Nov. 11, 1924. 1,514,699

E. C. HANSON

METHOD AND APPARATUS FOR WIRELESS CONTROL FOR TORPEDOES, ETC

Filed Aug. 1, 1921 2 Sheets-Sheet 1

Fig. 1.

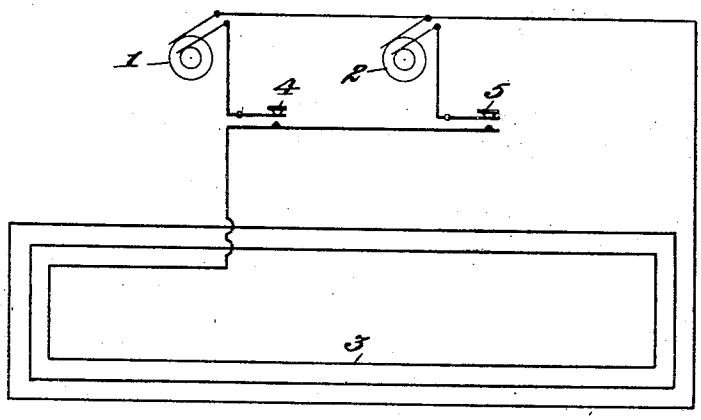


Fig. 3.

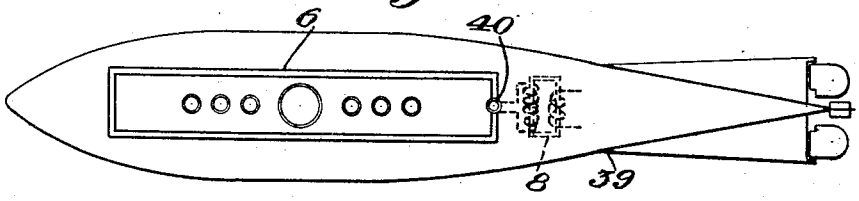
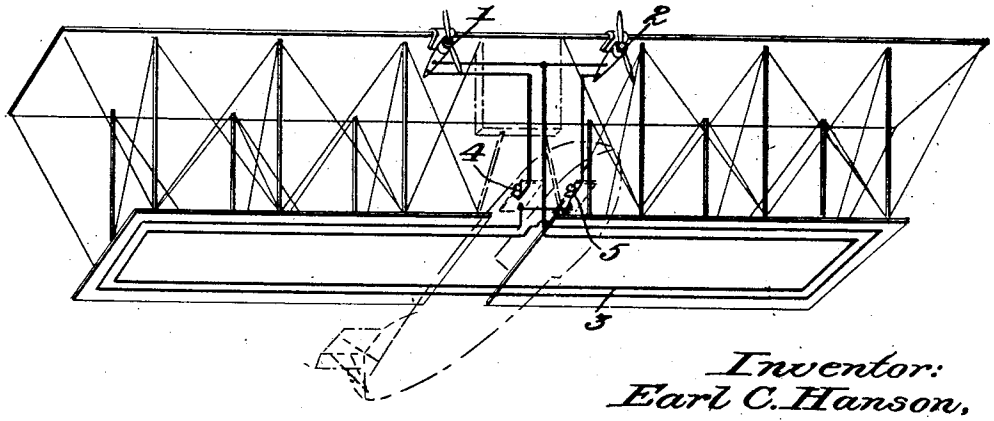


Fig. 4.



