June 16, 1936. T. F. WINDAS 2,044,025

ELECTRIC SWITCH

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Fig. 1.

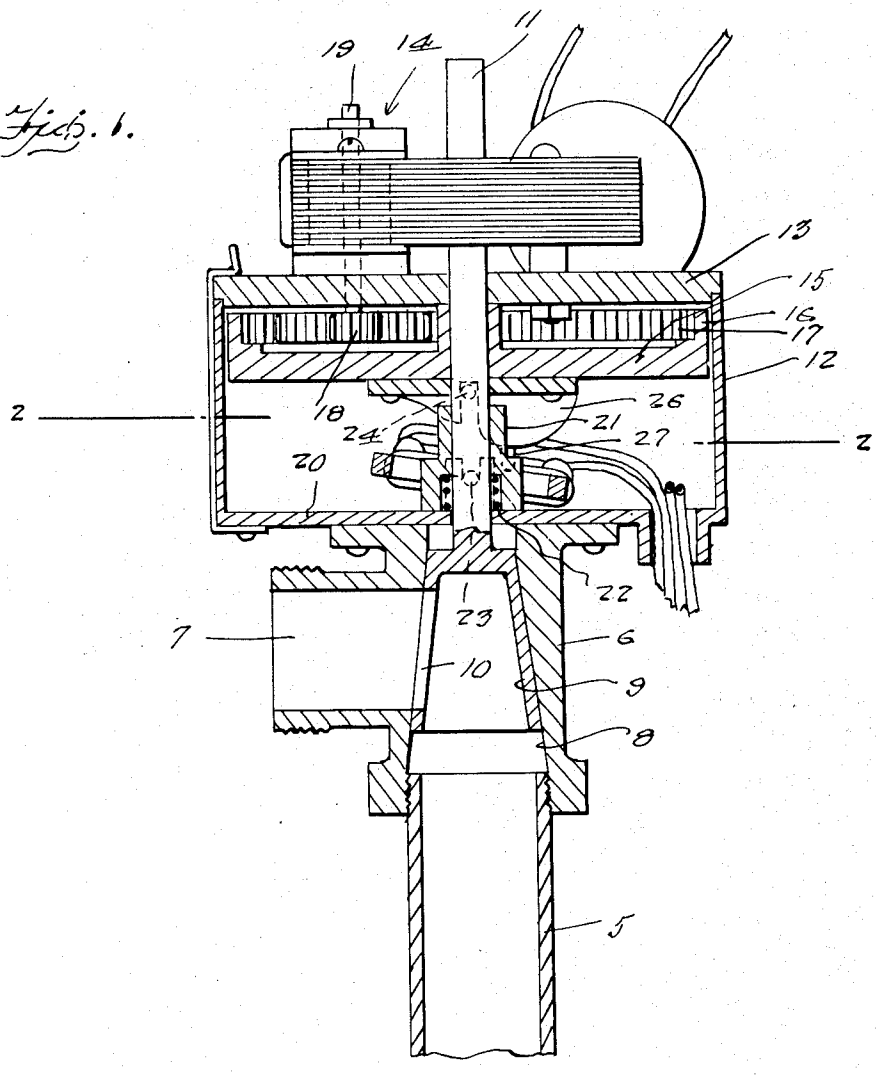
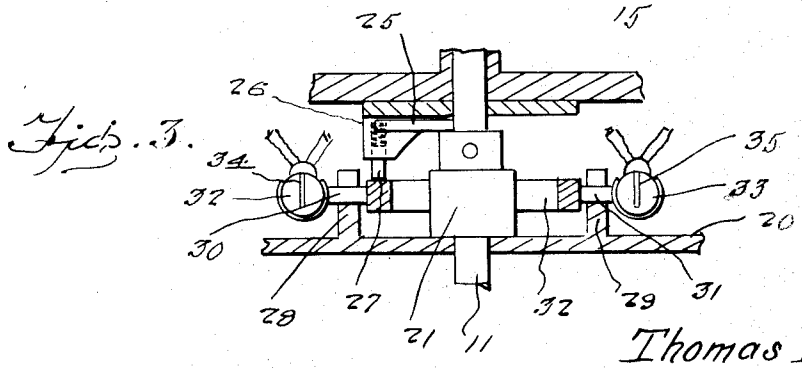


Fig. 3.



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Fig. 2.

