

July 18, 1961

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2,993,099

RANGE TIMER

Filed March 3, 1958

3 Sheets-Sheet 1

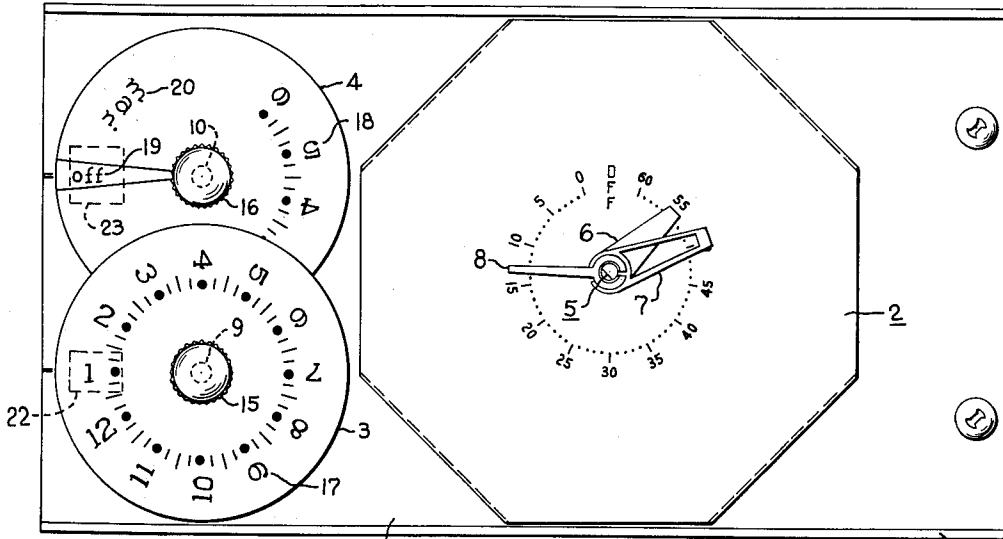


Fig. 1

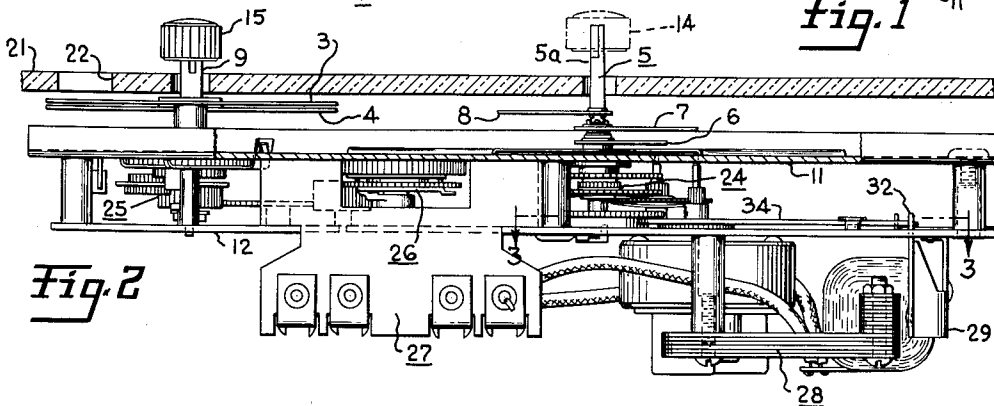


