July 25, 1944. W. P. GALLAGHER 2,354,368

INTERVAL TIMER

Filed Jan. 2, 1942 2 Sheets-Sheet 1

Fig. 1.

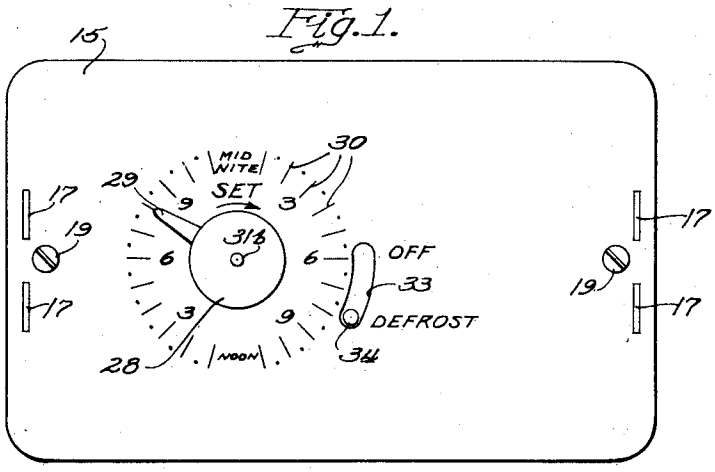


Fig. 2.

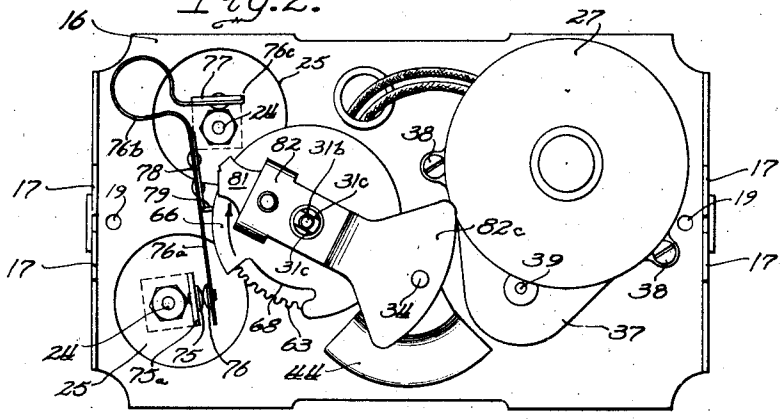
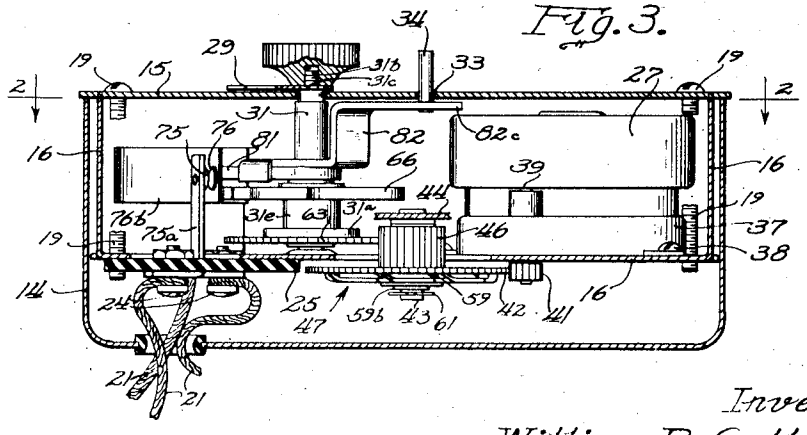


Fig. 3.



Inventor

William P. Gallagher

By Brown, Jackson, Boettcher & Dienner

Attys.

July 25, 1944. W. P. GALLAGHER 2,354,368

INTERVAL TIMER

Filed Jan. 2, 1942 2 Sheets-Sheet 2

Fig. 5.

