

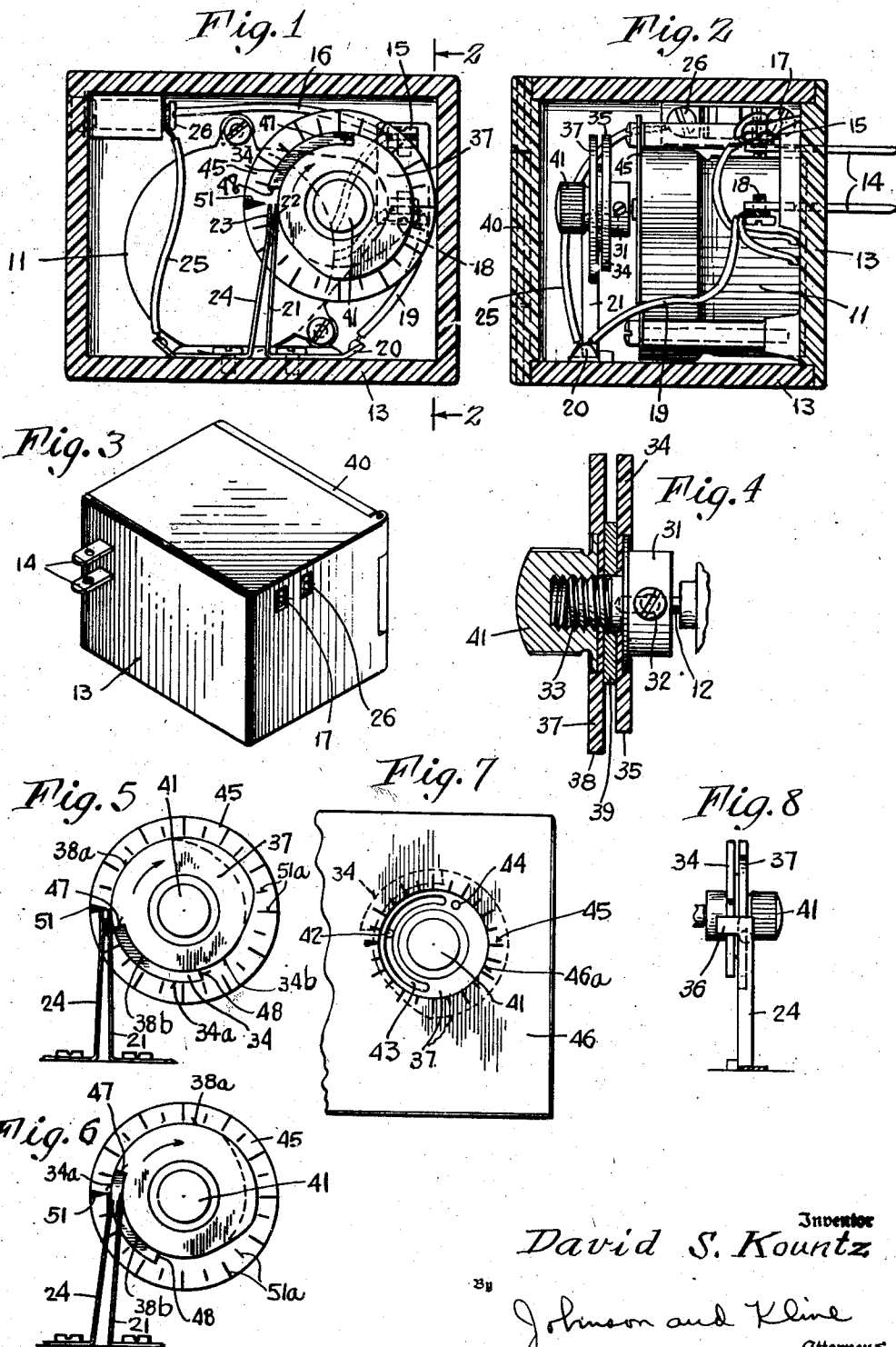
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TIME SWITCH

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TIME SWITCH

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This invention relates to electric switches and particularly to time switches such as are used to control the operation of one or more electric circuits for the purpose of periodically accomplishing a predetermined cycle of operations.