Fig. 2

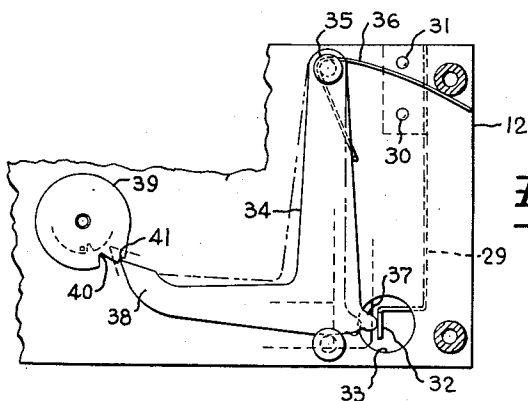


Fig. 3

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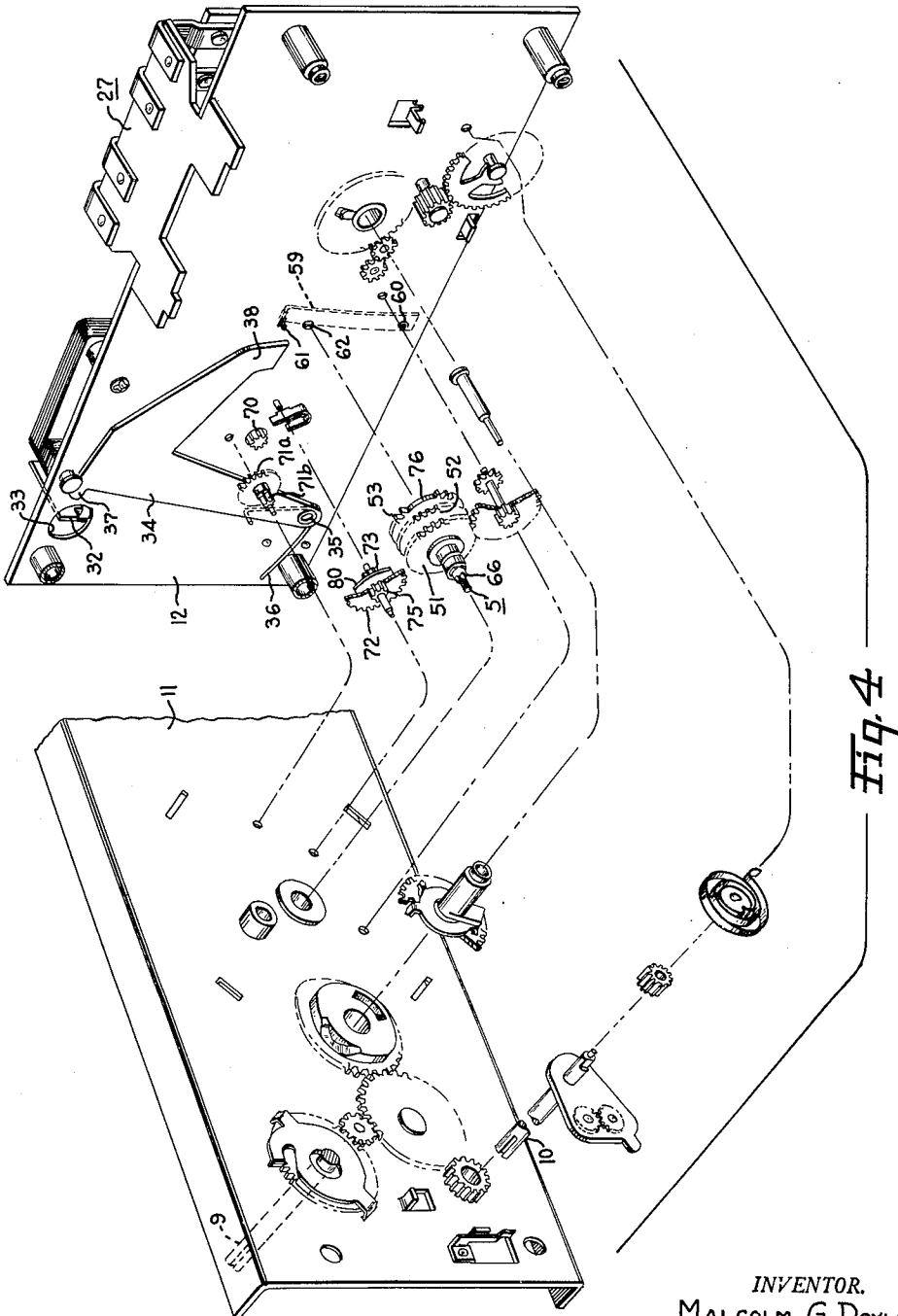
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3 Sheets-Sheet 2