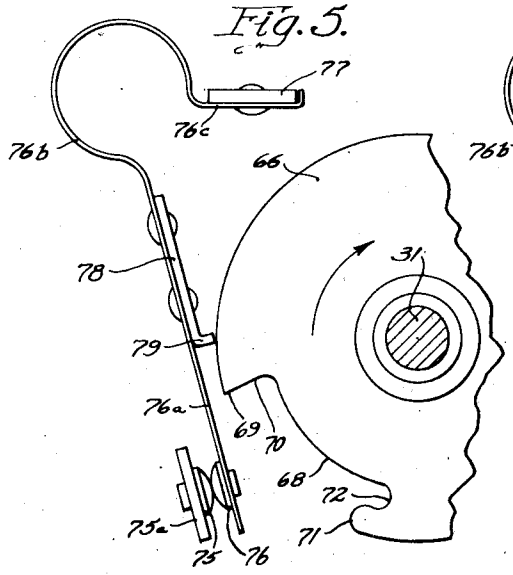


Fig. 6

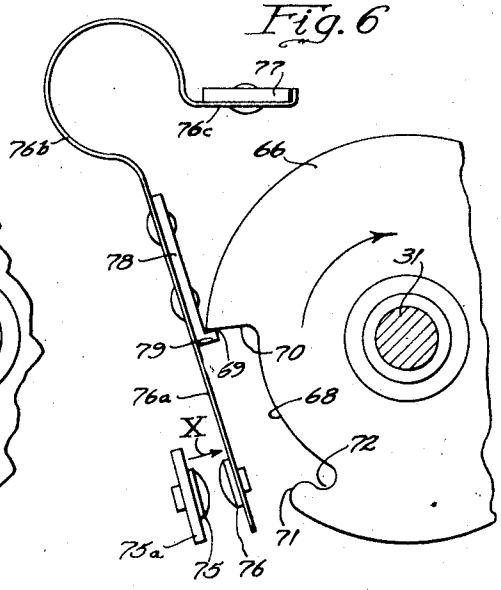


Fig. 7.

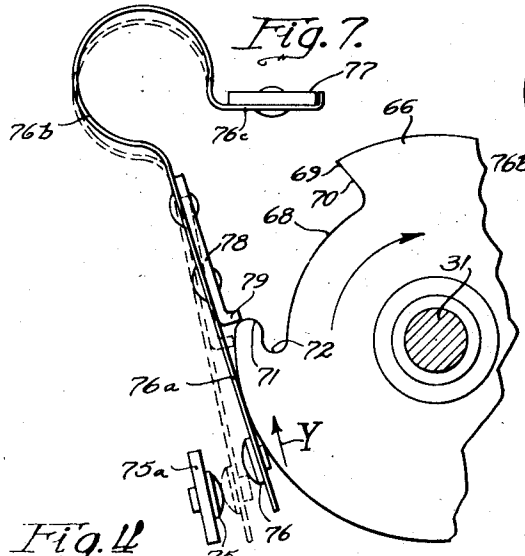


Fig. 8.

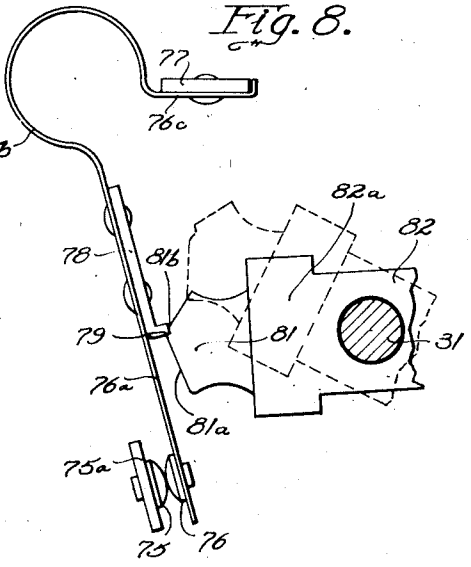
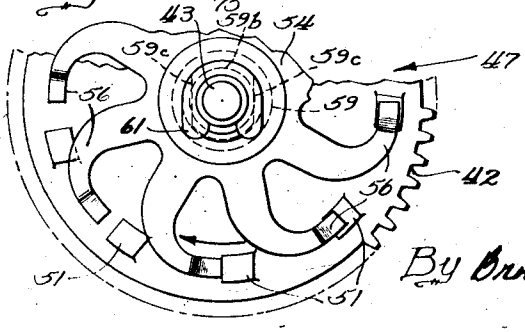


Fig. 4



Inventor:
William P. Gallagher
By Brown, Jackson, Boettcher & Dienner
Attys.

