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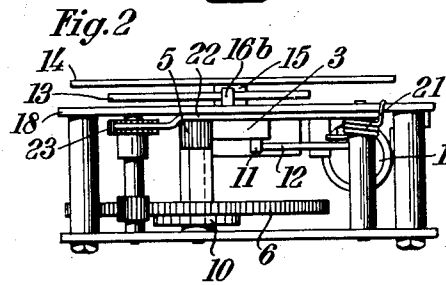
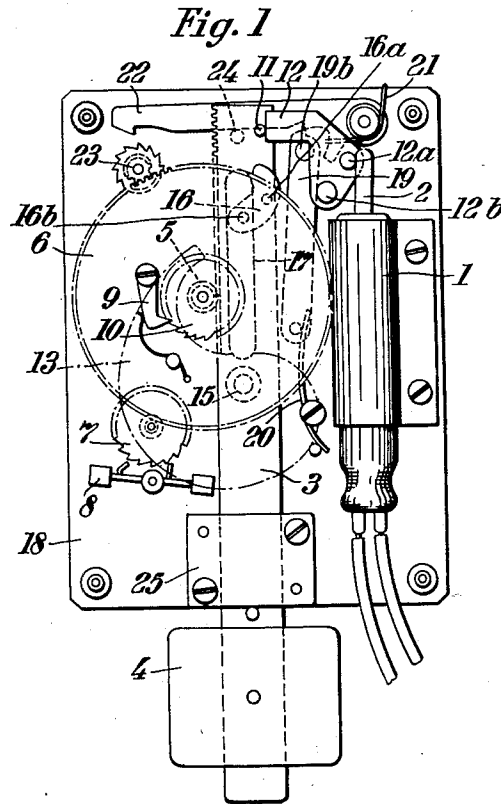
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2,148,790

TIME CONTROLLED ELECTRICAL SWITCH

Filed Aug. 12, 1936

2 Sheets-Sheet 1



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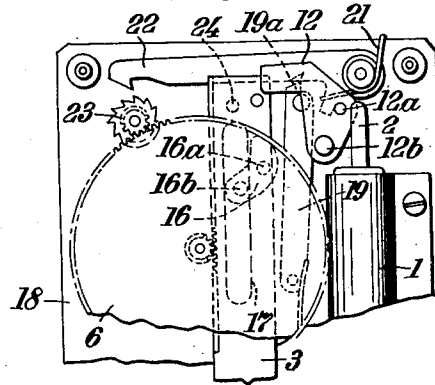
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## TIME CONTROLLED ELECTRICAL SWITCH

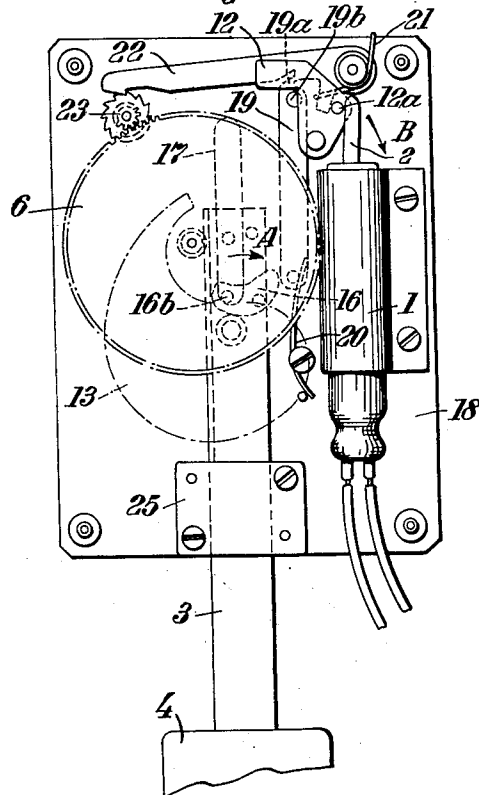
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*Fig. 3*



*Fig. 4*



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## UNITED STATES PATENT OFFICE

2,148,790

## TIME CONTROLLED ELECTRICAL SWITCH

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Application August 12, 1936, Serial No. 95,564  
In Germany August 14, 1935

7 Claims. (Cl. 200—41)

Our present invention relates to a time controlled electrical switch.

One of its objects is to provide an improved time controlled electrical switch, another object is to provide an improved time controlled electrical switch which is especially adapted for use in apparatus which is required to be used in dark rooms, for example in photographic printing devices. Further objects will be seen from the detailed specification following hereafter. Reference is made to the accompanying drawings in which—

Fig. 1 is a view of the apparatus with the front plate removed, and the weight in its upper position.

Fig. 2 is a plan.

Fig. 3 is a partial view of the timing device as the current is switched on, and

Fig. 4 is a partial view as the current is switched off.

Hitherto in nearly all time controlled devices for switching electrical current open contact switches have been employed. When a switch is to be used for switching on illumination for short periods of time, as is usual in modern photographic printing processes, such known devices cannot be employed since the contact surfaces of the contact switch easily fuse owing to arcing, are subjected to heavy mechanical wear and tear and are, furthermore, readily covered with dust. Uncertain conditions of operation of the switch are the result. Mercury switches are also unsuitable for use in time controlled switching means employed in photographic printing, since they cannot be fixedly mounted and also necessitate a long switching path.

In order to enable current for illumination in photographic printing and similar processes to be switched on and off at any desired regulable intervals of time in a satisfactory manner the present invention employs a vacuum switch with solid electrodes to effect the switching operation.

By using the vacuum switch, which is known per se, switching can be effected at short intervals with maintained accuracy.

The switching paths necessary in vacuum switches are very short, the force necessary to operate the switch is extremely small, while the contact surfaces cannot become dirty. Furthermore, if solid electrodes be used there is no limitation on the orientation of the switch as is the case with mercury switches.