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3 Sheets-Sheet 3

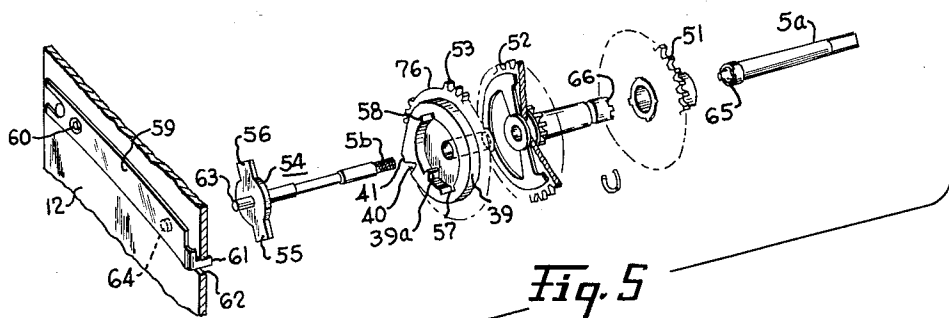


*Fig. 5*

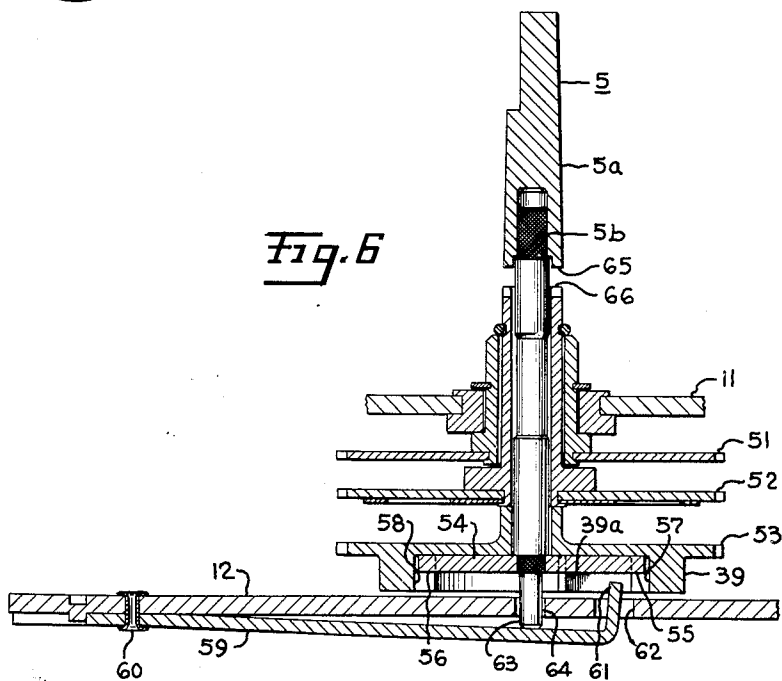


*Fig. 6*

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## RANGE TIMER

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Filed Mar. 3, 1958, Ser. No. 718,603  
12 Claims. (Cl. 200—38)

My invention relates to time switches of the range timer type and more particularly to that type of range timer having an interval timer and alarm therefor.

A timer such as that disclosed in application Serial No. 686,901, now Patent No. 2,921,150, by G. H. Wotring entitled "Range Timer" and assigned to the assignee of the present invention, discloses a range timer which is fool proof, reliable, and inexpensive and which has independent means for setting the stop time and cooking period with a fixed reference point for the stop time indication. This timer also has a self cocking switch actuating mechanism and a self erasing cooking period indication.

