# United States Patent

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[54] **CONTACT DEVICE FOR ELECTRIC TIMERS OR SIMILAR APPARATUS**
**8 Claims, 3 Drawing Figs.**


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[51] **Int. Cl.** ..... **H01h 13/36**
[50] **Field of Search** ..... 200/38 D, 38 E, 38 A, 67 D, 67 A, 67



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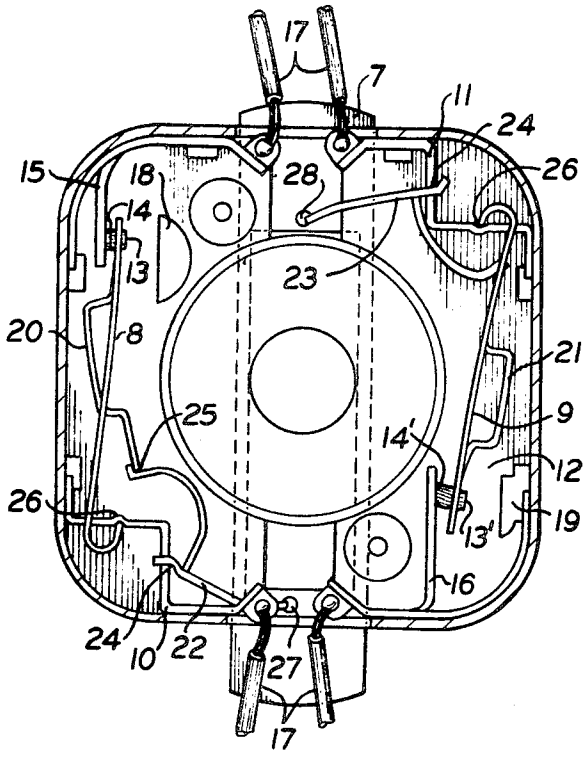
**ABSTRACT:** An electrical contact controlled by a timing mechanism in which not one, but two spring-biased contact arms are arranged in cooperating opposing relation. The contact tripping or actuating member of the timer, the part to which timer output movement is imparted in accordance with timing operation of the timer, is operatively connected to the springs of these contact arms so that the spring forces of each spring acting on the timing mechanism tend to cancel each other out and thus do not interfere with timer movement. However, the spring urgency exerted in a direction on the switch contacts is arranged to obtain circuit-completing positions of the contact arms under sufficient pressure which assures firm surface contact of the electrical contacts.

