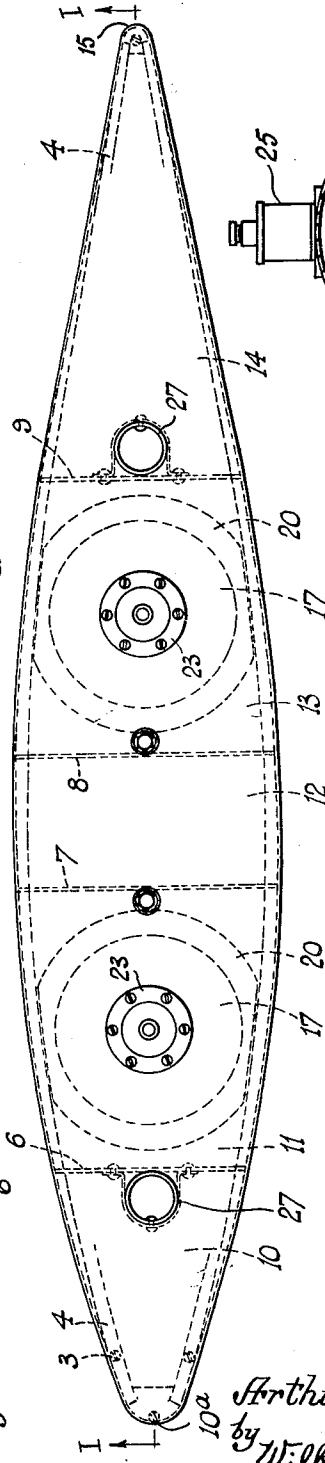


FIG. 2.

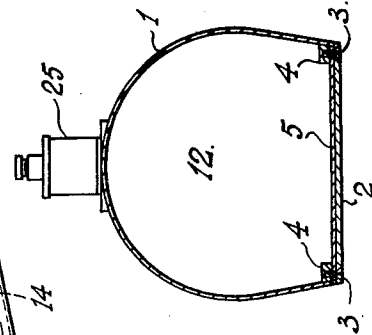


FIG. 3.

T6802

Inventor
 Arthur J. Hughes
 by Wilkinson & Mawhinney
 Attorneys.

Patented Aug. 27, 1940

2,212,604

UNITED STATES PATENT OFFICE

2,212,604

APPARATUS FOR DEPTH MEASUREMENT
BY ECHO RECEPTION METHODS

Arthur Joseph Hughes, Chigwell Row, England,
assignor of one-half to Henry Hughes & Son
Limited, London, England, a corporation of
Great Britain

Application November 12, 1937, Serial No. 174,273
In Great Britain December 3, 1936

5 Claims. (Cl. 181—0.5)

This invention relates to apparatus for depth measurement by echo reception methods and particularly to echo sounding apparatus as used by ships for taking soundings of the depth of water beneath the ship. Such apparatus, as is well known, generally includes a pair of electrically operated oscillators of which one is the sound transmitter and the other picks up the received echo, although a single oscillator member which is used alternately as the transmitter and receiver may be employed. The transmitter and receiver or the combined transmitter-receiver are generally attached to the inside of the skin of a ship or located in tanks attached to the inner surface of the ship's plating, but in some cases it is necessary for the oscillator or oscillators to be carried out-board as soundings may be required in situations in which it is not possible to get the whole hull of the boat. Also, it has been found that with the oscillators placed in-board in the bottom of a motor boat, as is required on certain occasions, the soundings are liable to be blanketed by aeration set up when a certain speed is reached.

The present invention consists in a unit adapted to be carried outboard from a ship and comprising transmitting and receiving members contained in a stream-lined casing. This casing is divided into compartments for the oscillators and preferably contains, also, an air-tight compartment which acts as a screen between the oscillator compartments, and other airtight compartments acting as buoyancy chambers.

Further features of the invention will be apparent from the accompanying drawing which illustrates a unit in which separate transmitting and receiving members are located in a stream-lined casing for outboard work.

In the drawing:

Fig. 1 is a part-sectional elevation, the section being taken along line I—I of Fig. 2,

Fig. 2 is a plan, and

Fig. 3 is a transverse section on line III—III of Fig. 1.

In the arrangement shown there is an elongated hollow casing 1 having throughout the greater part of its length a cross-section similar to that shown in Fig. 3 but gradually decreasing in size from its middle towards each end and ultimately tapering down to rounded ends at the front and rear so that it is of stream-lined form. The flat bottom of the casing is formed by a flat plate 2 secured by screws 3 or the like to a frame or rib 4 running round the bottom edge of the casing or hood 1 and secured thereto by welding

or the like. A sheet 5 of packing material is interposed between the plate 2 and the frame 4 and this sheet 5 extends over the whole inner surface of the plate 2 so as to form a water-tight and air-tight joint round the edge of the plate 2 and at other points as hereinafter mentioned.

The casing is divided internally by transverse plates or bulkheads 6, 7, 8 and 9 into five compartments along its length. The plates 6, 7, 8 and 9 extend completely across the interior of the casing and are welded or otherwise suitably secured to the rounded wall of the casing 1 while along their bottom edges 6', 7', 8', 9', the packing sheet 5 is pressed against them to form tight joints and seal off the compartments from one another. The first compartment 10 extending from the nose 10a of the casing to the bulkhead 6 is a buoyancy chamber and contains air; the second compartment 11 between the plate 6 and the plate 7 contains a transmitting oscillator member and is filled with fresh water; the third compartment 12 between the plate 7 and the plate 8 contains air; the fourth compartment 13 between plate 8 and plate 9 contains a receiving oscillator member and is filled with fresh water; while the last compartment 14 extending from the plate 9 to the tail 15 of the casing is another buoyancy chamber and contains air.