However, the aforementioned application does not disclose an interval timer of the type generally found to be desirable in range timing applications. That is, such an interval timer should provide for an indication of the elapse of a time period of one hour or less and an audible alarm indication should be given upon completion of the time interval period. Interval timers of this class are well known in the art but their combination and utilization with a range timer having the many desirable features disclosed in the aforementioned Wotring application present many difficult problems. The additional interval timing mechanism would normally require an increase in the over all dimensions of the existing range timer with an attendant increase in cost. Further, such a combination would be expected to increase the operational confusion of the housewife so as to reduce the opportunity for commercial success. In addition, the drive mechanism for the interval timer must not only produce positive control for the interval timer but must also be constructed to provide easy setting and minimum disturbance to the existing range timer mechanism.

It is therefore an object of this invention to provide an interval timer for use with a range timer whereby a minimum number of additional operating elements are provided and there is a minimum disturbance of the existing mechanism.

It is a further object of this invention to provide a range timer having an interval timing mechanism whose dimensions are only slightly greater than that of the range timer without the interval timer.

It is an additional object of this invention to provide an interval timer mechanism which can be arranged coaxially with the existing clock mechanism and which has a positive off position not subject to over travel.

It is another object of the present invention to provide an improved and efficiently operative range timer which utilizes a single shaft to set and control a clock mechanism and an interval timing mechanism, which shaft is also arranged to shut off an alarm mechanism actuated by the interval timing mechanism.

It is a still further object of this invention to provide an interval timing mechanism having an off position beyond which the interval timer cannot be inadvertently rotated.

It is a still further object of this invention to provide an interval timer which can be arranged coaxially with the central shaft of the clock mechanism so that the normal rotation of the central shaft will enable the interval timer to be set, rotation of the shaft in an axially depressed position will enable the clock time to be set, and a positive stop, operative in the normal position of the shaft and disengaged in the depressed position of the shaft, beyond which the interval timer cannot be inadvertently rotated.

In accord with one aspect of this invention and in fur-

therance of the stated objects, a range timer is provided having a single drive motor, a switch, a timer for the switch, a clock time mechanism and an interval time mechanism, this interval timer being driven from the drive motor through a maximum of less than one revolution by such mechanism and being disconnected from the drive motor upon completion of this partial revolution and having means for selectively limiting rotation of the shaft. Further, the interval timer mechanism is arranged coaxially with the clock time mechanism so that a common shaft can be used for setting both the interval and the clock time functions.

The novel features believed characteristic of the invention are set forth in the appended claims. The invention itself, however, together with further objects and advantages thereof may be easily understood by referring to the following description taken in connection with the accompanying drawings in which,

FIGURE 1 is a front view of the range timer embodying this invention;

FIGURE 2 is a bottom view of the range timer;

FIGURE 3 is a sectional view along line 3—3 of FIGURE 2 showing the interval timer cam and follower arrangement;

FIGURE 4 is an exploded perspective view of the mechanism between the front and back plates of the timer of FIGURE 1;

FIGURE 5 is a perspective view of the main elements of the minute timer and stop mechanism; and

FIGURE 6 is a cross sectional view of the central shaft of the range timer.

Referring to FIGURES 1 and 2, the range timer 1 is illustrated as having a clock 2 and a pair of rotatable time indicators 3 and 4 placed one above the other at one side of the clock 2. Clock 2 contains a central setting shaft 5 upon which is mounted interval timer hand 8, and about which rotate hour hand 6 and minute hand 7. Rotatable time indicators 3 and 4 are circular disks fixedly mounted on setting shafts 9 and 10 respectively. Clock shaft 5 and setting shafts 9 and 10 are all rotatably journaled in front and rear supporting plates 11 and 12 respectively with their front end portions extending through the front plate 11 and terminating in manually operable setting knobs 14, 15 and 16, respectively. The circular face of the time indicator 3 is divided into 12 hourly designations 17 and is used to set the finish or stop time of the desired cooking period and is referred to as the "stop time indicator." The rotatable time indicator 4 has a semi-circular portion of its face divided into 6 hourly designations 18 and contains on the other semicircular portion, "off" and "manual" designations 19 and 20 which indicate to the housewife the corresponding conditions of oven energization. Rotatable time indicator 4 is referred to as the "cooking period indicator." The front glass 21, shown in FIGURE 2, contains the clock face and covers the stop time and cooking period indicators 3 and 4 except for a pair of windows 22 and 23 which expose only a small rectangular portion of these indicators.