Time switches are customarily employed for controlling electric circuits to regulate and time the operations of one or more associated mechanisms. Such switches as heretofore constructed have usually been somewhat complicated and expensive, and generally require a special installation in which the time switch is incorporated as a permanent part of the mechanism to be controlled.

An object of this invention is to provide an improved construction of time switch of the variable interval type especially adapted for household use.

A further object is to provide a variable interval timer which can be inserted or plugged into a circuit between a conventional outlet therein and any mechanism operated thereby for the purpose of timing the operation of such mechanism, without having to be made a permanent part thereof.

A feature of the invention is the provision of a variable interval timer in which an open circuit interval can be fixed to occur at any predetermined time and also be adjusted to provide any length of interval.

A further feature is the provision of a variable interval timer which can be plugged into an electric circuit, for example, the circuit supplying an electric refrigerator, and employed to periodically open the circuit operating the refrigerator for defrosting purposes, and automatically reestablish the circuit at the end of a predetermined defrosting period.

A further feature is the provision of a variable interval timer in which the open circuit interval can be adjusted to occur at different times, to last for different periods or to be rendered non-functioning, as desired.

These and other objects and features are obtained by the present invention.

In the accompanying drawings:

Figure 1 is a view in elevation of a time switch mechanism constructed in accordance with one embodiment of the invention, the housing being shown in section.

Fig. 2 is a similar view taken on the line 2—2 of Fig. 1.

Fig. 3 is a perspective view of the housing showing the plug-in connections permitting the timer

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to be plugged into any conventional electric circuit.

Fig. 4 is a section through the contact control cams.

Figs. 5 and 6 are elevations showing different adjustments of the timing cams for controlling the length of the open circuit interval.

Fig. 7 is a similar view showing one form of mechanism for changing the adjustment of the timing cams as desired, and

Fig. 8 is a side elevation of the mechanism shown in Figs. 5 and 6.

In general, the invention provides a variable interval timer which can be plugged into an electric circuit for the purpose of periodically opening the circuit for a determinate interval to discontinue operation of any associated mechanism. For example, the device can be employed to automatically defrost an electric refrigerator at periodic intervals without requiring any alteration or modification in the conventional refrigerator mechanism, merely by plugging the device into the electric circuit supplying the refrigerator with current. At periodic intervals such, for example, as once every twenty-four hours, the current to the refrigerator will be cut off for whatever predetermined open circuit interval the device is set. At the expiration of such interval the circuit is automatically reestablished and the refrigerator again operated until the next defrosting period.

Although reference is herein made to the use of the invention in connection with the defrosting of electric refrigerators, it is to be understood that this is for the purposes of disclosure only, without limiting the utility of the invention for other purposes and for controlling and timing the operation of any current-operated mechanism.

The invention permits selectively adjusting the no current interval to such length as may be desired or to render it non-functioning.

In the illustrated embodiment of the invention, a driving mechanism such as an electric clock-works 11, the conventional details of which are not shown, rotates an operating shaft 12 at a fixed rate of speed. The device is mounted in a suitable housing or case 13 through which a pair of terminal prongs 14 extend to provide a male plug-in connector. A terminal 15 on one prong is connected by a line 16 to one terminal 17 of a pair providing a female connector. The terminal 18 of the other prong 14 is electrically connected by a line 19 to a terminal 20 of a movable and yieldable switch contact member 21 having a contact

22 adapted to engage a contact 23 on a second yieldable switch contact member 24, the latter being electrically connected by a line 25 to the other terminal 26 of the female connector.

Obviously, the circuit through the device from the prongs 14 to the connectors 17, 26 is regulated by the switch contact members 21, 24. For this purpose a switch control mechanism is operated by the shaft 12 to open and close the contacts 22, 23 in accordance with a predetermined cycle.