Patented July 25, 1944 2,354,368

UNITED STATES PATENT OFFICE

2,354,368

INTERVAL TIMER

William P. Gallagher, Chicago, Ill., assignor to International Register Company, Chicago, Ill., a corporation of Illinois

Application January 2, 1942, Serial No. 425,397

15 Claims. (Cl. 200—38)

The present invention relates to electrical interval timers or time switches, and more particularly to such devices of the fixed interval type in which the switch moves to a predetermined position at a set time of the day or night, and remains in that position for a substantially fixed interval of time, whereupon the switch is then restored to its normal position.

These fixed interval timers are particularly suited for use as "defrosting switches" in electric refrigerators. In such use, the interval timer automatically interrupts the circuit of the refrigerator motor at a predetermined time of the night or day (usually at night), and maintains said circuit interrupted for a substantially fixed interval of sufficient duration to defrost the refrigerator effectively, whereupon the timer again closes the motor circuit so that the refrigerator can resume normal operation. This time interval is generally of about three or four hours duration, and is preferably set to occur late at night or early in the morning, when the refrigerator is seldom being opened and closed. Once set to occur at this time, the automatic cycle of opening the motor circuit for a fixed interval will reoccur every night indefinitely without further attention.

One of the objects of the invention is to provide greatly simplified switch mechanism for automatically opening and closing the circuit. This switch mechanism obtains a snap opening of the contacts and a snap closing of the contacts by an improved construction and arrangement of movable switch elements wherein the movable switch part moves through one path in effecting the snap opening, and moves through another path substantially at right angles thereto in effecting the snap closing.

Another object of the invention is to provide an improved manual control which can be set to render the interval timer non-functioning so that there will be no interruption of the motor circuit.

Another object of the invention is to provide an improved interval timer in which the defrosting interval can be readily adjusted to occur at a different time or times.

Other objects, advantages and features of the invention will appear from the following detail description of one preferred embodiment thereof. In the accompanying drawings illustrating such embodiment:

Figure 1 is a plan view or front elevational view of the entire interval timer;

Figure 2 is a horizontal view of the operating mechanism in its mounting on the sub-frame immediately below the cover, corresponding to a view taken on the plane of the line 2—2 of Figure 3;

Figure 3 is a longitudinal sectional view through the housing, showing some of the mechanism in section;

Figure 4 is a fragmentary elevational view of the one-way drive mechanism which is interposed in the driving train between the electric motor and the switch actuator; and

Figures 5, 6, 7 and 8 are fragmentary views on a larger scale showing different positions of the switch parts.

The mechanism is preferably enclosed within a housing comprising a casing **14** closed over by a cover plate **15** (Figure 3). A U-shaped sub-frame **16** is secured to the under side of the cover plate **15**, and the various operating parts are assembled between this sub-frame and the cover plate. The end portions of said sub-frame are formed with tongues **17** which project upwardly through corresponding slots formed in the cover plate **15** (Figure 1). Screws **19** pass down through the cover plate and thread into tapped holes in the bottom of the sub-frame **16** for releasably securing the latter to the cover plate. The electrical conductors **21** enter the housing through the bottom wall of the casing **14** and have connection with suitable binding posts or terminals **24** projecting downwardly from an insulating panel **25** riveted to the underside of the sub-frame **16**. These conductors supply the alternating current which drives the synchronous motor **27**, and they also constitute the control circuit which is controlled by the interval timer. Projecting from the upper side of the cover plate **15** is a setting knob **28** and associated pointer **29** which rotate concentrically of a 24 hour dial **30** which is stamped or marked on the cover. This setting knob and pointer are mounted on the upper end of a time driven spindle or shaft **31** which carries the switch actuator. As hereinafter described in greater detail, rotation of the setting knob **28** and pointer **29** enables the interval timer to be properly synchronized with the time of day when the device is first cut into the circuit; and transposition of the pointer **29** to a diametrically opposite position with respect to the setting knob and actuator shaft enables the defrosting interval to be shifted from day time to night time, or vice versa. Also projecting upwardly from the cover plate **15**, through an arcuate slots **33**, is a control pin **34** which, when oscillated to the lower end of the slot, in the position illustrated, results in the

interval timer performing its intended function of defrosting the refrigerator periodically at the desired interval, and, which when swung to the upper end of the slot, renders the switch of the interval timer non-functioning, but without stopping the synchronous motor 27 and the switch actuator driven thereby.