Clock mechanism 24, manual setting means 25, and switch cocking and actuating mechanism 26 are all carried by the front and rear supporting plates 11 and 12 with the clock mechanism 24 generally located in the region of the clock shaft 5, the manual setting means 25 generally located in the vicinity of the setting shafts 9 and 10, and the switch cocking and actuating mechanism 26 located intermediate the clock mechanism 24 and the manual setting means 25. An oven controlling switch 27 is mounted on rear plate 12 directly behind the switch cocking and actuating mechanism 26. The electric motor 28 is also mounted on the rear plate 12 behind the clock mechanism 24. Manually operable setting shafts 9 and 10 function through setting means 25

to cock and adjust the time of operation of switch 27 while motor 23 functions to drive the clock mechanism 24 and to energize the switch cocking and actuating mechanism 26. Shaft 10 also functions to permit direct manual actuation of oven switch 27 between closed and open positions and the motor 23 also functions to drive the cooking period indicator 4 as the cooking period progresses.

Further details relating to the construction and operation of the switch, the stop time indicator, the cooking period indicator, and associated drive mechanisms is more fully set forth and explained in the copending application Serial No. 686,901, now Patent No. 2,921,150, by G. H. Wotring entitled "Range Timer" and assigned to the assignee of the present invention.

Referring now to FIGURES 2, 3 and 4, interval alarm or buzzer arm 29 is positioned near the stator laminations of drive motor 28 and is rigidly fastened at one end to the rear supporting plate 12 by welding at 30 and 31. The buzzer arm 29 has a bent over end 32 extending through an aperture 33 in the rear supporting plate 12. The cam follower 34 is pivotally mounted to the rear supporting plate 12 by rivet 35 and is biased towards the dotted position shown in FIGURE 3 by spring 36. Cam follower 34 has projection 37 positioned to cooperate with the bent over portion 32 of the buzzer arm 29 that extends through aperture 33. Arm 38 of the cam follower 34 is shaped and positioned to cooperate with interval timer cam 39. As seen most clearly in FIGURES 3 and 5, the interval timer cam 39 is generally circular in shape and has a first notch 40 and a second notch 41 in its periphery. When the cam follower arm 38 is in the position shown in solid lines in FIGURE 3 so that it is in registry with notch 41, the projection 37 on the cam follower 34 is in engagement with the projection 32 of the buzzer arm 29 thereby holding the buzzer arm 29 away from the motor stator laminations. However, when the arm 38 engages the notch 40, the cam follower assumes the position shown in dotted lines in FIGURE 3 thereby withdrawing the projection 37 from contact with the buzzer arm so as to leave the buzzer arm free to move or vibrate under the influence of the electromagnetic field associated with the stator laminations of the timer drive motor 28.

Referring now to FIGURES 4 and 6, it is seen that the shaft 5, journaled between the plates 11 and 12, has hour gear 51, minute gear 52 and interval timer gear 53 journaled thereon. As clearly seen in FIGURES 5 and 6, hub 54 is rigidly affixed near one end of shaft 5 and has projections 55 and 56 which engage the internal slots 57 and 58 on the interval timer gear 53. In the preferred embodiment, the interval timer gear 53 is integral with the previously described cam surface 39. The shaft 5 includes a setting stem 5a which fixedly engages the knurled section 5b thereby extending shaft 5 beyond the glass face 21 of the clock.

