March 20, 1951 M. H. KAEFER ET AL 2,545,617

TIMER MECHANISM

Filed June 19, 1946 2 Sheets-Sheet 1

Fig. 1

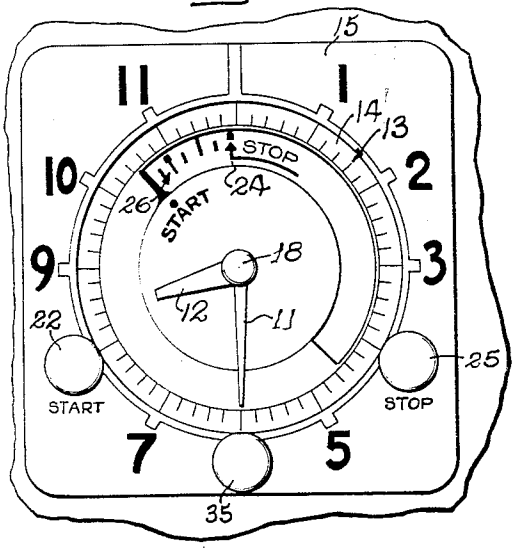


Fig. 2

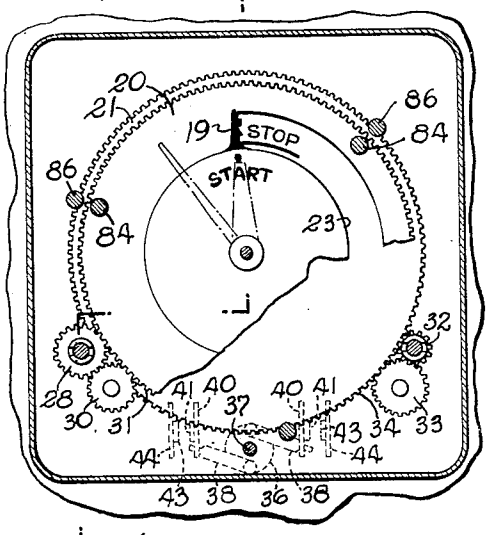


Fig. 3

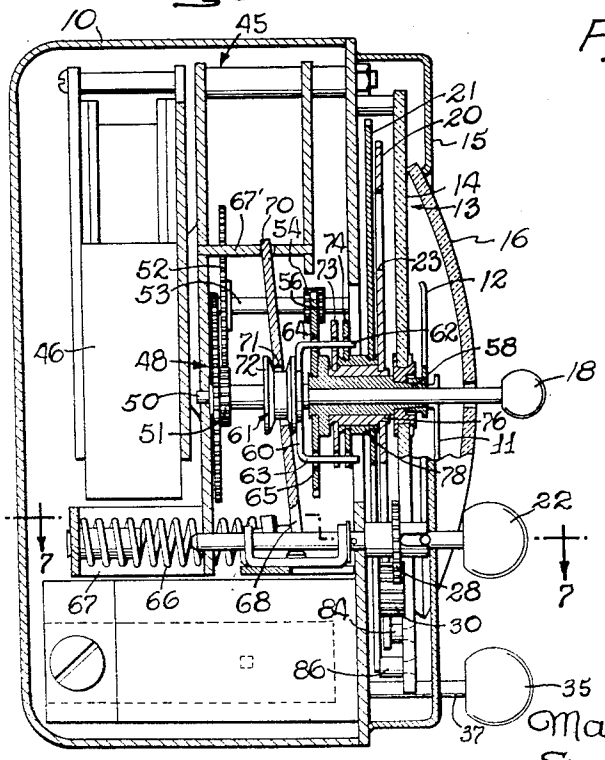


Fig. 4

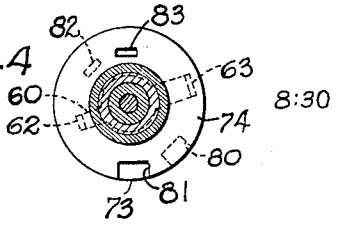


Fig. 5

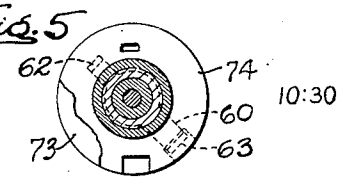
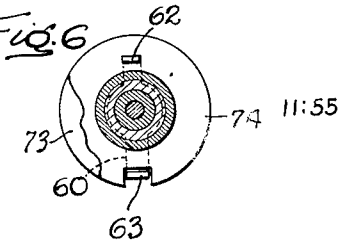


