Oct. 14, 1941. M. A. VAN DAM 2,259,402

ELECTRIC TIME CONTROLLED SWITCH

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Fig. 1.

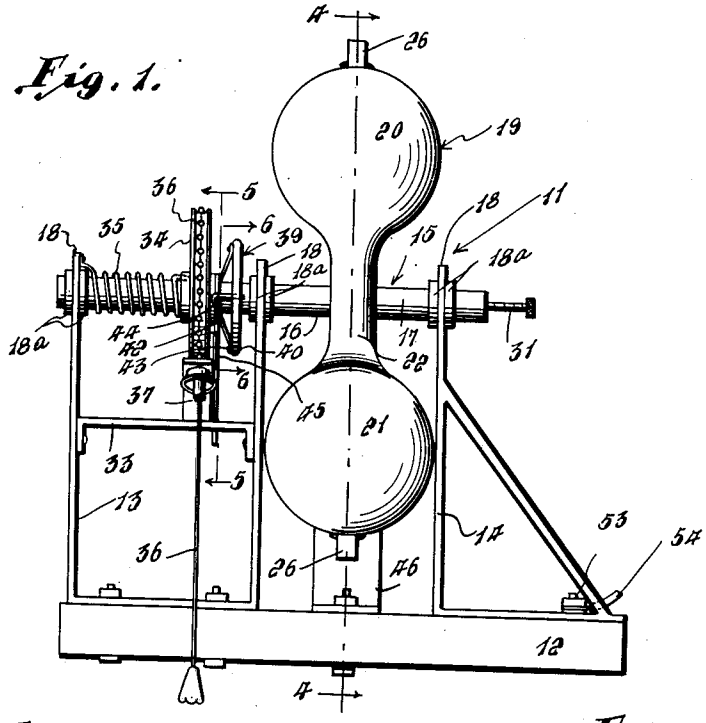


Fig. 2.

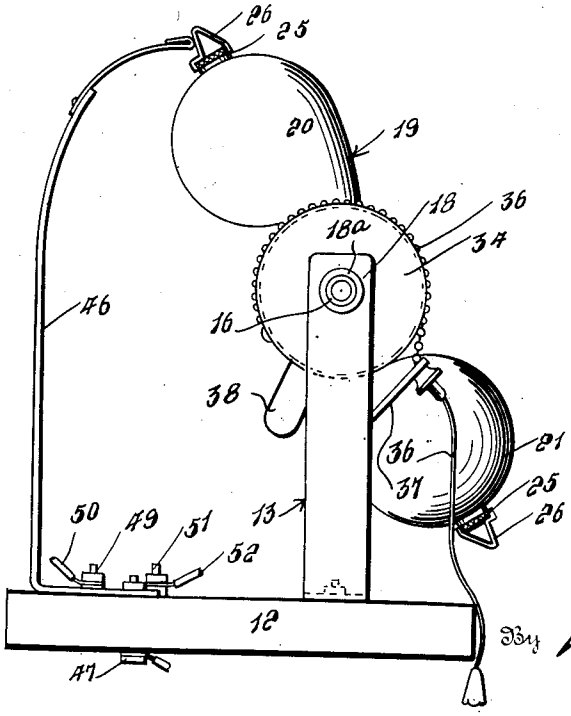
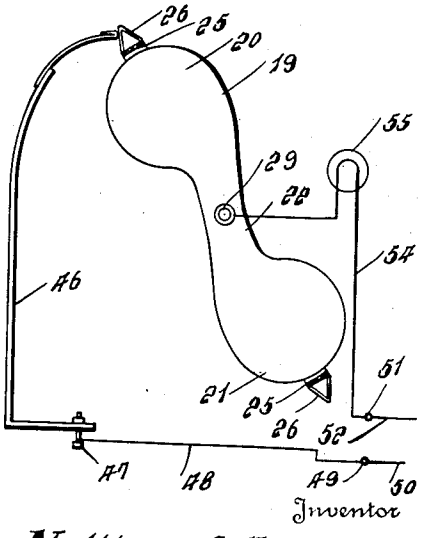


Fig. 7.



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ELECTRIC TIME CONTROLLED SWITCH

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Fig. 3.