As illustrated in Fig. 4, this mechanism includes a collar 31 adapted to be mounted on the projecting end of the shaft 12 and connected thereto by any suitable means such as a clamping screw 32, or the like. The collar has a projecting threaded stud 33 on which a switch operating and timing cam 34 is rotatably adjustable. The cam 34 has a cam face 35 engaging an ear 36 on the upper end of the switch contact member 24, see Fig. 8. A second switch operating and timing cam 37 is rotatably adjustable on the stud 33 adjacent the cam 34. The second cam 37 has a cam face 38 which rides against the upper end of the yieldable switch contact member 21. By this construction each switch contact member is independently moved by the associated cam. As illustrated, a spacing collar 39 is positioned between the two cams and a clamping thumb nut 41 is threaded on the stud 33 to clamp the cam in rotatably adjusted position against the face of the collar 31. It will be apparent that the rotative positions of the cams 34 and 37 relative to the shaft 12 and to each other can be set as desired by loosening the thumb nut 41 so as to free the cam disks from the frictional grip thereof.

The disks can be adjusted either by grasping them directly, or by means such, for example, as that shown in Fig. 7. As shown a pin 42 projects outwardly from the face of the cam 34 through an arcuate slot 43 in the cam 37, and a second pin 44 projects outwardly from the face of the cam 37. As shown in Figs. 2 and 3 one wall 46 of the casing is removable to give access to the cams.

As shown in Fig. 7, the adjusting pins 42, 44, and the clamping nut 41 may extend through an access opening 46 in the wall 46a. After adjusting the cams as desired, the thumbnut 41 is tightened to frictionally clamp the cam disks in adjusted position for rotation with the shaft 12 of the clockwork 11. A timer dial 45 is mounted in back of the cams 35, 37, to assist in accurately adjusting the latter so as to properly time the operation of the device, as hereafter described. As shown in Fig. 7, when the cams are positioned adjacent the access opening 46, the dial is provided on the face of the wall 46a around the opening 46.

Obviously, the specific shape of the cam faces will vary in accordance with different requirements of different installations. As illustrated, each cam is high for substantially 180°, and low for substantially 180°. The two cams preferably have substantially the same shape. When the high part 34a of cam face 38 on cam 37 engages the switch member 21, the latter is pressed outwardly to contact with the adjacent switch arm 24 and close the circuit, as shown in Fig. 5. When rotation of the shaft 12 and the circuit-controlling cams moves the step 47 of cam 37 past the switch contact member 21, the latter snaps off the step 47, as shown in Fig. 6, onto the low part 38b of face 38 on cam 37, leaving the switch contact member 24 held outwardly

by the high part 34a of the cam 34. This is the open circuit position of the switch contact members and it is maintained until the cams rotate sufficiently to move the step 48 of cam 34 past the ear 36 of switch arm 24, whereupon the ear 36 on the switch arm 24 snaps onto the low part 34b of cam 34 and the contact member 24 snaps into circuit closing contact with the member 21. As illustrated, the length of time of the open circuit interval is determined by the arcuate distance between the two cam steps 47 and 48. Accordingly, the open circuit interval can be rendered nonfunctioning by positioning the two cam steps together so that the two switch arms 21, 24 snap off the respective cam steps 47, 48 at the same instant.

