

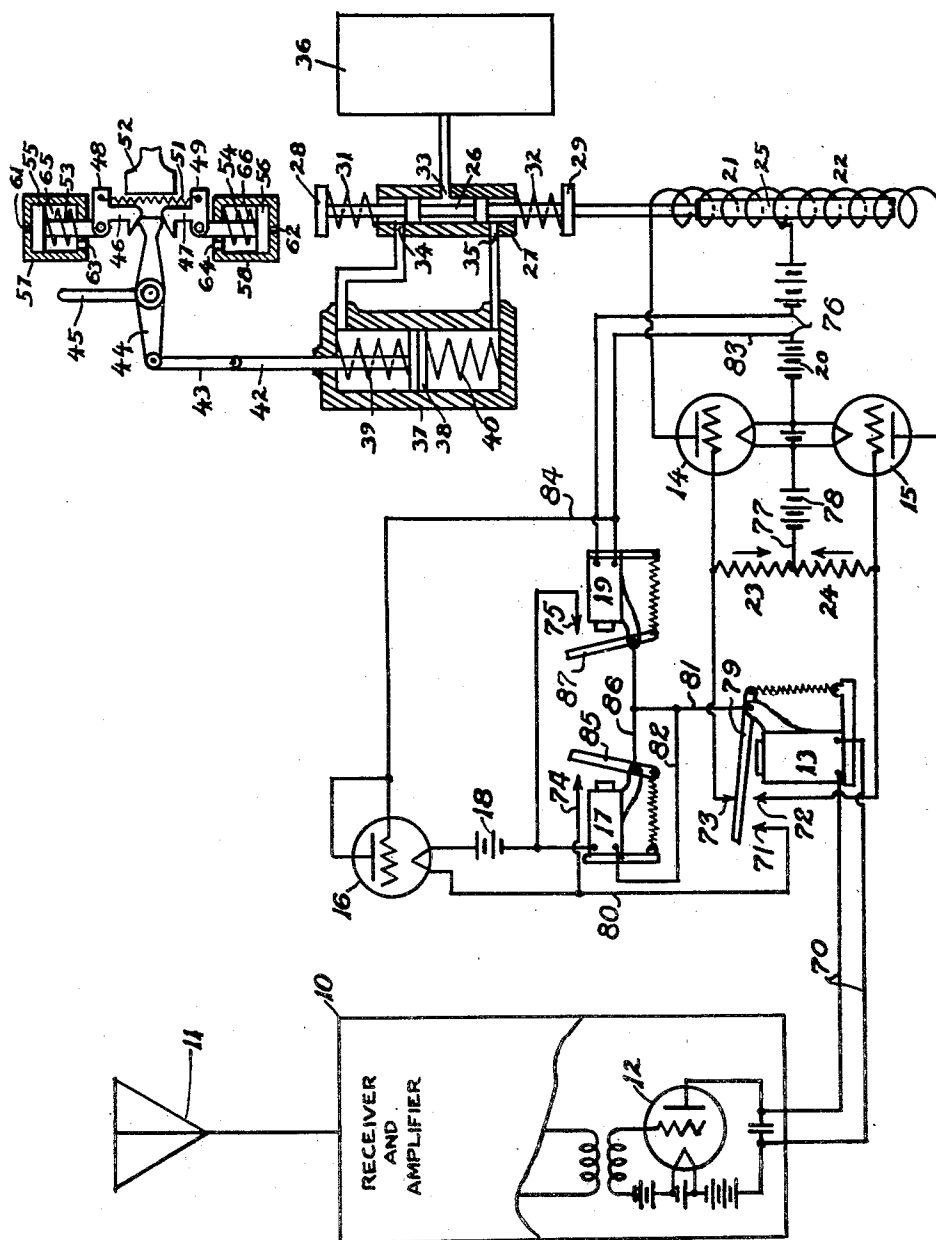
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TORPEDO CONTROL BY TIMING SELECTOR

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TORPEDO CONTROL BY TIMING SELECTOR

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This invention relates to the control of moving bodies from a distance and more particularly to a new and improved means for controlling said bodies by the duration of the signals transmitted.

The invention relates particularly to a selective receiving system for radiant energy which is adapted to control the movement of a torpedo after it has been launched. The steering means of the torpedo is rendered operative in response to radiant impulses transmitted from a distance and selectively affects the deviation of the torpedo to port or starboard or maintains the steering means in a central position.

The invention provides a selective system of radio control which is dependent in its operation upon the length of time during which the signal is transmitted, so that when a short signal is sent the torpedo will be steered in one direction and when a long signal is sent it will be steered in the opposite direction.