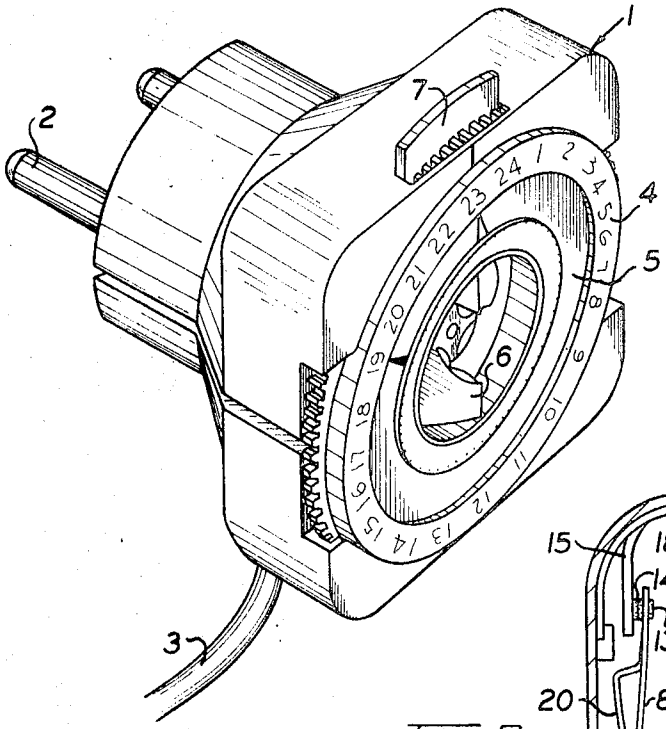



Fig. 1

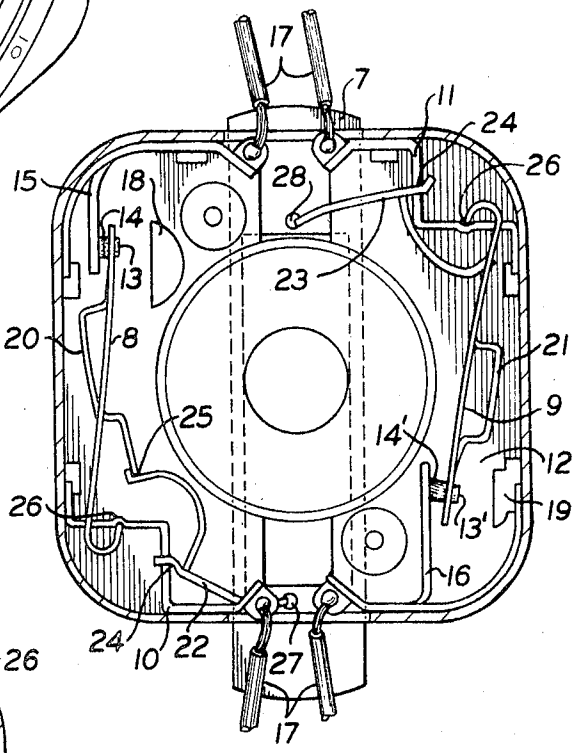



Fig. 2

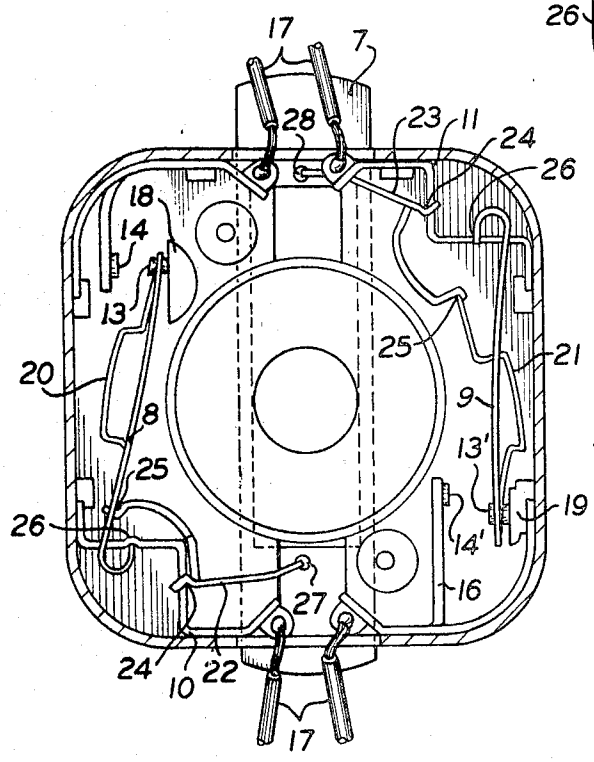



Fig. 3

# CONTACT DEVICE FOR ELECTRIC TIMERS OR SIMILAR APPARATUS

The present invention relates generally to switch-operating timers, and more particularly to an improved electrical contact of the type adapted to be operated in timed response to the operation of a timing mechanism.

A spring-biased electrical contact of the type designed to be operated by a timing mechanism at the end of a selected time duration is well known. In all of these known timer-operated contacts, the spring which biases the contact in the closed position thereof of necessity is anchored or connected to the same part to which time-responsive movement of the timing mechanism is imparted. That is, the part of the timer which progressively moves in timed relation to the timing operation of the timing mechanism is invariably the part to which at least one end of the spring is attached which biases and operates the electrical contact. Thus, in order to avoid the transmission of movement-opposing forces being exerted against this moving part and thus interfering with the rate of movement that is imparted by the timing mechanism, it has been the practice to use a very light bias spring for the electrical contact. This light spring, however, does not provide sufficient force to assure proper electrical contact of the switch contacts in their circuit-completing positions.