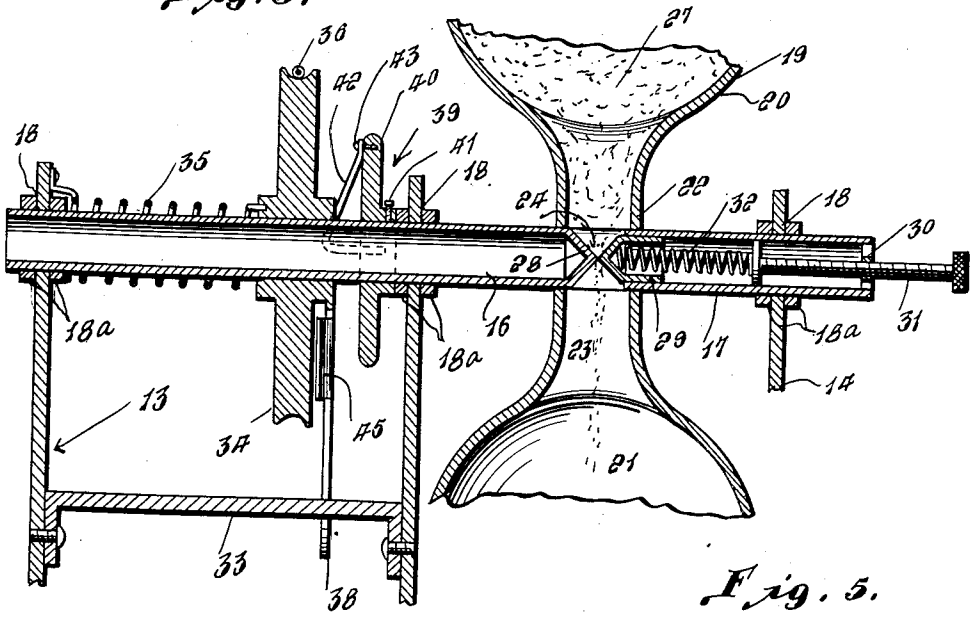


Fig. 4.

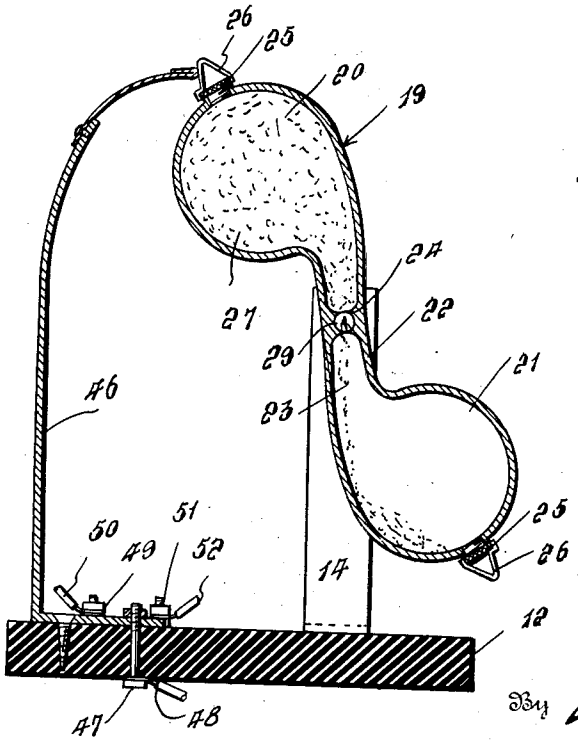


Fig. 5.

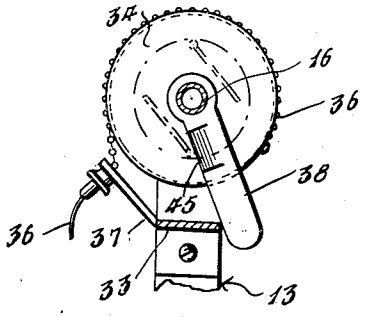
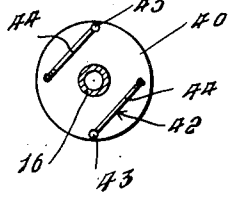


Fig. 6.



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ELECTRIC TIME CONTROLLED SWITCH

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Fig. 8.