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

Although the novel features which are believed to be characteristic of this invention will be particularly pointed out in the claims appended hereto, the invention itself, 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 drawing forming a part thereof, in which the single figure of the drawing illustrates diagrammatically the invention as applied to the control of moving bodies.

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

Referring to the form of the invention shown in the accompanying drawing, a radio receiver 10 is provided with the usual antenna 11. The last tube 12 of this device is strongly biased to approximately cut off, so that the output is practically all direct current. The output circuit of the receiver 10 is connected by wires 70 to the winding of a relay 13, which is provided with two front contacts 71, 72 and a back contact 73. Front contact 72 and the back contact 73 are connected to the grids of two space discharge devices 15 and 14, respectively, and front contact 71 is connected to the filament of a third space discharge device 16 and to the contact 74 of a second relay 17. The other side of the filament of the device

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16 is connected through a battery 18 to the winding of the relay 17, and also to the contact 75 of a third relay 19. The winding of the relay 19 is connected in series at 76 in the output circuit of the devices 14 and 15 which also include a double solenoid comprising windings 21 and 22. Across the input circuits of the devices 14 and 15 are two resistances 23 and 24 having a common connection 77 to battery 78.

The double solenoid 21-22 is provided with a magnetic core 25 which is connected to a valve 26, which reciprocates in a valve casing 27. Pinned to the valve 26 are two collars 28 and 29, between which and the casing 27 are two spiral springs 31 and 32. The valve casing 27 is provided with three ports 33, 34 and 35. The port 33 communicates with a source of fluid under pressure 36, and the ports 34 and 35 communicate with the opposite ends of a cylinder 37 in which reciprocates a piston 38. This piston is normally held in the central position by means of two springs 39 and 40, and is connected by means of a piston rod 42 and a link 43, to one end of an arm 44 which operates a rudder 45, which steers the torpedo. The other end of the arm 44 engages two hooks 46 and 47 which are provided with lugs 48 and 49. Interconnecting these lugs is a spring 51. Located between the lugs 48 and 49 is a block 52 which is secured to the frame of the torpedo. The hooks 46 and 47 are pivotally mounted on the ends of piston rods 53 and 54 which are attached to pistons 55 and 56, which are slidably mounted in cylinders 57 and 58. These cylinders are provided with very small holes 61 and 62, and with large holes 63 and 64. The pistons 55 and 56 are normally held in the position shown by means of springs 65 and 66.

In the operation of the invention shown in the accompanying figure, when a short impulse of radiant energy is received by the antenna 11, it will cause a direct current to flow through the relay 13, thereby energizing this relay and holding armature 79 closed against contacts 71 and 72 for the duration of the impulse. When this relay is energized it will close a circuit through the filament of the device 16, wire 80, armature 79, wires 81 and 82, relay 17, and the battery 18, energizing the relay 17 so that when the relay 13 is deenergized, due to the cessation of the received signal, the relay 17 will continue to be energized, thus acting as a holding relay.

As current flows through the filament of the device 16 it will gradually heat this filament, and after the lapse of a brief space of time will thus

allow current to flow through the device 16 from the battery 20 by way of wires 83, 84 and 81, contact 74, armature 85, wires 86 and 81, armature 79, contact 73 and resistance 23. As the relay 13 is now open this current will flow through the back contact 73, and through the resistance 23 in the direction of the arrow, thus building up a potential difference across this resistance which opposes the bias on the device 14, thus making the grid of this device more positive and allowing current to flow through device 14, relay 19 and the solenoid winding 21, thus causing the magnetic core 25 to be moved upwardly.

The upward motion of the core 25 causes a similar motion to the valve 26, thus allowing fluid under pressure to pass from the container 36 to the upper end of the cylinder 37 which forces the piston 38 down, thereby rotating the rudder in a counter-clockwise direction so as to steer the torpedo to starboard. At the same time the right hand end of the arm 44 will be engaged by the hook 46 which has snapped over its end.

Simultaneously with the energization of the solenoid winding 21, the relay 19 will also be energized to draw armature 87 against contact 75, thereby short circuiting the relay 17 through contact 74, armature 85, wire 86, armature 87 and contact 75 which thus opens relay 17, thereby breaking the circuit from the device 16 through the resistance 23 so that normal bias is again produced on the grid of device 14, thereby causing the current flowing through it to cease, thus deenergizing the solenoid winding 21. When this occurs the valve 26 will be brought back to the central position under the action of the springs 31 and 32, thereby connecting both ends of the cylinder 37 to the atmosphere. The piston 38 will then be moved upwardly under the action of the spring 40, thereby tending to return the rudder 45 to the central position. This motion is delayed, however, due to the dash pot action of the piston 55 in the cylinder 57, as this is allowed to move downwardly only at a slow rate, due to the small hole 61 which only allows air to enter the cylinder slowly. This continues until the lug 48 engages the block 52 which tends to rotate the hook 46 in a counterclockwise direction until it disengages the end of the arm 44, thus allowing this arm and the rudder 45 to be brought to a central position under the action of the springs 39 and 40. The hook 46 together with the piston 55 are returned to their initial positions under action of the spring 65.

