Aug. 9, 1966 D. MORRISON ETAL 3,264,818

FRONT SET MECHANISM

Filed Jan. 27, 1964 2 Sheets-Sheet 1

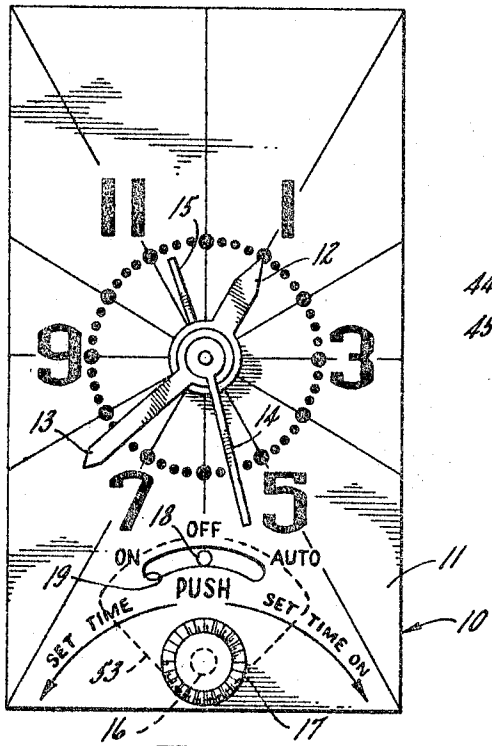


Fig. 1.

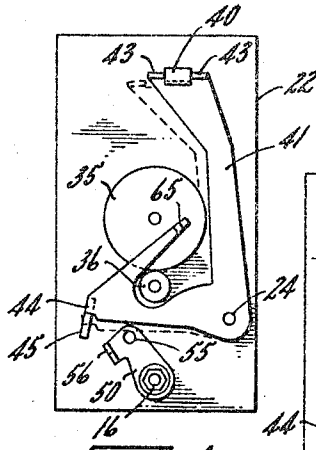


Fig. 4a.

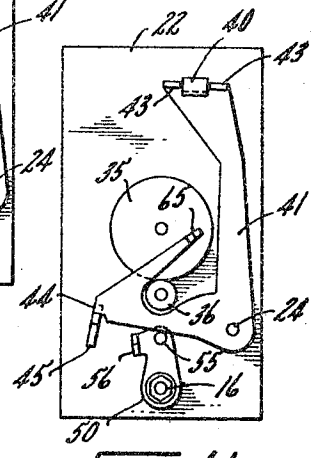


Fig. 4b.

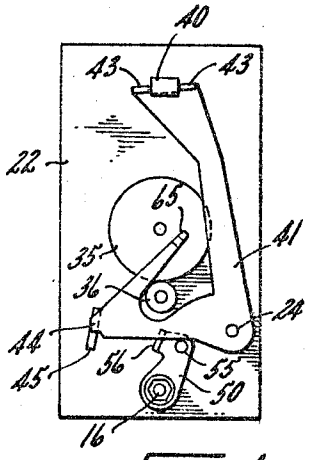


Fig. 4c.