Broadly, it is an object of the present invention to provide an improved time-responsive electrical contact overcoming the foregoing and other shortcomings of the prior art. Specifically, it is an object to provide an improved electrical switch in which the spring bias which operates the contact arm thereof which is exerted in a direction which could interfere with movement and operation of the timer is eliminated, for all practical purposes, while the component of said bias force which is exerted in a traverse direction, and thus not in a movement-opposing direction, is effectively retained and advantageously utilized to produce firm circuit-completing closing of the switch.

Further objects, features and advantages of the present invention will be more fully appreciated by reference to the following detailed description of a presently preferred, but nonetheless illustrative embodiment in accordance with the present invention, when taken in conjunction with the accompanying drawings, wherein:

FIG. 1 is a perspective view of a time-responsive electrical contact device according to the present invention illustrating the conventional timing mechanism thereof; and

FIGS. 2 and 3 are both front elevational views illustrating the internal structural features of the device, in which noteworthy internal structure as well as the mode of operation of said structure are illustrated by which the device achieves electrical contact opening and closing movements in timed response to the operation of the timing mechanism.

Reference is now made to the drawings wherein there is shown a timer, generally designated 1, demonstrating objects and advantages of the present invention. Timer 1 will be understood to be of the type which includes a conventional timing mechanism including dial faces 4, 5 and 6 which are adapted to be set relative to each other to provide a visual indication of a selected time interval until an electrical circuit is either opened or closed, as desired. In accordance with conventional construction and mode of operation of the timing mechanism of the timer 1, such mechanism is electrically operated by current supplied via an electrical plug 2 and, as is characteristic of timing mechanisms, it also includes at least one operating part which is slowly powered in rotation at a selected timed rate. It is this time-responsive output movement of the timing mechanism which is utilized to, in turn, cause the actuation of an electrical switch to either open or close an electrical circuit and thus enable the timer 1 to achieve its commercial function. The control electrical circuit which is either opened or closed is electrically connected to the timer 1 via the electrical conductor 3.



Thus far, what has been described is well known and is not an essential part of the invention. The inventive contribution is the electrical circuit contact means which is opened and closed in timed response to the operation of the timing mechanism of the timer 1, such electrical contact means being more particularly illustrated in FIGS. 2 and 3, to which figures reference is now specifically made. Heretofore, spring-biased electrical contacts had been operatively associated with timing mechanisms so as to be operated by these timing mechanisms at the end of a selected time duration. In these known timers, however, the spring which biases the contact in the closed position thereof of necessity is anchored or connected to the same part to which time-responsive movement of the timing mechanism is imparted. That is, the part of the timer 1 which progressively moves in timed relation to the timing operation of the timing mechanism is invariably the part to which at least one end of the spring is attached which biases and operates the electrical contact. Thus, in order to avoid the transmission of movement-opposing forces being exerted against this moving part and thus interfering with the rate of movement that is imparted by the timing mechanism, it has been the practice to use a very light bias spring for the electrical contact. This, however, is not desirable since the light biasing spring, while not interfering with movement of the internal parts of the timer, also does not provide a sufficient urgency or holding force holding the contacts of the electrical switch in firm surface contact with each other. As a result, the electrical circuit completed through the contact is adversely effected.

In accordance with the present invention, spring urgency of a comparatively large extent is utilized to maintain circuit-completing contact of the contact switch or arm, and yet this spring urgency is prevented from interfering with the timing movement of the internal parts of the timer 1. The manner in which this is achieved will be readily understood from the description which follows of the electrical circuit contact means which, in essence, is the inventive noteworthy aspect of the timer 1. Specifically, and as it is clearly illustrated in FIGS. 2 and 3, included as part of the timer 1 are not just one, but rather two spring-biased electrical contacts which are adapted to have simultaneous operation to, in turn, achieve the circuit opening and closing function for the timer 1 in timed response to the timing mechanism of the timer. Each of these contacts includes a contact arm 8 and 9, respectively, which simultaneously moves between circuit-completing positions, as illustrated in FIG. 2, and circuit-opening positions, as illustrated in FIG. 3. Tracing the electrical circuits through contact arm 8, this half of the circuit is completed through an electrical conductor 17 which then branches to the left, as viewed in FIG. 2, through a switch bracket 10, the contact arm 8, the electrical contacts 13 and 14 in surface contact against each other, the switch bracket 15, and finally the output electrical conductor 17. The other half of the electrical circuit is completed through the electrical conductor 17 which branches to the right, also as viewed in FIG. 2, through the switch bracket 16, the electrical contacts 13' and 14' in surface contact with each other, the contact arm 9, the switch bracket 11, and finally the output electrical conductor 17. As clearly illustrated in FIG. 3, the contact arms 8 and 9 are adapted to be snapped from their circuit-closing positions through circuit-opening movement into circuit-opening positions in which each bears against contact supports or seats 18 and 19 and the contacts 13 and 14, and 13', 14' respectively are in out-of-contact, clearance positions with respect to each other.