Fig. 6



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TIMER MECHANISM

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Fig. 7

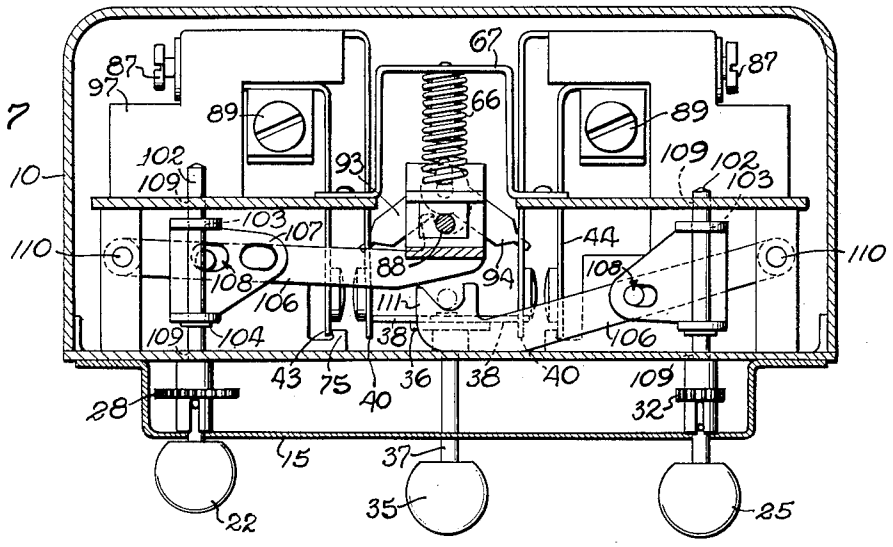


Fig. 8

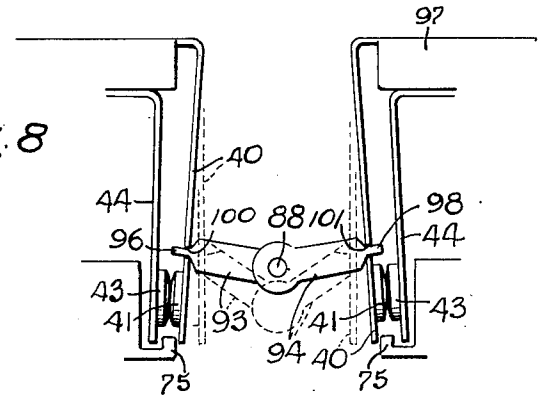
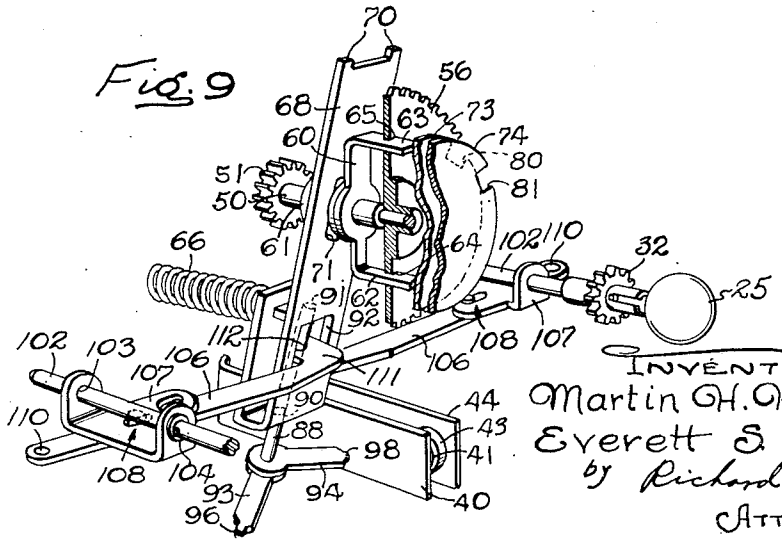


Fig. 9



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UNITED STATES PATENT OFFICE

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TIMER MECHANISM

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Application June 19, 1946, Serial No. 677,687

13 Claims. (Cl. 161—1)

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This invention relates to timing mechanisms and more particularly to a mechanism which includes an automatically operated electric switch for energizing an electrical load during a predetermined time interval.

Such devices may be used in timers for kitchen ranges or other controlling means for electrical cooking appliances wherein the circuit to the cooking element is closed at a predetermined time and opened at a later time. For other uses the parts may be so arranged as to cause the load to be deenergized only during the predetermined interval.

Range timers in order to be practically useful must be provided with an easily understandable control means. Otherwise the average housewife will find it easier to do without the range timer than to understand its operation. It is desirable to provide a range timer with controls which may be set in any order and which will clearly indicate both the duration of the cooking period as well as the time in which the cooking period is to start and to cease. It is also desirable to provide a control in which the active adjustment serves to place the switch and its associated operating mechanism into a proper initial condition. In order to prevent inadvertent operation of the timer during a succeeding twelve hour period it is further desirable that the control be self-deleted; that is to say, after the device has been set and the circuit has been closed and opened in accordance with such setting, the controls should not remain in their set condition for another cycle of operations, but should again be reset.

