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MAGNETICALLY CONTROLLED SWITCH

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FIG. 1.

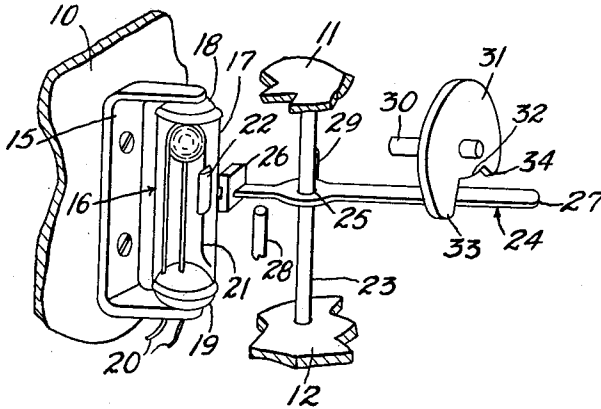
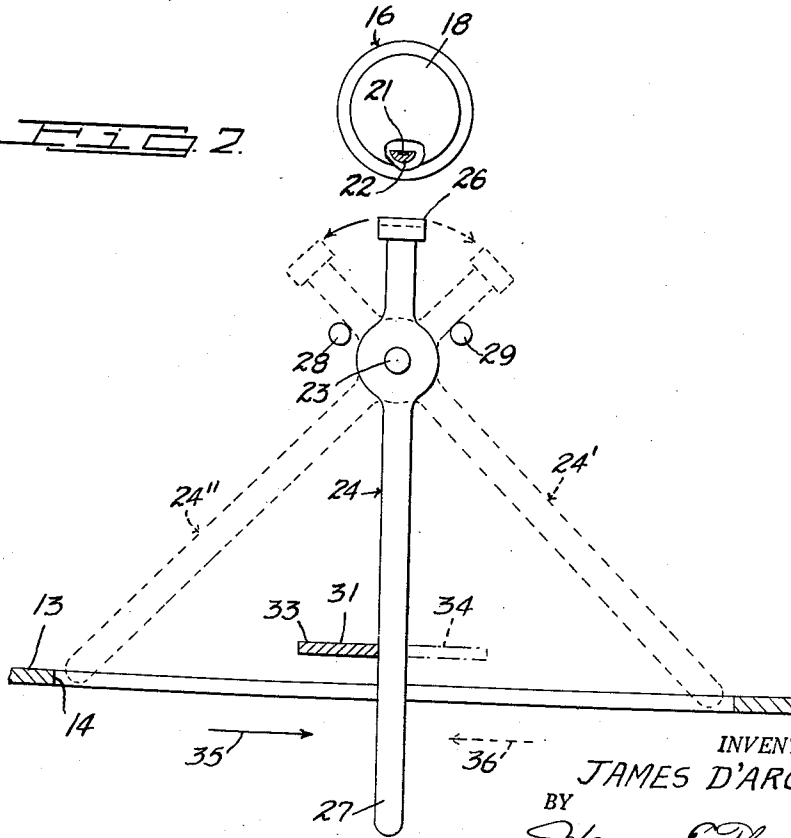


FIG. 2.



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1

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MAGNETICALLY CONTROLLED SWITCH

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This invention relates to switch devices employing a freely operable activating arm, supporting, at one end, a permanent magnet normally controlling one contact of a switch in maintaining said contact in predetermined circuit controlling position whereby, in actuation of said arm, the controlling position of said contact is varied. More particularly, the invention deals with a switch device of the character described, wherein the arm of the switch is operable in either of two directions and manually adjustable means is employed for operatively engaging the arm to control direction of movement to be imparted to the arm and in maintaining the arm in the normal contact controlling position.

The novel features of the invention will be best understood from the following description, when taken together with the accompanying drawing, in which certain embodiments of the invention are disclosed and, in which, the separate parts are designated by suitable reference characters in each of the views, and, in which:

FIG. 1 is a diagrammatic perspective view illustrating one form of switch and an activating arm and indicating portions of a casing supporting the switch and said arm and also diagrammatically illustrating the general position of a direction controlled stop which I employ; and

FIG. 2 is an enlarged diagrammatic view illustrating the casing only of the switch employed, with part of the construction broken away and in section and further illustrating the activating arm showing the direction controlled stop, part of a casing wall and indicating in dotted lines the limit of movement of the arm in both directions.

In order to simplify the illustration of my improved switch device, portions of the wall of a switch casing are diagrammatically shown, in part, in FIG. 1 and in FIG. 2. In FIG. 1, 10 can represent part of what might be a back wall of the casing, 11 part of the top wall, 12 part of the bottom wall and, in FIG. 2 of the drawing, 13 can represent part of the front wall, the front wall having an elongated aperture, as indicated at 14.

Mounted upon the inner surface of the wall 10 is a switch supporting bracket 15 and, in illustrating one adaptation and use of my invention, I have shown at 16 a magnetic mercury switch, comprising a transparent tube 17 having upper and lower closure caps 18 and 19. Circuit wires leading to the bottom cap 19 of the switch are diagrammatically seen at 20. Arranged within the tube 17 is a spring or spring actuated contact 21, to which is fixed an armature 22. While the contact of the switch may normally assume a closed circuit position, which will be the case with the switch 16 disposed, in some instances, it will be apparent that the contact of a switch in a circuit may be normally open and closed by actuation of my improved switch device.

