

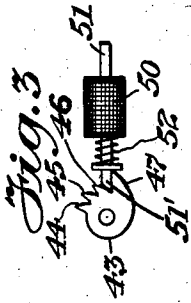
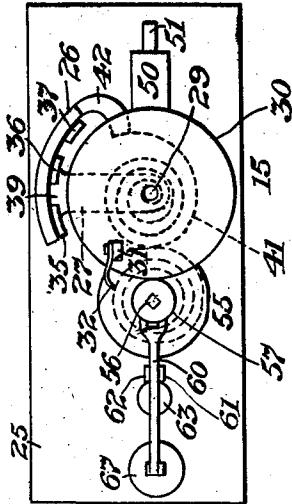
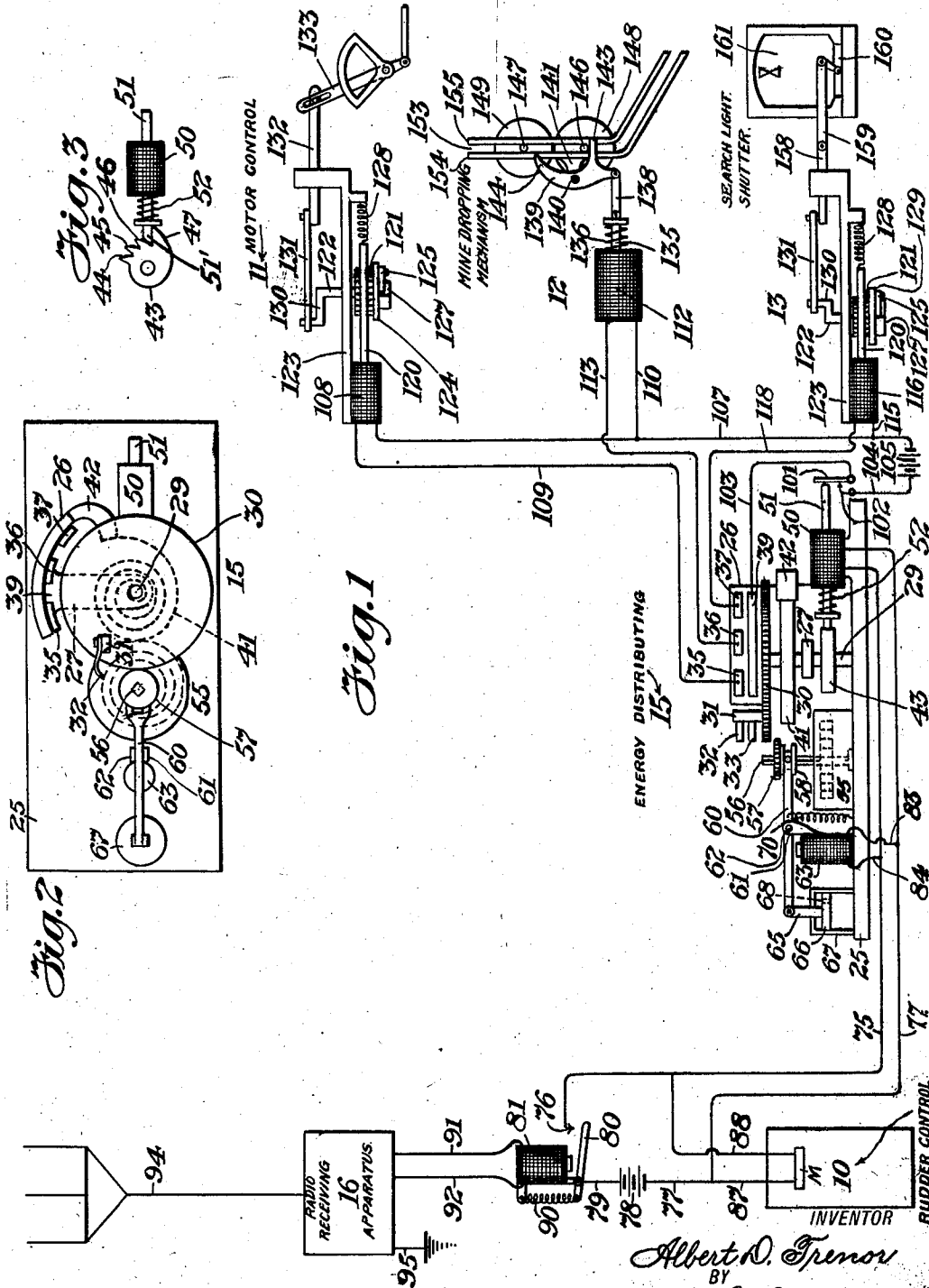
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SYSTEM OF CONTROL BY IMPULSES OF PREDETERMINED DIFFERENT DURATIONS