It is an object of the invention to provide an improved time switch of inexpensive construction which is positive and accurate in its operation, and which is provided with legible and easily adjusted control means.

It is another object of the invention to provide improved time responsive means to actuate electrical contacts at a predetermined time and to restore the same to their original position at a later time.

A further object of the invention is to provide an improved time switch wherein the controls are self-deleting and in which the unexpired portion of the cooking period may be read at a glance.

Still another object of the invention is to produce a timing mechanism utilizing a spring biased detent in which the frictional forces exerted upon the timing mechanism by the detent are of a balanced nature during the period

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that the automatic timing function is being used, and in which such frictional forces are completely removed during non-use of the automatic timing function.

It is a still further object of the invention to provide timing mechanism in which the switch and the switch operating parts are placed in an initial or cocked position automatically upon the setting of the time adjusting means.

Other objects and advantages of the invention will be apparent from the following detailed description taken in connection with the accompanying drawings, in which:

Figure 1 is a front elevation showing the external appearance of a timing mechanism constructed in accordance with our invention, the controls being set in this instance to energize the load at 10:30 o'clock and to deenergize the load at 11:55 o'clock.

Fig. 2 is a front elevation with the face of the mechanism removed in order to show the means for driving the time setting disks.

Fig. 3 is a vertical section taken along the line 3—3 of Fig. 2 to show the internal operating mechanism.

Fig. 4 shows the position of the switch operating detent in relation to the timer discs at 8:30 o'clock.

Fig. 5 shows the position of the detent of Fig. 4 at 10:30 o'clock.

Fig. 6 shows the positions of the detent and associated timer discs at 11:55 o'clock.

Fig. 7 is a horizontal section taken along the line 7—7 of Fig. 3.

Fig. 8 is a detailed view of the switch and controlling toggle mechanism.

Fig. 9 is a fragmentary perspective view in partial section showing the detent and associated timer discs together with the switch operating mechanism.

While the invention is susceptible of various modifications and alternative constructions and uses, we have shown in the drawings and will herein describe in detail one embodiment of the invention. It is to be understood, however, that we do not intend to limit the invention by such disclosure, but aim to cover all modifications and alternative constructions and uses falling within the spirit and scope of the invention as expressed in the appended claims.

Prior art timers for controlling electric ranges and the like have been relatively complex, thus making them both difficult and expensive to manufacture and complicated to use. Such complication has been overcome and a number of ad-

ditional advantages derived by application of the teachings disclosed herein. By way of introduction, in accordance with our invention a rotatable time driven member carries a biased detent. Placed in the path of movement of such detent are two coaxial discs rotatively coupled to time setting dials on the face of the mechanism, such dials being respectively adjustable to indicate an "on" time and an "off" time. The discs are adapted to engagedly receive the detent in succession as the time driven member brings the detent successively into registry with the discs. Movement of the detent, when the latter is received by the first disc, is utilized to turn the switch to the "on" position. Subsequent movement of the detent, upon being received by the second disc, restores the switch to its "off" position.

The external appearance of the mechanism and the means for adjusting the time setting components are shown in Figs. 1 to 3. It will be seen that the timing device, when enclosed in a housing 10, closely resembles a conventional clock and is of approximately the same size. Clock hands 11 and 12, driven by a timing gear train to be discussed, cooperate with graduations or indicia 13 which may be imprinted about the periphery of a transparent fixed dial 14 to indicate the time of day. Numerals corresponding to such graduations may, if desired, be imprinted on a retaining flange or bezel 15. The transparent cover glass 16, which may be apertured at the center to receive a hand setting knob 18, is retained by the bezel 15 in position to protect the clock hands and to improve the appearance of the device.

Arranged coaxially behind the transparent fixed dial 14 are two time setting dials 20 and 21. The dial 20, also referred to as the "start" dial, is adjustably rotatable by an adjusting knob 22 to indicate by a pointing index 19 the time at which the current will be applied to the load. The dial 20 has an annular aperture or window 23 near its outer edge which lies adjacent the index 19 and, in the present embodiment, extends halfway about the periphery of the disc. This window exposes to view a corresponding portion of the second or "stop" dial 21. The latter has a pointing index 24 which is adjustable in relation to the time scale by an adjusting knob 25. Adjacent the index 24 are graduations 26, a portion of which are obscured by the time setting dial 20. During operation of the device the visible graduations are a convenient indication of the time interval that the range or other connected device is to be operated.