Cooperating with the contacts 8 and 9 is a slide member 7, which member will be understood to be the member to which time-responsive movement is imparted in accordance with the operation of the timing mechanism. Slide 7 is arranged to be moved along a feed path in response to timed operation of the timing mechanism. Comparison of FIGS. 2 and 3 illustrate this feed movement in which the slide 7 is shown in FIG. 2 in a depressed starting position and in FIG. 3 in a raised terminating position, these positions being understood to respectively illustrate the positions of movement of the slide 7 at the start

and termination of a timed interval. That is, in the FIG. 2 starting position of the slide 7, the contact arms 8 and 9 are in a circuit-completing position and at the end of the time interval during which the slide is raised into its FIG. 3 position, this raising of the slide results in the snapping movement of the contact arm 8 and 9 into their circuit-opening positions as illustrated in FIG. 3.

Each of the cooperating contacts 8 and 9 may be of the well-known type in which opening and closing movements are achieved not only under spring bias but, as already indicated, in a characteristic snapping movement. To this end, these contacts are identically constructed and, using contact arm 8 as an example, the same includes a two-piece spring 20 hinged, as at 25, and connected, at one end, to the free end of the contact arm 8 and, at its other end, to a lever 22 fulcrumed, as at 24, at one end to the spring bracket 10 and at its opposite end to the slide 7. In similar fashion, contact arm 9 also includes a two-piece spring 21 connected at one end to the free end of the contact arm and at its opposite end to a lever 23 also fulcrumed, as at 24, at one end to the spring bracket 11 and connected at its opposite end to the slide 7.

Thus, the spring biased contact arms 8 and 9 have spaced connections 27 and 28 to a common member, namely the slide 7, which also is the part to which progressive timing movement is imparted during operation of the timing mechanism of the timer. The significance of the common slide member 7 serving as an anchoring point for the springs 20 and 21 of the contacts 8 and 9 are twofold.

Movement of the slide 7 can readily be seen from comparison of FIGS. 2 and 3, to cause snapping movement of the contact arms 8 and 9 between their circuit opening and closing positions. Using contact arm 8 as an example, as the slide 7 progresses from its depressed position as illustrated in FIG. 2 to its raised position of FIG. 3, there is counterclockwise pivotal movement of the lever 22 about the pivot point 24. In response to this pivotal movement, there is corresponding movement of the spring point 25 past the contact arm pivot point 26 with the result that the buildup of spring pressure or urgency is relieved by a clockwise pivotal movement of the contact arm 8 about its pivot 26. However, whether the contact arm 8 is in its circuit-completing position as illustrated in FIG. 2 or in its circuit breaking or opening position as illustrated in FIG. 3, in both instances there is a considerable and effective extent of spring urgency maintaining it in that position. This is significant since in the circuit-completing position, this urgency provides firm contact between the contacts 13 and 14, and 13', 14' respectively which is important to the electrical circuit completed through these contacts. Contact arm 9 is advantageously maintained under the same spring pressure when it is in its circuit-completing position.

