Jan. 10, 1961 J. H. HAMMOND, JR 2,967,502

TORPEDO

Filed Oct. 13, 1958 2 Sheets-Sheet 1

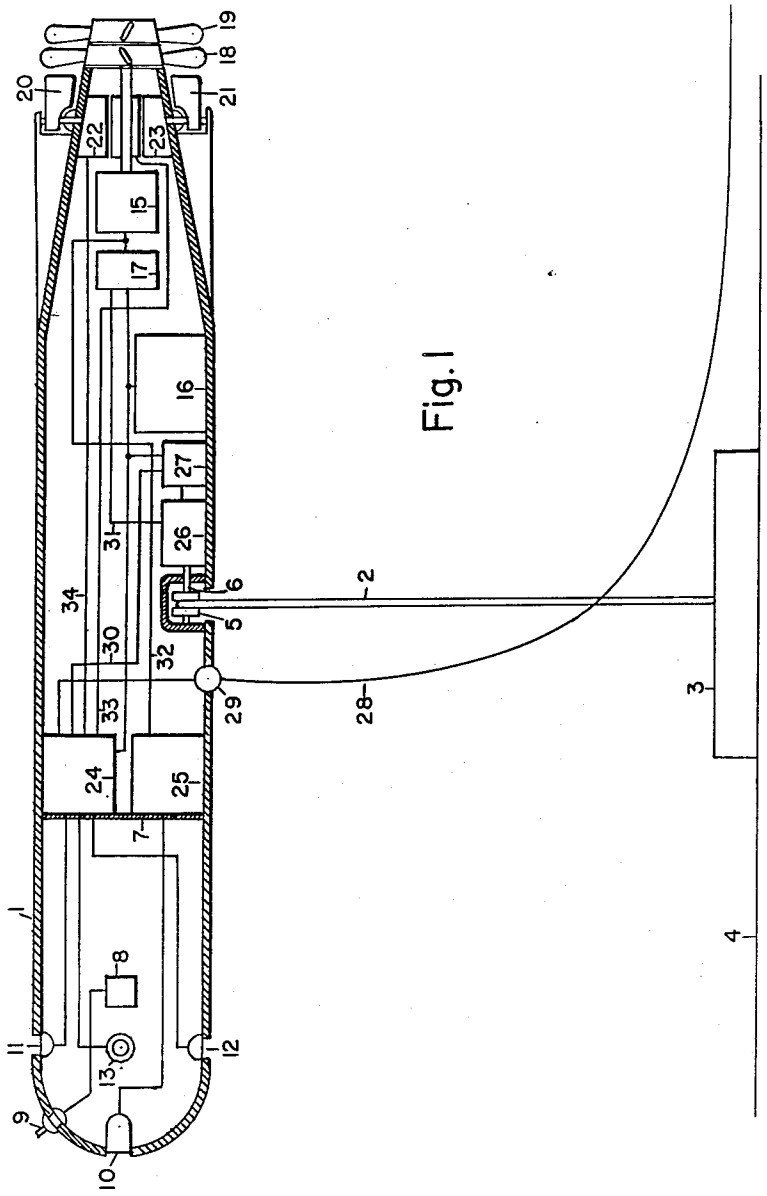

Fig. 1

INVENTOR
JOHN HAYS HAMMOND JR.

BY

ATTORNEY

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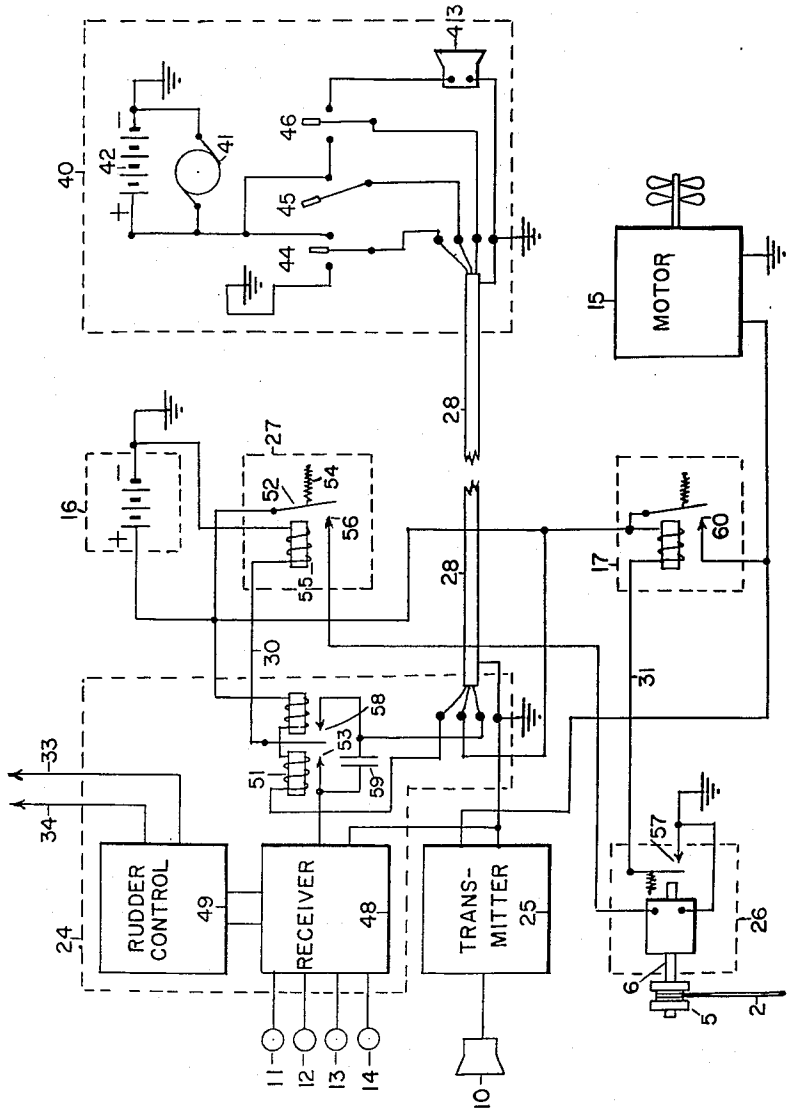