As shown in detail in Fig. 2, the adjusting knob 22 is rotatively coupled to the "start" time setting dial 20 by means of pinions 28 and 30, which engage a rack 31 at the periphery of the dial. In like manner the adjusting knob 25 is rotatively coupled to the time setting dial 21 by pinions 32 and 33 engaging the rack 34 at the periphery of the "stop" time setting dial 21. The idler pinions 30 and 33, respectively, are used to cause the time setting dials to rotate in the same direction as the adjusting knobs 22 and 25, which is a convenience in adjusting the dials. As later discussed, the adjusting knobs 22 and 25 must be axially depressed before engagement of the associated pinions takes place, such axial movement serving also to effect cocking of the switch contacts into an initial "off" position.

Also accessible from the front of the device is a manual switch operating knob 35 which may be used to override the automatic control of the electrical switch to place the range or other load in the "on" condition. In the present instance the latter knob is rotatively coupled by a shaft 37 (see Figs. 2 and 7) to a crank 36 which has switch operating plungers 38 pivotally mounted at its periphery. The plungers engage switch leaves 40 carrying movable contacts 41. Stationary contacts 43 resiliently mounted on switch leaves 44 cooperate with the movable contacts 41 to control the electrical circuit. If desired, two separate loads may be simultaneously energized or alternatively the contacts may be wired in series or in parallel, depending upon the current and voltage characteristics of the load.

Clock mechanism

The clock mechanism, in other words, the motor, time indicating hands and interconnecting gears, as such, form no part of the present invention except to the extent that the driving gear train cooperates with the automatic switching portion of the mechanism. As shown in Fig. 3 the clock mechanism is included in a frame indicated generally at 45. A motor 46 mounted on the frame and which is preferably of the synchronous alternating current variety drives a train of reduction gears 48 to move a central shaft 50 at a rate of one revolution per hour. The shaft 50 extends through to the hand setting knob 18 and carries the minute hand 11.

Also mounted on the central shaft 50 is a pinion 51 which drives a gear wheel 52 mounted on a shaft 53. The latter shaft carries a pinion 54 which, in turn, drives a rotatable member 56. In the present instance this rotatable member consists of a gear wheel having apertures therein to receive detenting mechanism for the operation of the time switch to be later described. An hour hand sleeve 58, which may be rotatively fixed to the gear wheel 56 by any desired means, surrounds the central shaft 50, extending forwardly within the clock body to engage the hour hand 12. Because of the speed reduction brought about through the use of pinion 51, gear wheel 52, pinion 54 and gear wheel 56, the hour hand moves, as is conventional, at $1/12$ the speed of the minute hand.

Switch operating detent mechanism

In order to understand fully the operation of the detent mechanism used to operate the electrical contacts, reference should be made especially to Figs. 3 and 9. Means are provided for successively engaging apertures in two manually positioned discs as the detent is rotated successively into registry therewith, the axial movement of the detent being utilized for switch operating purposes. In the present embodiment the engaging means is a detent 60 mounted on a rotatable collar 61, the latter being freely slidable on the shaft 50. Axially extending end portions 62 and 63 of the detent engage apertures 64 and 65 in the rotatable member 56. Thus as the rotatable member 56 rotates once every twelve hours, the detent 60, being in engagement therewith, is driven at the same speed.

The detent 60 is urged forwardly within the clock housing by the biasing force of a spring 66 mounted on a bracket 67 and acting upon a follow-up member 68. In the present instance the follow-up member 68, the movement of which controls the switch, is pivoted to a cross member 67' of the clock frame 45 by means of a pivot which may, for example, include dowel-like extensions 70 engaging cooperating holes in the

cross member. Joint axial movement of the follow-up member 68 and the detent 60 results from the interference between the edges of aperture 71 and flanges 72 on the collar 61.

The switch mechanism to be later detailed is mounted in the lower portion of the housing 10 remotely from the pivoted end of the follow-up member 68. Because of the pivoted nature of the follow-up member and because of the relative location of the detent and switch mechanism, the follow-up member 68 serves as a displacement multiplying lever. Thus very little axial movement of the detent 60 is required to produce appreciable movement of the remote or switch end of the follow-up member 68.

Placed coaxially with the time driven member 56 and in the path of axial movement for the detent 60 are two detent receiving members 73 and 74. These members may be conveniently referred to as timer discs. The first of such discs, 73, is fixed to a bushing 76 which also has fixed to it the time setting dial 20. In like manner the timer disc 74 is fastened to a bushing 78 which has fixed to it the remaining time setting dial 21. Provision is made for receiving the detent as the detent is bodily rotated into a position of registry. In the present instance the end portion 63 of the detent is received in apertures or notches 80 and 81 (Fig. 4) located at the periphery of the discs 73 and 74 respectively while apertures 82 and 83 serve to receive the end portion 62 of the detent. It is to be noted that each of the end portions 62 and 63 of the detent engage the respective apertures at the same time, thereby causing the detent to be received by the discs both abruptly and positively.