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SYSTEM OF CONTROL BY IMPULSES OF PREDETERMINED DIFFERENT DURATIONS.

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Some of the objects of this invention are to provide a system for controlling from a distance in response to radiant or other impulses a main operative device and simultaneously controlling selectively any one of a plurality of subsidiary operative devices; to provide improved means for controlling selectively any one of a plurality of operative devices; and to provide other improvements as will appear hereinafter.

In the accompanying drawings Figure 1 is a diagrammatic side elevation of a system of control constructed in accordance with this invention;

Figure 2 is a plan view of a portion of the same;

Figure 3 is a top plan view of a detail of the same.

Referring to the drawings, one embodiment of this invention comprises a radio system of control especially adapted and arranged to be mounted upon a movable body such as a marine vessel, aircraft or any other movable body, and including a main operative device 10, three subsidiary operative devices 11, 12 and 13, an energy distributing device 15, and an energy receiving system 16. Only so much of the main operative device 10 is shown in the accompanying drawings as is necessary to an understanding of the present invention. The device 10 includes an operating magnet M as disclosed in U. S. Patent No. 1,295,741 granted to John Hays Hammond, Jr., February 25, 1919, adapted and arranged to control a rudder for steering a movable body either in one direction or in the opposite direction. The subsidiary devices 11, 12 and 13 shown in the drawings are particularly arranged respectively to control the speed of a motor for propelling the movable body to control the dropping of mines or other objects from the movable body, and to open or close the shutter of a search light arranged upon the movable body. The distributing device 15 comprises a fixed base 25 to which is rigidly secured a rigid supporting member 26 provided with a bracket 27 rigid therewith, and extending snugly but rotatively through this bracket is a vertical rotary shaft 29, the lower end of which is supported by a bearing in the base 25. Surrounding and rigidly secured to the upper end of the shaft 29 is a gear wheel 30 which is rigidly secured to and insulated from a support 31 which carries two brushes 32, 33, which are elec-

trically connected together. Rigidly secured to but insulated from the supporting member 26 are three spaced conducting segments 35, 36 and 37 and a longer conducting segment 39. The brushes 32, 33 at suitable times co-operate with these segments. One end of a spiral spring 41 is connected to the shaft 29 and the other end is secured to a projection 42 of the support 26. This spring tends to rotate the shaft 29 with gear wheel 30 in a counter clockwise direction as seen in Fig. 2. Rigidly secured to the shaft 29 is a ratchet 43 (see Fig. 3) which is provided with three teeth 44, 45 and 46 of equal length and with a fourth tooth 47 considerably longer than the other three. A solenoid 50 is fixedly secured to the base 25 and is provided with a reciprocative core 51, the left end of which is beveled to form a pawl or detent 51' arranged to cooperate with the teeth 44, 45, 46 and 47 and is normally forced towards and held in engagement with the ratchet 43, as shown in Fig. 3 by a spring 52.

A clock work mechanism 55 of any well known suitable construction is supported upon the base 25 and is so arranged that its shaft 56 extends vertically upwards and is continuously rotated at a constant predetermined speed. This speed may be varied by the usual or any suitable means. The shaft 56 is square in cross section and carries a gear or pinion 57 having a hub provided with an annular groove 58. This gear with its hub is arranged to slide freely longitudinally of the shaft 56 but to be held against rotation with respect thereto. An arm 60 see Fig. 1 is pivoted at 61 to a fixed bracket 62 which is secured to an electromagnet 63 which is fixed upon the base 25. One end of this arm is in the form of a yoke which engages in the groove 58, and the other end of the arm is pivotally connected to a piston rod 65 which is secured to a piston 66 in a dash pot cylinder 67 fixed upon the base 25. The piston 66 is provided with a small hole 68. A spring 70 is provided which normally holds the member 60 and gear 57 in the position shown in Fig. 1.