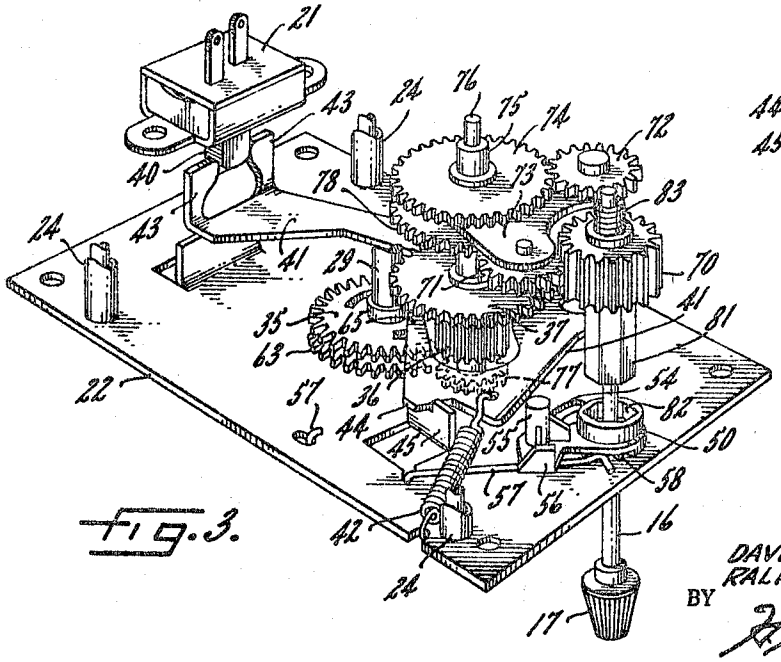


Fig. 3.

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FRONT SET MECHANISM

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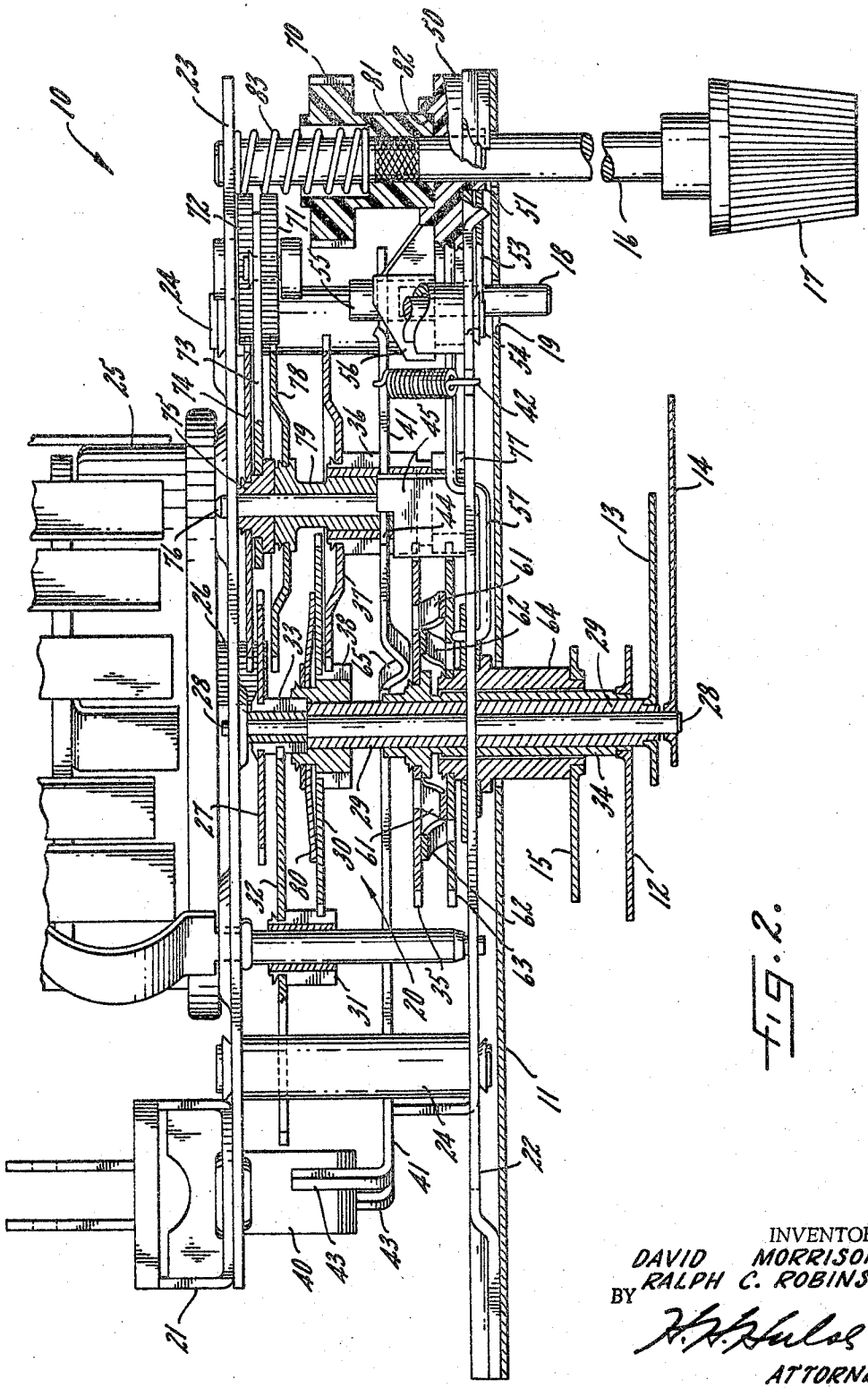


FIG. 2.