Spring 59 is fastened to the back plate 12 at point 60 and has a projection 61 extending through aperture 62 in back plate 12. Shaft 5 has a portion 63 which extends through aperture 64 in back plate 12 so as to engage spring 59 thereby biasing shaft 5 away from the back plate 12. Thus, teeth 65 on the setting stem 5a are normally biased out of engagement with teeth 66 on the hub of minute gear 52.

The interval gear 53 has a projection 39a on the internal surface of cam 39, this projection being engageable with projection 61 on the spring member 59. When these projections are engaged by rotation of gear 53, further rotation of the interval gear 53 is prevented. However, depression of the shaft 5 against the spring bias of the spring 59 will force the projection 61 out of engagement with the internal projection 39a, thereby allowing free rotation of the shaft 5 and gear 53. The axial movement of shaft 5 when depressed against the spring 59 not only will allow free rotation of gear 53, but will also

bring teeth 65 and 66 into engagement so that rotation of the setting stem 5a will turn the minute gear 52 and the hour gear 51 to permit setting of clock time.

Referring to FIGURE 4, it is seen that motor pinion 70 engages gear 71a so as to drive gear 71b (on the same shaft) which engages the gear 72 so as to drive the interval timer through the gears 73 and 53. The teeth 75 on the second pinion engage the teeth on the minute gear 52 which, through intermediate gears drives the hour gear 51. The numeral 80 (FIGURE 4) designates a spring biased friction clutch which allows pinion 73 to slip relative to gear 72 to permit manual rotation of gear 53.

As seen in FIGURES 4 and 5, the interval gear 53 has a portion of its periphery 76 from which the teeth have been removed. This construction gives rise to the term "mutilated gear." This mutilated portion enables the interval timer gear 53 to be disconnected from the drive motor at a selected portion of its rotative cycle. That is, the gear 53 is subject to rotation of an amount less than one complete revolution as determined by the number of teeth removed. As the gear 53 is driven by teeth 73 it will reach the mutilated portion 76 so as to disengage gear 53 from the motor drive gear train. At this point, the cam follower 34 and its arm 38 engage the notch 40 in the cam surface 39 of the interval timer gear 53. The cam follower 34 then moves under the bias force of the spring 35 so as to release the buzzer arm 29 from its constrained position enabling it to vibrate freely under the influence of the electromagnetic field from the stator laminations of motor 28. To turn the buzzer off, the knob on the shaft extension 5a is rotated until the projection 61 on spring 59 engages the projection 39a on the internal surface of the interval timer gear 53. The engagement of these two projections acts as a positive stop to prevent further rotation of the interval timer gear. This position of engagement of the projections 61 and 39a corresponds to the mating position of the arm 38 on the cam follower 34 and the depression 41. Thus, when the two projections engage, the buzzer arm 29 is held away from the stator laminations so as to prevent further vibration or buzzing. The timer is then in the off position as indicated on the face of the timer. The timer can be reset to perform an interval timing function by rotating the knob 14 attached to shaft 5a in a counterclockwise direction until the desired interval to be measured is indicated on the clock face or the shaft 5a can be depressed thereby disengaging the projection 61 and 39a to allow rotation of the interval timer gear in either direction.

Assuming that the timer is in the off position, setting of the interval timer is accomplished by rotating knob 14 in a counterclockwise direction until the indicating arm 8 is opposite the desired time interval to be measured as shown on the clock face. The rotation of gear 53 while the clock motor is running is permitted by the spring slip clutch 80. The interval timer gear 53 is then driven through the desired cycle by the drive motor 28 and the intermediate gears until the mutilated portion 76 is reached at which time rotation of gear 53 stops. At this same instant, the cam follower arm 38 engages the notch 40 thereby releasing the alarm arm 29 and allowing it to vibrate freely against the laminations of the drive motor. Further manual rotation of knob 14 in a clockwise direction rotates the interval timer to the point where the cam follower 38 engages the slot 41 so as to prevent further vibration of arm 29 and at the same time the projection 61 engages the projection 39a so as to prevent further manual rotation in the clockwise direction. It is thus seen that the positive off position and the alarm position of the interval timer occur at that point on the periphery of the interval timer gear 53 from which the teeth have been removed (76).