One side of the winding of the solenoid 50 of the distributing device 15 is connected by a conductor 75 to terminal 76 and the other side of the winding of the solenoid is connected by a conductor 77 to one side of a battery 78. The other side of the battery 78 is connected by a conductor 79 to a pivot-

ed armature 80 of a fixed electromagnet 81. The winding of the magnet 63 is connected to wires 75, 77 by wires 83, 85. The main operative device 10 is connected by conductor 5 87 to conductor 77 and by conductor 88 to conductor 75. The armature 80 of electromagnet 81 is held in position shown in Fig. 1 by means of a spring 90. The two ends of the wiring of magnet 81 are connected by 10 conductors 91, 92 to the radio receiving apparatus 16.

The radio receiving apparatus 16 may be of any well known or suitable construction and is provided with an antenna 94 and a 15 suitable ground 95. The arrangement is such that when an electroradiant impulse is received by the antenna 94 the electromagnet 81 is energized thus closing the circuit through the main operative device 10, the 20 solenoid 50 and the magnet 63 of the distributing device 15.

At the right hand end of the core 51 of the solenoid 50 is secured a contact member 101 which is insulated therefrom, and which 25 is arranged to co-operate with a contact member 102. The contact 101 is connected by a conductor 103 to the segment 39, and the contact 102 is connected by a conductor 104 to one side of a battery 105, the other 30 side of which is connected by a conductor 107 to one side of the winding of a fixed solenoid 108, the other side of the winding of which is connected by a conductor 109 to the segment 35. A conductor 110 leads from 35 the conductor 107 to one side of the winding of a fixed solenoid 112, the other side of the winding of which is connected by a conductor 113 to the segment 36. The conductor 107 is connected by a conductor 115 40 to one side of the winding of a fixed solenoid 116, the other side of the winding of which is connected by a conductor 118 to the segment 37.

In the subsidiary or motor control device 45 11, the solenoid 108 is provided with a reciprocative core 120 which is provided with a rack which meshes with a pinion 121 loosely mounted upon a rotary shaft 122, 50 having a bearing in a fixed frame 123 which supports the solenoid 108. To the pinion 121 is rigidly secured a disk 124 pivoted to which is a spring pressed pawl 125 which meshes with a two toothed ratchet 127 which 55 is rigidly secured to the shaft 122. The core 120 is normally held in the outward position shown by means of a spring 128. The upper end of shaft 122 is provided with a crank member 130 to which is pivoted a link 131. The other end of this link is pivoted 60 to a rod 132 which slides in a bearing in frame 123. The outer end of this rod engages a slot in a throttle arm 133 of the driving engine.

In the second subsidiary or mine dropper 65 device 12, solenoid 112 is provided with a

reciprocative core 135 which is held in an outward position by a spring 136. This core is connected by a link 138 to a releasing member 139 which is pivoted at 140 to a frame 141. The member 139 is provided 70 with two arms 143, 144, which are adapted to engage alternately and in succession pins 146, 147 of explosive cylindrical submarine mines 148, 149 respectively. The pins 146, 75 147 are constrained to slide in a raceway 153 formed by two elongated fixed guides 154, 155. The pins 146 and 147, the guides 154 and 155 and the releasing member 139 are duplicated upon the opposite ends of the 80 mines, and the releasing members 139 are connected together to be oscillated in unison by the link 138.

In the third subsidiary or searchlight control device 13 the main parts 120 to 131 are 85 identical in construction and operation with the corresponding parts 120 and 121 of the subsidiary mechanism 11, first described. The link 131 in the third subsidiary mechanism 13 is connected to a rod 158 which has 90 a bearing in the frame 123. The outer end of rod 158 is connected to a link 159 which operates to open or close a shutter 160 controlling the emission of light from a search light 161.