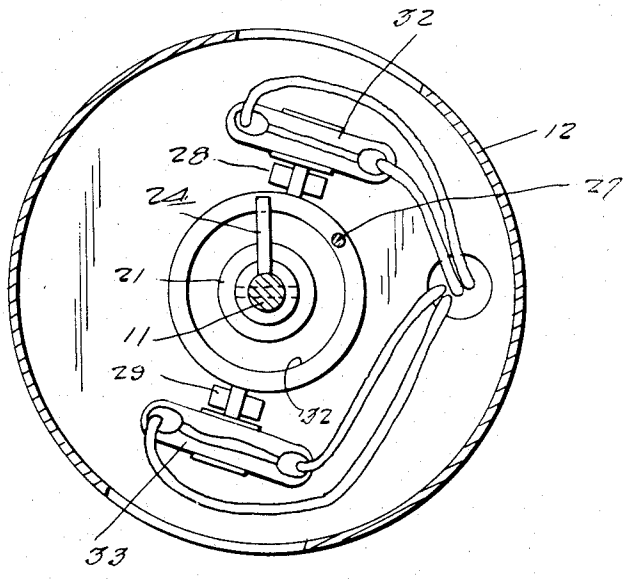
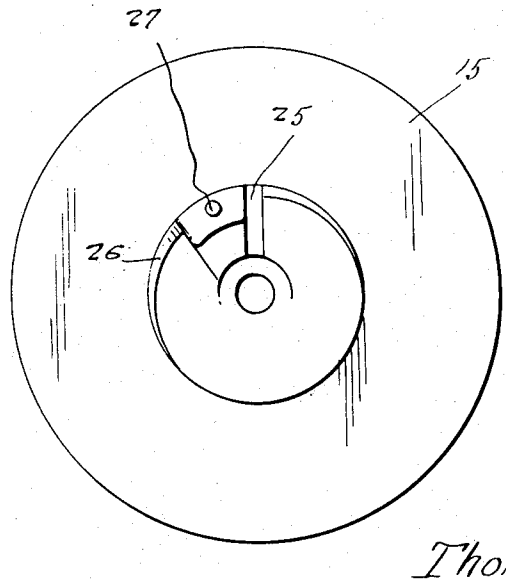


Fig. 4.



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UNITED STATES PATENT OFFICE

2,044,025

ELECTRIC SWITCH

Thomas Fitchie Windas, Santa Barbara, Calif.

Application July 20, 1932, Serial No. 623,612

13 Claims. (Cl. 200—153)

My invention relates to electrical means for operating valves, and particularly to improvements in electrical means for operating rotary and other types of fluid control valves, wherein is incorporated means for opening or closing circuits for operating or starting the operation of elements operatively associated with the valve.

It is an important object of my invention to provide a valve structure of the type described which can be connected in circuit with a clock or thermostat so as to be operated at a predetermined time and for a predetermined period, such a control being especially valuable to operate lawn spraying or other sprinkling systems, for irrigation control, and for operating and controlling the valves of a hot water or steam radiator system, and for operating electrically separate control means for affecting, for instance, the draft of a furnace, or the heating element or other operative part thereof.

It is also an important object of my invention to provide electrical switch means of the mercury type which is so arranged and constructed as to avoid the undesirable effects usually present in mercury switches, namely, the effects produced by the rebound and second contact caused by the movement of the mercury in its container.

Other objects and advantages of my invention will be apparent from a reading of the following description in connection with the drawings, wherein for purposes of illustration I have shown a preferred embodiment of the invention.

In the drawings:—

Figure 1 is a general transverse vertical sectional view through the embodiment.

Figure 2 is a horizontal sectional view taken approximately on the line 2—2 of Figure 1 looking downwardly.

Figure 3 is an enlarged detailed transverse vertical sectional view through Figure 1.

Figure 4 is a plan view of the operating cam.

In the drawings, wherein like numerals refer to like parts throughout the same, the numeral 5 generally designates a pipe in a fluid conduit, the passage from or into which of air, or liquid or steam is to be controlled by the valve of the invention. Upon the upper end of the pipe 5 is mounted in a conventional manner the vertical valve casing 6 which has at one side the tubular extension 7 which leads thereinto. Within the valve casing there is provided a tapered bore 8 with which coacts a tapered plug 9 having an opening 10 in one side thereof for communication between the pipe 5 and the extension 7. Of course, the plug 9 is hollow and open at its lower end. Its upper end is closed and provided with a vertically projecting stem 11 which extends vertically and rotatably through the switch casing generally designated 12 which may be in the form of a flat drum whose upper side is closed by means of a plate 13 upon which is mounted a suitably constructed electric motor 14. Under the plate 13 the stem 11 has keyed to it a spider or wheel 15 which has an upwardly projecting circumferential flange 16 whose inward side is provided with teeth 17 with which cooperates a pinion 18 on the lower end of the shaft 19 of the motor 14 which extends through the plate 13 for this operation.

On the floor 20 of the casing 12 and surrounding the stem 11 is a tubular housing 21 within the lower expanded portion of which is located a helical spring 22 which operates in conjunction with a transverse pin 23 through the stem 11 to maintain the stem normally in an upward position so as to properly position the plug 9 in the closing relationship with the tapered bore 8 of the valve casing and to automatically take up wear, thereby permitting the elimination of expensive and troublesome packing.