The use of a vacuum switch with solid electrodes is particularly advantageous in photographic printing with a timing device controlled

by a falling weight. In this case the means controlling the vacuum switch can be attached directly to a rack loaded by the weight. The height of fall of the rack may be adjusted by a cam surface with which a control member sooner or later comes into contact and thereupon switches off the current.

A vacuum switch of the usual type consists in an evacuated glass tube containing a stationary contact operated from the outside by a glass rod. A vacuum switch 1 of this type is incorporated in a time controlled switching device, for example a device controlled by a falling weight. The glass rod 2 operates the switch 1. The extraordinary small switching motions necessary to switch the printing illuminations on and off are produced as follows. A rack 3 is guided by a guide 25 is loaded by a weight 4 and, when the weight falls, drives a toothed wheel 6 by means of a pinion 5 which latter engages with the rack. The toothed wheel 6 operates an anchoring device 7, 8. A pawl and ratchet 9, 10 enables the rack 3 to be raised without operating the anchoring device. At the upper end of the rack 3 a pin 11 is provided which, at the beginning of the downward movement of the rack, bears against a bell crank lever 12. The pin 11 presses the lever 12 to one side and by means of a pin 12a causes the glass rod 2 to break the current to the lamp. As soon, however, as the rack 3 moves downwards, the pin 11 releases the lever 12 and it is rotated about its pivot 12b by spring pressure on the glass rod 2 and the switch closes the circuit to the lamp. This point of time is shown in Fig. 3.

In order to limit the interval of time between switching on and off of the current to any desired extent, a cam plate 13 is provided, which, together with a dial plate 14, is rotatable on an axle 15. According as a short or a long illumination time is desired, the dial plate 14 and therewith the cam plate 13 is rotated anti-clockwise or clockwise with reference to a fixed index mark. In Fig. 1 the cam plate 13 is shown in a position which gives the clock a long period of fall. A lever 16 is rotatably mounted on a pin 16a on the rack 3. A stop 16b is fixed on the lever 16 which slides in a slot 17 in the base plate 18. As soon as the rack 3 has fallen sufficiently far for the pin 16b to strike the cam plate 13 (see Fig. 4) the lever 16 is rotated in the direction of the arrow A and presses a lever 19, rotatably mounted on a pin 19b on the base plate 18 to one side against the action of a spring 20. This causes a pawl 22 to fall into engagement with a tooth 19a on the lever 19 and with the teeth of a ratchet wheel 23

against the action of a spring 21. The nose of the lever 22 presses against pin 12a and thus rotates the lever 12 in the direction of the arrow. This causes the pin 12a to press the glass rod 2 to one side so as to break the current to the printing lamp. The ratchet 23 is in toothed engagement with the gear wheel 6 and thus limits the fall of the rack 3 in accordance with the adjustment of the cam plate 13. A pin 24 on the rack 3 serves to lift the pawl 22 from the ratchet 23 and the tooth 19a as the rack is raised so that the apparatus can rotate freely the next time the weight falls.

What we claim is:

1. In a photographic printing device, in combination, a vacuum switch with solid electrodes, means for operating said switch, a weight-operated movable member, means carried by said movable member for actuating said switch-operating means at one point in the movement of said member, other means carried by said member for effecting actuation of said switch-operating means at a different point in the movement of said member, and means for varying said second point in the movement of said member where said other means carried by said member becomes effective.

2. A device as defined in claim 1, wherein said weight-operated movable member is a weight-operated rack.

3. A device as defined in claim 1, wherein said weight-operated movable member is a rack and wherein the means for varying said second point in the movement of said rack is a cam.

4. In a printing device, in combination, a support, a vacuum switch having solid electrodes carried thereby, means for operating said switch, a weight-controlled rack, means carried by said rack for actuating said switch-operating means at one point in the movement of said rack, means pivoted to said support also adapted to actuate said switch operating means, other means carried by said rack for operating said pivoted means at a different point in the movement of said rack, and means for varying said second point in the movement of said rack where said other means carried by said rack becomes effective.

5. In a printing device, in combination, a support, a vacuum switch having solid electrodes carried thereby, a bell crank for operating said

switch, a weight-controlled rack, a stop member carried by said rack for contacting said bell crank at one point in the movement of said rack to cause the bell crank to operate said switch, a lever pivoted to said rack, said support having a slot therein, a stop member on said lever adapted to ride in said slot as the rack is moved, a second lever pivoted to said support and carrying a tooth at the upper end thereof, an additional lever pivoted to said support above said last-named lever having a notch adapted to engage the tooth of said second lever, a stop member carried by said additional lever adapted to bear against and actuate said bell crank, a cam pivoted to said support and adapted to strike the lever carried by said rack as the rack is moved to force said lever against said second lever and thereby cause actuation of the bell crank through said additional lever, said cam being adjustable to vary the point at which it strikes the lever carried by said rack and thus the time at which said lever becomes effective.

6. A time controlled electrical switch comprising a rockable element for opening and closing an electric circuit, a movable weight controlled member, adjustable cam controlling means coacting with said member for determining the time of movement thereof, and means coacting between said movable member and said rockable element for actuating the latter to close the electrical circuit at the beginning of movement of said member and open said electrical circuit at the timed end of said movement.

7. A time controlled electrical switch comprising a rockable element for opening and closing an electric circuit, a movable weight controlled member, adjustable cam controlling means coacting with said member for determining the time of movement thereof, and means coacting between said movable member and said rockable element for actuating the latter to close the electrical circuit at the beginning of movement of said member and open said electrical circuit at the timed end of said movement, said means comprising a pivoted arm carried by said movable member and a pivoted member engageable with said rockable element.

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