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3,200,577

SINGLE CONTROL FOR FULL FEATURE TIMER

Filed Nov. 7, 1961

2 Sheets-Sheet 1

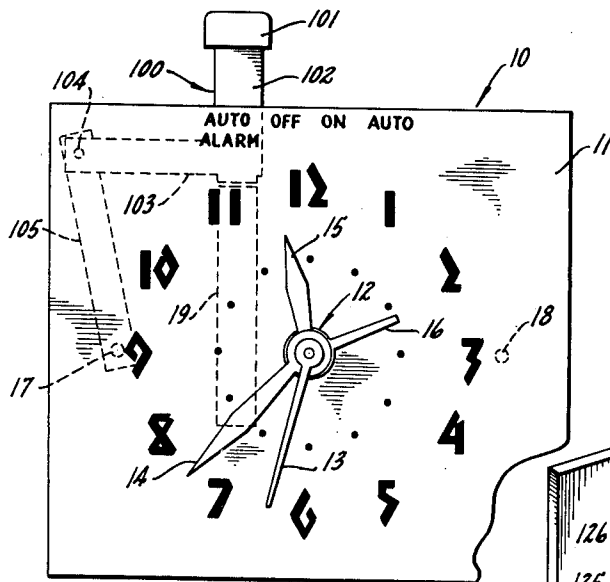


Fig. 1.

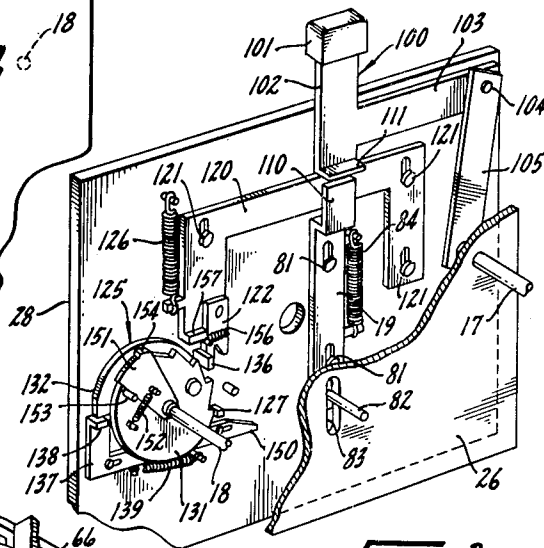


Fig. 3.

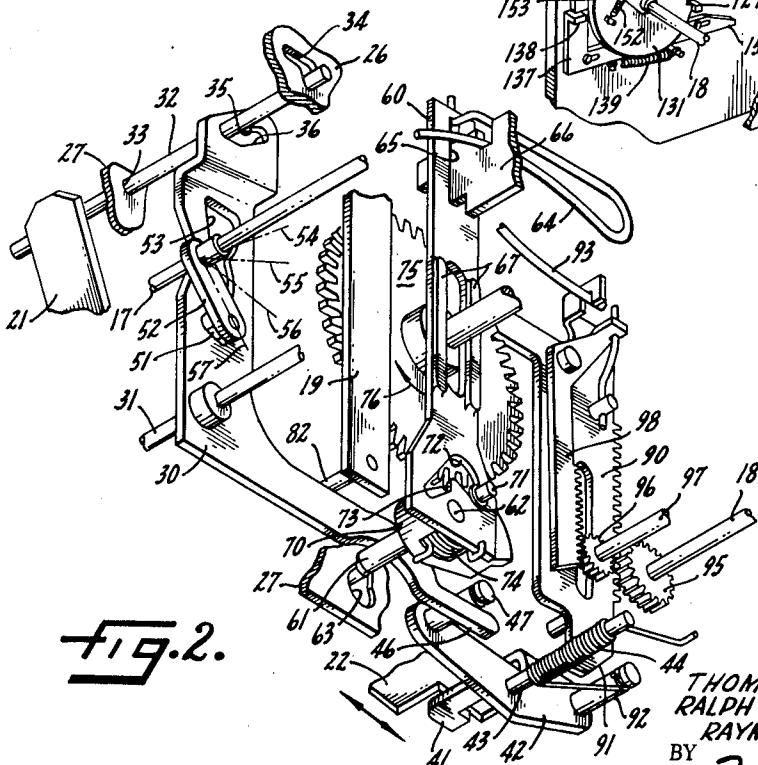


Fig. 2.