Referring now in detail to the construction, the electric motor 27 which drives the interval timer is preferably a conventional synchronous alternating current motor of the type commonly employed for driving electric clocks, although it will be understood that other time controlled or time driven mechanism can be employed in lieu of such electric motor. The motor unit 27 includes a gear reduction housing 37 enclosing suitable reduction gearing, this housing being secured by screws 38 to the horizontal portion of the sub-frame 16. A shaft 39 at the outer end of this reduction gearing mounts a small spur pinion 41 on the under or back side of the sub-frame 16. This pinion meshes with a large spur gear 42 which is part of a one-way drive mechanism rotatably mounted on a stationary bearing stud 43. The upper end of this bearing stud 43 is rigidly staked in a raised supporting lug 44 which is punched upwardly or forwardly from the body of the sub-frame 16. The large gear 42 is adapted to transmit a drive to a pinion 46 coaxial therewith through the one-way drive device, indicated in its entirety at 47. This one-way drive device enables the interval timer to be properly set without transmitting reverse motion to the switch actuator, and without transmitting any such setting motion to the electric motor 27. The details of this one-way drive device are fully disclosed in my copending application Serial No. 417,614, filed November 3, 1941, and hence I shall only make a brief description of the construction in this application. The driving gear 42 is formed with an annular series of driving shoulders 51 projecting rearwardly from the body of the gear. As shown in Figure 4, these shoulders are preferably formed by punching tongues rearwardly from the gear, the free ends of the tongues facing in the normal, clockwise direction of rotation of the driving gear 42. The driven element of this one-way drive device is in the form of a spider 54 comprising a hub portion from which radiates a plurality of evenly spaced spring arms 56. These spring arms are preferably curved in the approximate S-formation shown so as to be of longer length for increased resiliency. The central portion of the spider is spaced slightly from the drive gear 42, but the tip ends of the spider are sloped forwardly so as to bear constantly against the surface of the gear and to be engaged by the driving shoulders 51. With reference to the mounting of this one-way drive device, the pinion 46 is formed with an integral bearing extension or hub 59, and this gear and hub unit is rotatably mounted on the stationary bearing stud 43. The drive gear 42 is mounted on the bearing hub 59 so as to be capable of free rotation thereon. The spider 54 is mounted on an outer reduced extension 59b of the bearing hub 59, the shoulder at the inner end of the outer extension maintaining the hub of the spider spaced away from the surface of the drive gear 42. Splayed or other like driving surfaces 59c on the outer bearing extension 59b engage corresponding driving surfaces formed in the hub of the spider 54 so that a keyed relation is always maintained between the spider 54 and pinion 46. The bearing hub 59 of gear 42 and the bearing hub of the spider 54 are held against endwise displacement off the end of the stationary bearing stud 43 by a U-shaped retainer clip 61 which snaps into an annular groove formed in the end of the stud 43.

It will be apparent that the small spur pinion 41 driven by the electric motor 27 will impart a continuous, time driven rotation to the large driving gear 42 at all times. In Figure 4, this direction of rotation is clockwise, such rotation operating through the gears 46 and 63 to impart clockwise rotation to the time driven shaft 31, pointer 29 and knob 28, as viewed from the front of the timer unit. It will be noted that in this clockwise rotation of the driving gear 42, the driving shoulders 51 transmit the driving torque to the tip ends 56 of the spider 54. There are preferably a relatively large number of driving shoulders 51 and a relatively large number of driven shoulders 56, and the number of shoulders in one series is in prime relation to the number of shoulders in the other series. For example, in the preferred construction shown, there are nine driving shoulders 51 and eight driven shoulders 56, these two numbers being in prime relation to each other. By virtue of this relation, only one driving shoulder and one driven shoulder will be engaging at any particular time. Upon a very small advancing movement of the spider relatively to the drive gear, drive relation is immediately transferred to another drive shoulder and driven shoulder (the next in rearward sequence). The gear reduction from the armature of the electric motor to the pinion 41 is of such design or of such magnitude that the motor cannot be driven in the reverse direction by any manual force capable of being exerted on the setting knob 28. It will thus be seen that by virtue of this one-way driving relation, the gear 42 positively drives the spider 54 in a clockwise direction, and also enables the spider to be advanced in a forward or clockwise direction relatively to the gear, but does not permit the spider to be rotated backwardly relatively to the gear.

