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TIME CONTROLLED ELECTRIC SWITCH

Filed June 28, 1928

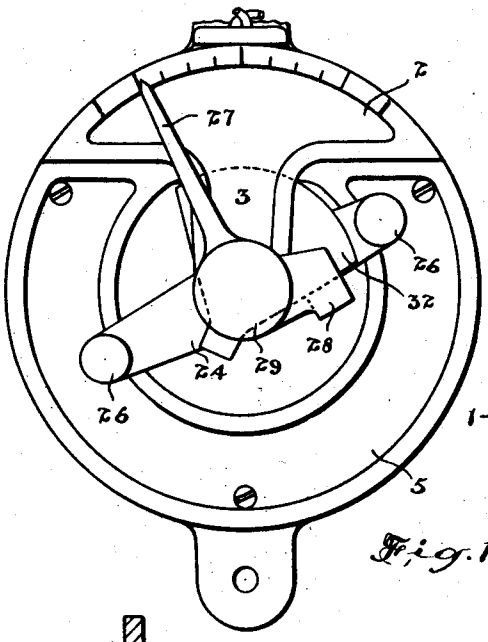


Fig. 1.

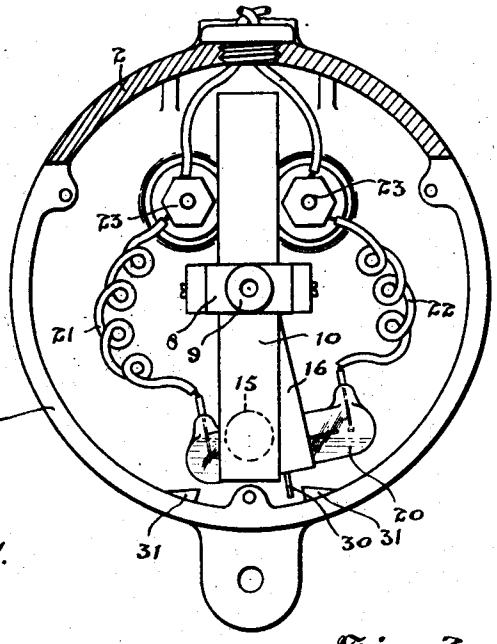


Fig. 2.

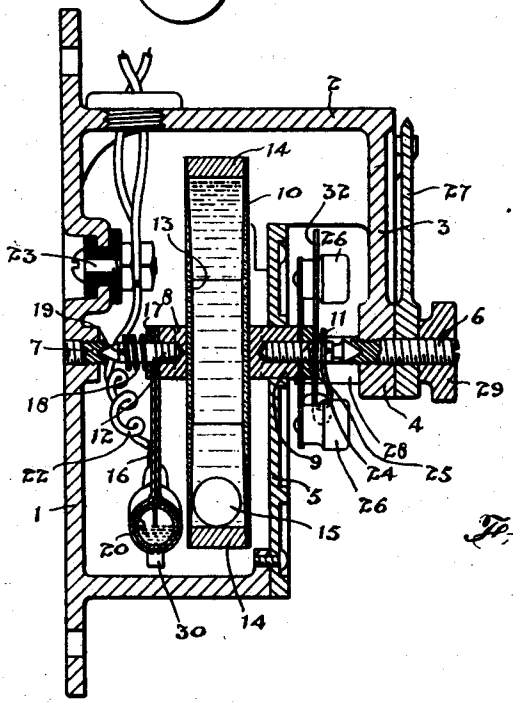


Fig. 3.

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UNITED STATES PATENT OFFICE

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TIME CONTROLLED ELECTRIC SWITCH

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The principal objects of the invention are, to provide a simple form of time switch for controlling the operation of electrical devices for a limited period which may be instantaneously adjusted to operate for different periods and will operate with precision.

The principal feature of the invention consists in the novel arrangement of a tubular member on a pivotal member supporting a contact breaker and the provision of a gravity actuating member within said tube to effect the tilting of the pivotal member.

A further important feature consists in the novel construction and arrangement of the means for adjusting and limiting the movement of the gravity operated member.

In the drawings, Figure 1 is a front elevational view of the improved timing switch.

Figure 2 is a front elevational view with a portion of the casing broken away and the cover removed.

Figure 3 is a vertical mid-sectional view through the switch.