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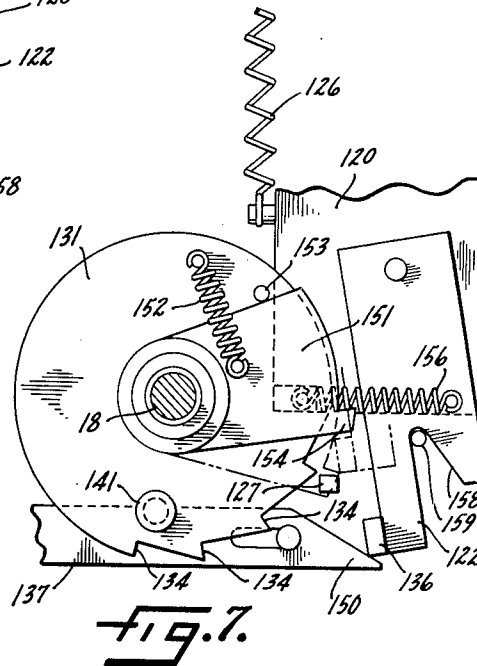
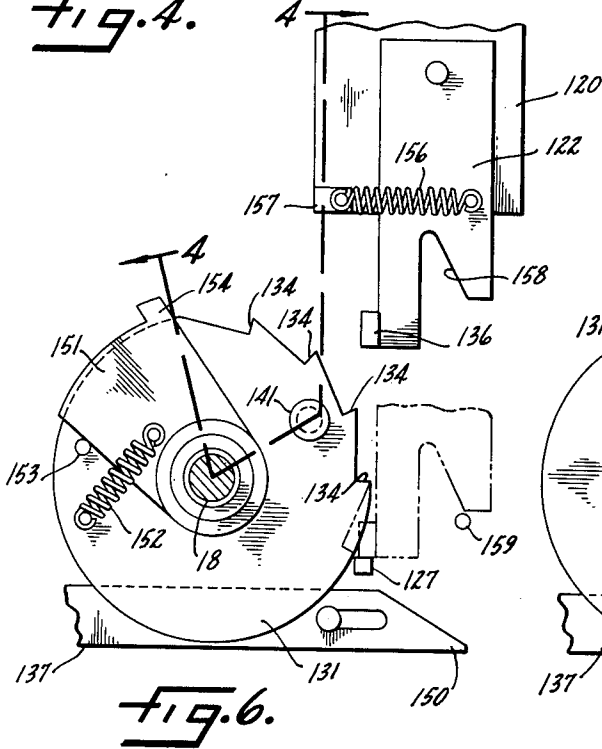
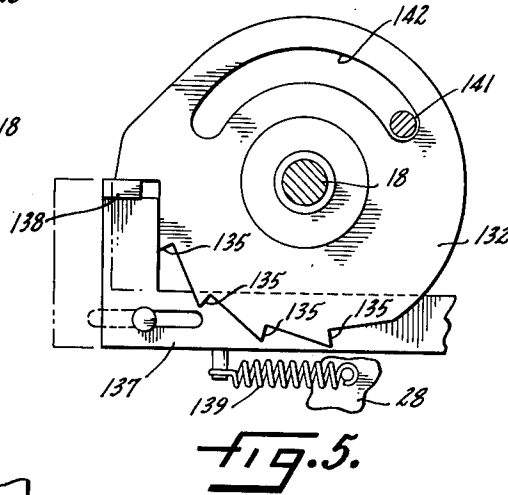
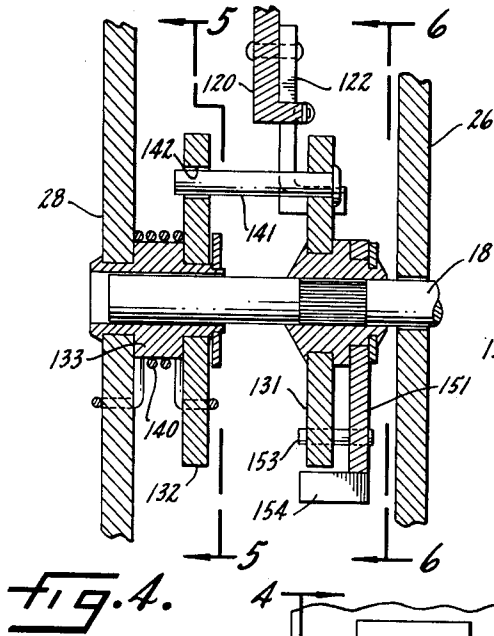
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2 Sheets-Sheet 2



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SINGLE CONTROL FOR FULL FEATURE TIMER
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7 Claims. (Cl. 58—21.155)

This invention relates to clock timers and concerns more particularly a control arrangement for a full feature timer.