The gear ratio of the driving train is such that the gear 63 and time driven spindle 31 make exactly one complete revolution every 24 hours. The spindle 31 has a reduced rear end which is journaled in the sub-frame 16, and has a reduced upper portion which is journaled in the cover plate 15. The spur gear 63 is riveted to a flange 31a projecting outwardly from the rear portion of the shaft 31. The setting knob 28 screws over a right hand thread formed on the reduced front end 31b of the shaft 31. Two diametrically opposite splayed surfaces 31c are formed at the inner end of the reduced portion 31b for receiving corresponding driving surfaces formed in the central portion of the pointer 29. The setting knob 28 screws inwardly along the thread and clamps the pointer 29 to the inner ends of the splayed surfaces 31c. By removing the setting knob 28, the pointer 29 can be released from the splayed surfaces, and then transposed to a diametrically opposite position, where it is again secured to the shaft 31 by the setting knob 28. This transposition of 180° results in a 12 hour shift in the indication afforded on the dial 30, as a result of which the defrosting interval can be shifted from an a. m. time to a p. m. time, or vice versa. The right hand thread 31b over which the setting knob 28 screws enables the setting knob to advance the shaft 31 in a right hand or clockwise direction, but merely results in the knob unscrewing from

the shaft if it is attempted to adjust the shaft in a counterclockwise direction. Such counterclockwise direction would be likely to injure the switch mechanism.

The switch mechanism is actuated by an actuating cam 66 which is secured fast to the splayed forward end of a hub portion 31e on the shaft. This cam is composed of insulating material, such as a linen base Bakelite punch stock. Formed in the periphery of this cam is an arcuate gap or notch 68 which is proportioned in length to give the desired fixed interval of time for defrosting the refrigerator. In most instances, a defrosting interval of approximately four hours is desired, although it will be understood that longer or shorter intervals may be easily obtained by merely substituting actuating cams having longer or shorter notches 68. As clearly shown in Figure 5, the leading edge 69 of this notch 68 is formed relatively sharp, and is undercut or recessed at 70 to effect snap opening of the switch. The trailing end 71 of the notch is slightly rounded, and is also preferably recessed or undercut at 72.

The switch comprises a stationary contact 75 and a movable contact 76, the latter responding to the cam 66. The stationary contact 75 is secured to the forward portion of a rigid terminal bracket 75a which has its rear end anchored to the insulating panel 25, and carries one of the terminal screws 24. The movable contact 76 is secured to one end of a leaf spring blade element 76a which is capable of switch opening motion in one path and switch closing motion in another path, substantially at right angles thereto. To accommodate these two motions, the blade 76a is formed with a substantially circular resilient loop 76b terminating in an attachment portion 76c which projects approximately at right angles to the main length of the blade element. The attachment portion 76c is riveted to a rigid terminal bracket 77, which has its rear end anchored to the insulating panel 25, and carries one of the terminal screws 24. Riveted to the flexing span of the blade element, at a point intermediate the contact 76 and the bowed portion 76b is a clip or bracket 78 formed with a right angle flange or shoulder 79 at one end. This shoulder 79 constitutes the rider element of the movable blade assembly which rides on the time driven cam 66. The inherent resiliency in the spring blade 76a tends to bias the switch toward the open circuit position shown in Figure 6.