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FRONT SET MECHANISM

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This invention relates to switch controlling timers and more particularly concerns a mechanism for setting or conditioning such timers from the front or dial side.

Switch controlling timers are widely used in a variety of household and industrial mechanisms, perhaps the most common being the clock-radio. Such timers normally display "the time" on a conventional clock face, include a control for manually opening and closing the switch, and provide for automatically closing the switch at the time indicated by an "alarm" pointer which is settable over the clock face. Control of such a timer therefore requires the ability to set the clock hands, set the alarm pointer, turn the switch ON and OFF, and condition the switch for automatic AUTO operation at the time set by the alarm pointer. Heretofore, timers employed at least two manually operated shafts to provide the required control.

It is an object of the present invention to provide a set mechanism for a switch controlling timer in which a single, manually operated shaft performs all of the required setting functions, including setting both the clock hands and the alarm pointer, and conditioning the switch for ON, OFF and AUTO operation.

A collateral object is to provide a set mechanism as characterized above in which rotation of a shaft in one direction sets the clock hands of the timer and rotation in the opposite direction sets the alarm pointer, with no axial shifting of the shaft or other conditioning of the mechanism being required.

Another object is to provide a set mechanism of the above kind which is simple, reliable and well suited for economical, large quantity production.

A further object is to provide a set mechanism as described above which is quite compact so that it can be readily embodied in relatively small timers. Moreover, the set mechanism is well adapted for existing timer designs.

Other objects and advantages of the invention will become apparent upon reading the following detailed description and upon reference to the drawings, in which:

FIGURE 1 is a switch controlling timer embodying the present invention as seen from the front or dial side;

FIG. 2 is an enlarged fragmentary side elevation, partially in section, of the timer shown in FIG. 1;

FIG. 3 is a fragmentary perspective of portions of the mechanism shown in FIG. 2; and

FIGS. 4*a–c* are fragmentary, partially schematic views of three alternate positions of the mechanism shown in FIG. 3.

While the invention will be described in connection with a preferred embodiment, it will be understood that we do not intend to limit the invention to that embodiment. On the contrary, we intend to cover all alternatives, modifications and equivalents as may be included within the spirit and scope of the invention as defined by the appended claims.

Turning now to the drawings, and first to FIG. 1, there is shown a timer **10** embodying the invention and having a dial plate **11** carrying the usual clock face indicia and over which rotate hour, minute and second hands **12, 13** and **14** respectively. Underlying this stack of hands, and also movable over the clock face, is an alarm pointer **15**.

Projecting forwardly from the lower portion of the timer **10** is a control shaft **16** carrying a serrated knob **17** so as to permit fingertip operation of the control shaft. The set condition of the timer **10** is displayed by an indicator button **18** which rides in an arcuate slot **19** formed in the dial plate **11**. In FIG. 1, the button **18** is illustrated in the OFF position. To the left is the ON position and to the right is the AUTO or automatic position.

Behind the dial plate **11**, the timer **10** includes a timing train **20** and an electrical switch **21** mounted on frame plates **22** and **23** which are held in spaced relation by a plurality of frame posts **24**. The dial plate **11** is secured to the front frame plate **22**.

The timing train **20** is driven by a synchronous motor **25** whose output pinion **26** meshes with a second wheel **27** that is fixed to a shaft **28** carrying the second hand **14**. The minute hand **13** is secured to a sleeve **29** on the shaft **28** and carries a minute wheel **30** that is coupled, by a pinion **31** and a gear wheel **32**, to a pinion **33** that supports the second wheel **27** and is secured to the shaft **28**. The hour hand **12** is secured to a sleeve **34**, fitted over the sleeve **29**, which carries an hour wheel that is coupled, by a pinion **36** and a gear wheel **37**, to a pinion **38** that supports the minute wheel **30** and is secured to the sleeve **29**. The above described timing train operates in a conventional manner to rotate the hands **12, 13** and **14** at the proper rates from the synchronous motor **25**.