A full feature timer is a switch controlling clock which includes a settable alarm, a function control having a switch ON, switch OFF, AUTO and AUTO-ALARM positions, a "sleep" mechanism affording delayed operation of the switch, and a "drowse" mechanism which permits temporary interruption of the alarm signal for a short drowse period. Such timers are most commonly utilized in clock radios wherein the timer switch operates the radio. It will be appreciated however that such timers are suited for many uses and can be employed to control virtually any electrically operated device.

A particular full feature timer is fully illustrated and described in copending application Serial No. 105,947, filed April 27, 1961, now Patent No. 3,109,280, issued November 5, 1963, which is assigned to the assignee of the present invention. The control illustrated and claimed herein has been described for convenience as arranged to control a timer of the type shown in the aforementioned application.

It is the primary aim of the present invention to provide a one-operator control arrangement for a full feature timer. That is, to provide a single control for selecting the timer function desired, controlling the "sleep" mechanism, and operating the "drowse" mechanism.

Another object of the invention is to provide a linear, or push button, operating mechanism for a positionable shaft which permits selective setting of the shaft to predetermined positions as well as return of the shaft to its starting position at any time.

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 shows the dial face of a timer embodying a control constructed in accordance with the present invention;

FIG. 2 is a fragmentary perspective, taken from the lower front, of a portion of the mechanism embodied in the timer shown in FIG. 1;

FIG. 3 is a fragmentary perspective, taken from the upper rear, of the control of FIG. 1 which is arranged to operate the mechanism of FIG. 2;

FIG. 4 is an enlarged fragmentary section of a portion of the control shown in FIG. 3 and, to better illustrate the parts, this section is taken approximately along the broken line 4—4 of FIG. 6;

FIG. 5 is a fragmentary section taken approximately along the lines 5—5 of FIG. 4; and

FIGS. 6 and 7 are fragmentary sections taken approximately along the line 6—6 in FIG. 4 and showing the parts in alternate positions.

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 first to FIG. 1, there is shown a timer 10 constructed in accordance with the invention and includ-

ing a dial face 11 bearing the usual 12-hour clock face indicia. A shaft and sleeve stack 12 supports the conventional set of hands including a second hand 13, a minute hand 14, an hour hand 15 and an alarm indicating hand 16. The stack 12 is driven by a synchronous motor (not shown) through a conventional timing train so that the hands sweep across the dial face 11 in the usual manner.

The timer 10 is a full feature timer and includes a function shaft 17, a sleep shaft 18 and a push button slide 19, which control the operation of an audible alarm and an electrical switch. In FIG. 2, a portion of the alarm vibrator 21 and a portion of the switch operator 22 are shown. In a typical application, the timer 10 could be embodied in a "clock-radio," with the electrical switch being used to turn the radio on and off. As is conventional in such applications, rotation of the sleep shaft 18 from a neutral position operates the timer switch so as to turn on a radio for a period determined by the time required to drive the shaft 18 back to its neutral position. When the neutral position is reached, the radio goes off "automatically." The duration of the "sleep" period is thus determined by the angle through which the sleep shaft is manually set.

As is also well known, rotation of the function shaft 17 selects the mode of operation desired of the timer 10. In the OFF position, the timer switch and alarm remain inoperative. In the ON position, the electrical switch is closed so that the associated radio or other device is turned on. In the AUTO position, the timer switch is closed at the time indicated by the alarm indicating hand 16. In the AUTO-ALARM position, the timer switch is not only closed at the time indicated by the alarm indicating hand 16 but, in addition, the audible alarm is sounded following a delay period of perhaps 10 minutes from the closing of the timer switch.