Also cooperating with the rider shoulder 79 is a manual cam 81 which responds to the shifting of the control pin 34 in the slot 33. Said manual actuated cam 81 is also composed of insulating material, preferably of the same composition as the cam disc 66, and is formed with a cam slope 81a terminating in a detent notch 81b. The cam is riveted to the rear arm 82a of a rotatable bracket 82. This rear arm of the bracket is formed with a bearing hole which engages over the shaft 31, so that the bracket 82 rotates about the axis of the shaft. The bracket is formed with a forwardly extending web portion which terminates in a front arm or segment 82c. This segmental portion lies immediately under the arcuate slot 33 in the cover plate 15, and the control pin 34 is fixedly anchored in said segmental portion 82c. When the control pin 34 is oscillated down to the "defrost" end of the slot 33 the cam 81 assumes the inoperative or non-functional position shown in dotted lines in Figure 8. When the control pin 34 is swung up to the "off" end of the slot 33 the cam 81 is oscillated into the switch closing position illustrated in full lines in Figure 8, such motion of the cam acting through the cam slope 81a against the movable contact shoulder 79 to flex the movable contact into circuit closing position. In this position, the shoulder 79 snaps into the detent notch 81b of the cam for establishing a releasable detent engagement, holding the control pin 34 in its "off" position.

Referring now to the operation of the timer, Figure 5 illustrates the normal closed circuit position of the switch. In this position, the solid periphery of the cam 66 bears against the rider 79 of the movable blade element 76a, thereby retaining the movable contact 76 pressed against the stationary contact 75. Because of the spring resiliency of the blade element 76a, and the fact that the rider member 79 is mounted thereon substantially intermediate the ends of the blade element, the transverse resiliency of the blade is utilized to hold the contacts together under spring pressure. Figure 6 illustrates the switch opening operation with occurs as soon as the leading shoulder 69 of the notch 68 rotates past the rider shoulder 79. The blade element 76a immediately flexes toward the right, producing a snap separation of the contacts 75 and 76. The switch remains in this open circuit position for the fixed interval predetermined by the length of the notch 68. Near the end of this interval, the rounded trailing shoulder 71 of the notch engages the forward surface of the rider member 79 and starts exerting pressure on the blade element 76a in a direction approximately along the length of the blade element. With the continued rotation of the actuator disc 66, the shoulder 71 continues to force the blade element 76a substantially in a rearward direction, as illustrated in full lines in Figure 7. The resiliency inherent in the relatively large loop portion 76b permits this endwise rectilinear motion of the blade element. With the continued rotation of the actuator disc, the trailing shoulder 71 finally rides off the edge of the shoulder member 79, thereby permitting the blade element 76a to snap forwardly again under the spring energy stored in the loop portion 76b. In snapping forwardly under this spring energy, the riding shoulder 79 follows the circular contour of the disc 66. This guides the return motion of the movable contact 76 in a general direction toward the stationary contact 75, so that the two contacts are brought together with a sidewise motion, the movable contact sliding across the face of the stationary contact substantially from the side thereof. This results in a wiping of the contact surfaces at the time that they reengage. In the final position indicated in dotted lines, the switch is back in the normal closed circuit position shown in Figure 5. The engagement of the contacts in this switch closing operation occurs with a snap motion, so that all pitting and arcing of slowly engaging contacts is avoided. In snapping back into this closed circuit position, the movable blade structure moves into a wedging relation wherein the movable contact 76 is wedged against the stationary contact 75 and the rider shoulder 79 is wedged against the periphery of the disc 66, which holds the two contacts together under resilient pressure, as described above in connection with Figure 5.

It will be noted that the movable contact or movable blade element has motion through two paths, substantially at right angles to each other,

In the switch opening operation, the contact 76 moves along the path indicated at X in Figure 6, such being in a plane substantially at right angles to the plane of interengaging faces of the contacts. In the switch closing operation, the movable contact 76 moves along a path indicated approximately by the arrow Y in Figure 7, which is approximately parallel to the plane of the interengaging faces of the contacts. This operating relation enables the snap separation and the snap reengagement of the contacts to be obtained with a relatively simple structure and simple operating motion.

Figure 8 illustrates the manually actuated cam 81 swung into switch closing position, when it is desired to discontinue the automatic defrosting cycle. This exerts camming pressure on the rider shoulder 79 for swinging the movable contact 76 into engagement with the stationary contact 75. The yieldable detent engagement of the rider member 79 in the notch 81b resiliently holds the manual control in this position until the control pin 34 is swung back to the lower end of the slot 33. This manual control mechanism enables the interval timer to be placed in a non-operative condition with the switch 75—76 held closed, whereby the refrigerator will continue in its normal operation without being interrupted by any defrosting interval. Such may be a desirable condition temporarily, in order to meet brief peak load requirements, or to insure operation after current failures etc. This non-operative condition of the interval timer is obtained without stopping the synchronous motor 27, and hence the timer is not thrown out of timed step by the performance of the manual control.