In operation, assuming for example the timer is to be employed in automatically controlling the operation and defrosting of an electric refrigerator, the mechanism is inserted in the line supplying electric current to the refrigerator. For example, the prongs 14 can be plugged into a wall socket and the cord connector on the refrigerator plugged into the female connector 17, 26 on the device. In this use, the clockwork mechanism 11 preferably rotates once every twenty-four hours. The dial 45 has an index point 51 and additional index marks 51a for indicating hourly or half hourly intervals, or such other periodic intervals as may be desired. Assuming a twenty-four hour dial, each index 51a in the illustrated dial marks an hour. With the clamping nut 41 unthreaded sufficiently to free the timing cams 34, 37 of its clamping pressure the latter can be adjusted, either by finger or by means of the adjusting pins 42, 44. In the latter case the arcuate slot 43 in the cam disk 41 through which the pin 42 projects, extends from a point adjacent the pin 44 on the disk 37 to a point diametrically opposite. This arrangement provides an adjustable open circuit or defrosting period from zero to 12 hours in length. When the pins 42, 44 are positioned adjacent each other the cam steps 47, 48 are located together. In such a position, both switch arms 21, 24 snap off the cam faces simultaneously. Hence the open circuit interval during which defrosting will occur can be adjusted to last for any desired period and to occur at any time during the 24 hours. By adjusting the cam 37 so that the step 47 rides past the index 51 at for example, midnight and adjusting the cam 34 so that the step 48 is spaced for example 6 hours later as shown in Fig. 5, the open circuit interval will continue until 6 a. m. Obviously, this interval can be adjusted for any suitable length of time. It may, for example, be set to last for one hour only or for any other length of time between zero and 6 hours. At the end of the open circuit interval, the ear 36 on the switch arm 24 snaps off the cam step 48 to again close the circuit, as shown in Fig. 1.

It will be apparent that the control shaft 12 can be extended to support and operate any suitable number of control devices for controlling a plurality of circuits and associated mechanisms, and that the description of the device as applied to an electric refrigerator is for the purposes of disclosure only. The invention can also be variously modified and adapted and parts of the improvements can be used without others.

I claim:

1. A time switch having a pair of movable contacts, a rotary control member having a separate cam face for independently moving each

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contact in a predetermined cycle to open and close the switch at predetermined times and for predetermined periods, means for continuously rotating said control member, clamping means for adjusting the relative positions of said cam faces to vary the relative lengths of the periods when said switch is opened and closed, and means for adjusting each cam face relative to said control member to vary the time at which said switch is opened and closed.

2. A time switch having a pair of movable contacts, a rotary control member for independently moving each contact to open and close the switch, including a separate cam disk engaging each contact member, means for continuously and simultaneously rotating said cam disks at a constant speed to move each contact through a predetermined cycle to open and close said switch at predetermined times for predetermined periods, means for adjusting the relative positions of said cams rotatively so as to vary the length of the period when said switch is opened and closed and means for independently adjusting the rotative position of each cam disk relative to the cam rotating means to vary the times at which said contacts are opened and closed.

3. A time switch having a pair of movable contact members, a rotary control member for independently and successively moving each contact member to alternately open and close the switch, including a separate cam disk engaging each contact member, each cam disk having approximately 180° high and 180° low surface, means for continuously and simultaneously rotating each cam disk at a constant speed to independently move each contact and provide an open circuit interval of predetermined length at predetermined times, means for adjusting the relative positions of said cams rotatively so as to vary the length of said open circuit interval time, and means for adjusting the time of operation of said cams to provide said open circuit interval at any preselected instant.

4. A time switch having a pair of movable contact members, control means for independently and successively moving each contact member to alternately open and close the switch, including a supporting shaft, a separate cam disk

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for engaging each contact member supported on said shaft for relative rotative adjustment, an adjusting pin on one cam extending through an arcuate slot in the other of said cams whereby the relative rotative position of said cams can be varied, and means for securing said cams to said shaft in adjusted position.

5. A time switch having a pair of movable contact members, control means for independently moving each contact member to open and close the switch, including a supporting shaft, means for operating said shaft at a fixed rate of speed, a separate cam disk for separately engaging each contact member supported on said shaft for relative rotative adjustment, a cam securing nut threaded to said shaft for securing the cams thereto in adjusted position, and a switch casing having an opening in one side thereof to give access to said cams and said clamping nut.

6. A time switch having a pair of movable contact members, control means for independently and successively moving each contact member to alternately open and close the switch, including a supporting shaft, a separate cam disk for engaging each contact member supported on said shaft for relative rotative adjustment, an adjusting pin on one cam extending through an arcuate slot in the other of said cams whereby the relative rotative position of said cams can be varied, means for securing said cams to said shaft in adjusted position and a switch casing having an opening in one side thereof to give access to said cam adjusting pin and said clamping nut.

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