In the operation of this improved system, 95 the main operative device 10 is arranged to be controlled by means of short impulses received by the antenna 94 and acting through the radio receiving apparatus 16 100 to energize electromagnet 81. These impulses are so short that the arm 60 of the distributing device 15 is not rotated by magnet 63 to such an extent to cause the pinion 57 to engage the gear 30, because of the 105 retarding action of the dash pot 67. If, however, a sufficiently prolonged impulse is received the arm 60 will be rotated in a counter clockwise direction by means of magnet 63 to such an extent as to cause the 110 pinion 57 to be moved into engagement with the gear 30 and as the pinion 57 is constantly rotated at a uniform speed in a counter clockwise direction, as viewed in Fig. 2, the gear 30 will then be rotated at 115 a uniform slow rate of speed in a clockwise direction thus carrying the contacts 32, 33 with it. At the same time the solenoid 50 is energized which disengages the pawl 51' from the ratchet 43. After a predetermined 120 interval of time the contacts 32 and 33 will engage segments 35 and 39 and contact 32 will remain in engagement with segment 35 for a predetermined length of time, after 125 which it will move off of this segment and on to segment 36 which it will be on for another predetermined interval of time and then it will move off of this segment and on to the segment 37 for a predetermined 130 interval of time. The solenoid 50 being energized, contact 101 is moved out of en-

gagement with 102 so that the motion of brush 32 over contacts 35, 36, 37 has no action upon the subsidiary devices 11, 12 and 13. As soon as the received impulse of radiant energy is terminated, however, and the circuit through the magnet 63 and solenoid 50 is broken, the core 51 will be moved to the left by the action of spring 52 and will engage with one of the teeth 44, 45 and 46 of the ratchet 43 dependent upon the position of the gear wheel 30 at the end of the impulse. For example, if this gear wheel 30 happened to be in such position that the brush 32 was on segment 35, the pawl 51' would engage with tooth 46 thus holding the gear 30 in a fixed position.

Upon the cessation of the prolonged received impulse, the pinion 57 will be moved out of engagement with the gear 30, by the spring 70 which is retarded by the dash pot 67. During this sliding movement of the pinion 57, the gear 30 will remain in such displaced position as it is held against movement in a counter clockwise direction by the tooth 46. As a further result of the cessation of the prolonged impulse, the contact 101 will be moved into engagement with contact 102 thereby closing the circuit through conductor 103, segment 39, brushes 32, 33, segment 35, conductor 109, solenoid 108, conductor 107, battery 105 and conductor 104, thus energizing the solenoid 108, which pulls the core 120 to the left thus rotating the pinion 121 through one-half a revolution and by means of the pawl and ratchet 125, 127 turning the shaft 122 through a half revolution. This moves the link 131 to the right, which by means of the rod 132 moves the throttle lever 133 to the right to decrease the speed of the driving engine. This leaves the gear 30 held in this position by means of the core 51 engaging with tooth 46.

When the next impulse is received, either of short or long duration, the core 51 will be drawn to the right thus releasing the shaft 29 which under the action of the spiral spring 41 will then be rotated in a counter clockwise direction until the long tooth 47 engages the core 51 thus stopping the rotation of shaft 39 and leaving the gear wheel 30 in its initial position.

If another impulse is received of such a duration as to bring the brush 32 on segment 35, an action similar to that first described will take place and the shaft 122 will be rotated through a half revolution into the position shown in Fig. 1, thus pulling the throttle lever 133 to the left and consequently increasing the speed of the driving engine. If the length of the received impulse is so proportioned as to cause the brush 32 to move onto the segment 36, at the end of the impulse, the circuit will be closed through conductor 113, solenoid

112, conductor 110, conductor 107, battery 105, conductor 104, contacts 102, 101, conductor 103, segment 39, brushes 32, 33, segment 36, thus energizing the solenoid 112, which pulls the core 135 to the left and the member 139 will be rotated in a clockwise direction allowing the mine 148 to be dropped but preventing the mine 149 from falling out until the solenoid 112 is deenergized when the member 139 will have assumed its normal position thus allowing the mine 149 to fall into the position held previously by mine 148.