At 23 is shown a pivot rod having a very free mounting in the walls 11 and 12 to provide extremely sensitive actuation of an activating arm 24 fixed to said rod, as at 25, intermediate the ends thereof. Suitably fixed to the inner or short end of the arm 24 is a permanent magnet 26; whereas, the other long end portion 27 of the arm projects through the wall 13 of the casing a predetermined degree and operates in the elongated aperture 14 in said wall.

Two stop pins 28 and 29 are supported in the casing of the switch, preferably on the bottom wall 12 thereof and in position to limit swinging movement of the arm 24

2

from the normal position, shown in full lines in FIG. 2, to either of the dotted line positions, shown at 24' and 24'' in said figure. Suitably supported in the casing of the switch by means of a shaft 30 is a manually adjustable direction control stop 31. The stop 31 is in the form of a disc having a cutout portion 32 forming spaced arm engaging portions 33 and 34. In the position shown in FIG. 1 and illustrated in full lines in FIG. 2, the stop 31 is set to provide movement of the arm 24 in the direction of the full line arrow 35 of FIG. 2 and to check movement of the arm 24 in the direction of the dotted arrow 36. In other words, when the arm 24 is intended to be operated in the direction of the arrow 36, the projection 34 will be moved into operative position, as indicated in dot-dash lines in FIG. 2, thus limiting movement of the arm 24 in the direction of the arrow 35. The stop 31 maintains the arm 24 in its normal position with the magnet 26 having its effective magnetic force operating upon the armature 22. It will be understood that the positioning of the magnet 26 with respect to the armature, in combination with the tension of spring actuation of the contact 21, can be adjusted to control the switch operation desired, particularly in timing the period of release of the contact 21 from its control by the magnet 26, in other words, the period of changing the circuit through the wires 20 at any point from the normal full line position of the arm 24, shown in FIG. 2, to the limit of movement of said arm, as indicated by the dotted line showings.

By virtue of the highly sensitive characteristics of the actuation of the arm 24, the switch can be constructed to be actuated by little or no force applied to the arm in either of the directions indicated by the arrows 35, 36 in FIG. 2 of the drawing. However, in some instances and by control of the magnetic energy employed, the force or energy required in actuation of the arm can be varied.

One of the distinctive features in my improved switch device resides in the fact that, as and when it is desired to move the arm actuating member, element or the like in a continued uninterrupted path and beyond the limit of travel of the arm, such member, element or the like is free to pass across the front wall 13 of the switch casing and, after the member, element or the like has extended beyond the end of the aperture 14, the arm 24 will then be released and automatically return to the normal full line position of FIG. 2 by the magnetic attraction to the armature 22.

It will also be understood that, in some instances, the member, element or the like would move the arm only a partial degree of the limit of swinging movement of the arm and sufficient to release the contact 21 for controlling the circuit 20 and then the direction of movement of said member, element or the like would be reversed. Such applications would be desirable where circuits are controlled for reversing direction of travel of members, elements or the like in devices, machines or apparatus of various types and kinds.

In the present illustration and as previously stated, the switch 16 is a normally closed switch. In other words, when the force of the magnet is not active upon the armature 22, the contact 21 will automatically move into closed circuit position, completing the circuit through the wires 20; whereas, in the normal position of the arm 24, the magnet 26 serves to support the contact 21 in the open circuit position.

One important point of interest in actuation of switches of the type and kind defined is in the fact that, as the arm 24 is actuated through a member, element or the like, continued movement of the arm results in minimizing the degree of force or energy required to actuate the arm, which will be understood in movement of the mag-

3

netic force away from direct action upon the armature 22. At the same time, the mounting of the arm 24 is so sensitive as to insure positive return of the arm to its normal position by reason of the attraction by the magnet to the armature 22.

From the foregoing, it will be apparent that the permanent magnet at one end of the activating arm serves to normally maintain the arm in what might be termed a neutral inoperative position and, at the same time, serves to automatically return the arm to such neutral position after the arm has been actuated by a medium of any type or kind. The expression "neutral inoperative position" will, of course, define inoperativeness, in the sense that the circuit of the switch employed, such as for example as the switch 16, may be held open or held closed, depending entirely upon whether actuation of the arm through the medium would result in completing a circuit or breaking a circuit.

For purposes of description, the arm 24 may be said to define a switch contact actuating element supporting a magnet and mounted for free movement toward and from the contact of said switch.

Having fully described my invention, what I claim as new and desire to secure by Letters Patent is:

1. A switch device of the character described comprising a casing, a wall of the casing having an elongated aperture therein, a U-shaped bracket in said casing, a mercury switch supported in said bracket, said switch having a spring actuated contact controlling an electric circuit by movement into and out of engagement with the mercury of said switch, an armature on said spring contact, an element pivotally mounted for free swinging movement of the casing toward and from the armature of said spring contact, said element having a short end supporting a magnet in position adjacent and registering with said armature in support of the spring con-

4

tact in predetermined circuit controlling position in the normal position of said element, said element having a long end which, in the normal position of said element, projects through the elongated aperture in said wall of the casing and adapted to be actuated through a suitable medium movable over the surface of said wall of the casing in one of two directions in movement of the magnet away from the armature of said spring contact to a degree releasing the spring contact for predetermined control of the circuit in which the spring contact is arranged, the elongated aperture in the wall of said casing being such as to permit movement of the long end of said element to position within boundaries of the casing in actuation of said long end of the element by said medium in said one direction, a manually adjustable direction control stop in said casing, and release of the long arm of said element by said medium providing automatic return of the arm to normal position engaging said stop by action of said magnet.

2. In a switch device as defined in claim 1, wherein means is provided in said casing engaging said element to limit movement of the element in both of said directions.

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