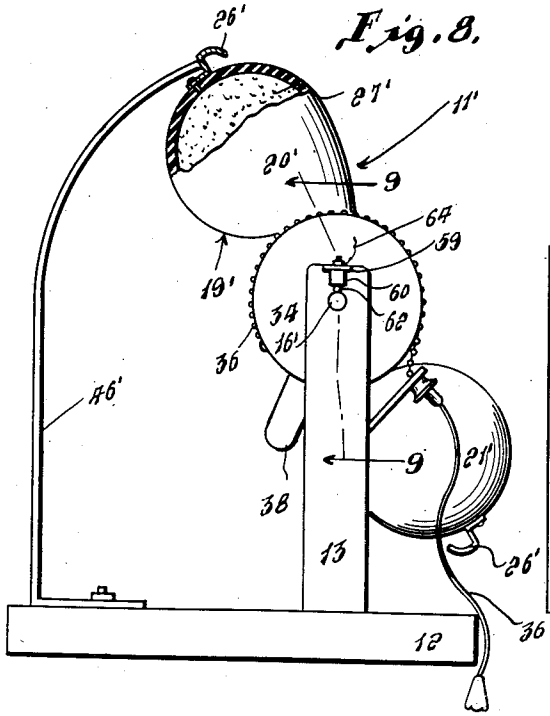


Fig. 10.

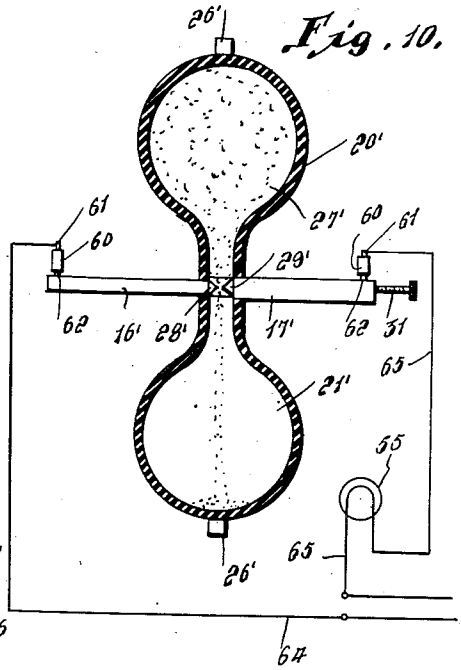
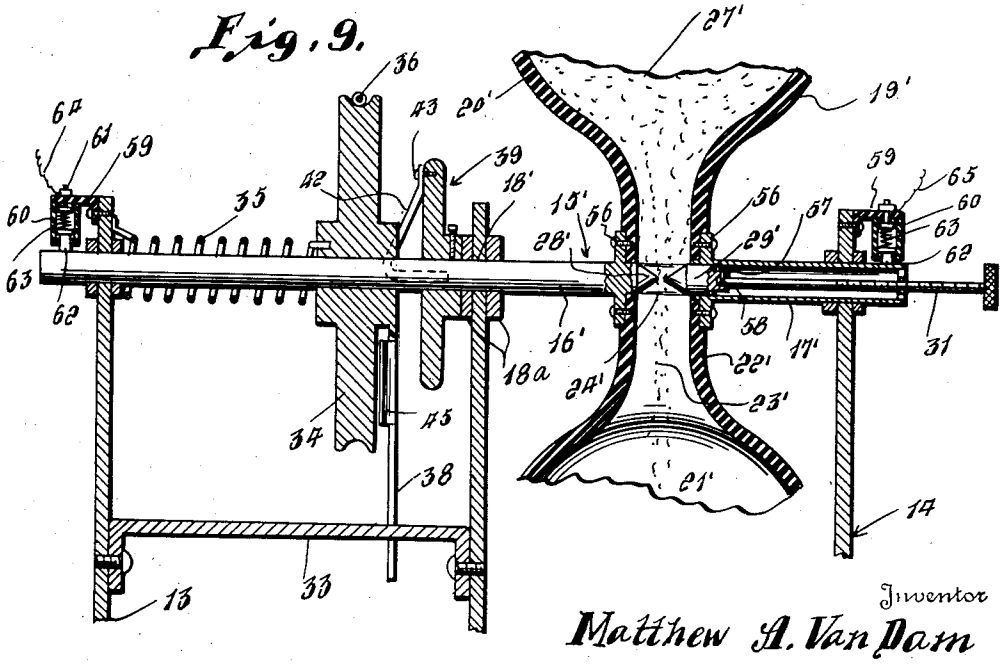


Fig. 9.



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2,259,402

UNITED STATES PATENT OFFICE

2,259,402

ELECTRIC TIME CONTROLLED SWITCH

Matthew A. Van Dam, Lansing, Ill.