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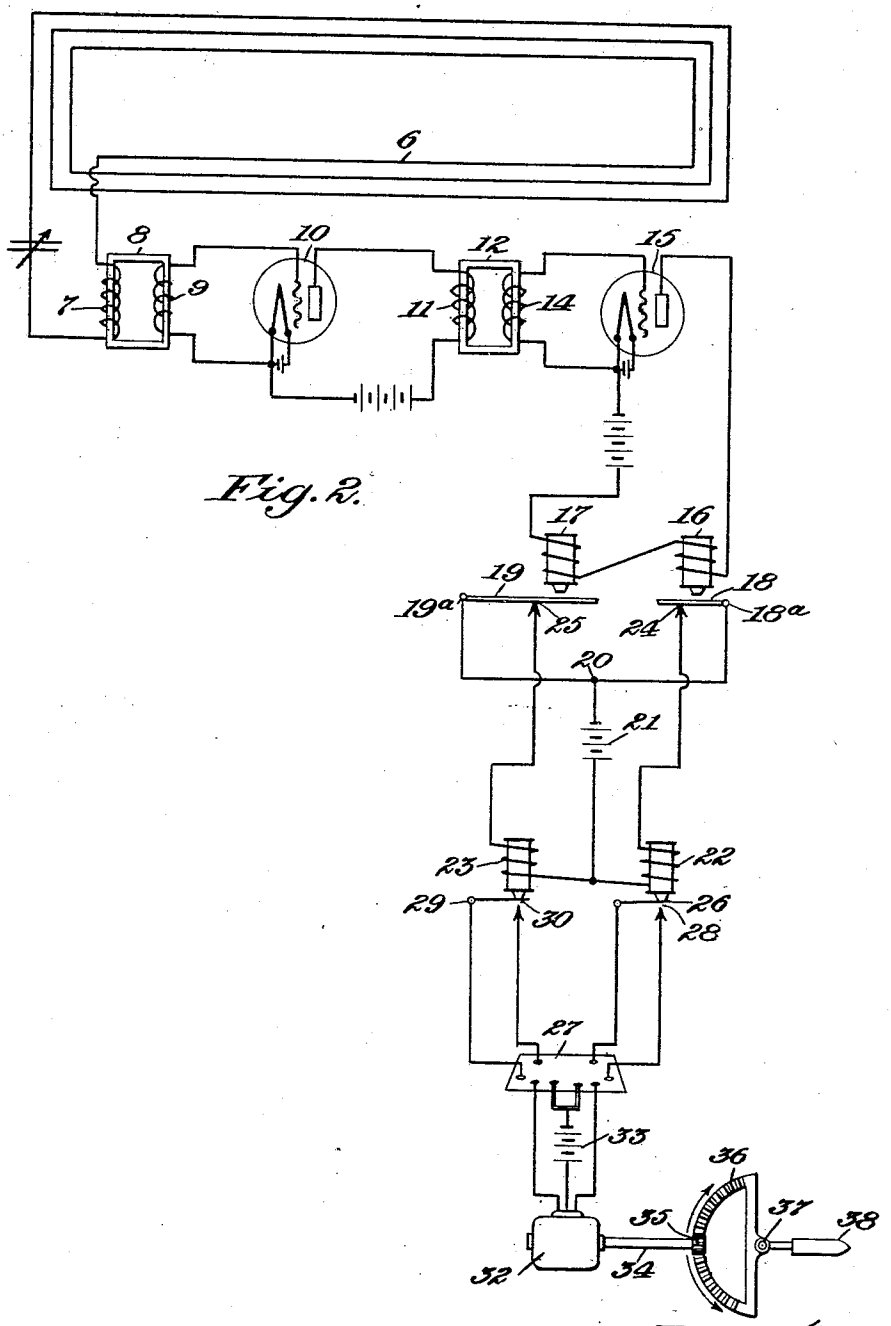


Fig. 2.

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UNITED STATES PATENT OFFICE.

EARL C. HANSON, OF WASHINGTON, DISTRICT OF COLUMBIA.

METHOD AND APPARATUS FOR WIRELESS CONTROL FOR TORPEDOES, ETC.

Application filed August 1, 1921. Serial No. 488,819.

To all whom it may concern:

Be it known that I, EARL C. HANSON, a citizen of the United States, residing at Washington, in the District of Columbia, have invented certain new and useful Improvements in Methods and Apparatus for Wireless Control for Torpedoes, Etc., of which the following is a full, clear, and exact description.

This invention relates to the method of and apparatus for controlling the operation of apparatus by long wave length wireless energy. In particular it relates to the control of such apparatus as torpedoes, air craft, or other craft by the means referred to.

The invention will be best understood from the following description, in connection with the accompanying drawings illustrating one application of the invention, but it is to be understood that the method and apparatus described is capable of many other applications than that herein illustrated by way of example only. The novel features of the method and apparatus will be pointed out in the claims hereunto annexed.

In the accompanying drawings,

Figure 1 represents, diagrammatically, a loop antenna such as may be carried by an air craft, with two audio frequency generators in connection therewith;

Figure 2 is a diagrammatic represention of a loop antenna system, together with thermionic vacuum tube apparatus connected with selective relay mechanism, and the necessary connections for wirelessly controlling the course of a torpedo, or other vessel;

Figure 3 is a diagrammatic representation of a torpedo, with a loop antenna and connections with a transformer, and

Figure 4 illustrates a flying boat, with antenna, controllers, etc., such illustration being also diagrammatic.

Referring to Figure 1, two audio frequency generators 1 and 2 are shown as connected through suitable controlling means, such as the keys 4 and 5 to the antenna 3, for transmitting long wave length wireless energy which may be generated by either of the generators 1 or 2 at will. The transmitting apparatus as illustrated in Figure 1 is shown in Figure 4 carried by air craft, such as a flying boat, and the audio frequency generators which are preferably similar to the aero generators used for radio communication from air craft are under control of the keys 4 and 5 which may be located in any suitable position to enable the operator upon the air craft to connect either of said generators to the antenna system. The generator 1, can, for example, be a 3,000 cycle type and the generator 2, a 6,000 cycle type.

