March 10, 1936. R. L. WILLIAMS 2,033,165

OSCILLATOR MOUNTING

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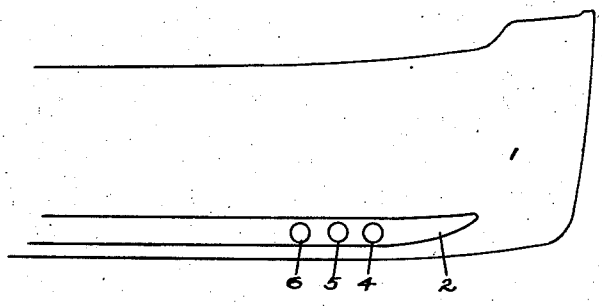



FIG 1

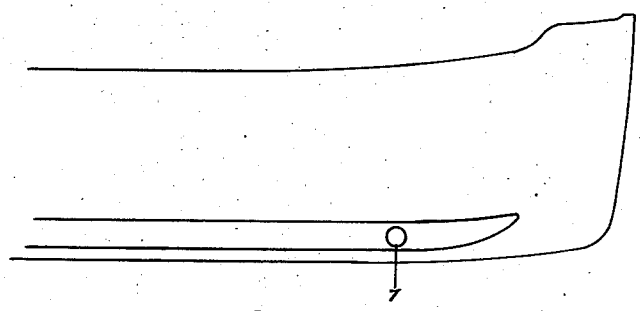



FIG 2

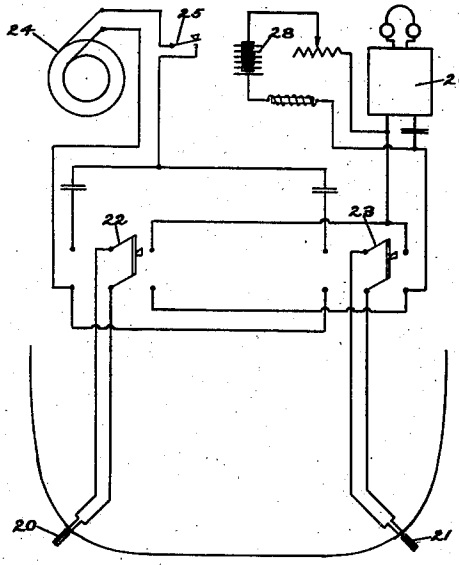



FIG 4

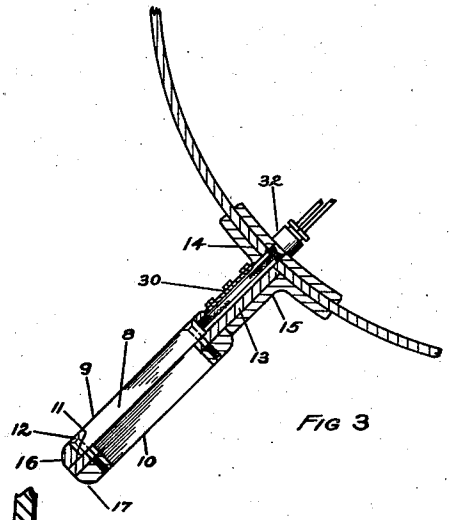



FIG 3

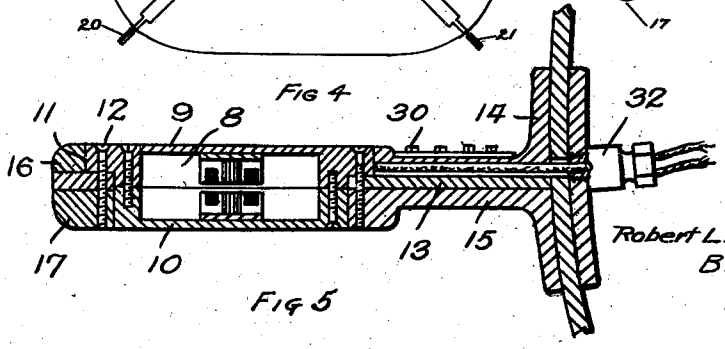



FIG 5

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## OSCILLATOR MOUNTING

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5 Claims. (Cl. 177—386)

The present invention relates to submarine signaling apparatus, and more particularly to the means and method of mounting such apparatus on a vessel, especially where sending and receiving apparatus may be employed simultaneously.

In the present invention, the apparatus is so mounted on the vessel and associated therewith that it may be used for determining depths as well as for general signaling.

In the prior art, the apparatus mounted upon the vessel could be used only for general signaling and not for both general signaling and for depth sounding, or for general signaling and directive reception.

When oscillators are installed on the side of the vessel, there is a tendency for the vessel to screen the sound from proceeding in certain directions, and likewise with receivers there is a tendency for the ship to interfere with the reception of sound coming from certain directions with reference to the boat. If the oscillators are installed on the bottom of the vessel, there seems to be great difficulty in forcing the sound out horizontally, and also when receiving, if the receivers are at the bottom of the ship it is practically impossible to receive sound with any reliability other than sound reflected from the sea bottom.

At present it is becoming essential to provide means which will function not only for general signaling and reception but also for signaling directively and for depth sounding purposes.

In the system of the present application, I provide sound receiving and sending apparatus mounted in the bilge keel.