If the length of another radiant impulse is so proportioned that brush 32 is on segment 37 at the end of the impulse, the solenoid 116 will be energized which will rotate the shaft 122 as hereinbefore described through half a revolution, thus moving rod 158 to the left which rotates the search light shutter 160 through a quarter of a revolution thus allowing a beam of light to emerge from the search light. Another impulse of this length will again energize solenoid 116, thus rotating the shaft 122 through an additional half revolution and thereby close the shutter 160 of the search light 161.

Should it so happen that a number of the subsidiary devices are operated successively with the possible result that the course of the body be slightly changed thereby, this may easily be corrected by sending a suitable number of relatively short impulses each sufficiently short not to operate the subsidiary devices, but each partly correcting the course of the boat. A suitable number of such corrective impulses would bring the boat back to its desired course without actuation of the subsidiary devices.

Having thus described this invention what I claim is:

1. The combination with a main device of a subsidiary device, means responsive to impulses of energy and operative to control said main device as a result of each impulse received, and operative to control only said main device in response to a comparatively short impulse, selector means interposed between said devices to control said subsidiary device in response to an impulse of longer predetermined duration, said selector means including a gear wheel for driving said selector means, and a clock mechanism intermittently connected to said gear wheel for driving said gear wheel at a predetermined rate of speed, said gear wheel having its movement initiated and terminated under control of said impulse responsive means.

2. The combination with a main device, of a plurality of subsidiary devices, means responsive to an impulse of energy and operative to control said main device as a result of each impulse received, selector means interposed between the main device and said plurality of subsidiary devices to actuate one

of said subsidiary devices selectively dependent upon the duration of the received impulse, said selector means including a gear wheel for driving said selector means, and a clock mechanism intermittently connected to said gear wheel for driving said gear wheel at a predetermined rate of speed, said gear wheel having its movement initiated and terminated under control of said impulse responsive means.

3. The combination with a main device of a plurality of separately operative subsidiary devices, an energy distributing selector device interposed between the main device and said plurality of subsidiary devices for controlling said subsidiary devices selectively and a receiving system for energy controlling said main device and said energy distributing device simultaneously, said energy distributing device including time measuring means for measuring the length of received impulses of energy.

4. The combination with a main device of a plurality of separately operative subsidiary devices, an energy distributing selector device interposed between the main device and said plurality of subsidiary devices for controlling said subsidiary devices selectively and a receiving system for energy controlling said main device and said energy distributing device, said main device being controlled as a result of each impulse received by said receiving system and said energy distributing device being controlled only in response to impulses of longer duration than necessary to control said main device, said energy distributing device including time measuring means for measuring the length of received impulses of energy.

5. The combination with a main device, of a subsidiary device, a receiver responsive to impulses of energy and operative to control said main device as a result of each impulse received, and operative to control only said main device in response to a relatively short impulse, a selector interposed between said devices to control said subsidiary

device in response to an impulse of longer predetermined duration, said selector including a clutch controlled by said impulse responsive means for driving said selector, and a clock mechanism intermittently connected by said clutch to said selector, the intermittent connection being initiated and terminated under control of said impulse responsive means arranged when operatively connected to said selector to drive the selector at a predetermined rate of speed.

6. The combination with a main device, of a plurality of subsidiary devices, means responsive to an impulse of energy and operative to control said main device as a result of each impulse received, a distributor interposed between the main device and said plurality of subsidiary devices to actuate one of said subsidiary devices selectively dependent upon the duration of the received impulse, and a clock mechanism operated at a constant rate of speed, said distributor including a clutch for intermittently connecting said clock mechanism to said distributor for driving said distributor and having the intermittent connection initiated and terminated under the control of the impulse responsive means.

7. The combination with a receiving system for energy, of a main device movable by impulses received by said receiving system to a comparatively large number of positions, a plurality of separately operative subsidiary devices, and a selector interposed between the main device and said plurality of subsidiary devices for controlling said subsidiary devices selectively, said selector including time measuring means for measuring the length of received impulses of energy and operative to control a selected subsidiary device on a relatively long impulse of energy without changing the position of the main device to an appreciable extent.

Signed at New York, in the county of New York and State of New York, this 30th day of July, 1920.

ALBERT D. TRENOR.