The switch **21** has an operating slide **40** that is controlled by a shiftable operator **41** which is mounted on one of the frame posts **24** for pivoting and rocking movement. The operator **41** is biased by a spring **42**, anchored to the frame plate **22**, so that the operator is urged toward the frame plate and counter-clockwise in the drawings. One end of the operator **41** is bifurcated to define a pair of fingers **43** which embrace the switch operating slide **40**. The force of the spring **42** urging the operator **41** counter-clockwise in the drawings thus tends to shift the switch slide **40** to the left in FIGS. 3 and 4 which, preferably, is the switch closed position. The force of the spring **42** urging the operator **41** toward the frame plate **22** tends to move a ledge **44** on the operator into engagement with a frame lug **45** carried on the plate **22**. With the ledge **44** resting against the lug **45** under the urging of the spring **42**, the fingers **43** on the operator **41** hold the switch slide **40** in the switch open or operated position.

To manually position the switch operator **41**, a positionable selector **50** is mounted for rotation in the front frame plate **22** about the control shaft **16**. The selector **50** includes a collar portion **51** that fits rotatably in an opening in the frame plate **22** (see FIG. 2) and, on the outer portion, fixedly carries a segment **53** that holds the selector **50** in place and which also supports the indicator button **18**. The button **18** passes through the segment **53** and an arcuate slot **54** in the frame plate **22** that is alined with the dial plate slot **19** so that the inner end of the button **18** is seated in the selector **50**, thus insuring that the selector **59** remains in position and that the button **18** rotates with the selector. The fan shape of the segment **53**, best seen in FIG. 1, permits the segment to serve as a neat background for the dial plate slot **19** in all angular positions of the selector **50** and the indicator button **18**.

The selector **50** includes both an abutment **55** and a cam **56**. In the AUTO position of the selector **50**, shown in FIG. 4*a*, both the abutment **55** and the cam **56** clear the operator **41**. In the OFF position, shown in FIG. 4*b*, the abutment **55** engages the operator **41** and swings it clockwise into its switch operating position wherein the switch slide **40** is slid to the right and the switch is held open. In the ON position, shown in FIG. 4*c*, the abutment **55** releases the operator **41** for counter-clockwise swinging movement and the cam **56** tilts the operator outwardly from the frame plate **22** so that the ledge **44** is

lifted over the lug 45, whereupon the spring 42 pulls the operator 41 counter-clockwise to its switch operating position.

Establishing click stops for the selector 50 is a spring detent element 57 which fits into alternate ones of a series of notches 58 formed about the pivot axis of the selector 50. Three notches 58 are provided which correspond to the AUTO, ON and OFF positions of the selector.

For automatically operating the switch 21, the hour wheel 35 is formed with cam abutments 61 which cooperate with abutments 62 formed on a positionable alarm gear 63. The alarm gear 63 is mounted on a sleeve 64 that surrounds the sleeve 34 and projects forwardly to support the alarm pointer 15. At the present time, the abutments 61, 62 come together so as to cam the hour wheel 35 from the alarm gear 63, the sleeve 34 sliding within the sleeve 64, with the result that the hour wheel 35 engages a finger 65 on the operator 41 so as to lift the operator from the lug 45. Thus, with the selector 50 in the AUTO, FIG. 4*a*, position, axial shifting movement of the hour wheel 35 at the preset alarm time causes the operator 41 to be moved away from the frame plate 22 until the ledge 44 clears the lug 45, whereupon the spring 42 shifts the operator 41 to the dashed line position shown in FIG. 4*a* to thereby discontinue operation of, and close, the switch 21.