Again with reference to the typical clock radio application of the timer 10, the AUTO position enables the user of the timer 10 to have the radio come on at a selected hour in the morning, or, by setting the shaft 17 in the AUTO-ALARM position, have the radio come on to be followed some ten minutes later by the sounding of the vibrator alarm.

To round out the "full features" embodied in the timer 10, the push button slide 19 controls a "drowse" function. That is, upon manual shifting of the slide 19 while the audible alarm is sounding, the alarm is turned off for a short period of time following which the alarm again sounds.

While the above described structures and modes of operation have become conventional in the art, it will be appreciated that mechanisms for accomplishing these results, either proposed or actually adopted, differ in detail. The present invention concerns manipulation of the standard timer controls, i.e., the function shaft 17, the sleep shaft 18 and the drowse push button slide 19, and how these controls accomplish their task is beyond the scope of this application. However, so as to complete the present disclosure, the timer 10 has been shown embodying the full feature mechanisms illustrated and described in applicant's above-referred to copending application Serial No. 105,947, filed April 27, 1961, now Patent No. 3,109,280, issued November 5, 1963, and assigned to the assignee of the present invention. Therefore, reference may be had to the aforesaid disclosure to amplify the following brief discussion of the timer operating mechanisms.

The timer 10 includes front and rear frame plates 26 and 27, respectively (see FIG. 2), and, in addition, a control plate 28 is mounted in closely spaced relation to the front frame plate 26 (see FIGS. 3 and 4). The con-

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trol plate 28 carries the dial face 11 and the operating mechanism to which later reference will be made.

A function lever 30 is mounted on a shaft 31 that is journaled in the front and rear frame plates 26, 27. The function lever controls the audible alarm through a controller rod 32 which is pivoted at 33 in the rear frame plate 27 and has its forward end received in an L-shaped latch slot 34 formed in the front frame plate 26. The center portion of the control rod 32 passes through a cam slot 35 in the function lever 30 and the rear end of the rod is adapted to engage, and thus silence, the alarm vibrator 21.

In the position of the parts illustrated in FIG. 2, the alarm is silenced with the control rod 32 being latched in the slot 34 with its rear end firmly engaging the alarm vibrator 21. Upon counterclockwise movement of the function lever 30, a camming surface 36 forming a portion of the cam slot 35 engages the control rod so as to free the end of the rod in the latch slot 34 and thus allow the rod to swing away from the vibrator 21. As soon as the vibrator is released it begins sounding an audible alarm. Upon return clockwise movement of the function lever 30 the controller rod 32 is pivoted about the point 33 back into latched position in the latch slot 34 so that the rear end of the rod again engages the vibrator 21 to silence the alarm.

Turning to the timer electrical switch, the switch operator 22 is normally biased by an arm 41 on a switch control lever 42 that is mounted on a shaft 43 and urged in a counterclockwise direction by a torsion spring 44.

The timer switch controlled by the operator 22 is normally closed but the biased control lever 42, through the arm 41, holds the operator 22 and thus the associated switch in its operated, switch-open condition.

To enable the function lever 30 to control the switch, a one-way connection between the function lever and the switch control lever 42 is established by a finger portion 46 of the function lever 30 and a pin 47 secured to the switch control lever 42. Counterclockwise movement of the function lever 30, as seen in FIG. 2, thus swings the switch control lever 42 against the bias of the spring 44 so as to lift the arm 41 from the switch operator 22, thereby allowing the switch to close.

The function lever 30 has three distinct positions. In the first position, the full clockwise position illustrated in FIG. 2, the alarm is silenced and the switch is held in the OFF condition by the switch control lever 42.

In the second position of the function lever 30, one step counterclockwise from the FIG. 2 illustrated position, the finger 46 swings the switch control lever 42 sufficiently far to release the operator 22 and allow the timer switch to close. However, the cam surface 36 does not yet engage the controller rod 32 so that the alarm vibrator 21 remains silenced.

In the third position of the function lever 30, the full counterclockwise position of the lever, the timer switch remains closed and the controller rod 32 is released in the latch slot 34 so that the alarm is sounded.