When the interval timer is first cut into circuit in its capacity of controlling the refrigerator motor, the knob 28 is rotated in a clockwise direction to place the pointer 29 in registration with that point of the dial 30 corresponding to the hour of the night or day when the refrigerator is first started. The one-way drive device 47, together with the right hand thread 31b on the shaft 31, enable the knob, pointer and cam 66 to be rotated into this synchronized position by clockwise rotation, but prevent counterclockwise rotation, which might cause injurious jamming between the cam drop-off shoulder 69 and the rider lug 79. If it is desired to transpose the defrosting interval from an a. m. time to a p. m. time, or vice versa, it is only necessary to transpose the pointer from one position on the driving surfaces 31c to the diametrically opposite position permitted by these surfaces, and to then reset the time indication of the pointer over the dial 30 so that it indicates the true clock time of that moment. This transposition merely changes the angular relation between the pointer 29 and the notch 68 corresponding to an interval of twelve hours. If a smaller shift in the defrosting time is desired, such can be accomplished by adjustments made through the knob 28, even though such adjustments may introduce a slight error of reading in the time indication given over the dial 30.

While I have illustrated and described what I regard to be the preferred embodiment of my invention, nevertheless it will be understood that such is merely exemplary and that numerous modifications and rearrangements may be made therein without departing from the essence of the invention.

I claim:

1. In a switch, the combination of a pair of cooperating contacts, one movable relatively to the other, and switch actuating mechanism effecting snap opening of said switch by motion of said movable contact along one path, and effecting snap closing of said switch by motion of said movable contact along another path.

2. In a switch, the combination of a relatively stationary contact, a contact spring carrying a movable contact adapted to engage said relatively stationary contact, said spring being capable of transverse motion and endwise motion, said spring being biased transversely so as to tend to separate said contacts, and rotary switch actuating means operative to open the switch by permitting such transverse separation of the contacts, and operative to close said switch by causing said spring to move endwise and transversely.

3. In a switch, the combination of a relatively stationary contact, a contact spring anchored at one end and carrying a movable contact at its other end adapted to engage with said relatively stationary contact, a resilient loop portion formed in said contact spring permitting transverse motion and endwise motion of the contact carrying end of said spring, and a switch actuating cam governing transverse motion of said contact spring in the opening of the switch and governing endwise motion of the spring in the closing of the switch.

4. In a switch, the combination of a relatively stationary contact, a contact spring anchored at one end and carrying a movable contact at its free end, a resilient loop portion formed in said contact spring intermediate its ends, said loop portion permitting transverse motion and endwise motion of said free end, and a time-driven rotary cam comprising a notch permitting transverse motion of said contact spring in the opening of the switch, and comprising a shoulder for causing endwise motion of said spring in the closing of said switch.

5. In a fixed interval timer, the combination of a relatively stationary contact, a resilient contact spring anchored at one end and carrying a movable contact at its free end, a resilient loop portion formed in said contact spring intermediate its ends, said loop portion permitting transverse motion and endwise motion of the free end of said spring, a rider shoulder projecting from said spring, a time driven rotary cam against which said rider bears, a notch in said cam permitting transverse motion of said contact spring in the switch opening operation, and a shoulder on said cam adapted to engage said rider shoulder and shift said spring endwise, and to thereupon release said spring for return endwise motion into engagement with said relatively stationary contact in the switch closing operation.

6. In an interval timer, the combination of a pair of cooperating switch contacts, one movable relatively to the other, switch actuating mechanism comprising a time driven member together with means cooperating therewith for effecting separation of said contacts by motion of said movable contact along one path, and for effecting engagement of said contacts by motion of said movable contact along another path, and separate control means operative to hold said contacts engaged independently of said switch actuating mechanism.