As previously described, clocktime is set by depressing the shaft 5 thereby bringing the teeth 65 into engagement with the teeth 66 and depressing the spring 59 so as to bring the projection 61 out of engagement with the

projection 39a thereby permitting free rotation of the minute gear 52 by rotation of knob 14. When the proper clock time has been set, the shaft is released and is returned to its normal position under the influence of spring 59.

It is thus seen that I have provided an interval timer which is arranged coaxially with the clock mechanism, which provides a minimum increase in dimensions of the timer, which is adapted to use the maximum number of elements of the existing range timer mechanism, and which provides a positive off position for the interval timer beyond which the interval cannot be rotated inadvertently so as to commence another interval timing cycle.

Although I have described only one embodiment of my invention, many modifications can be made and I intend, by the appended claims, to cover all such modifications as fall within the true scope and spirit of the invention.

What I claim as new and desire to secure by Letters Patent of the United States is:

1. In a range timer having a drive motor, a switch, a timer for the switch, and a clock time mechanism, an improved interval timer comprising a shaft mounted for rotational and axial movement in said clock time mechanism and having an indicator at one end thereof, a gear train for rotating said shaft by the drive motor through a maximum of less than one revolution, drive means operated by axial movement of said shaft for selectively engaging said shaft with the clock time mechanism so as to permit setting of the clock time, an alarm mechanism, means for energizing said alarm mechanism upon completion of the partial rotation of said shaft by the drive motor, means for turning off said alarm mechanism by rotation of said shaft, and means for preventing rotation of said shaft beyond a predetermined position.

2. In a range timer having a drive motor, a switch, a timer for the switch, and a clock time mechanism, an improved interval timer comprising a shaft, means for mounting said shaft for axial and rotative movement, a gear train including a gear having a portion of its teeth removed mounted on said shaft for establishing operative engagement between said shaft and the drive motor, drive means on said shaft operated by axial movement of said shaft for selectively engaging said shaft with the clock time mechanism so as to permit setting of the clock time, an alarm mechanism, a cam on said shaft having inner and outer surfaces, a cam follower engaging the outer cam surface and arranged to initiate energization of said alarm mechanism when the outer cam surface and follower reach one certain relative position and to turn off said alarm mechanism when the outer cam surface and follower are in another certain relative position, a spring fastened to said mounting means so as to bias said drive means out of engagement with the clock time mechanism, and a projection on said spring for engaging the inner cam surface so as to prevent rotation of said shaft beyond a predetermined position.

3. The range timing mechanism set forth in claim 2 wherein said projection on said spring is disengaged from the inner cam surface by the axial movement of said shaft thereby to permit unlimited rotation of said shaft.

4. A coaxial clock and interval time mechanism comprising a drive motor, a clock mechanism operatively connected to said drive motor and having a hollow central shaft, an interval time shaft mounted for axial and rotative movement within said central shaft, a clutch for establishing selective engagement between said interval timer shaft and said hollow central shaft, spring means biasing said clutch out of engagement with said central shaft, a gear train including a mutilated gear on said interval time shaft for establishing operative engagement between said interval time shaft and said drive motor, an alarm, a cam surface on said mutilated gear, a cam follower engaging said cam surface and arranged to initiate energization of said alarm when the cam and follower reach one predetermined relative position and to turn off

said alarm when the cam and follower are in another relative position, and means for preventing the rotation of said interval time shaft beyond a predetermined position.