The function shaft 17 controls the function lever 30 through a cam driver 51 mounted on an arm 52 secured to the function shaft 17. The driver 51 is received within a cam slot 53 formed in the function lever 30. The function shaft 17 has four angular settings indicated by the dashed lines 54, 55, 56 and 57 in FIG. 2 which correspond to the four functions of the timer 10. Swinging the function lever 17 counterclockwise so as to dispose the arm 52 along the line 54, the cam driver 51 is received within a relatively wide portion of the cam slot 53 which permits the function lever to move between all three of its above described positions. This is the AUTO-ALARM position of the function lever 17.

With the arm 52 alined with the dashed line 55, the driver 51 enters a narrowed portion of the slot 53 which is shaped to force the function lever 30 to the position illustrated in FIG. 2. This is the OFF position of the

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function lever, with both the alarm silenced and the timer switch held open.

Swinging the function lever 17 so that the arm 52 aligns with the dashed line 56 disposes the cam driver 51 in another narrow portion of the cam slot 53 which forces the function lever to its second above-described position. This is the ON position wherein the timer switch is closed and the alarm held silenced.

With the function lever 17 swung to its fourth position, that illustrated in FIG. 2 with the arm 52 in alignment with the dashed line 57, the cam driver 51 is disposed in a wider portion of the cam slot 53 that allows the function lever 32 to swing between its first and its second positions. This is the AUTO position of the function shaft which permits the function lever to swing sufficiently far to close the timer switch while not affecting the audible alarm.

For swinging the function lever 30 at a desired timer determined moment, a shift lever 60 is slidably and tiltably mounted on the rear frame plate 27 through a pin 61 that is rigidly secured at 62 to the shift lever 60 and loosely anchored in a slot 63 formed in the rear frame plate. A spring 64 biases the lower end of a slot 65 formed in the shift lever 60 against a stepped projection 66 which is rigidly mounted on the front frame plate 26.

The project 66 is formed with three adjacent steps against which the slot 65 can rest. In the first, or lowermost position of the shift lever 60, the pin 61 clears the function lever 30 and allows the biased switch control lever 42 to swing the function lever to its above-described first position.

Tilting the shift lever 60 inwardly from the front frame plate 26 causes the slot 65 to slip from the first step so that the shift lever is snapped upwardly by the spring 64 with the end of the slot 65 resting on the second step of the projection 66. In this position, the shift lever pin 61 pulls the function lever 30 to its second position, wherein the switch operator 22 is operated to close the timer switch while the alarm vibrator 21 remains silenced.

Further inward movement of the shift lever 60 causes the slot 65 to slip from the second step of the projection 66 and the shift lever is snapped upwardly by the spring 64 so that the shift lever assumes its third or topmost position. In this position, the shift lever pin 61 pulls the function lever 30 into its third position wherein the timer switch remains closed and the alarm vibrator 21 released for sounding the audible alarm.

In the above description of the stepping of the shift lever 60 and the successive positioning of the function lever 30 it has been assumed, of course, that the function shaft 17 had been rotated to the AUTO-ALARM position with the arm 52 alined with the dashed line 54 and that therefore there was sufficient clearance between the cam driver 51 and the edges of the cam slot 53 to permit movement of the function lever through its full range of three positions. Should the function shaft 17 be positioned so that the cam driver 51 limits movement of the function lever 30, then the shift lever 60 simply moves through an idle sequence with the pin 61 suspending the shaft lever on the stationary function lever against the biasing force of the spring 64.

The shift lever 60 is tilted away from the front frame plate 26 so as to clear the successive steps of the projection 66 by means of cooperating, axially slidable alarm and alarm setting gears of the conventional type which form a part of the timing train of the timer 10. As is well known to those skilled in the art, and as fully described in the above referred to application, such gears are cammed axially apart at a predetermined time indicated by the alarm setting hand 16, and this cammed axial movement of the gears engages a set of ridges 67 on the shift lever 60 so as to successively urge the slot 65 from the steps of the projection 66.

To provide a "drowse" function, a drowse cam 70

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is loosely journaled on the pin 62 and provided with a cam pin 71 which rides in an arcuate cam slot 72 having a dropoff 73 formed in the shift lever 60. The drowse cam 70 is biased by a torsion spring 74 clockwise in FIG. 2 to a start position established by engagement of the cam pin 71 with the righthand end of the slot 72 as seen in that figure.