7. In a switch, the combination of a relatively stationary contact, a cooperating relatively movable contact, means mounting said movable con-

tact for movement in a direction substantially at right angles to said stationary contact and for movement in a direction substantially parallel to said stationary contact, automatic switch actuating means for causing movement of said movable contact in one direction for closing the switch and in the other direction for opening the switch, and manual control means for holding said contacts in engagement independently of said automatic switch actuating mechanism.

8. In a switch, the combination of a pair of cooperating contacts, one movable relatively to the other, a single time driven switch actuator operative by unidirectional rotation to effect opening of said switch by motion of said movable contact along one path, and to effect closing of said switch by motion of said movable contact along another path, an electric motor for driving said switch actuator, adjusting means for adjusting said switch actuator relatively to said electric motor, and a one-way drive device associated with said switch actuator to restrict such adjustment to motion in one direction.

9. In a fixed interval timer of the class described, the combination of a switch comprising a pair of cooperating switch contacts, one movable relatively to the other, a resilient contact spring anchored at one end and carrying said movable contact at its free end, a resilient loop portion formed in said contact spring intermediate its ends, said loop portion permitting transverse motion and endwise motion of the free end of said spring, a time driven rotary cam cooperating with said contact spring, said cam permitting transverse motion of said spring in the opening of said switch, and causing endwise motion of said spring in the closing of said switch, time indicating means, an electric motor driving said time driven rotary cam and said time indicating means, adjusting means enabling relative angular adjustment to be effected between said time driven rotary cam and said time indicating means, a one-way drive device interposed in the driving train between said electric motor and said time driven rotary cam, whereby rotational adjustment of said cam can only be performed in one direction, and manual control means for holding said contacts in closed circuit position independently of the operation of said time driven rotary cam.

10. In a switch, a relatively stationary contact, a spring, a point of anchorage for one end of said spring permitting lateral and endwise movement of said spring, a movable contact carried by said spring adjacent to the other end thereof, said spring having a normal bias tending to separate said contacts, a rotary cam adapted to bear against said spring intermediate its ends to hold said contacts closed, a notch in said cam adapted to permit lateral flexure of said spring for opening said contacts, and a shoulder on said cam for imparting endwise movement to said spring in the operation of closing said contacts.

11. In a switch, a relatively stationary contact, a spring, a point of anchorage for one end of said spring permitting lateral and endwise movement of said spring, a movable contact carried by said spring adjacent to the other end thereof, said spring having a normal bias tending to separate said contacts, a rotary cam adapted to bear against said spring intermediate its ends to hold said contacts closed, a notch in said cam adapted to permit lateral flexure of said spring for opening said contacts, a shoulder on said cam for imparting endwise movement to said spring in the operation of closing said contacts, and separate control means operative to hold said contacts engaged independently of said rotary cam.

12. In a switch, the combination of a pair of cooperating contacts, one movable relatively to the other, switch actuating mechanism effecting snap opening of said switch by motion of said movable contact along one path, and effecting snap closing of said switch by motion of said movable contact along another path, and separate control means operative to hold said contacts engaged independently of said switch actuating mechanism.

13. In a switch, the combination of a pair of cooperating contacts, one movable relatively to the other, and switch actuating mechanism comprising a rotary member disposed on the back side of said movable contact in position for forcing said movable contact into engagement with said stationary contact, and also comprising means for effecting separation of said contacts by motion of said movable contact along one path, and for effecting engagement of said contacts by motion of said movable contact along another path.

14. In a switch, the combination of a pair of cooperating stationary and movable contacts, means mounting said movable contacts for motion along separate paths in the opening and closing of said switch, rotary switch actuating means disposed in position for forcing said movable contact into engagement with said stationary contact, means associated with said rotary switch actuating means for causing said movable contact to move along one path, and means associated with said rotary switch actuating means causing said movable contact to move along another of the aforesaid paths.

15. In a switch, the combination of a pair of cooperating stationary and movable contacts, means mounting said movable contacts for motion along separate paths in the opening and closing of said switch, rotary switch actuating means disposed in position to press said movable contact into engagement with said stationary contact, a notch associated with said rotary switch actuating means for causing said movable contact to move along one of the aforesaid paths, a shoulder associated with said rotary switch actuating means for causing said movable contact to move along another of the aforesaid paths, and separate control means operative to hold said contacts engaged independently of said rotary switch actuating means.

WILLIAM P. GALLAGHER.