Application July 11, 1940, Serial No. 344,993

6 Claims. (Cl. 200—33)

This invention relates to an improved electric switch of simple construction for breaking an electric circuit at a predetermined time after the switch is set and is especially adapted for use for extinguishing electric lamp bulbs so that the light will be maintained for a certain interval after the switch has been actuated.

More particularly, it is an aim of the invention to provide an electric time switch of simple construction employing the principle of an hourglass for actuating the switch in breaking an electric circuit.

More particularly, it is an aim of the invention to provide a switch including a rotatably mounted vessel having enlarged compartments at its ends, connected by a restricted passage, for containing a fluent material the weight of which will rock said vessel, when a sufficient quantity of the material has flowed through the passage therein, by gravity, for moving the vessel for breaking an electric circuit.

Still another aim of the invention is to provide a time controlled switch employing the hourglass principle of operation wherein the fluent material is of an electrical conducting material and functions as a conductor between two spaced contact elements while the material is flowing from the upper compartment of the vessel to the lower compartment thereof.

Other objects and advantages of the invention will hereinafter become more fully apparent from the following description of the drawings, which illustrate preferred embodiments thereof, and wherein:

Figure 1 is a side elevational view of one embodiment of the electric time controlled switch,

Figure 2 is an end view in elevation of the same,

Figure 3 is an enlarged fragmentary longitudinal, vertical sectional view of the same,

Figure 4 is a transverse vertical sectional view taken substantially along the plane of the line 4—4 of Figure 1,

Figures 5 and 6 are transverse vertical sectional views taken substantially along the planes of the lines 5—5 and 6—6, respectively, of Figure 1,

Figure 7 is a diagrammatic view of the circuit of which the electric time controlled switch forms a part,

Figure 8 is an end view partly in elevation and partly in section of another embodiment of the invention,

Figure 9 is an enlarged longitudinal vertical sectional view taken substantially along the plane of the line 9—9 of Figure 8, and

Figure 10 is a diagrammatic view of the circuit of which the switch, as illustrated in Figures 8 and 9, forms a part.

Referring more particularly to the drawings, wherein like reference characters designate like or corresponding parts throughout the different views, 11 designates generally one embodiment of the electric time controlled switch, as illustrated in Figures 1 to 7, which includes a base 12 of electrical insulating material on which are mounted standards 13 and 14. The standard 13 includes two upwardly projecting posts having openings in their upper ends forming bearings while the standard 14 comprises a single upwardly projecting post having a similar opening forming a bearing which alines with the openings in the posts of the standard 13 for journaling a tubular shaft 15 formed of the sections 16 and 17. The section 16 is journaled in the bearings 18 in the posts of the standard 13 and the section 17 is journaled in the bearing 18 of the standard 14. The shaft sections 16 and 17 are provided with collars 18a to prevent said sections from sliding relatively to their bearings 18.

A vessel or container, designated generally 19, which is formed of an electrical conducting material, is provided with compartments 20 and 21 at its ends which are connected by a restricted neck portion 22 provided with a passage 23 connecting the compartments 20 and 21 and having a restricted intermediate portion 24. The compartments 20 and 21 at their remote ends are provided with threaded openings adapted to be normally closed by threaded plugs 25 on which are mounted corresponding keeper elements 26. As best seen in Figure 4, the compartments 20 and 21 are offset relatively to the neck 22 in opposite directions relatively to each other. The vessel 19 is adapted to be partially filled with a fluent material or substance 27 which may be of granular form, such as sand, or which may be in the form of a liquid.

The adjacent ends of the shaft sections 16 and 17 are secured to the vessel 19, intermediate the ends of its neck portion 22 and contiguous with the restricted passage portion 24, as best seen in Figure 4. As best seen in Figure 3, the shaft section 16 is provided with a tapered end 28 which projects into the restricted bore portion 24. A valve element 29 is slidably mounted in the corresponding end of the shaft section 17 and is provided with a tapered end which projects into the passage portion 24 in opposed re-

lationship to the end 28. The opposite, outer end of the shaft portion 17 is provided with a restricted threaded opening 30 to receive a threaded follower screw 31 provided with a head on its inner end to which is secured one end of an expansion coil spring 32, the opposite end of which is secured to the valve 29, so that the follower screw 31 can be adjusted to move the valve 29 toward and away from the end 28 to vary the size of the passage portion 24 for regulating the flow of the fluent material 27 therethrough.