Fig. 2

INVENTOR
JOHN HAYS HAMMOND JR

BY

ATTORNEY

United States Patent Office

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John Hays Hammond, Jr., Hammond Research Corporation, Gloucester, Mass.

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1 Claim. (Cl. 114—20)

This invention relates to torpedoes and more particular to a torpedo which is anchored and is automatically released to become a target seeking torpedo when a submarine or ship approaches.

The object of the invention is to provide a torpedo which can be anchored near the bottom of the sea in a region to be mined and which is released from its anchor by the approach of an enemy submarine or ship and after release seeks the target automatically by acoustic control.

A further object of the invention is to provide a cable connection from a shore station to the torpedo through which the sounds received by the torpedo's ears can be heard at the shore station and the release of the torpedo may be controlled from shore.

The invention also consists in certain new and original features of construction and combinations of parts hereinafter set forth and claimed.

The nature of the invention, as to its objects and advantages, the mode of its operation and the manner of its organization, may be better understood by referring to the following description, taken in connection with the accompanying drawings forming a part thereof, in which—

Fig. 1 is a schematic diagram of the torpedo showing the essential elements and their connections.

Fig. 2 shows a more detailed schematic diagram of the circuits for shore control.

Like reference characters denote like parts in the several figures of the drawing.

In the following description parts will be identified by specific names for convenience, but they are intended to be generic in their application to similar parts.

Referring to Fig. 1, the torpedo is encased in shell 1 which is anchored by cable 2 to a suitable anchor such as a heavy block 3 resting on or attached to the sea bottom 4. Cable 2 is attached to a ring 5, which is secured to the torpedo 1 by a rod 6 passing through ring 5. Means are provided, as will be explained later, for freeing the torpedo by withdrawing rod 6 from ring 5.

The forward compartment of the torpedo, bounded by shell 1 and partition 7, is filled with explosive which is detonated by detonator 8 when actuated by contact device 9. The forward compartment also contains a sound projector 10, and four listening ears 11, 12, 13, and 14. Ears 12 and 13 are mounted in a vertical plane, one on the top surface and the other on the bottom surface of shell 1. Ears 13 and 14 (not shown in Fig. 1) are similarly mounted on the shell in a horizontal plane.

The rear compartment of the torpedo contains a motor 15 powered from a battery in block 16 through a control switch in block 17. Motor 15 drives propellers 18 and 19 which rotate in opposite directions. Rudders 20 and 21 are oriented by suitable mechanism in blocks 22 and 23 to control the direction of motion of the torpedo in the horizontal plane. Similar rudders, not shown in Fig. 1, control the direction of motion of the torpedo in the vertical plane.

The rear compartment of the torpedo also contains a receiver 24 connected to ears 11, 12, 13, and 14; a transmitter 25 for generating pulses of high frequency sound waves which are sent out by projector 10; a mechanism in block 26 actuated by a switch in block 27 for withdrawing the retaining rod 6 from ring 5.

A cable 28 connects the receiver and control mechanism in block 24 to a shore station so long as the torpedo is anchored. When the torpedo is released from the anchor, cable 28 is disconnected at plug and socket connection 29.

While the torpedo remains anchored, sound waves from an approaching submarine or other vessel are received through ears 11, 12, 13, and 14. The impulses received are amplified in receiver 24, and if of a predetermined frequency or quality, act over line 30 to close a relay in box 27. The closing of the relay in box 27 starts a motor in box 26 which withdraws bar 6 from ring 5 thus freeing the torpedo from the anchor chain 2.