With the detent 60 engaging the timer discs 73 and 74 as shown in Fig. 3, it will be apparent that the discs will rotate in unison with the movement of the detent and the time driven member 56. Under such conditions no frictional load will be placed on the driving mechanism since the bushings 76 and 78 will be rotated precisely in step with the movement of the central bushing 58 leading to the hour hand 12. The latter condition exists after the automatic switching mechanism has completed its function and the clock is in the free running condition.

The condition of the mechanism prior to the performance of an automatic switching operation is illustrated in Fig. 9. In this figure it is seen that the detent 60 has been cocked or retracted out of engagement with the timer discs 73 and 74. Further, the apertures 80, 81 are out of registry with the end portions 62, 63 of the detent. Under such circumstances the end portions of the detent are urged into resilient frictional engagement with the disc 73. Because of the axial pressure between the detent and the timer disc 73, the line of action of which is spaced from the axis of the disc, there is a tendency of the detent to produce an unbalanced or tilting force perpendicular to the disk. An unbalanced force of this nature is obviously undesirable because of the resulting increased wear and increased frictional forces. In the present embodiment such unbalance has been substantially eliminated by the use of the two end portions 62 and 63, since the latter are located on opposite sides of the axis and at approximately the same distance therefrom. Thus the forces applied perpendicular to the disc 73 are substantially balanced and tendency for the disc to tilt is practically eliminated. Because the detent 60 is double ended, the end portions 62 and 63 are located at different distances from the axis, and only one position of registry exists during a twelve hour time cycle.

Upon passage of time, the time driven member 56 causes bodily rotation of the detent 60 to a point at which the end portion 63 of the detent is received in the notch 80 and the remaining end portion 62 is received in the aperture 82. As this occurs the detent, under the urging action of the spring 66, moves axially, the ends of the detent successively engaging the presented surface of the disc 74. The latter movement of the detent is caused to complete the circuit and thereby to energize the load. Subsequent rotative movement of the detent will bring the end portions 62 and 63 into registry with the apertures 83 and 81 respectively, whereupon the detent suffers further axial movement. The latter movement, as will be seen, is utilized to restore the switch to the open position thereby deenergizing the load.

It will be noted that prior to engagement by the detent the time setting dial 20, the attached bushing 76, and the associated timer disc 73 are freely rotatable. It would seem, therefore, that there may be danger of the time setting dial 20 rotating undesirably because of the frictional urging action of the end portions 62 and 63 on the presented face of the timer disc 73. However, means are provided for preventing such rotation. It will be noted from Fig. 3 that the time setting dial 20 engages an abutment 84 (Figs. 2 and 3) placed at the periphery of the dial to limit the axial outward movement. Since a certain amount of axial play exists between the interfitting bushings 58, 76 and 78, substantially the full axial force of the detent is counteracted by pressure of the dial 20 against the abutment 84. Such pressure results in friction which resists turning movement of the time setting dial as long as axial force is exerted thereon by the detent. Since the abutment 84 is at a greater radius than the end portions 62 and 63 of the detent, the frictional torque preventing movement of the time setting dial 20 always exceeds the frictional drag tending to produce rotation thereof. Thus the dial 20 remains stationary at all times.

It is to be noted that after the detent 60 passes through the timer disc 73, the resisting force exerted by the abutment 84 is reduced to zero and the time setting dial 20 thereupon becomes freely rotatable with the clock driving mechanism. The automatic removal of such frictional load becomes especially important in view of the low power rating of the conventional clock motor. Rotation of time setting dial 21, the attached bushing 78 and the associated timer disc 74 is prevented in like manner by an additional abutment 86 located at the periphery of the dial. Preferably a plurality of such abutments 84 and 86 spaced equally about the periphery are used to eliminate unbalanced forces on the bushings associated with the time setting dials.

As a specific example of the relationship which may exist between the detent and the associated timer disks, reference is made to Figs. 4, 5 and 6. Let it be assumed that the time is 8:30 o'clock, that the cooking operation is to begin at 10:30 and to stop at 11:55, the settings corresponding thereto being shown in Fig. 1. At 8:30 (Fig. 4) the detent 60, although contacting the back of disc 73, is in rotative engagement with neither of the timer discs. At 10:30 (Fig. 5) the detent has moved into registry with the apertures 80, 82 of the disc 73 and the resultant axial movement turns the switch to the "on" position. At 11:55 (Fig. 6) the detent 60 comes into registry with

the apertures 81, 83 and the resultant axial movement of the detent causes the switch to be restored to the "off" position.