The posts of the standard 13 are connected intermediate of their ends by means of a bar 33. A spool 34 is turnably mounted on the shaft section 16 above the bar 33 and between the posts of the standard 13. A coil spring 35 is fixed at one end to one of the posts of the standard 13 and at its opposite end to the spool 34 for turning the spool in one direction on the shaft section 16. The intermediate portion of the spring 35 is coiled around the shaft section 16. A flexible member 36 is fixed at one end to the spool 34 and is trained partially therearound with its opposite, free end extending through an aperture in an arm 37 which is secured to the bar 33. An arm 38 is secured to the spool 34 and extends radially therefrom to form a stop for engaging the bar 33 to limit the turning movement of the spool 34 in one direction, as urged by the spring 35.

A clutch, designated generally 39, includes a disk 40 which is fixed to the shaft section 16, between the posts of the standard 13, by a set screw 41. Disk 40 is provided with a pair of corresponding spring elements 42 which are fixed at their corresponding ends at 43 to the disk 40, adjacent its periphery and in diametrically opposed relationship to each other. The spring elements 42 are provided adjacent their secured ends 43 with the cam portions 44 which are disposed obliquely to the plane of the disk 40 and which are inclined toward the ends 43. The opposite, free ends of the spring elements 42 extend inwardly of and loosely through the disk 40. The stop 38 is provided along one edge thereof with the inclined cam face 45 for engaging one or the other of the cam portions 44, when the spool 34 is turned by the spring 35 to retract the spring element 42 of which said cam portion 44 forms a part, to permit the stop to pass thereover. When the spool 34 is turned in the opposite direction by a pull on the flexible member 36 the stop member 38 will engage the free end of one of the spring elements 42 to turn the shaft section 16, in a clockwise direction, as seen in Figure 4, through an arc of slightly less than one hundred and eighty degrees to thereby invert the vessel or container 19.

A spring latch element 46, of electrical conducting material, is fastened at one end to the base 12 and extends upwardly therefrom, on one side of the shaft 15, with its free end disposed thereabove and bent to project toward the vertical plane of the shaft 15. One of the fastenings by means of which the latch element 46 is secured to the base 12 forms a contact post 47 which is connected by a conductor 48 to a contact post 49, secured to the base 12 and connected to a conductor 50. Another contact post 51 is mounted in the base 12 and is provided with a conductor 52. The conductors 50 and 52 lead to a source of electric current, not shown, and form positive and negative conductors, respectively, thereof. A contact post 53, as seen in Figure 1, is connected to the standard 14, which is of conducting material, and is provided with a conductor 54 which connects with the post 51. The shaft section 17 is likewise of conducting material and connects the post 14 to the vessel or container 19.

This circuit is shown diagrammatically in Figure 7 with an electric lamp bulb 55 shown connected to the conductor 54, intermediate of its ends. It will thus be seen that the current flows from the source of electricity through conductor 50, contact post 49 and conductor 48 to contact post 47, through the spring latch element 46 and the keeper 26 which is in contact therewith to the vessel 19, from the vessel 19 through the shaft section 17 and standard 14 to the contact post 53, through the conductor 54 through the lamp bulb 55 to post 51, and from the post 51 through conductor 52 back to the negative side of the source of electric current so that when the spring latch element 46 is engaging one of the keepers 26 the lamp bulb 55 will be energized and it will be deenergized when the vessel 19 is moved so that neither of the keeper elements 26 are in contact with the spring latch element 46.

Assuming the time controlled switch 11 to be in the position, as seen in Figures 2 and 4 with the compartment 20 above the compartment 21 and filled with the fluent material 27, the weight of the fluent material will tend to cause the vessel 19 to turn in a counterclockwise direction to the position, as seen in Figures 2 and 4 where it will be held by the spring latch element 46 at an oblique angle to the standards 13 and 14. In this position the circuit, heretofore described, will be closed and the bulb 55 energized. With the vessel 19 thus positioned, the fluent substance 27 will flow through passage 23 to compartment 21 and when there is sufficient substance 27 in compartment 21 to counterbalance and exceed the weight of the substance in compartment 20 compartment 21 will swing downwardly or in a clockwise direction to swing compartment 20 upwardly so that its keeper 26 will move out of engagement with latch element 46 to break the circuit to the lamp bulb 55. The material 27 will continue to flow through passage 23 until it fills compartment 21. A pull on the free end of the flexible member 36 will turn the spool 34 in a clockwise direction, as seen in Figure 2, to cause the stop member 38 to engage the free end of one of the latch elements 42 to turn the shaft section 16 and the vessel 19 in a clockwise direction to swing the compartment 21 to the position formerly occupied by the compartment 20. As its keeper element 36 rides under and retracts the free end of the latch element 46 the swinging movement will be slowed down to prevent it from swinging past the vertical, dead center position so that when released, by releasing the flexible member 36 its keeper element 26 will rest against the latch element 36 and the spool 34 will be turned counterclockwise by its spring 35 with the stop 38 retracting and passing over the other spring element 42. This will again complete the circuit to energize the lamp bulb 55 which will be maintained until the weight of the fluent substance 27 in compartment 20 again breaks the circuit, in the manner as heretofore described. By adjusting the valve 29 the rate of flow of the substance or material 27 can be varied to vary the length of time that the circuit will be maintained.