When the shift lever 60 is urged by the alarm and alarm setting gears from the first step of the projection 66, the drowse cam 70 snaps onto the periphery of a minute wheel 75 forming a conventional part of the timer timing train and which rotates in the direction of the arrow 76. Although the drowse cam is loosely journaled on the pin 62, the shift lever 60 remains suspended from the second step of the projection 66 because of the engagement with the cam pin 71 with the edge of the cam slot 72. This condition exists until the drowse cam 70 is rotated in a counterclockwise direction by the minute wheel 75 sufficiently far to carry the cam pin 71 over the dropoff 73, at which time the shift lever 60 is shifted upwardly relative to the drowse cam 70 under the influence of the spring 64 so that the slot 65 engages the second step of the projection 66.

The drowse cam 70 holds the shift lever 60 only a slight distance from the second step of the projection 66 so that the function lever 30 is swung to its second position by the pin 61 both when the drowse cam 70 is being driven by the minute wheel 75 and when the slot 65 comes to rest on the second step of projection 66. Thus, during the alarm initiating sequence when the shift lever 60 is successively stepped from the first to the second and from the second to the third steps of the projection 66, the rotation of the drowse cam 70 and the shift of the cam pin 71 over the dropoff 73 is only an idle movement.

Since the drowse function comprises interrupting of the alarm vibrator 21 for a short predetermined length of time, that function takes place when the function lever is swung to its fully counterclockwise third position with the function shaft 17 rotated so that the arm 52 is aligned with the dashed line 54.

To initiate a drowse period, that is to suspend sounding of the alarm for a predetermined interval, the drowse button slide 19 is shiftable mounted on pins 81 fixed to the control plate 28 and is provided with an arm 82 which extends through a slot 83 in the front frame plate 26 to overlies the function lever 30. A tension spring 84 normally biases the slide 19 upwardly.

Assuming that the function lever 30 is in its third position, that is, its fully counterclockwise position as seen in FIG. 2, it will be recalled that the alarm vibrator 21 is released and sounding and that the shift lever 60 has been shifted to its third or uppermost position. The function shaft 17 has of course been rotated to the AUTO-ALARM position so as to permit movement of the function lever into its third position. With the parts so positioned, downward sliding movement of the drowse button slide 19 causes the arm 82 to rock the function lever 30 clockwise so as to latch the controller rod 32, silencing the alarm vibrator 21, and lower the shift lever 60. Downward movement of the shift lever 60 brings the drowse cam 70 into engagement with an abutment (not shown), which lifts the drowse cam relative to the shift lever 60 and causes the cam pin 71 to slip over the dropoff 73, whereupon the spring 74 rotates the drowse cam to its illustrated starting position. Manual release of the drowse button slide 19 clears the arm 82 from the function lever 30 and the spring 64 lifts the shift lever 60 and swings the function lever 30 in a counterclockwise direction. However, the drowse cam 70, now in its starting position, strikes the minute wheel 75 so that the function lever 30 is held in its second position, with the alarm vibrator 21 silenced, until the drowse cam times out, whereupon the function lever is returned to its third position so as to release the controller rod 32 from the

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latch slot 34 and thus resume sounding of the audible alarm. In this way, a quick down and up movement of the drowse button slide 19 initiates a drowse period determined by the time required to rotate the drowse cam 70 until the cam pin 71 falls from the dropoff 73.

For providing a "sleep" function, a shiftable rack 90 is slidably mounted on the rear frame plate 27 and provided with a cam surface 91 that is engageable with a pin 92 on the switch control lever 42. The rack 90 is biased upwardly by a spring 93, only a portion of which is shown, and it can be seen that downward movement of the rack against the bias of the spring 93 causes the cam surface 91 to engage the pin 92 and rock the switch control lever 42 in a clockwise direction so as to release the switch operator 22 and close the timer switch.

The sleep shaft 18 is coupled to the rack 90 by a pinion 95 so that counterclockwise rotation of the sleep shaft 18 runs the rack 90 downwardly and closes the timer switch. The rack 90 is driven back to its starting illustrated position at a timed rate by a constantly rotated ratchet wheel 96 that is mounted on a shaft 97 which is driven at a constant rate from the timing train of the timer. The rack 90 carries a biased pawl 98 which engages the ratchet wheel 96 upon downward shifting movement of the rack 90. The shaft 97, and thus of course the ratchet wheel 96, rotate constantly in a clockwise direction so as to return the rack 90 upwardly whenever the pawl 98 is moved downward into engagement with the wheel 96. During this upward timed movement of the rack 90 it will be appreciated that the sleep shaft 18 is driven in a clockwise direction back to its starting position.

