Dec. 15, 1942. C. J. MERRIAM 2,305,485

TORPEDO CONTROL

Filed Oct. 15, 1941

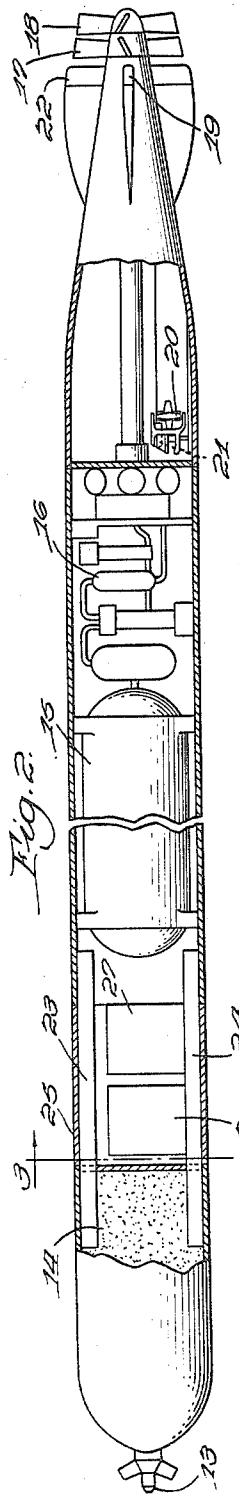


Fig. 2.

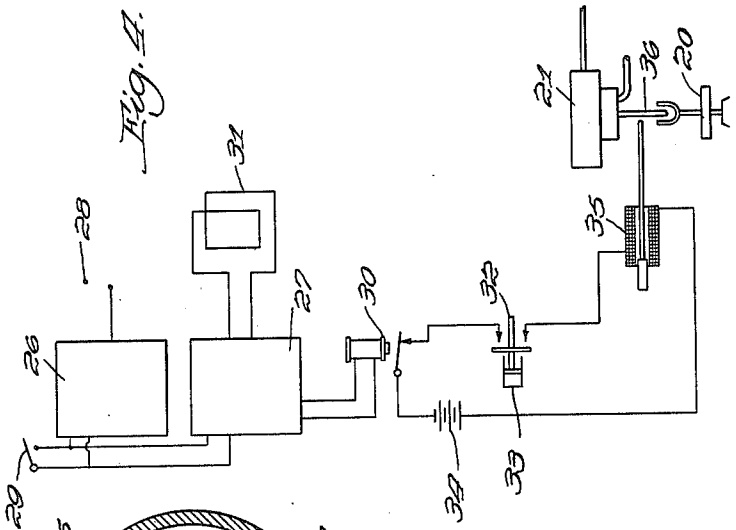


Fig. 4.

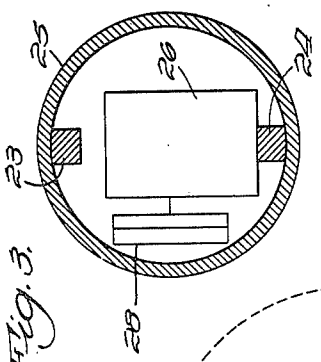


Fig. 3.

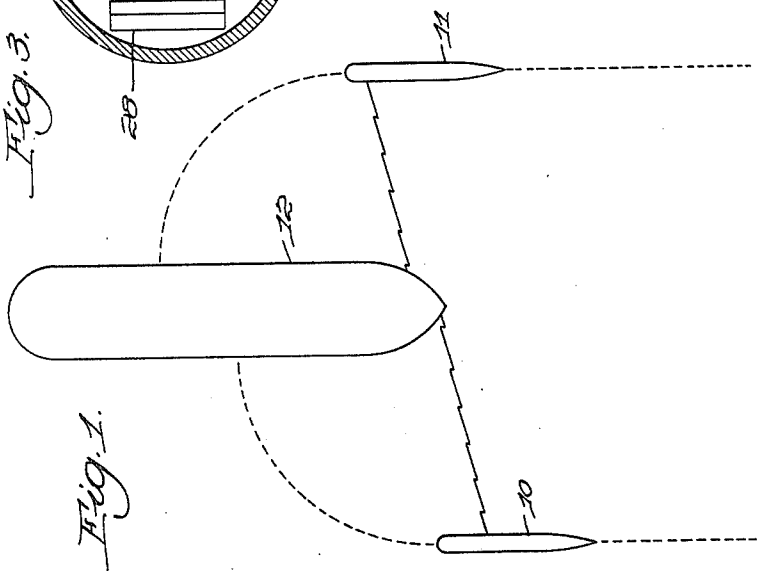


Fig. 1.