In accordance with the invention, the control shaft 16 is part of a set mechanism permitting manual control of all functions of the timer 10. The shaft is mounted in the frame plate 22, 23 for both axial and rotatable movement. In one axial position, "in" as seen in FIG. 1 and "up" as seen in FIGS. 2 and 3, rotation of the shaft 16 in one direction sets the clock hands 12, 13 and rotation in the other direction sets the alarm pointer 15. In a second axial position of the control shaft 16, "out" as seen in FIG. 1 and "down" in FIGS. 2 and 3, rotation of the shaft sets the selector 50 into a desired one of its three positions, ON, OFF or AUTO.

To set the clock hands and the alarm pointer, the control shaft 16 carries a drive gear 70, and a pair of spaced gears 71 and 72 are respectively coupled to the timing train 20 and the alarm gear 63. The gears 71, 72 are mounted on a common plate 73 in slightly spaced planes with the gear 72 meshing with a gear wheel 74 mounted on a hub 75 that is secured to a shaft 76. The shaft 76 is journalled in the frame plates 22, 23 and passes through and defines the axis of the pinion 36 and the gear wheel 37. The shaft 76 also has locked to it a pinion 77 which meshes with the alarm gear 63.

The gear 71 meshes with a gear wheel 78 secured to a sleeve 79 rotatably carried on the shaft 76 and which non-rotatably carries the pinion 36 and its associated gear wheel 37. Within the timing train 20, the minute wheel 30 is coupled to the pinion 38 on which it is mounted by a friction device 80 so that rotation of the pinion 36 through the gear 71 and the gear wheel 78 can set the clock hands 12, 13 without exerting a driving torque back through the timing train to the motor 25.

The plate 73 is freely pivoted on the hub 75 so that the gears 71, 72 can swing back and forth toward the axis of the drive gear 70 while remaining in engagement with their respective gear wheels 78 and 74. The radial spacing of the gears 71, 72 is such that the tooth tips of both gears can engage the drive gear 70 if the plate 73 is centered but, if either gear is fully meshed with the drive gear, then the other gear completely clears the drive gear. As a result, assuming the drive gear 70 is in the planes of the gears 71, 72 (see FIG. 3), rotation of the drive gear 70 in a clockwise direction will tend to push the gear 72 away and wedge the gear 71 into full meshing engagement between the drive gear 70 and the gear wheel 78. Continued rotation of the drive gear in this clockwise direction is thus effective to set the timing train 20. Rotation of the drive gear 70 in the opposite direction, that is, counter-clockwise as seen in FIG. 3, tends to push the gear 71 away from the drive gear and wedge the gear 72 into full meshing engagement between the drive gear 70 and the gear wheel 74. Continued rotation of the drive gear in this direction is thus effective to set the alarm pointer 15. The legends on the face of the dial plate 11, see FIG. 1, indicate the proper directions of rotation for the control shaft 16 to accomplish the desired objectives.

To set the switch operator selector 50, the control shaft 16 carries a clutching element 81, preferably formed integrally with the drive gear 70, and the clutching element 81 and the selector 50 have interengageable portions preventing relative rotation when the control shaft 16 is "out" as seen in FIG. 1, the position shown in FIG. 2, and which separate when the control shaft is pushed "in," the condition shown in FIG. 3. In the illustrated mechanism, the interengaging portions of the selector 50 and the clutching element 81 take the form of a hexagonal socket 82 formed in the selector 50 and a matching hexagonal periphery on the clutching element 81. When interfitted, the hexagonal shape of these parts prevents relative rotation. Furthermore, the hexagonal shape insures that a maximum turning angle of 15 degrees is all that is required to interlock the clutching element 15 and the selector 50.

Preferably, a compressed helical spring 83 is interposed between the drive gear-clutching element 70, 81 and the rear frame plate 23 so as to urge the control shaft 16 outwardly of the dial plate 11, or downwardly as seen in FIGS. 2 and 3. This establishes the parts in a normal position wherein the control shaft is conditioned to position the selector 50. When setting of the timing train or the alarm pointer is desired, the control shaft 16 is pushed inwardly against the force of the spring 83 so as to bring the drive gear 70 into alinement with the gears 71, 72. It is also desirable to form the selector 50 and the drive gear-clutching element 70–81 of a tough plastic such as nylon so as to achieve a smooth, quiet, self-lubricating action.

