

Sept. 26, 1961

J. R. BOYKIN

3,001,476

MAGNETIC FUZE

Original Filed June 4, 1945

Fig. 1.

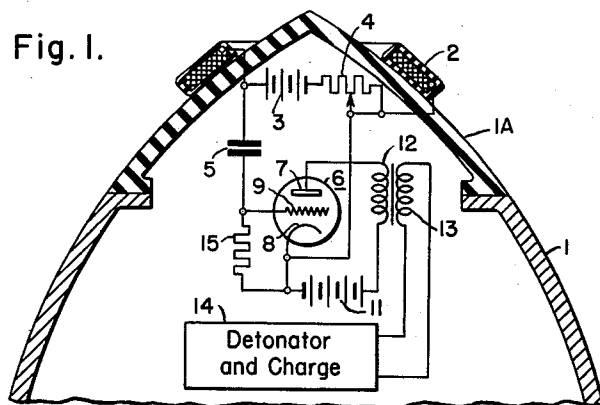
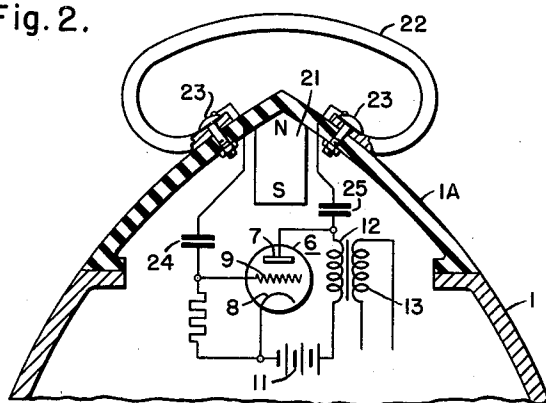


Fig. 2.



WITNESSES:

Robert C. Baird
Wm. L. Groom

INVENTOR

John R. Boykin.

BY

Hyman Diamond
ATTORNEY

1

3,001,476

MAGNETIC FUZE

John R. Boykin, Baltimore, Md., assignor, by mesne assignments, to the United States of America as represented by the Secretary of the Navy
Original application June 4, 1945, Ser. No. 597,451.
Divided and this application Nov. 19, 1948, Ser. No. 60,918

8 Claims. (Cl. 102-70.2)

My invention relates to control devices and, in particular, to devices to be mounted on bombs, projectiles, rockets and the like, and designed to act as antennas in conjunction with radio apparatus housed within the bomb, or the like. This application is a division of my application Serial No. 597,457 filed June 4, 1945 now Patent No. 2,959,128 for a Control Device.

Many pieces of equipment have been developed in recent years in which bombs, projectiles or other moving vehicles, are provided with radio apparatus which either radiate or receive energy from electromagnetic fields external to the vehicle and employ it in conjunction with radio apparatus housed within the vehicle. In such cases, it is necessary to provide some form of antenna on which the radiated or received electromagnetic waves may react. However, the high speeds with which the vehicles travel through the air imposes many mechanical stresses on these antennas and the design of an antenna, which will be mechanically stable and able to resist the stresses of the air streams flowing past the surface of the vehicle, has proved to constitute a problem of grave difficulty.

One object of my invention is, accordingly, to provide a form of antenna or electrical radiator suitable for mounting on bombs, or other rapidly moving projectiles, or vehicles and which shall produce magnetic fields having a desirable space distribution about the moving vehicle.

Another object of my invention is to provide a structure suitable for radio antennas mounted on bombs, projectiles, or other vehicles, adapted to move at high velocity through the air.

A still further object of my invention is to provide a bomb, shell or other vehicle intended for rapid motion through the air, with means for triggering an electric control circuit when the projectile closely approaches an object, such as a target.

Another object of my invention is to provide a bomb, shell or other missile or the like, with means for creating a substantially steady or constant magnetic field relative to said device and for detecting the presence of objects moving within this magnetic field.

Still other objects of my invention will become apparent upon reading the following description, when taken in connection with the accompanying drawings, in which:

FIGURE 1 is a figure, partly schematic and partly a sectional elevation, illustrating a structure suited to produce a magnetic field in the region about a bomb and also to act as a receiving antenna therefor in accordance with one modification of my invention; and

FIG. 2 is a figure of similar nature illustrating another modification of my invention which embodies a permanent magnet and has a separate receiving antenna.

Referring in detail to FIGURE 1, it shows an arrangement well adapted to permit a projectile 1 to be exploded by the reactions of a steady or constant magnetic field set up by the projectile itself on objects into proximity with which the projectile moves. Thus, the projectile may have a cap portion 1A of insulating material carrying a winding 2 which sets up a substantially steady or constant magnetic field when energized by current flowing from a direct-current source 3 through a suitable control

2

resistor 4, the winding 2 being mounted on the nose of the projectile preferably with its axis aligned with the axis thereof. The terminals of winding 2 are coupled through a capacitor 5 across the grid-to-cathode circuit of an electron tube 6. The tube 6 has an anode 7, a cathode 8 and a control electrode 9, all of a form well-known in the electronic art. The tube 6 has its cathode 8 connected to its anode 7 through a voltage source 11 and a coupling winding 12 of a form well-known in the electronic art. A trigger circuit 13 may be coupled by any means well-known in the electronic art, for example, by electromagnetic induction, with the circuit of the anode 7. The circuit 13 may, for example, constitute a portion of a trigger circuit of a detonator 14, of any type well-known in the art, adapted to detonate a charge of explosives carried by the projectile 1. The cathode 8 is connected to the grid 9 through a conventional grid resistor 15.