Switch structure

In the practice of the invention switch means are provided for enabling the switch to be initially in the "off" position, for enabling the switch to be closed upon movement of the follow-up lever 68 to an intermediate position, and for enabling the switch to be reopened upon further movement of the follow-up lever in the same direction. In the present embodiment this is accomplished by a toggle mechanism. As shown in Fig. 9, the follow-up lever 68 is terminated in a shaft-like extension 88, such extension engaging the follow-up lever at points 90 and 91. The portion of the extension 88 intermediate the points of support 90, 91 is made accessible by an aperture 92 in the follow-up lever 68 for a purpose to be described. At the end of shaft 88 are pivotally mounted toggles 93, 94. These toggles have pin-like extensions 96 and 98, respectively, which engage apertures 100 and 101 in the switch leaves 40 (Fig. 8). The switch leaves 40 and 44 are anchored in blocks of insulation 97 and are terminated in binding posts 87, 89 for connection of external wiring.

The length of the toggles 93 and 94 is such that prior to engagement between the detent 60 and the disc 73 (Fig. 9), the toggles are in an off-center condition. Under such circumstances the spring leaves 40 are in the innermost position, and since follow-up movement of the contacts 42 on leaves 44 is limited by retaining edges 75, the contacts are accordingly open. Subsequent movement of the detent into engagement with the disc 73, however, causes the toggles 93, 94 to be rotated into the dead-center position illustrated in Fig. 8. Such movement forces the spring leaves 41 outwardly and contact is made between contacts 41 and 43. Next, movement of the detent into engagement with the timer disc 74 causes outward swinging of the extension 88 of the follow-up lever 68, reverse folding of the toggles 93 and 94 and consequent separating of the contacts.

Since the spacing of the time discs 73 and 74 is normally quite close, only limited axial movement of the detent occurs as the detent is received by the recesses in the discs. However, the distance multiplying action of the follow-up lever 68 insures that adequate toggle actuating movement is produced. The use of a toggle has been found ideal for operating the electrical switch, since continued movement of the toggle actuating shaft 88 in the same direction causes the circuit to be made and subsequently broken. Furthermore, because of the nature of the toggle powerful leverages are available as the toggle moves into the vicinity of the dead center position, further insuring the high contact pressures particularly desirable in the case of ranges having a high current drain.

Automatic cocking mechanism

It is necessary in connection with detent operated switches that means be provided for cocking the detent into an initial position and for concurrently placing the switch contacts in a desired initial condition. In accordance with our teachings this is done automatically as an incident to the setting of the time setting dials. In the present embodiment axial movement of the adjusting knob 22 is necessary to engage the associated pinions 28 and 30 thereby to set the dial 20 to the desired position. As shown in Figs. 3, 7 and 9, the knob 22 is attached to a shaft 102, which is slidably mounted in apertures 109 in the frame and which extends through apertures 103 in a bracket 107. Axial movement of the shaft results in rearward movement of the bracket 107 because of the presence of a pinned washer 104 or similar obstruction on the shaft 102. The bracket 107 is loosely pivoted to a horizontally extending resetting lever 106 by any desired means, for example, by a dowel and socket joint 108. Inward movement of the bracket 107 therefore causes inward movement of the resetting lever 106 about a pivot 110 mounted on the clock frame.

At the free end of the resetting lever 106 is a rearwardly extending projection 111 having provided therein a notch 112. As shown in Fig. 9, the projection 111 is positioned to extend through the aperture 92 into engagement with a portion of the shaft-like member 88. The engagement between the smooth surface of the latter member and the smooth internal surface of the notch insures substantially frictionless pivotal engagement at this point. From the foregoing it is obvious that inward movement of the knob 22 to the position shown in Fig. 7 or 9 is effective to cause inward swinging of the follow-up lever 68, compression of the detent spring 66, withdrawal of the detent 60 from the discs 73 and 74 and the opening of the contacts 41, 43. Inward movement of the knob 22 is also effective to engage the pinions 28, 30 as previously seen, and subsequent rotation of the knob 22 is effective to move the time setting dial 20 (and therefore the timer disc 73) to any desired position.

The foregoing discussion has considered the resetting mechanism associated only with adjusting knob 22. It is to be understood, however, that substantially identical mechanism is used in connection with the adjusting knob 25 and for the same purpose. Corresponding reference numerals are used in each instance.

Summary of operation

Prior to use of the timing mechanism the detent 60 will normally be in engagement with the discs 73 and 74, and the associated time setting dials 20 and 21 will be subject to free rotation with the hour hand 12 of the clock mechanism. To set the start dial it is necessary to apply inward pressure to the adjusting knob 22 which produces rearward translation of the bracket 107 and rearward rotation of the resetting lever 106 about the pivot 110. The resulting pressure applied to the lower end of the follow-up lever 68 removes the detent from the discs 73, 74 against the bias of the spring 66 and opens the switch contacts 41, 43. Rotation of the adjusting knob 22 is thereupon effective to rotate the "start" time setting dial 20 to any desired position, for example, the 10:30 o'clock position shown in Fig. 1.