In the apparatus herein shown the casing 1 is of circular form and the upper portion thereof is provided with an extension portion 2 from which an arm 3 projects downwardly and supports a boss 4 opposite the centre of the casing.

A cover 5 is provided to enclose the lower part of the casing below the extension 2.

A threaded pivot socket 6 is secured in the boss 4 in alignment with a threaded pivot socket 7 secured centrally of the back of the casing 1.

A member 8 formed with a centrally arranged cylindrical portion 9 in which is secured the tube 10 is provided with a pair of threaded pivot points 11 and 12 which engage the pivot sockets 6 and 7 respectively.

The tube 10 may be formed of glass or any other standard material and is formed with a central cylindrical bore 13 which flares outwardly at each end to the ends of the tube and the flared ends are closed by the plugs 14. The central bore 13 thus forms a constricted passage intermediate of the length of the tube.

The tube is filled with a heavy fluid, such as oil or glycerine and a ball 15 is enclosed in the tube.

The diameter of the ball is very slightly smaller than the central constricted portion of the bore 13 so that it will move through the central portion actuated by gravity very slowly but when said ball passes the end of the cylindrically bored portion it will move rapidly to the end where it unbalances the tube 10 and causes the same to assume a vertical position as hereinafter described.

A stirrup clip 16 is suspended from the pivot point 12 and is frictionally held to the pivot by a washer 17 engaged by a coil spring 18 encircling the pivot point and held by a pin 19. This arrangement permits of the relative movement, beyond certain limits, of the pivot and saddle.

A mercury tube 20 is supported in the stirrup member 16 and is provided with electrical contacts and terminals which are connected with the wires 21 and 22. These wires are coiled to render them extremely flexible and are secured to bolts 23 which are insulated from the casing.

The outward end of the member 8 has secured thereto a flexible spring arm 24 which is inserted over the pivot point 12 and secured by a nut 25 and is adapted to be turned by said arm to set the tube 10 to the desired angle as determined by an adjustable stop member as hereinafter described.

The arm 24 is provided with buttons or knobs 26 at each end.

A finger 27 is pivotally mounted upon the pivot socket member 6 and extending from said member is a lug 28 which extends inwardly past the extension arm 3 and is adapted to be engaged by the spring arm 24, but said spring arm may be moved past the end of the lug 28 by its being pressed inwardly toward the casing. The finger is locked in said position by a thumb screw 29.

In the operation of this switch the indicating finger is moved to whatever position may be desired on the scaled portion of the cover as determined by the time in which the switch is to operate and the stop lug 28 is moved with the finger 27 which is then locked by the thumb screw 29. Assuming now that

the tube 10 and contact tube 20 are in their normal position (after operation) as shown in Figure 2 of the drawings in which position the contact is broken in the tube 20 by reason of the tube 20 being held in the right inclined position by the tube 10 which has been gravity-actuated in a counter-clockwise direction. Now, in order to again set the device to close the circuit in member 20 and hold it closed for a given time the tube 10 must be rotated in a clockwise direction by means of arm 24 and this is accomplished in the following manner.

It is necessary in resetting the tube 10 from the position shown in Figure 2 to turn the same clockwise each time one half of a complete turn plus the distance required to impart the required incline to same as determined by the setting of stop lug 28. This requires that during the setting movement of arm 24 one of the spring arms thereof (the first to encounter the stop 28 in the resetting movement) is pressed inwardly slightly to clear the lug and the rotation of tube 10 continues until the other arm of member 24 encounters the stop lug 28 as shown in Figure 1 of the drawings.

The tube 10 has thus been moved to a position where the ball weight 15 is at its upward end and concurrent with the setting movement of the tube 10 the stirrup member carrying the contact tube 20 has been moved clockwise therewith to a position where the projection engages the left hand lug projection 31 which arrests the further movement of the stirrup holder closing circuit in member 20 while the tube 10 continues to move independently thereof to the set position. This relative movement of the tube and breaker is permitted by reason of the frictional connection of the two effected by the spring 18.