In summary, it can be seen that the single control shaft 16 gives complete control of the timer 10. This set mechanism, as those familiar with the art will appreciate, is quite simple in design and, hence, is well suited for large scale manufacture. It can also be seen that the set mechanism is reliable, compact and easily adapted for mounting in standard timer structures.

We claim as our invention:

1. A switch controlling timer comprising, in combination, a settable timing train, a shiftable switch operating member having ON, OFF and AUTO positions, a settable alarm mechanism cooperable with said timing train and said member, and a manually operable control shaft for selectively setting said timing train, setting said alarm mechanism and shifting said member between ON, OFF and AUTO position.

2. A switch controlling timer comprising, in combination, a settable timing train, a shiftable switch operating member having ON, OFF and AUTO positions, a settable alarm mechanism cooperable with said timing train and said member, and a rotatable manually operable control shaft having two axial positions for selectively setting, when in one axial position, said timing train upon rotation in one direction and setting said alarm mechanism upon rotation in the other direction, and shifting said member between ON, OFF and AUTO positions upon rotation when shifted to the other axial position.

3. A switch controlling timer comprising, in combination, a settable timing train, a shiftable switch operating member having ON, OFF and AUTO positions, a settable alarm mechansm cooperable with said timing train and said member, a manually operable control shaft having one axial position for selectively setting said timing train and setting said alarm mechanism and a second axial position for shifting said member between ON, OFF and AUTO positions, a drive gear fixed on said control shaft,

a pair of spaced gears one coupled to said timing train and the other coupled to said alarm mechanism, a mounting member supporting said gears for alternate engagement by said drive gear when said control shaft is in said one axial position, a rotatable selector having alternate angular positions for shifting said switch operating member between said ON, OFF and AUTO positions, and a clutching element fixed on said control shaft, said selector and said clutching element having interengageable portions preventing relative rotation when said shaft is in said second axial position and which separates when the shaft is shifted to said one axial position.

4. In a timer having a timing train, a switch with a shiftable operating member, and a settable alarm mechanism cooperable with the timing train and switch operating member, the improvement comprising, a manually operable control shaft mounted for axial and rotational movement, first means including said shaft when in one axial position for alternatively setting said timing train and said alarm mechanism upon rotation of said shaft in opposite directions, and second means including said shaft when in a second axial position for shifting said operating member.

5. In a timer having a timing train with settable clock hands, a switch with a shiftable operating member having ON, OFF and AUTO positions and a settable alarm mechanism cooperable with the timing train and switch operating member, the improvement comprising, a manually operable control shaft mounted for axial and rotational movement, first means including said shaft when in one axial position for alternatively setting said clock hands and said alarm mechanism upon rotation of said shaft in opposite directions, and second means including said shaft when in a second axial position for shifting said member between ON, OFF and AUTO positions.

6. The combination of claim 5 in which said first means comprises, a drive gear fixed on said control shaft, a pair of spaced gears one coupled to said timing train and the other coupled to said alarm mechanism, and a mounting member supporting said gears for alternate engagement by said drive gear when said control shaft is in said one axial position.

7. The combination of claim 5 in which said second means comprises, a rotatable selector having alternate angular positions for shifting said switch operating member between said ON, OFF and AUTO positions, and a clutching element fixed on said control shaft, said selector and said clutching element having interengageable portions preventing relative rotation when said shaft is in said second axial position and which separates when the shaft is shifted to said one axial position.

8. In a timer having a timing train with settable clock hands and a settable alarm mechanism cooperable with the timing train, the improvement comprising, a manually operable control shaft mounted for rotational movement, and means including said shaft when in one axial position for alternatively setting said clock hands and said alarm mechanism upon rotation of said shaft in opposite directions.

9. The combination of claim 8 in which said means comprises, a drive gear fixed on said control shaft, a pair of spaced gears one coupled to said timing train and the other coupled to said alarm mechanism and a mounting member supporting said gears for alternate engagement by said drive gear upon rotation in said opposite directions.

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