In Figures 8, 9 and 10 another embodiment of the time controlled switch, designated 11' is illustrated. The parts of the time controlled electric switch 11' which correspond to similiar parts of the switch 11 bear corresponding reference characters and include the base 12, standards 13 and

14, collars 19, spool 34, spring 35, arm 38, and the clutch mechanism, designated generally 39. The spool 34 and clutch mechanism 39 are mounted on the shaft section 16' of the shaft 15'. The shaft section 16' is actuated in the same manner as the shaft section 16 by the spring 35 and the flexible member 36 through the spool 34 and clutch mechanism 39. A vessel 19' of electrical insulating material is secured to the adjacent ends of shaft sections 16' and 17' by means of the collars and fastenings 56, intermediate the ends of its neck portion 22'. The vessel 19' is of the same shape as the vessel 19 and differs therefrom only in that it is formed of a non-conducting material and is provided with a slightly different type of keeper elements 26' which are connected to the remote, closed ends thereof for engaging the spring latch element 46' which is of the same shape and disposed in the same position as the latch element 46 but which does not form an electrical conductor. The shaft section 16' is provided with a tapered end 28' which extends into the restricted passage portion 24' while the tubular shaft section 17' is provided with a follower screw 31 which is swivelly connected at its shank end to a valve member 29' by means of a set screw 57 which extends into a socket portion of the valve 29' for engaging an annular groove 58 in the shank end of the screw follower 31. The shaft sections 16' and 17' and the valve 29' are formed of conducting material so that the end 28' and the corresponding end of the valve 29', which is likewise disposed in the restricted passage portion 24' form contacts which are adapted to be spaced from each other and which are likewise adapted to restrict the flow of the fluent material 27' therethrough. The valve 29' is adjustable in the same manner as the valve 29 for regulating the flow of the material 27' which, in the switch 11', is of electrical conducting material such as fine particles of metal.

To the upper end of one of the posts of the standard 13 and to the upper end of the standard 14 are secured corresponding brackets 59 of insulating material from which are suspended cylinders 60 by means of nut and bolt fastenings 61. A piston 62 is slidably mounted in each of the cylinders 60 with one end projecting therefrom and urged outwardly by means of an expansion coil spring 63 which bears against the fastening 61 and the inner end of the piston 62. Pistons 62 are disposed in wiping engagement with the remote ends of the shaft sections 16' and 17' and are of conducting material as are also the springs 63 and fastenings 61 to which are connected the conductors 64 and 65 which lead to positive and negative sides, respectively, of a source of electric current, not shown.

The inverting of the vessel 19' and the means 46' for holding the filled end thereof in uppermost position is the same in the switch 11' as in the switch 11. Likewise, the means for regulating the flow of the material 27' through the passage 23' is the same. However, instead of employing the vessel 19' as a part of the circuit the current flows from the source of electric current, through conductor 64 to one of the fastenings 61, through one of the springs 63 and piston 62 to the shaft section 16', from its end 28' through the conducting material 27' passing through the restricted passage 24' to the combination valve and contact element 29', through the shaft section 17' to and through the other piston 62, spring 63 and fastening 61 to the conductor 65 to which is connected a lamp bulb 55, as illustrated in the diagrammatic view, Figure 10, which is energized by the current passing through this circuit back through the conductor 65 to the negative side of the source of electric current. The circuit is maintained so long as there is sufficient of the fluent substance 27' in the upper compartment 20' to flow by gravity through the restricted passage 24' and to bridge and thereby maintain the circuit between the contact points 28' and 29'. The movement of the upper compartment 20' away from the latch element 46' will not affect the circuit to the lamp bulb 55' which will be sustained until the fluent substance 27' ceases to bridge the contacts 28' and 29'. By inverting the vessel 19' by a pull on the cord 36, in the same manner that the vessel 19 is inverted, as heretofore described, the compartment 21' will be raised and disposed in the same position as the compartment 20', in Figure 8, so that the fluent material 27' passing downwardly therefrom will again complete the circuit to energize the lamp bulb 55'. By adjusting the member 29' through operation of the follower screw 31 the flow of the fluent material 27' is varied and likewise the space between the contact points 28' and 29' is varied to increase or decrease the amount of the fluent substance 27' which is required to maintain the electric circuit.