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TORPEDO CONTROL

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6 Claims. (Cl. 114—21)

This invention relates to a torpedo control, and more particularly to automatic means for causing a torpedo to strike a target which it would otherwise have missed.

One feature of this invention is that it provides a torpedo which is more effective than any heretofore in use; another feature of this invention is that a torpedo which would otherwise have missed a target is caused to automatically turn toward and strike that target; yet another feature of this invention is that the control mechanism may be added to conventional types of torpedoes; other features and advantages of this invention will be apparent from the following specification and the drawing, in which:

Figure 1 is a diagrammatic illustration of the way in which this invention operates; Figure 2 is a partial longitudinal sectional view of a torpedo embodying my invention; Figure 3 is a transverse sectional view along the line 3 of Figure 2; and Figure 4 is a diagrammatic illustration of part of the circuits and control mechanism.

A modern torpedo is provided, in addition to its driving apparatus, with control mechanism for maintaining it on a given compass course at a given depth. In one form of torpedo steering control is effected by a gyroscope through a steering motor operated by compressed air; and depth control is regulated through a device responding to water pressure and acting upon the horizontal elevator surfaces of the torpedo. By means of this control mechanism a torpedo started on a given course maintains that course to the end of its run.

Since torpedoes are frequently fired at a distance of several thousand yards from the moving ship which is the target, variations in the course of the ship can cause the torpedo to miss its mark, and ships aware of the approach of a torpedo generally turn sharply toward or away from the direction from which the torpedo is coming. This results in the torpedo passing harmlessly by the ship; and it is to obviate this difficulty that my invention is designed.

I contemplate discharging a pair of torpedoes approximately simultaneously on slightly diverging or parallel courses, so aimed that one torpedo would strike the ship if it continued on its course, and the other would pass behind it. If the ship then alters its course sharply to avoid the torpedo which would otherwise strike it, it passes between the two torpedoes, and I take advantage of this to cause the torpedoes to turn from their course toward each other as the ship passes between them, thus generally resulting in the torpedoes striking the ship from opposite sides. In order to effect this variation in the course of the torpedoes I provide each of them with impulse transmitting and receiving means and means operative upon the steering equipment, upon cessation of reception of impulses from the other torpedo, to turn the torpedo toward the point or direction from which it was receiving the impulses.

In the particular embodiment of my invention illustrated herewith torpedoes 10 and 11 are shown on courses which, if undisturbed, would cause them to both miss the ship 12, it being assumed that this ship has turned sharply at right angles from the course it was originally traveling. However, as soon as the ship passes between the torpedoes it interrupts impulses being sent from one to the other, and this interruption causes the torpedoes to turn toward the ship, as illustrated. It is preferable to fire one torpedo slightly ahead of the other so that the rearmost torpedo will be sure to strike even a fast moving ship even if the foremost torpedo should turn too late to strike it.

Referring now more particularly to Figures 2 and 3, a torpedo is shown as provided with the conventional firing pin 13 and explosive charge 14. More toward the center of the torpedo is the compressed air container 15, and behind this is the depth control gear, the fuel bottle 16, and the drive motor. In accordance with conventional practice, this motor burns liquid fuel and air to rotate the propellors 17 and 18 in opposite directions. Conventional depth control equipment, which will not be particularly described, controls the horizontal elevator surfaces 19 to maintain the torpedo at a desired depth, and a gyroscope 20 and associated steering motor 21 control the vertical rudders 22 to normally maintain the torpedo upon the desired straight course.

The explosive chamber is here shown as connected to the rear portion of the torpedo by a pair of beams 23 and 24, the portion 25 of the torpedo body adjacent these beams being of nonmagnetic material, as a plastic. Within the chamber provided by this nonmagnetic body portion are housed a radio transmitter 26 and a receiver 27. As may be better seen in Figures 3 and 4, the transmitter 26 is connected to a beam aerial 28 adapted to propagate the radio waves in a relatively narrow beam directed toward the other torpedo. It will be understood that, in carrying out my invention, two different types of

torpedoes would have to be provided, which may be termed right and left hand torpedoes. That is, the torpedo on the right (referring to Figure 1) would incorporate transmitting apparatus projecting a beam to the left, and would be so arranged that any interruption of the impulses which it was intended to receive would cause it to turn to the left; whereas the lefthand torpedo would be arranged to transmit its beam to the right, and to turn to the right.