The common connecting member 7 serves as an anchoring point for contacts 8 and 9. Reaction spring forces which are applied at each of the connections 27 and 28, act in opposing direction to tend to cancel each other out and, as a consequence, do not interfere with movement of the slide 7. As illustrated in FIG. 2, not only does spring 20 bias contact arm 8 into its circuit-completing position but this spring also has a tendency to urge lever 22 in clockwise direction about the fulcrum 24. This, in turn, is transmitted at the connection 27 to the slide 7 and places the slide under a downward biasing force. However, the spring 21 of the cooperating contact 9 is similarly applying a clockwise biasing force to the lever 23 and this force is transmitted via the connection 28 to the slide 7. This, naturally, has a tendency to bias the slide 7 in an upward, lifting direction. Thus the forces applied at the connections 27 and 28 to the slide 7 act in opposing directions with the result that there is a minimum of net spring force applied against the slide 7 which could possibly interfere with its sliding movement. When slide 7 is displaced from the position of FIG. 2 to that of FIG. 3, the force from lever 23 is initially greater than that from lever 22. This excess force holds the slider 7, and hence the switch, in the position of FIG. 2. Upon switchover, this small excess vertical (FIGS. 2 and 3) force is overcome and, as the slide moves upwardly and springs 20, 21 change shape, force from spring 23 will decrease and force from spring 22 increase; after balance has been reached, further movement of slide 7 will cause the contact springs, and with it slide 7, to snap into the position of FIG. 3, in which the force applied by spring 20 on lever 22, and hence slider 7, will be slightly greater than that of spring 21 and again hold the slider 7 in position. The slide 7 functions efficiently as an anchoring member for the application of spring forces of the springs 20 and 21.

A latitude of modification, change and substitution is intended in the foregoing disclosure and in some instances some features of the invention will be employed without a corresponding use of other features.

What I claim is:

1. Contact device for electrical timers or similar apparatus comprising

at least one contact pair (13,14);

a first movable switching lever (8), one of the contacts (14) of said pair being fixedly mounted, and the other contact (13) of said pair being mounted at one end of said switching lever (8), the other end of said switching lever being pivoted for switching movement of the contact end toward and away from the fixedly mounted contact;

a second switching lever (9) having one end pivotally mounted;

a first pivotally mounted operating lever (22) and a first spring means (20) interconnecting said first operating and said first switching levers for overcenter movement of said first spring means upon pivoting of said first operating lever;

a second pivotally mounted operating lever (23) and a second spring means (21) interconnecting said second operating and said second switching lever (9) for overcenter movement of said second spring means upon pivoting of said second operating lever;

a coupling member (7) coupling said operating levers together for joint movement,

said spring-loaded operating levers engaging said coupling member in a direction such that the spring forces transferred by said operating levers apply to said joint coupling member (7) relative forces which are in opposition to each other, to assist movement of said coupling member in a given direction by one of the spring means under opposition by the other spring means until the overcenter position of both said spring means is reached and, after such position, to provide opposition by said one spring means and assistance for further movement of said coupling member by the other spring means.

2. Device according to claim 1 wherein said coupling member (7) is located intermediate said operating levers (22,23), said operating levers moving in opposite directions upon movement of said coupling member (7).

3. Device according to claim 1, wherein the coupling member (7) is a slider located between said operating levers.

4. Device according to claim 1, wherein the force of the first spring means in the overcenter position, when the contact is closed (FIG. 2), is greater than the force in the overcenter position on the first spring means when the contact is open (FIG. 3), whereby the closing force on the contacts will be greater than the combined holding force on the coupling member and will be greater than the hold-open force upon change of position of said first operating lever.

5. Device according to claim 1 including a second set of contacts (13', 14'), one of the contacts being fixedly mounted and the other contact being mounted on the other end of said second switching lever (9).

6. Device according to claim 1 wherein the coupling member is a slider (7) located between said operating levers (22,23), said operating levers being pivoted about axes (24) extending in a plane transverse to the sliding movement of the slider and located laterally therefrom at opposite sides of the slider to rock said operating levers, upon sliding movement of said slider, about their axes (24) and in opposite directions;

the spring means (20,21) engaging the associated operating levers (22,23) to transfer their force to said levers and, hence, said slider in opposite directions and decrease the net-operating force on said slider upon movement thereof.

7. Device according to claim 6 wherein said spring means (20,21) are located with respect to their associated operating lever (22,23) to engage the associated operating lever nonsymmetrically with respect to the overcenter operation of the spring means upon change of position of the operating lever upon change of contacts position between closed and open contacts;

the force exerted by said spring means to close the contacts being greater than the force to hold said contacts open.

8. Device according to claim 6 wherein said spring means are bowed leaf springs.