Various modifications and changes in the construction and arrangement of the parts in each of the embodiments of the invention are contemplated and may obviously be resorted to as only preferred embodiments thereof have been disclosed.

I claim as my invention:

1. A time controlled electric switch, comprising a shaft, bearings in which the ends of the shaft are journaled, a spool rotatably mounted on the shaft, spring means for turning the spool in one direction, a stop connected to the spool for limiting its turning movement in said direction, means connected to said spool for turning it in the opposite direction, clutch means associated with the shaft and spool to cause the shaft to be turned with the spool when the latter is rotated in the last mentioned direction, and to cause the spool to turn relatively to the shaft when turned in the first mentioned direction; a container having compartments at its ends connected by a restricted neck portion having a bore forming a communicating passage between said compartments, said neck portion being fixed to the shaft for inverting the container when the shaft is turned, a pair of electrical contacts, and a fluent substance contained in said container and partially filling the same, to flow from the upper compartment through the bore to the lower compartment, for making and breaking a circuit between the two contacts.

2. An electric switch as in claim 1, comprising spaced contacts mounted in said neck portion and projecting into the bore thereof, said fluent substance being of electric conducting material, said container being formed of a non-conducting material, and the fluent subtsance passing through said bore forming a conductor between said spaced contacts.

3. An electric switch as in claim 1, comprising spaced contacts mounted in said neck position and projecting into the bore itself, said fluent substance being of electric conducting material, said container being formed of a non-conducting material, the fluent substance passing through said bore forming a conductor between said spaced

contacts, one of said contacts being adjustable relatively to the other for adjusting the volume of flow of said fluent substance through the bore.

4. An electric switch as in claim 1, comprising valve means mounted in said neck portion for restricting the passage of said bore, said valve means being adjustable to vary the flow of the fluent substance through said bore.

5. An electric time controlled switch as in claim 1, comprising a base member for supporting said bearings, a spring latch element secured at one end to said base member and extending upwardly therefrom, the opposite free end of said latch element being disposed above and to one side of said shaft, said spring latch element forming an electrical contact, said container being formed of electrical conducting material to form an electrical contact, the compartments of said container being offset relatively to the neck portion and in opposite directions relatively to each other so that the upper compartment, when filled with the fluent substance will be swung, by the weight thereof, into engagement with the free end of said latch member for completing a circuit between said contacts, said upper end being movable out of engagement with said spring latch member by the weight of the fluent substance in the lower compartment when the amount of fluent substance in the lower compartment exceeds the quantity in the upper compartment.

6. A time controlled electric switch, comprising a shaft, bearings in which the ends of the shaft are journaled, a spool rotatably mounted on the shaft, spring means for turning the spool in one direction, a stop connected to the spool for limiting its turning movement in said direction, means connected to said spool for turning it in the opposite direction, clutch means associated with the shaft and spool to cause the shaft to be turned with the spool when the latter is rotated in the last mentioned direction, and to cause the spool to turn relatively to the shaft when turned in the first mentioned direction; a container having compartments at its ends connected by a restricted neck portion having a bore forming a communicating passage between said compartments, said compartments being offset in opposite directions relatively to the neck portion, said neck portion being fixed to the shaft for inverting the container when the shaft is turned, a pair of electrical contacts interposed in an electric circuit, and a fluent substance contained in said container and partially filling the same, and adapted to flow through the neck portion from the upper to the lower compartment, the circuit through the contacts being maintained in a closed position by the fluent substance, when it is disposed in the upper compartment, and being interrupted by the movement of the fluent substance to the lower compartment.

MATTHEW A. VAN DAM.