Above the pin 23 is located a pin 24 which extends from the side of the stem and works in a slot 25 formed at one side of the high-point 25' of the cam 26. The high-point 25' of the cam has vertically slidable therein a spring tensioned pin 27 which is normally pressed downwardly upon the upper surface of the ring 32.

The cam 26 is fastened to the underside of the web or wheel 15, and the cam being connected by the pin 24 for rotation with the valve stem 11, as the wheel 15 is rotated by the motor 14 the valve stem 11 will be rotated. The spring housing 21 remains stationary with the switch casing 12 while the valve stem 11 is being rotated.

Rockably mounted in diametrically oppositely located supports 28, 29, are diametrically alined arms 30 and 31 extending from opposite sides of the ring 32 upon the upper side of which the lower end of the spring pressed pin 27 is arranged to ride. Each of the diametrical arms 30, 31 carries outwardly of the supports 28, 29 a transversely disposed glass or other suitable elongated container 33, 33a in either end of each of which is located a pair of contact conductors 34, 35 with either of which a quantity of mercury within the containers is adapted to contact and bridge as the containers are tilted at one end or the other by tilting of the ring 32 according to the position of the spring finger 27 with respect to the ring 32.

It will be obvious that as the motor circuit is

energized in any manner, the valve stem will be rotated so as to open or close the passage of fluid or the like through the extension 7, and that this rotating movement carries the cam 26 around within the switch casing with the spring finger 27 riding upon the upper surface of the rocking ring 32, and that this causes rocking of the ring and its mercury switches so as to open and close any variety of circuits which may be introduced into the ends of the mercury containers 33, 33a, whereby such circuits, such as circuits associated with the device upon which the desired valve structure is mounted, in a manner to cause action of such devices concurrently with the operation of the valve, as for example, to shut off the flame in an oil or gas burner and control the draft in a coal fired heating apparatus concurrently with the shutting off of the hot or cold air ducts and radiators, these effects being necessary to a complete shutting off of the heating system. Other similar examples would be equally effective in illustrating the definite operative connection between the closing or opening movement of the valve and the closing and opening of a plurality of circuits operatively associated with the structure upon which the valve is mounted.

In order to prevent rebound of the mercury within the containers 33, 33a, each of the containers is in longitudinally bowed form so as to form a depressed pocket at either end thereof, or the same may be straight and provided with a depression at either end. In either case, the mercury after moving to such end will be confined against rebounding and closing a second contact of an undesirable nature.

Though I have shown and described herein a preferred embodiment of the invention it is to be definitely understood that I do not desire to limit the application of the invention thereto, and any change or changes may be made in material and structure and arrangement of parts, within the spirit of the invention and the scope of the subjointed claims.

It will be obvious that the device of the invention may be efficiently employed as a relay switch for opening and closing fuel valves or check draft motors in a heating system. Also the switch ring may be operated by means of a thermostat so as to operate the motor 14. Employed to control sprinkling and irrigation systems the ring 32 may be operated by means of an electric clock.

What is claimed is:—

1. In combination, a housing a rotatable stem within said housing, rotary cam means on said stem within said housing and secured against rotation relative to said stem, a motor on said housing operatively connected to said rotary cam means, and switch means within said housing and having a rockable portion operably engaged by said cam means whereby a circuit may be opened and closed as said rotary means is operated to tilt said portion, said rockable portion comprising a ring rockably mounted within said housing and with which said rotary cam means is slidably engaged.

2. In combination, a housing a rotatable stem within said housing, rotary cam means on said stem within said housing and secured against rotation relative to said stem, a motor on said housing operatively connected to said rotary cam means, switch means within said housing and having a rockable portion operably engaged by said cam means whereby a circuit may be opened and closed as said rotary means is operated to tilt said portion, said rockable portion comprising a rockably mounted frame, mercury switch elements carried by said frame and operable by the tilting of said frame.

3. In a device of the character described, a switch housing, a stem journaled in said switch housing, a wheel on said stem within said switch housing and secured so as to rotate with said stem, means mounted on said housing operatively engaging said wheel for rotating the wheel, a switch mounted within said housing on the bottom thereof and having a tiltable member, means connected to said tiltable member for opening and closing a circuit, a cam depending from said wheel and engaging said tiltable member for tilting the said member as said wheel is rotated.

4. In a device of the character described, a switch housing, a stem journaled in said switch housing, a wheel on said stem within said switch housing and secured so as to rotate with said stem, means mounted on said housing operatively engaging said wheel for rotating said wheel, a switch mounted within said housing on the bottom thereof and having a tiltable member, means connected to said tiltable member for opening and closing a circuit as the tiltable member is tilted, a cam depending from said wheel and engaging said tiltable member for tilting the said member as said wheel is rotated, said means comprising mercury make and break means.