The turning of the arm 24 swings the tube 10 as described carrying the lower end with the ball contained therein above the axis and beyond a vertical line passing through the axis. The ball drops rapidly in the diverging uppermost end of the tube as the tube is turned over due to the ease with which the fluid is displaced at this point between the ball and the wall of the tube until it reaches the constricted portion where it is checked in its downward movement and thereafter moves quite slowly through the constricted portion of the tube in accordance with the clearance of the ball in the tube and the viscosity of the fluid.

Immediately the ball passes through the restricted portion it drops to the bottom and thereby unbalances the tube through the action of gravity causing the tube to swing in a return or counter-clockwise direction carrying the switch carrying stirrup therewith until the latter is arrested by the right hand stop lug 31 at which point the circuit is broken in tube 20 as shown in Figure 2.

The stirrup 16 is so located in relation to the spring arm 24 that when the said spring arm is moved into contact with the lug the mercury tube will be moved to such a position that the contacts will be closed. When, however, the tube swings to the return position the stirrup will be moved back to break the contact.

It will thus be seen that the contact-breaker member 20 has only a very limited movement in either direction, the setting tube 20 being movable relative thereto beyond the limits defined by the stop lugs 31. In this way the lead wires 22 extending to the breaker 20 will not interfere with the desired sensitivity of operation of the device as would be the case if the breaker member had as great a latitude of movement or displacement as the gravity-actuated member 10.

It will be readily understood that the period of time taken by the ball to pass through the restricted portion of the tube 10 will vary in accordance with the inclination of same from the vertical, consequently the setting of the gauge indicator 27 will, in changing the position of the lug 28, effect a change in position of the tube 10 in relation to the vertical and thus alter the time allowance for the return of the tube to its normal substantially vertical position.

The stirrup carrying the switch tube is provided with a lug extension 30 which is adapted to engage limiting lugs 31 on the inside of the casing and the member 8 carrying the tube will turn freely while the stirrup moves only a short distance therewith until engaging one of the lugs 31 but the frictional contact of the pressure of the spring 18 against the washer 17 is sufficient to hold the mercury contact tube in the inclined position until the tube 10 is returned by the falling of the ball to the bottom thereof.

A counter-balance 32 is arranged on the outer end of the pivot 11 and is formed of a sheet metal member shaped in a quadrant form and looped longitudinally to provide a spring contact which will cause the arm to rotate with the pivot but which will allow the pivot to turn freely in the setting of the tube. This counter-balance is provided to compensate the weight of the ball until it leaves the restricted central portion of the tube, thus holding the tube securely in its adjusted position while the ball is passing through the central restricted portion. When the ball falls clear of the restricted portion of the tube it will swing the counter-balance with it. The counter-balance is preferably made of segmental form to bring its centre of gravity into alignment with the centre line of the tube 10.

A switch such as described is extremely compact. The parts are very simple and are not liable to get out of order and a consider-

able latitude of time interval is effected in the adjustment of the indicator 27 and stop lug 28.

What I claim as my invention is:—

1. A time controlled electric switch, comprising a pivotal member, an electric contact member carried by said pivotal member, a fluid filled tube carried by said pivotal member and adjustable relative to said contact member, said tube having a constricted passage intermediate of its length, and a weight adapted to enter and pass slowly through said constricted passage and rapidly at either end thereof to operate said pivotal member and the switch contact carried thereby.

2. A time controlled electric switch, comprising a pivotal member, an electric contact member carried by said pivotal member, a fluid filled tube mounted diametrically on said pivotal member and adjustable relative to said contact member in a direction circumferentially of said pivotal member and having a constricted central portion with diverging outer end portions and a weight of slightly smaller diameter than the central constricted portion adapted on the setting of said tube to move rapidly inward from the end in the diverging portion and to move slowly on reaching the constricted central portion said weight effecting the tilting and return of the cylindrical member and said electric contact member on reaching the opposite diverging end portion.

3. A time controlled electric switch, comprising a horizontally mounted rotatable member, a tubular member secured in said rotatable member in diametrical arrangement, said tube having a constricted central portion and diverging end portions and enclosing a fluid, a weight arranged in said tube adapted to pass slowly through the central constricted portion in a downward direction and on passing therethrough to swing the tube on its axis to its normal position, and a switch contact member mounted for limited rotative movement with said pivotal member and being rotatable beyond said limit relative thereto and adapted to swing with said pivotal member a limited distance on the return of said tube to break the electrical connection through said switch member.