Figure 3 represents a torpedo carrying a loop antenna 6 with leads passing through an insulator 40 and connected to the winding of the transformer 8. The torpedo 39 may be constructed to enable the loop antenna to be arranged in a groove in order to preserve the stream line effect of the torpedo. The arrangement of the elements of the receiving apparatus on the torpedo or other craft to be controlled, is shown in detail in Figure 2. The antenna 6 is herein illustrated as connected to the primary winding 7 of a transformer 8, the secondary winding 9 of which is connected to the input circuit of a vacuum tube 10. The output of this vacuum tube is connected to the primary winding 11 of a transformer 12, preferably of the type employing an iron core. The secondary winding 14 of this transformer is connected to the input circuit of a second vacuum tube 15, the plate circuit of which is connected to the electromagnets 16 and 17 by suitable leads. These magnets are provided with tuned reeds 18 and 19 which are adapted to be operated selectively by the energy transmitted wirelessly from an antenna carried by the air craft, as shown in Figure 4, for example. The battery 21 is connected through suitable leads to the reeds 18, 19, at the points 18^a and 19^a and said battery has also connection through electromagnets 22 and 23 to the contact points 24 and 25 of the reeds 18 and 19 respectively.

If the operator on the air craft closes the key 4, for example, the 3,000 cycle generator 1 will transmit long wave length wireless energy to the antenna 6 on the torpedo and the received energy will be amplified by the vacuum tube amplifier and will cause the reed 19 which is adjusted to respond to 3,000 cycles, to vibrate, which will cause the contact 25 to be broken, thereby releasing the armature 29 of the electromagnet 23. This operation permits the contact 30 of the armature 29 to be closed, thus energizing a power relay 27 which permits current from a battery 33 to energize the motor 32 in such a manner as to cause the shaft 34 to rotate. The shaft 34, as herein shown, is provided with a bevel pinion 35 which meshes with a secondary rack

36 connected by a bar which is pivoted at 37 and supports the rudder 38 of the torpedo or other craft. Rotation of the shaft 34 which follows the energizing of the magnet 23 in the manner above described, will be in such a direction as to cause the rudder 38 to move in a given direction, thereby controlling the course of the torpedo. The extent of the turning movement of the torpedo will depend upon the amount of rotation that the shaft 34 makes before its rotative movement is arrested by the release of the control key 4 on the air craft. If the operator, on the other hand, presses the control key 5, the loop antenna 3 will be energized by the 6,000 cycle generator 2, thereby causing the reed 18 to be actuated and in turn so controlling the relay 27 as to cause the shaft 34 of the motor 32 to rotate in a direction opposite to its direction of rotation, which followed the closing of the key 4. This will reversely operate the secondary rack 36, causing the rudder 38 to move in a direction for causing the torpedo to turn in an opposite direction to that which was caused by a closure of the control key 4.

The operator can observe the movement of the torpedo and determine when it is advisable to move the rudder to the right or left. The antenna systems on the air craft and torpedo may, if desired, be of the trailing wire type, or two trailing wires may be used for the radiating and receiving antennae. The trailing wire antenna on the torpedo can be of the type familiar to the Radio Division, Bureau of Engineering (Patents and Research Section) Navy Department. The antenna on the torpedo can be, if desired, connected through tuning and filter systems (for example, the type developed by the American Telephone and Telegraph Company, and the Western Electric Company) to the input circuit of thermionic vacuum tube amplifiers. In this case the transformer 8 can be eliminated. The output circuit of the amplifier can be connected through filter circuits to any relay mechanism that will permit the operator on the air craft to control the rudder on a torpedo. It is possible, if desired, to utilize some of the relay mechanisms developed by John Hays Hammond, Jr., Lowenstein or others.

It has been explained above that in the system disclosed in the drawings, an operator at a distant point, such as for example on air craft, can control wirelessly the movement of torpedoes by employing very long wave lengths. This system is immune from interference by radio transmitting stations.

Many other applications of this invention than that above described may obviously be made. For example, an air craft could be equipped with audiofrequency generators, controllers, and an antenna through which very long wave length receiving apparatus contained on a balloon could be made to release aerial bombs that would drop upon ships or other air craft or fortifications for destroying the same. Any number of balloons could be controlled by one operator in an air craft and this operator could be out of range of the anti-air craft guns carried by the enemy ships.

Among the many applications of this invention is that to the control of flood gates on hydro-electric projects and on irrigation systems, in which the long wave wireless control apparatus of the general character above described could be employed. If desired, the antenna system at a receiving station for such projects could be submerged in water or buried in the earth.

What I claim is:

1. The method of controlling the operation of torpedoes and other vessels, which consists in transmitting electrical energy at long wave lengths to said vessel, receiving said energy by a submerged antenna, amplifying the received energy thermionically, and controlling the steering mechanism of said vessel by the amplified energy.

2. The method of controlling the operation of torpedoes or other craft, which consists in selectively energizing an antenna at a long-wave length wireless transmitting station at audiofrequency, receiving the energy on a torpedo or other craft by means of a submerged antenna, amplifying the received energy thermionically, and operating selective relay mechanism, said mechanism controlling the steering mechanism of torpedoes or other craft.

In testimony whereof I have hereunto set my hand this 30th day of July A. D. 1921.

EARL C. HANSON.