The compartment 12 between the two compartments 11 and 13 containing the oscillators acts as an insulating chamber to screen the vibrations of the transmitting oscillator from the receiving oscillator and allows the transmitter and receiver to be brought close together to enable accurate depth readings to be obtained in shallow water.

The transmitting and receiving members are electro-mechanical oscillators preferably operating on the magnetostriction principle and are indicated by reference numeral 16, and have conical reflectors 17 which are directed downwardly and have their open ends resting on the bottom plate 2 of the casing. At the positions of the reflectors two holes are cut in the bottom plate of the casing to allow access to the oscillators and these holes are covered by circular plates 18 which are clamped into position by screws 19 screwing into base rings 20, and the joints between the reflectors 17 and the plates 18 are made water-tight by means of joint rings 21. The circular plates 18 are recessed into the bottom of the casing so that they are flush with the outside face. The oscillators 16 are attached by screwed sleeves 22 to the upper ends of the conical reflectors 17 and are held in position by clamping rings 23 secured to sockets 24 so as to

form water-tight joints where the oscillators pass through the casing. Each oscillator unit has at its upper end a junction box 25 by which the necessary electrical connections are made with the oscillator windings. The compartments containing the oscillators are filled with fresh water through filling plugs 26.

The casing is supported by means of columns 27 which extend into the compartments 10 and 14 and are attached to the plates 6 and 9 respectively by means of clamps 28 riveted to the columns 26 and to the plates 6 and 9. The upper ends of these columns 27 have screw threads 29 to connect with external supports on the boat on which the apparatus is carried, while provision may also be made for guy lines extending fore and aft to take the strain off the supporting columns. The external supports to which the columns are attached may be secured to hinged deck plates so as to enable the oscillators and their casing to be readily taken out of the water in any emergency.

By building the transmitting and receiving members as a separate unit as above described it is possible to ensure that the oscillators are located in the most suitable position, relative to the ship or boat on which they are carried, according to the circumstances. For instance, in some aspects of survey work, and for boats navigating rivers the most suitable position for the oscillators is one in which they are carried right forward over the stem off a boom, as this enables the oscillators to be put into positions where the boat could not follow, while for navigation purposes it permits soundings to be taken ahead of the boat. In other cases where rolling or pitching may be excessive it is possible to arrange that these movements are not communicated to the oscillator unit which can therefore be maintained at a substantially constant depth below the surface. Also it is possible to position the oscillators so as to avoid the blanketing effect set up by aeration which sometimes occurs when the oscillators are placed inboard in the bottom of a motor boat or launch. The stream-lined casing provides proper protection for the oscillator members while reducing the frictional resistance due to their motion through the water.

Obviously, the separate transmitting and receiving members may, in suitable cases, be replaced by a single oscillator member which is used alternately as the transmitter and receiver.

What I claim as my invention and desire to secure by Letters Patent is:

1. A casing for containing a sound generator and receiver, comprising a hood open at the bottom and curved transversely and tapering longitudinally, transverse partitions secured across the inside of said hood, a flat plate secured over the open bottom of the hood to close it, and sealing means interposed between the bottom edge of the hood and said plate.

2. A casing for containing a sound generator and receiver comprising a hood tapering longitudinally towards each end, an opening at the bottom of said hood, transverse partitions secured

across the inside of said hood, a flat plate secured over the opening at the bottom of said hood to close it, and supporting members secured to transverse partitions and projecting through said hood.

3. A casing, for containing a sound generator and receiver, comprising a hood of streamlined form, and closed at the bottom by a flat plate, transverse partitions dividing the interior of the casing into compartments, sound directing means in one of said compartments for directing sound through said flat bottom plate, means for mounting an oscillation generator in association with said sound directing means, sound directing means in another of said compartments to collect sound received through said flat plate, and means for mounting a member responsive to oscillations in association with the second mentioned sound directing means.

4. A casing, for containing a sound generator and receiver, comprising a hood curved transversely and tapered longitudinally, a flat plate closing the bottom of said hood, partition plates secured transversely across the inside of the casing dividing the interior into a plurality of sealed compartments, sound directing means within one of said compartments and consisting of a conical reflector with its large end secured to said bottom plate, means for mounting an oscillation generator at the smaller end of said reflector, sound directing means within another of said compartments and consisting of a conical reflector with its large end secured to said bottom plate, means for mounting a member responsive to oscillations at the smaller end of the second mentioned reflector, means for filling the compartments containing said reflectors with liquid, an air-filled compartment between said compartments containing sound directing means, and supporting means projecting at the curved surface of the casing.

5. A casing, for containing a sound generator and receiver, comprising a hood curved transversely and tapered longitudinally, a flat plate closing the bottom of said hood, partition plates secured transversely across the inside of the casing dividing the interior into a plurality of sealed compartments, sound directing means within one of said compartments and consisting of a conical reflector with its large end secured to said bottom plate, means for mounting an oscillation generator at the smaller end of said reflector, sound directing means within another of said compartments and consisting of a conical reflector with its large end secured to said bottom plate, means for mounting a member responsive to oscillations at the smaller end of second-mentioned reflector, means for filling the compartments containing said reflectors with liquid, means for providing an air filled compartment located between said compartments containing sound-directing means, means for providing buoyancy chambers at each end of the casing, and supporting members in said buoyancy chambers and secured to transverse partitions and projecting through said hood.

ARTHUR JOSEPH HUGHES.