Thus, as seen in FIG. 2, the sleep shaft 18 may be rotated in a counterclockwise setting direction so as to shift the rack 90 downwardly and close the timer switch. The rack 90 is slowly returned upwardly by the ratchet wheel 96 and the sleep shaft 18 is thus driven in a clockwise direction back to its starting position. The timer switch remains closed until the rack 90 returns to the position illustrated and thus the sleep interval depends upon how far the sleep shaft 18 is initially turned in a setting direction.

The drive to the shaft 97 from the timer timing train is frictional so that the sleep shaft 18 can be manually rotated in its driven direction at any time, thus accelerating the sleep period and opening the timer switch whenever the operator desires and without waiting for the ratchet wheel 96 to return the rack 90 to its uppermost starting position.

In summary, it should again be mentioned that for additional details of any of the above described mechanisms and a more elaborate description of their operation, reference can be had to the application identified above.

In accordance with the present invention, the function shaft 17, sleep shaft 18, and drowse button slide 19 are all selectively controlled by a single control operator 100. The operator 100 includes a knob 101 secured to a flat member 102 that is mounted for movement between the front frame plate 26 and the control plate 28.

To couple the operator 100 with the function shaft 17, the member 102 is provided with a laterally extending portion 103 which is pivoted at 104 to a crank arm 105 that is secured to the function lever 17. Thus, sliding movement of the operator 100 along a first line rotates the function lever 17 and permits selective positioning of the arm 52 with its cam driver 51. With the operator 100 in the AUTO-ALARM position illustrated in FIG. 1, the arm 52 is in alignment with the dashed line 54 shown in FIG. 2. Sliding the operator 100 to the right in FIG. 1 through the OFF and ON positions to the AUTO position, swings the arm 52, successively, through the angular positions indicated by the dashed lines 55, 56 and 57.

To connect the operator 100 to the "drowse" mechanism, the push button slide 19, mounted as a plunger on the control plate 28, is provided with a plunger portion

110 which underlies a flange 111 formed on the member 102 when the operator 100 is in the AUTO-ALARM position. The plunger portion 110 is thus connected through the slide 19 to the arm 82 which overlies the function lever 30, which, as described above, serves as the "drowse" actuator. Thus, when the operator 100 is in the AUTO-ALARM position and the shift lever 60 has timed out over the steps of the projection 66 so as to cause the alarm vibrator 21 to sound the audible alarm, the operator of the timer depresses the operator knob 101. The operator 100 swings freely about the pivot 104 and the flange 111 depresses the plunger portion 110 so that the arm 82 swings the function lever 30 and initiates the drowse period in the manner described above.

For operating the sleep shaft 18, a bar 120 is slidably mounted on a plurality of pins 121 fixed to the control plate 28 so that the bar is vertically slidable beneath the operator 100. The bar 120 carries a setting pawl 122 which is effective to step a ratchet mechanism 125 upon downward sliding movement of the bar 120 caused by depression of the operator 100.

In the preferred embodiment, the bar 120 is generally U-shaped and is biased upwardly by a tension spring 126 so that the pawl 122 normally clears the ratchet mechanisms 125. The bar 120 is proportioned to lie beneath the operator member 102 in any of the four positions of the operator. Thus, the operator knob 101 can be depressed at any time so as to slide the bar 120 downwardly against the bias of the spring 126. Downward movement of the bar 120 is limited by engagement of the pawl 122 with a stop 127 secured to the control plate 28.

The ratchet mechanism 125 includes a setting ratchet 131 that is secured to the sleep shaft 18 and a locking ratchet 132 that is journaled coaxially of the sleep shaft 18 on a collar 133 mounted in the frame plate 28 (see FIG. 4). Each of the ratchets 131, 132 is provided with the same number of equally spaced, but oppositely facing, teeth 134, 135 respectively. The setting ratchet 131 is positioned so that its teeth 134 face upwardly and underlie a driving tip 136 carried on the setting pawl 122. Thus, downward movement of the pawl 122 causes the tip 136 to strike the teeth 134 so as to rotate the setting pawl 131 clockwise as seen in FIG. 6, thus carrying the sleep shaft 18 one step in its setting direction. As indicated by the dashed lines in FIG. 6, the setting pawl 131, and thus the sleep shaft 18, is rotated the length of one of the teeth 134 by movement of the pawl 122 against the stop 127.