When the projectile 1 approaches a body having any substantial conductivity, a steady or constant magnetic field set up by the projectile itself will induce eddy currents in such a conductive body, which in turn, will react to induce current in the coil 2 which acts as an antenna and impresses voltages on the tube 6. The voltages thus induced on the control electrode 9 of the tube 6 may be made sufficient to cause sufficient current flow through the winding 12 and the trigger circuit 13 to detonate an explosive charge within the projectile 1. The detonation of an explosive is mentioned merely as one possible way of employing the reactions in the output circuit of the tube 6, and such reactions may be employed for any other desired control purposes.

In the modification shown in FIG. 2 a permanent magnet 21 is used to set up the magnetic field, and a separate antenna 22 of a type described and claimed in my above-mentioned parent application, and consisting of a strap of conducting material bent around so that its opposite ends may be secured by bolts 23 to the cap portion 1A of the projectile 1, which latter is similar to that already described in FIG. 1.

The opposite ends of the antenna 22 are respectively connected through capacitors 24 and 25, to the control electrode 9 and the anode 7 of a tube 6 connected to circuits like those already described in FIG. 1. When arranged as so far described, the voltages generated in the antenna 22 by electromagnetic reactions of the field due to magnet 21 are obviously capable of exciting the tube 6 and producing amplified control effects in apparatus connected to its output circuit. Thus the device of FIGURE 2 operates in substantially the same way as the device of FIGURE 1.

I claim as my invention:

1. In combination with a projectile intended for rapid movement through the air, means for generating a substantially steady magnetic field mounted on said projectile, an antenna means mounted on said projectile and comprising an open ended loop of strap material having its respective ends fastened to points spaced apart on the wall of said projectile, and an amplifier circuit within said projectile connected to the antenna means and arranged to respond to eddy currents induced in neighboring objects by said magnetic field.

2. In combination with a projectile intended for rapid movement through the air, a winding supported on the nose of said projectile with one of its faces shaped to fit closely the surface of said projectile at its area of contact therewith, an energizing circuit for supplying direct current to said winding, an amplifier tube having a control circuit and a load circuit within said projectile, and connections to impress voltage from said energizing circuit on said control circuit.

3. In combination with a projectile intended for rapid

3

movement through the air, a winding supported on the nose of said projectile with one of its faces shaped to fit closely the surface of said projectile at its area of contact therewith, an energizing circuit for supplying direct current to said winding, an amplifier tube having a control circuit and a load circuit within said projectile, and connections to impress voltage from said energizing circuit on said control circuit, and a detonator for an explosive charge in said load circuit.

4. In combination with a projectile intended for rapid movement through the air, and adapted for detonation within a predetermined proximity to a target, a source of power for setting up substantially steady or constant magnetic flux lines about said projectile, said flux lines adapted to induce eddy currents in said target, an amplifier circuit including a control circuit and a load circuit, a detonator in said load circuit, and antenna means responsive to said eddy currents which are induced in said target and connected to govern said control circuit.

5. The combination with a projectile or the like of means secured to said projectile for creating a substantially steady magnetic field relative to the projectile, and means including antenna means secured to said projectile for detecting eddy currents set up by said magnetic field in a body having conductivity and moving into proximity with said projectile.

6. A projectile having means secured thereto for creating a steady or constant magnetic field relative to the projectile, and means secured to said projectile for detecting eddy currents set up by said magnetic field in an object having conductivity moving into proximity with said

4

projectile, said detecting means comprising an antenna, an amplifier circuit connected to the antenna, a trigger circuit connected to the output of the amplifier so that when the projectile moves into a predetermined proximity with said object, the trigger circuit is activated.

7. The combination with a projectile of a permanent magnet secured to said projectile so as to create a magnetic field about the projectile, an antenna secured to the projectile, an amplifying circuit connected to the antenna, a triggering circuit connected to the amplifying circuit so that when the projectile moves in sufficiently close proximity with a target that is a conductor, eddy currents are created in the target by the magnetic field established by the permanent magnet, said eddy currents inducing electromotive forces in the antenna which are amplified by the amplifying circuit so as to actuate the triggering circuit.

8. The combination with a projectile of a winding secured to said projectile, a source of substantially steady direct current connected to the winding, an amplifying circuit connected to the winding, the winding also serving as an antenna to detect eddy currents established in an object which moves into proximity with the projectile, and a triggering circuit connected to the amplifier.

References Cited in the file of this patent

UNITED STATES PATENTS

2,398,801	Minkler	Apr. 23, 1946
2,400,551	Hings	May 21, 1946
2,403,567	Wales	July 9, 1946