To adjust the "stop" time setting dial 21 inward pressure is applied to adjusting knob 25 and the knob is rotated to bring the "stop" time setting dial to the desired position, for example, 11:55 o'clock.

Upon passage of time, bodily rotation of the detent 60 occurs until at 10:30 o'clock the detent engages the apertures 80, 82 in the disc 73, the resulting axial movement of the detent causing the switch contacts to close. Since the detent 60 is then in positive engagement with the timer disc 73, this disc and the attached time setting dial

20 will rotate with the hour hand of the clock. Thus the indicia 26 will be gradually covered, the uncovered graduations being a measure of the time yet remaining in the cooking period. Finally, at 11:55 o'clock the detent will come into registry with the apertures 80, 83 of disc 74, and the resultant axial movement of the detent will cause the switch contacts to be opened, ending the cooking period. Subsequent rotation of the clock mechanism will cause the time setting dials 20, 21 to be rotated with the hour hand. Thus the setting of the time interval is automatically deleted and will not be repeated as the hour hand goes through a succeeding twelve hour cycle.

We claim as our invention:

1. A timing mechanism comprising a time driven rotatable member, an eccentrically disposed detent mounted for rotation therewith, means biasing said detent for axial movement, a start disc mounted coaxially with said rotatable member in the path of biased movement of said detent and having an aperture to receive said detent in rotative engagement upon rotational movement of said detent into registry therewith so that said disc is rotated by said time driven member, a stop disc mounted coaxially with said start disc and having an aperture to receive said detent upon additional rotation thereof, a switch, an operator for said switch, said switch operator being coupled to said detent and responsive to successive movement thereof for operating said switch.

2. A timing mechanism comprising a time driven rotatable member, an axially biased detent mounted for bodily rotation therewith and spaced from the axis thereof, a first detent receiving member mounted coaxially with said rotatable member for receiving said detent and being rotated thereby upon said detent moving into a position of registry therewith, a second detent receiving member mounted coaxially with said rotatable member for receiving said detent and being rotated thereby upon successive movement of said detent into a position of registry therewith, a pivoted member engaging said detent, a switch, and a switch operating toggle engaging said pivoted member and movable therewith for operating said switch as said detent moves into successive engagement with said detent receiving members.

3. A timing mechanism comprising a time driven rotatable member, an axially biased detent mounted for bodily rotation therewith, and spaced from the axis thereof, a first detent receiving member mounted coaxially with said rotatable member for receiving said detent and being rotated thereby upon said detent moving into a position of registry therewith, a second detent receiving member mounted coaxially with said rotatable member for successively receiving said detent and being rotated thereby upon said detent moving into a position of registry therewith, a toggle connected to said detent and movable into dead-center position as said detent moves into registry with said first detent receiving member and beyond dead-center position as said detent moves into registry with said second detent receiving member, and a switch operated by said toggle and arranged to be in closed position only with said toggle in substantially dead-center position.

4. A timing mechanism comprising a time driven rotatable member, an eccentrically disposed detent axially slidable therein, a start disc mounted coaxially with said rotatable member in the path of movement of said detent and having an aperture to receive said detent upon rotational movement of said detent into registry therewith, a stop disk mounted coaxially with said start disc and having an aperture to receive said detent upon additional rotation thereof, a toggle responsive to axial movement of said detent upon successive reception thereof by said discs, movement of said detent into a received position in said start disc being effective to move said toggle into dead-center position, a pair of contacts mounted on each side of said toggle and adapted to be operated thereby, both of said contact pairs being in the closed position when said toggle is on dead-center but being in the open position when said toggle is on either side of dead-center.

5. A timing mechanism comprising a time driven rotatable member, detent means, a spring for biasing said detent means, means supporting said detent means for arcuate rotation with said time driven member, a first rotatably positioned member coaxial with said detent supporting member for receiving said detent means upon said detent means moving into a position of registry therewith, a second rotatably positioned member coaxial with said detent supporting member for receiving said detent means upon said detent means moving into a successive position of registry therewith, a switch operated by the movement of said detent means resulting from the reception thereof by said detent receiving means, and means for causing rotation of each of said detent receiving means in unison with said detent after reception of said detent.

6. A timing mechanism comprising first and second time setting dials, a time driven rotatable member, an axially biased detent mounted for bodily rotation by said rotatable member and spaced from the axis thereof, first and second detent receiving members mounted coaxially with said rotatable member and arranged for the successive reception of said detent upon said detent coming into successive registry therewith, and means for coupling said dials to said detent receiving members for movement of said dials in unison therewith upon respective engagement by said detent.