4. A time controlled electric switch, comprising a pivotal member, an electric contact member carried by said pivotal member, a fluid filled tube carried by said pivotal member and adjustable relative to said contact member, said tube having a constricted passage intermediate of its length, a weight adapted to enter and pass slowly through said constricted passage and rapidly at either end thereof to operate said pivotal member and the switch contact carried thereby, and adjustable stop means for limiting the angular position to which said tube may be manually set.

5. A time controlled electric switch, comprising a horizontally mounted rotatable member, a tubular member secured in said rotatable member in diametrical arrangement, said tube having a constricted central portion and diverging end portions and enclosing a fluid, a weight arranged in said tube adapted on the setting of said tube to move rapidly through the uppermost diverging portion to the central constricted portion and pass slowly therethrough in a downward direction and on pasing therethrough to swing the tube on its axis, a switch contact member carried by said pivotal member to break the electrical connection therethrough, and adjustable means for setting said pivotal member with the tubular member arranged in an inclined position.

6. A time controlled electric switch, comprising a horizontally mounted rotatable member, a tubular member secured in said rotatable member in diametrical arrangement, said tube having a constricted central portion and diverging end portions and enclosing a fluid, a weight arranged in said tube adapted on the setting of said tube to pass rapidly inward from the uppermost tube end in the diverging portion thereof and to pass slowly through the central constricted portion in a downward direction and on passing therethrough to swing the tube on its axis, a switch contact member carried by said pivotal member to break the electrical connection therethrough, a flat spring arm secured to said pivotal member and extending in transverse relation thereto, and an adjustable stop arranged to engage said spring arm to limit its tilting movement.

7. A time controlled electric switch, comprising a circular casing having a front plate partially enclosing the casing and an overhanging forwardly projecting arm, a pivotal member supported between said arm and the back of the casing and extending through said cover, a switch member carried by said pivotal member within the casing, gravity actuated means mounted for adjustment relative to said switch member for swinging said pivotal member to a predetermined position, a stop member pivotally supported from the forwardly supporting arm, and stop means carried by said pivotal member outside of the casing cover adapted to engage said stop member.

8. A time controlled electric switch, comprising a circular casing having a front cover and a forwardly projecting rigid arm, a pivot support arranged in the back of said casing, a pivot support arranged in said arm, a pivotal member having pivot pins at either end engaging said pivotal supports, gravity actuated means carried by said pivotal member for swinging same on its pivots, a stirrup member pivotally mounted on said pivot member, friction means for swinging said

stirrup member for a limited distance with the pivot member, a mercury contact tube carried by said stirrup member, and means for regulating the movement of said stirrup member in relation to the gravity operating member.

9. A time controlled electric switch, comprising a casing, a pivot member supported within the casing, gravity means for operating said pivot member, and a mercury contact tube pivotally suspended from said pivot member, and friction means for normally connecting said pivoted member and tube to cause same to move a limited distance in unison.

10. A time controlled electric switch, comprising a pivotal member, an electric contact member carried by said pivotal member and movable relative thereto, a fluid filled tube carried by said pivotal member having a constricted passage intermediate of its length terminating at either end in a passage of greater cross-section, a weight in said tube adapted on the setting of the tube to move rapidly inward from the end and to enter and pass through said constricted passage and to operate said pivotal member and the switch contact carried thereby, and means for counterbalancing the weight as it passes through the constricted portion of the tube.

11. A time controlled electric switch, comprising a pivotal member, an electric contact member carried by said pivotal member, friction means interposed between and operatively connecting said pivotal and contact members and permitting their relative movement, a fluid filled tube carried by said pivotal member having a constricted passage intermediate of its length, a weight adapted to enter said constricted passage and pass therethrough to operate said pivotal member and the switch contact carried thereby, and a counterbalance arranged on said pivotal member and spring held in the counterbalancing position.

12. A time controlled electric switch, comprising a pivotal member, an electric contact member carried by said pivotal member and movable relative thereto, a fluid filled tube carried by said pivotal member having a constricted passage intermediate of its length, a weight adapted to enter said constricted passage and to pass therethrough and operate said pivotal member and the switch contact carried thereby, a counterbalance rotatably mounted on said pivotal member, spring clutch means for holding said counterbalance in place on said pivotal member, and means for adjusting the position of said counterbalance.

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