In my Patent 1,677,945, there is shown an elongated oscillator mounted on the bilge keel, but such an installation, while suitable in many ways and for many things, is not able to put out as much power or so much power uniformly distributed as the system disclosed in the present invention. Whereas the oscillator in the Patent 1,677,945 also has a particular directive quality, the oscillator used in the present invention has practically a uniform radiation in all directions, and the directive feature is obtained by a combination of oscillators mounted in the bilge keel. Then again, while the oscillator is not directive, it can be used for soundings as well as for general signaling, and by the use of a number in conjunction, can be used for sounding and directive signaling.

The further features and details of the invention, as well as the advantages thereof, will be learned from the description given below in connection with the figures of the drawing, in which:

Figure 1 shows the position of a plurality of sound receiving or sending devices upon the vessel;

Figure 2 shows the mounting of an individual sender or receiver;

Figure 3 shows the details of mounting;

Figure 4 shows the circuit employed in the system; and

Figure 5 shows an enlarged view of Figure 3 showing the oscillator in section.

In Figure 1, 1 represents a vessel provided with a bilge keel 2, in which are mounted receiving and sending devices 4, 5 and 6. These may be mounted on both sides of the vessel as shown in Figure 4. The elements 4, 5 and 6 may be oscillators capable of use for both sending and receiving, and are so shown in Figure 4.

Figure 2 shows a single oscillator 7 so mounted. In Figure 1, the phase of the oscillators may be so controlled that a directive beam may be emitted by having each oscillator run by a separate generator driven on one and the same shaft and adapted to be shifted in position with respect to each other.

In Figure 3 is shown the method of installing the device in the bilge keel. The oscillator 8 is a double diaphragm device having diaphragms 9 and 10 on opposite halves thereof. The oscillator used is of the flat type and is provided on one side with a flange 11. The bilge keel 2 is provided with an inner plate 13, which is held fast to the boat by the angles 14 and 15 riveted thereto on either side thereof. A hole is cut in the plate 13 the size of the smaller end of the oscillator and the oscillator is set therein. A ring 16 on the flanged side of the oscillator, and another ring 17 on the opposite side, are used to provide a streamline body. The oscillator is held fast to the plate by bolts 12 which pass through the oscillator flange and screw into the ring 17. The boss or ring 16 is held by rivets or bolts or is welded to the plate 13. The angle 14 is cut at 30 to allow the cable 31 from the oscillator to pass through to the interior of the boat through the cable head 32, which is watertight.

In prior methods of mounting, only one face of the oscillator has been exposed. Employing such a method in using the bilge keel would mean that the sound could not be efficiently radiated in all directions. In fact, if radiation was from the bottom side, there would be a directive tendency downward and from the top side there would be a slight screening downward. By radiating from

top and bottom, practically a uniform radiation throughout a sphere with the oscillator as a center is obtained.

In Figure 4 is shown the circuit which I prefer to use in the present system, the oscillators 20 and 21, mounted in the bilge keel, may be operated as senders by throwing the switches 22 and 23 to the left in the figure. Both oscillators are then connected to the generator 24 through the key 25. By throwing the switches 22 and 23 to the right, the oscillators are connected for receiving to the amplifier 26 and the indicator or telephone 27. The battery 28 furnishes a polarizing current, if necessary. Both switches may be thrown in the same direction or one may be thrown to the right and the other to the left.

When employing the system for simultaneous receiving and sending, the oscillator, while radiating substantially in a sphere, as explained above, nevertheless is shielded when used as a receiver from direct reception of the sound from the other oscillator on the opposite bilge keel, because of the boat and the proximity of the receiver and sender. This shielding zone does not extend far from the boat, and in fact does not seriously prevent sending equally efficiently in all directions.

When used for receiving, either unit may be used alone or both together. In fact, by providing proper indicating means the receivers 20 and 21 could be used as a base for determining the direction of a source of sound.

Having now described my invention, I claim:

1. In combination, an oscillator having two sound producing diaphragms in opposite sides thereof and a boat having a bilge keel, said bilge keel being provided with a hole adapted to receive said oscillator, said oscillator having a flange on one side resting on said keel and means for bolting said oscillator flange to said keel.

2. In combination with a bilge keel, having a hole therein, a sound signaling means having opposed diaphragms, a flange provided on one diaphragm, a ring fitting around the opposite diaphragm, means for holding fast said flange and ring with said bilge keel, and a second ring provided about said flange the outer edges of said rings being curved to provide a stream line body with said bilge keel.

3. In combination with a vessel having a bilge keel with a hole cut therein, an oscillator of substantially the same shape and size as said hole and the same thickness as the keel, said oscillator having two opposed parallel diaphragms and flange extending outwardly from one diaphragm forming a shoulder for supporting the oscillator to the keel, means securing said flange to said keel, and means positioned about the periphery of both diaphragms and secured to said keel forming a stream-line effect with the keel.

4. In combination with a vessel having a bilge keel with a hole cut therein, an oscillator of substantially the same shape and size as said hole and the same thickness as the keel, said oscillator having two opposed parallel diaphragms and flange extending outwardly from one diaphragm forming a shoulder for supporting the oscillator to the keel, means securing said flange to said keel, means forming a ring about the oscillator positioned at the edge of each diaphragm and forming a stream-line surface with the keel and means supporting said ring to said keel.

5. In combination with a vessel having a bilge keel with a hole cut therein, an oscillator of substantially the same shape and size as said hole and the same thickness as the keel, said oscillator having two opposed parallel diaphragms and flange extending outwardly from one diaphragm forming a shoulder for supporting the oscillator to the keel, means securing said flange to said keel, means positioned about the periphery of both diaphragms and secured to said keel forming a stream-line effect with the keel, and means electrically connecting said oscillator from the inside of the vessel, including a cable and means retaining said cable to the surface of said keel.

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