7. A timing mechanism comprising a time driven rotatable member, an axially biased detent eccentrically mounted for bodily rotation by said rotatable member, first and second timer discs mounted coaxially with said rotatable member in the path of movement of said detent, manually positioned time setting dials coaxially fixed to said timer discs respectively for movement therewith, said timer discs having apertures for successive rotative engagement by said detent as said detent moves into respective registry therewith, said discs being manually positionable by rotation of the associated time setting dials to provide a predetermined angular relationship between said apertures, rotative engagement between said detent and said first timer disc upon movement of said time driven member being effective gradually to bring said dials into a condition of alinement.

8. A timing mechanism comprising a time driv- rotatable member, an axially biased detent eccentrically mounted with respect to said member for bodily rotation therewith, a timer disc mounted coaxially with said rotatable member in the path of movement of said detent and having an aperture for the insertion of said detent upon

said detent moving into registry therewith, said detent being in resilient frictional contact with said disc prior to insertion, a flange mounted for axial and rotative movement with the said disc, a stationary axial abutment arranged to frictionally engage said flange and to prevent axial movement thereof under the urging of said detent, the release of axial detent pressure upon the insertion of said detent into said aperture causing the removal of pressure from said abutment and enabling substantially frictionless subsequent rotation of said disc.

9. A timing mechanism comprising a time driven rotatable member, an axially biased detent eccentrically mounted with respect to said member for bodily rotation therewith, a timer disc mounted coaxially with said rotatable member in the path of movement of said detent and having an aperture for the rotative engagement of said detent as said detent moves into registry therewith, a time setting dial coaxially fixed to said timer disc for movement in unison therewith, an axial abutment mounted at the periphery of said time setting dial to limit axial movement thereof caused by the force of said detent on said disc, said abutment being located at a sufficient radius from said axis so that the torque resisting rotation of said dial and caused by frictional contact with said abutment exceeds the torque of the frictional drag of said detent on said disc.

10. A timing mechanism comprising a time driven rotatable member, an axially biased detent eccentrically mounted for bodily rotation with said member, first and second detent receiving members mounted coaxially with said rotatable member in the path of movement of said detent and having apertures respectively for the successive engagement of said detent as said detent moves into registry therewith, a switch, a toggle for operating said switch, a follow-up member coupled to said detent for axial movement therewith and coupled to said toggle for operating said toggle from a first position in which the toggle arms are at an angle with each other, to a second position in which the toggle arms are approximately in a straight line and then to a third position in which the toggle arms are again at an angle, means for rotatively adjusting said detent receiving members, and means associated with said adjusting means for moving said detent out of engagement with said detent receiving members and also moving said follow-up member and toggle to said first position prior to rotative adjustment of said members.

11. A timing mechanism comprising a time driven rotatable member, an axially biased detent eccentrically mounted for bodily rotation with said member, first and second detent receiving members mounted coaxially with said rotatable member in the path of movement of said detent and having apertures respectively for the successive engagement of said detent as said detent moves into registry therewith, a switch, a toggle for operating said switch, a follow-up member coupled to said detent for axial movement therewith and coupled to said toggle for operating said toggle from a first position in which the toggle arms are at an angle with each other, to a second position in which the toggle arms are approximately in a straight line and then by further axial movement in the same direction to a third position in which the toggle arms are again at an angle, adjusting knobs for rotative adjustment of said detent receiving members, and means associated with said adjusting knobs responsive to axial movement thereof for moving said detent out of engagement with said detent receiving members and also moving said toggle to said first position prior to rotative movement of said member.

12. A timing mechanism comprising a time driven rotatable member, an axially biased detent eccentrically mounted for bodily rotation with said member, first and second detent receiving members mounted coaxially with said rotatable member in the path of movement of said detent and having apertures respectively for the successive engagement of said detent as said detent moves into registry therewith, said detent receiving members being adapted to be driven by said detent upon engagement therewith, a member pivoted at one end and connected to said detent at a point between the ends of said member, a toggle having its arms pivoted on the other end of said member, and two pairs of contacts biased to open and adapted to be closed, one pair by each arm of said toggle when said toggle is in a substantially dead-center position.

13. A timing mechanism comprising a time driven rotatable member, an axially biased detent eccentrically mounted for bodily rotation with said member, first and second detent receiving members mounted coaxially with said rotatable member in the path of movement of said detent and having apertures respectively for the successive engagement of said detent as said detent moves into registry therewith, a member pivoted at one end and connected to said detent at a point between the ends of said member, a toggle having its arms pivoted on the other end of said member, two pairs of contacts biased to open and adapted to be closed, one pair by each arm of said toggle when said toggle is in a substantially dead-center position, a first rotatable shaft for setting said first detent receiving member, a second rotatable shaft for setting said second detent receiving member and means connecting said rotatable shafts to said toggle so that said toggle may be placed in its open position by the axial movement of either rotatable shaft.

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