5. A coaxial clock and interval time mechanism comprising a drive motor, a clock mechanism operatively connected to said drive motor and having a hollow central shaft, an interval time shaft mounted for axial and rotative movement within said central shaft, a clutch for establishing selective engagement between said interval timer shaft and said hollow central shaft, spring means biasing said clutch out of engagement with said central shaft, a gear train including a mutilated gear on said interval time shaft for establishing operative engagement between said interval time shaft and said drive motor, an alarm, inner and outer cam surfaces on said mutilated gear, a cam follower engaging said outer cam surface and arranged to initiate energization of said alarm when the cam and follower reach one predetermined relative position and turn off said alarm when the cam and follower are in another relative position, and a projection on said spring means for engaging the inner cam surface so as to prevent rotation of said interval timer shaft beyond a predetermined position.

6. The range timing mechanism set forth in claim 5 wherein said projection on said spring is disengaged from the inner cam surface by the axial movement of said shaft thereby to permit unlimited rotation of said shaft.

7. In a range timer having a drive motor, a switch, a timer for a switch and a clock time mechanism, an improved interval timer comprising a shaft mounted for rotational and axial movement in said clock time mechanism and having an indicator at one end thereof, a gear train for rotating said shaft by the drive motor through a maximum of less than one revolution, said gear train being disengaged from said shaft upon completion of said partial revolution, drive means operated by axial movement of said shaft for selectively engaging said shaft with the clock time mechanism so as to permit setting of the clock time, an alarm mechanism, means for energizing said alarm mechanism upon completion of the partial rotation of said shaft, manual means for rotating said interval timer shaft to turn off said alarm, and means for preventing rotation of said shaft beyond a predetermined position.

8. In a range timer comprising a switch, a cooking time mechanism for controlling said switch, said mechanism having dependent means for setting the stop time and cooking time and including self-cocking means for the switch, a clock motor for operating the range timer, a clock mechanism having a hollow central shaft, and an interval timer, said interval timer comprising a shaft mounted for axial and rotative movement within said hollow shaft and having an indicator at one end thereof, clutch means on said shaft engaged by axial movement of said shaft for selectively engaging the clock time shaft so as to permit the setting of the clock time, a gear train including a mutilated gear on said interval time shaft for establishing operating engagement with said clock motor, an alarm, a cam surface on said mutilated gear, a cam follower engaging said surface and arranged to initiate energization of said alarm when the cam and follower reach a predetermined position, manual means for rotating said interval time shaft to deenergize said alarm, and means for preventing the rotation of said shaft beyond a predetermined position.

9. The range timer set forth in claim 8 wherein the means for preventing the rotation of said shaft can be rendered inoperative by axial movement of said shaft.

10. In a timer having a switch, a clock mechanism for operating said switch, a rotational interval timer mechanism concentric with and actuated by said clock mechanism, a first indicating means for said clock mechanism, a second indicating means for said timer mechanism, a single shaft for adjusting said first and second indicating

means, a means for positively limiting rotation of said interval timer mechanism beyond one rotational position, and means controlled by said shaft for overriding said limiting means.

11. In a timer having a switch, a clock mechanism for operating said switch, a first indicating means for said clock mechanism, a rotational interval timer mechanism concentric with and actuated by said clock mechanism, a second indicating means for said timer mechanism, a signaling means actuated by said interval timer mechanism, a single setting means for setting said first and second indicating means and turning off said signaling means, a means for positively limiting rotation of said interval timer mechanism beyond one rotation position, and means controlled by said shaft for overriding said limiting means.

12. A range timer comprising a clock mechanism, an interval timer mechanism concentric with said clock mechanism and having a central control shaft coaxial with said clock mechanism, a first indicating means for said clock mechanism, a second indicating means for said interval timer mechanism, a signaling means positioned on one side of said clock mechanism and actuated by said interval timer mechanism, said control shaft adapted to set said first and second indicating means and turn off said signal-

ing means, means for positively limiting the rotation of said control shaft beyond one rotational position when said shaft is in its normal position, means controlled by said shaft for overriding said limiting means, a switch, a switch controlling means positioned on the other side of said clock mechanism, said switch controlling means being adjustable to control operation of said switch by said clock mechanism, said switch being positioned intermediate said clock mechanism and said switch controlling means.

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