5. In a device of the character described, a switch housing, a stem journaled in said switch housing, a wheel on said stem within said switch housing and secured so as to rotate with said stem, means mounted on said housing operatively engaging said wheel for rotating the same, a switch mounted within said housing on the bottom thereof and having a tiltable member, means connected to said tiltable member for opening and closing a circuit as the same is tilted, a cam depending from said wheel and engaging said member for tilting the same member as said wheel is rotated, said means comprising mercury make and break means, said switch including a mounting rising from said bottom of the housing around said stem, said tiltable member comprising a ring surrounding and concentrically spaced from said stem and from said mounting and rockably connected to said mounting.

6. In a device of the character described, a switch housing, a stem journaled in said switch housing, a wheel on said stem within said switch housing and secured so as to rotate with said stem, means on said housing operatively engaging said wheel for rotating the same, switch means mounted within said housing and having a tiltable member, third means on said tiltable member for opening and closing at least two separate circuits as said member is tilted, a cam depending from said toothed wheel and engaging said tiltable member for tilting the same member as said wheel is rotated, said third means comprising mercury make and break means, said switch means including a mounting rising from the bottom of said housing around said stem, said tiltable member comprising a ring surrounding and concentrically spaced from said stem and from said mounting and rockably connected to said mounting.

7. A switch comprising a housing, a rotatable shaft journalled in said housing, a tubular mounting on the bottom of said housing and surrounding said shaft, a switch member tiltably mounted on said mounting, a wheel on said shaft above

said member and secured for rotation with said shaft, a cam on said wheel operatively engaging said tiltable member for tilting the same as said shaft is rotated, said member being operable to open and close a circuit as the same is tilted.

8. A switch comprising a vertical rotary shaft, means rotatably supporting said shaft, a member tiltably mounted on said means, a cam member on said shaft and secured for rotation therewith, said cam member having a portion operatively engaged with said member for tilting the same as said shaft is rotated, switch means on said member operable by tilting thereof for opening and closing a circuit.

9. A switch comprising a housing, a rotatable shaft journalled in said housing, a tubular mounting on the bottom of said housing and surrounding said shaft, a switch member tiltably mounted on said mounting, a wheel on said shaft above said member and secured for rotation with said shaft, a cam on said wheel operatively engaging said tiltable member for tilting the same as said shaft is rotated, said member being operable to open and close a circuit as the same is tilted, and a cam on said toothed wheel for operating switch means concurrently with the opening and closing of said valve, said switch means being carried by said tubular mounting, a pin on said shaft engaging in a slot in said cam member in a manner to support said cam member on said shaft and prevent rotation of said cam member relative to said shaft.

10. A switch comprising a housing, a rotatable shaft journalled in said housing, a tubular mounting on the bottom of said housing and surrounding said shaft, a switch member tiltably mounted on said mounting, a wheel on said shaft above said member and secured for rotation with said shaft, a cam on said wheel operatively engaging said tiltable member for tilting the same as said shaft is rotated, said member being operable to open and close a circuit as the same is tilted, said cam on said toothed wheel operating switch means concurrently with the rotation and counter-rotation of said shaft.

11. A switch comprising a housing, a rotatable shaft journalled in said housing, a tubular mounting on the bottom of said housing and surrounding said shaft, a switch member tiltably mounted on said mounting, a wheel on said shaft above said switch member and secured for rotation with said shaft, a cam on said wheel operatively engaging said switch member for tilting the same as said shaft is rotated, said switch member being operable to open and close a circuit as the same is tilted, and a cam on said toothed wheel for operating said switch member concurrently with the rotation and counter-rotation of said shaft.

12. A switch comprising a housing, a rotatable shaft journalled in said housing, a tubular mounting on the bottom of said housing and surrounding said shaft, a switch member tiltably mounted on said mounting, a toothed wheel on said shaft above said switch member and secured for rotation with said shaft, a cam on said wheel operatively engaging said switch member for tilting the same as said shaft is rotated, said switch member being operable to open and close a circuit as the same is tilted, said switch member including circumferentially spaced double ended mercury make and break devices, said devices extending in directions divergent from the axis of tilt of said switch member.

13. A switch comprising a housing, a rotatable shaft journaled in said housing, a tubular mounting on the bottom of said housing and surrounding said shaft, a switch member tiltably mounted on said mounting, a wheel on said shaft above said member and secured for rotation with said shaft, a cam on said wheel operatively engaging said tiltable member for tilting the same as said shaft is rotated, switch means carried by said tiltable member and being operable to open and close a circuit as the tiltable member is tilted, in different directions concurrently with the rotation and counter rotation of said rotatable shaft.

THOMAS FITCHIE WINDAS.