Referring now more particularly to Figure 4, it will be seen that means is provided for energizing the transmitter and receiver before the torpedo is started on its course, this being shown as a manual switch **29** adapted to be thrown to on position when the torpedoes are loaded into the tubes. The receiver **27** has its output connected to and energizing the coil of the relay **30**, so that when the aerial **31** is receiving impulses from the other torpedo the relay **30** will be energized to maintain its switch contacts open. It will be understood that the transmitter and receiver in each torpedo are tuned to different frequencies, the receiver of one torpedo being tuned to the frequency of the transmitter of the other torpedo, so that the impulses which originate in the same torpedo have no effect.

Inasmuch as the metal torpedo tubes interfere with reception of impulses from the other torpedo, it is desirable to prevent operation of my apparatus until the torpedo has left the tube and traveled a predetermined distance on its course, and I here show means for accomplishing this in the form of a plunger switch **32** having a dashpot **33** associated therewith. The plunger may be spring pressed through an opening in the wall of the torpedo and held in as long as the torpedo is in the tube, moving out to close the contacts associated with it as soon as the torpedo has been started on its course. The dashpot can be arranged to restrain outward movement of the switch for a desired length of time, preferably at least five or ten seconds after the torpedo has left the tube. This insures reception of impulses from the other torpedo even though it may be fired later, before the steering circuit becomes operative, and opening of the relay **30**. That is, with this arrangement the steering circuit (including the source of energy here illustrated as a battery **34** and the solenoid **35**) is never closed until impulses from the other torpedo are no longer received by the loop aerial **31** (as the result of the interposition of a ship) and then the relay **30** closes to energize the solenoid. It it is desired to prevent emission of radio waves until the torpedoes are quite close to the ship, the plate voltages for the transmitters may be wired through another pair of contacts associated with the plunger switch **32** and adapted to be closed a second or so before the steering circuit contacts are closed.

Energization of the solenoid **35** acts upon the valve control lever **36** of the steering motor **21** with sufficient force to overcome the gyroscope **20** and cause the torpedo to turn from its course in the desired direction. It will be apparent that the solenoid would be arranged on opposite sides of the steering motor, in accordance with whether the torpedo was to be used to the right or to the left of a ship. By this arrangement the conventional steering apparatus of the torpedo is used to accomplish the desired turning, the steering circuit of my invention merely overcoming the gyroscope when impulses are no longer received from the other torpedo. It will be understood beam transmission is necessary in conjunction with radio waves in order to insure the ship blocking sufficient of the impulses to cause the relay **30** to open. It is also obvious that my invention is not limited to the use of radio waves, since light waves or sound waves traveling in a beam could also be used for the same purpose.

It is preferred to adopt any suitable key system so that a right hand torpedo cannot be placed in a left hand tube and vice versa.

Means may also be provided if desired for returning the torpedo to a straight path of predetermined interval after it has entered upon its divergent course.

While I have shown and described certain embodiments of my invention, it is to be understood that it is capable of many modifications. Changes, therefore, in the construction and arrangement may be made without departing from the spirit and scope of the invention as disclosed in the appended claims.

I claim:

1. A pair of torpedoes adapted to travel substantially parallel courses, each torpedo having driving and steering mechanism and including: impulse transmitting means; selective means adapted to receive the impulses originating at the other torpedo; and means operative upon the steering mechanism upon cessation of reception of said impulses to cause the torpedo to turn toward the other torpedo.

2. Apparatus of the character claimed in claim 1, wherein each torpedo has a non-magnetic body portion and its transmitting and receiving means are adapted to transmit and receive radio waves of different frequency.

3. A pair of torpedoes adapted to travel substantially parallel courses, each torpedo having driving and steering mechanism and including: means for transmitting radio waves in a beam directed toward the other torpedo; selective means adapted to receive the waves originating at the other torpedo; and means operative upon the steering mechanism upon cessation of reception of said impulses to cause the torpedo to turn toward the other torpedo.

4. Apparatus of the character claimed in claim 3, including means rendering said last mentioned means inoperative until the torpedo has traveled a predetermined distance upon its course.

5. Apparatus of the character claimed in claim 3, wherein the transmitter in one torpedo and the receiver in the other are tuned to one frequency and the other transmitter and receiver are both tuned to another frequency.

6. In a torpedo, control apparatus including means carried by the torpedo for emitting radio impulses; means for directing the outgoing impulses to a companion torpedo traveling on a substantially parallel course; means adapted to receive radio impulses from the companion torpedo, said means being unaffected by the outgoing radio impulses; and means for varying the course of the torpedo upon cessation of reception of said incoming radio impulses.

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