At a predetermined time during the withdrawal of rod 6 from ring 5, a circuit is closed through line 31 to block 17, where a relay is operated. This relay in block 17 closes a circuit from battery 16 to motor 15 resulting in the rotation of propellers 18 and 19.

The closing of the circuit in block 17 also sends current from battery 16 over line 32 to transmitter 25. Transmitter 25 starts sending from projector 10 a series of pulses of very high frequency sound waves. When these waves are reflected from a nearby object, such as a vessel, the echo waves are received by ears 11, 12, 13, and 14 and cause the torpedo to home on the vessel causing the echoes. This system of acoustic homing guidance has been fully described in U.S. Patent No. 1,892,431 and elsewhere. In order, however, to explain its operation in relation to the present invention the essential features of the homing system will be described here.

The echo waves received by the two ears 11 and 12 mounted on the torpedo in the vertical plane, are separately received and compared in receiver 24. If, say, the output of ear 11 is greater than that of ear 12, current is transmitted over line 33 to the control box of the horizontal rudders causing the rudders to deflect the head of the torpedo upward until the echos received by ears 11 and 12 are equal in magnitude.

The echoes received by ears 13 and 14 act similarly over line 34 to deflect rudders 20 and 21 until the torpedo heads in such a direction as to receive equal echos in the ears 13 and 14.

The torpedo, thus guided to home on the vessel or object causing the echoes, will explode when device 9 comes in contact with the vessel.

While the torpedo is anchored and its listening device is activated, power is drawn from battery 16. Unless this battery is recharged the effective life of the torpedo is limited. Also it may be desirable to deactivate the torpedo while friendly vessels are in the mine field. Furthermore, it may be desirable to shift control of the ultimate release of the torpedo from the torpedo to a shore station. To accomplish these ends, the torpedo is connected to a shore station by a cable 28 which is automatically unplugged from the torpedo when the torpedo is released from its anchor.

The control from the shore station is explained by reference to Fig. 2 showing the essential electrical connections. The equipment at the shore station is shown enclosed in block 40. All other equipment in Fig. 2 is in the torpedo. The shore station is connected to the torpedo by a three-conductor cable 28 with grounded sheath.

The shore station has a generator 41 and floating battery 42 or an equivalent source of direct-current power

of voltage somewhat greater than that of battery **16**. At the shore station there is a listening phone **43** and three control switches **44**, **45**, and **46**.

The torpedo block **24** contains, in addition to receiver **48**, rudder control circuits **49**, and two relays **51** and **52**. Relay **51** is a polarized relay and hence closes either contact according to the direction of flow of current through its magnet coil. The armature of relay **52** is normally held away from the magnetic core by spring **54**. When a current passes through coil **55** the contact **56** is closed. The wires through the cable **28** connect to corresponding points on the terminal boards at the two ends. While switch **45** is closed battery **16** in the torpedo is being charged from power source **41** and **42**. Charging of the battery does not alter the mode of operation in any other way.

When switch **44** is momentarily closed to the left current from battery **16** flows through the coil of relay **51** closing contact **53**. The torpedo is then self controlled. The signal of an approaching vessel passes from receiver **48**, through contact **53** to the coil **55** of relay **52**. Contact **56** is closed causing the anchor release mechanism in block **26** to operate. Contact **57** is mechanically closed causing contact **60** in block **17** to close and start the motor in block **15** and the transmitter in block **25** as previously described.

When switch **44** is momentarily closed to the right the larger voltage of battery **42** predominates over the voltage of battery **16** causing the current through the coil of relay **51** to flow in the opposite direction of the previous case and to close contact **58**. The torpedo can now be released or fired only by closing switch **46** to the left.

Closing switch **46** to the right permits the audio signal of approaching vessels received by ears **11**, **12**, **13**, and

14 to be transmitted through capacitor **59** to the ear phone **43**. The operator guided by sounds heard in ear phone **43** can then fire the torpedo by moving switch **46** from right to left.

Although only a few of the various forms in which this invention may be embodied have been shown herein, it is to be understood that the invention is not limited to any specific construction but may be embodied in various forms without departing from the spirit of the invention.

What is claimed is:

A torpedo having propelling means and guiding means and having a sound wave transmitter and echo wave receiving means adapted to actuate said guiding means for steering said torpedo toward the source of said echo waves, a fixed mooring means, releasable means for mooring said torpedo to said mooring means, a sound wave receiver on said torpedo, monitoring means located at a distant point, lines connecting said sound wave receiver on said torpedo to said monitoring means for monitoring at said distant point the sound received by said receiver, and means operable at said distant point to actuate said releasable means for releasing said torpedo from said mooring means, for starting said propelling means and for energizing said sound wave transmitter and said echo wave receiving means.

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