In this way it is seen that after a short impulse the rudder will be turned to the starboard, and returned to a central position at a predetermined slow rate of speed which is dependent upon the size of the hole 61, and the strength of the spring 40. This is so calculated that during this interval of time, the torpedo will be turned through a definite angle, say for example, five or ten degrees, which can be calculated by knowing the turning speed of the torpedo.

When a long impulse is received, the relay 13 will be closed for a long interval of time so that when the filament of the device 16 is heated sufficiently to allow current to pass through this device, this current will flow through wire 80, armature 79, contact 72, resistance 24 and battery 78 to battery 20, thence back to 16 as above described, as the armature of the relay 13 will still be held in the down position, thus making the bias on the device 15 more positive so that current flows through this device and through the solenoid winding 22. This causes the core 25,

together with the valve 26, to be moved downwardly so that fluid under pressure is allowed to enter the lower end of the cylinder 37, thus causing the piston 38 to be moved upwardly, which rotates the rudder 45 in a clockwise direction, causing the torpedo to be steered to port through an angle predetermined by the length of pulse. The other end of the arm 44 will thus be engaged by the hook 47.

At the termination of the long impulse, the valve 26 will be returned to its central position as already described, thus connecting the two ends of the cylinder 37 to the atmosphere. The rudder 45 then starts to slowly move in a counter-clockwise direction, under the force of the spring 39, but is retarded by the dash pot action of the piston 55 in the cylinder 58. This continues until the lug 49 engages the block 52 which causes the hook 47 to be disengaged from the arm 44, thereby allowing the rudder 45 to be centralized. The hook 47 then returns to its initial position under the action of the spring 66.

It is thus seen that when a long impulse is received, the torpedo will be steered to port through any predetermined angle which is obtained in a manner similar to that already described.

Although only a single embodiment of this invention has been shown herein, it is to be understood that the invention is not limited to any specific construction, but might be embodied in various forms without departing from the spirit of the invention or the scope of the appended claims.

What is claimed is:

1. A system for controlling the operation of dirigible bodies at a distance by radiant energy in combination with a steering mechanism, a means responsive to radiant energy at a distance, a first relay operated by said means, a primary space discharge device, the cathode of which is energized by the closing of said first relay, a second relay which is operated by the closing of said first relay and which acts as a holding relay to keep the filament circuit of said primary space discharge device closed, two secondary space discharge devices which are controlled by the output of said primary space discharge device and which are selected by the position of the armature of said first relay, means responsive to current through either secondary discharge device to open said second relay and a selector operated by the outputs of the secondary space discharge devices for controlling said steering mechanism.

2. In a remote control system for moving bodies, a means receptive to radiant energy, a selector relay operated by said means, a time interval device, the operation of which is initiated by the closing of said selector relay, a plurality of control circuits operated by the conjoint action of said relay and said time interval device, means responsive to operation of a control circuit to render said time interval device inoperative and a steering mechanism actuated by the outputs of said control circuits.

3. In combination with a moving body, a rudder, a means for the reception of radiant energy, a primary relay operated by said means, a time interval device, the operation of which is initiated by said relay, a holding relay associated with said time interval device, two space discharge devices controlled by said time interval device, the position of said primary relay determining which one of said space discharge devices is actuated, a releasing device for releasing said holding relay when either of said space discharge devices is

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actuated, and a steering mechanism controlled by said space discharge devices for operating said rudder.

4. In a self propelled body, a rudder, means for operating said rudder comprising a pair of solenoids, space discharge devices, having control elements, associated with said solenoids, means for varying the potential on said control elements, including two resistances, and a secondary space discharge device having a time interval characteristic, a relay for causing the output of said secondary space discharge device to flow through either one of said resistances, and means responsive to radiant energy for operating said relay, for a short or long interval of time.

5. A radiant energy controlled device responsive to signals of a short duration to move a member in one direction and responsive to signals of a predetermined longer duration to move said member in another direction, comprising means

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for converting radiant energy impulses into direct current impulses, a relay connected to be energized by said impulses, a space discharge device provided with a cathode which requires a predetermined time interval for energization, means for energizing the cathode of said space discharge device responsive to the energization of said relay, locking means for maintaining the cathode of said space discharge device energized even after the deenergization of said relay, automatic means to release said locking means and means for moving said member in one direction responsive to the energization of the cathode of said space discharge device when said relay is energized or for moving said member in another direction responsive to the energization of the cathode of said space discharge device when said relay is deenergized.

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