The teeth 135 of the locking ratchet 132 face a locking pawl 137 having a tab 138. The pawl 137 is slidably mounted on the control plate 28 and is biased by a spring 139 toward the locking ratchet 132. The locking ratchet 132 is urged by a torsion spring 140 in the driven direction of the sleep shaft 18 so that its teeth 135 tend to seat against the locking pawl tab 138.

A one-way connection is provided between the setting ratchet 131 and the locking ratchet 132, which takes the form of a pin 141 secured to the setting ratchet 131 and received within an arcuate slot 142 formed in the locking ratchet 132. Thus, each time the setting ratchet 131 is stepped by the pawl 122, the pin and slot connection 141, 142 also rotates the locking ratchet 132 a single step in the setting direction so that one of the teeth 135 snap over the locking pawl tab 138 to prevent return movement of the ratchets 131, 132 under the force of the torsion spring 140. However, the pin and slot one-way connection 141, 142 does permit the sleep shaft 18, and the setting ratchet 131, to be returned in their driven direction as the rack 90 is driven back to its starting position.

In the illustrated embodiment the driving ratchet 96 for the rack 90 rotates at a speed that is effective to return the rack from its lowermost set position to its starting position in approximately one hour. This of course provides a maximum sleep period of one hour. The setting and locking ratchets 131, 132 are formed with four

teeth 134, 135 so as to divide the total setting range of the sleep shaft 18 into four equal units each corresponding to a fifteen-minute sleep interval. Therefore, each time the bar 120 is slid downwardly by the operator 100 so as to advance the setting and locking ratchets 131, 132 one step, the "sleep" mechanism is set for a fifteen-minute sleep period. Depression of the operator 100 two, three or four times advances the ratchets 131, 132 to the second, third or fourth steps so as to initiate sleep periods of one half hour, forty-five minutes, or the full hour interval available. It will be apparent that the number of ratchet teeth 134, 135 which might be provided can be easily varied so as to change the increments through which the sleep interval can be set.

As an important feature of the invention, provision is made for releasing the ratchet mechanism 125 and returning the sleep shaft 18 to its neutral or starting position at any time. For this purpose, the locking pawl 137 is formed with a release arm 150, and a guide 151 is carried by the setting ratchet 131 that is effective, after the setting ratchet 131 has been stepped to its fully set position, to shift the setting pawl 122 out of alignment with the stop 127 and into engagement with the release arm 150. The engagement of the pawl driving tip 136 with the release arm 150 shifts the locking pawl 137 against the bias of its spring 138 so as to release the locking ratchet 132 and allow the torsion spring 140 to return the locking ratchet, together with the setting ratchet 131 and the sleep shaft 18, to their initial starting positions.

In the illustrated construction, the guide 151 is formed as a segment pivoted relative to the sleep shaft 18 adjacent the setting ratchet 131. A spring 152 normally holds the guide against a stop pin 153 mounted on the setting ratchet 131. The guide 151 includes a tooth 154 which extends over the periphery of the setting pawl 131.

The setting pawl 122 is biased by a spring 156 against a stop 157 formed on the bar 120 and is formed with a guide notch 158 adapted to cooperate with a pin 159 mounted on the control plate 28.

The operation of the parts just described can be best seen by reference to FIG. 7 wherein the setting ratchet 131 is shown advanced four steps to the full setting of the sleep shaft 18. Upon the next downward movement of the bar 120, the pawl tip 136 strikes the tooth 154 of the guide 151 and the pawl 122 is cammed to the right against the bias of the spring 156 so as to clear the stop 127, note the position shown in dashed lines. Further downward movement of the bar 120 causes the pawl notch 158 to slip over the pin 159 so as to guide the pawl tip 136 against the release arm 150 of the locking pawl 137. This cams the locking pawl 137 to the left in the drawings so as to release the locking ratchet 132 and permit the torsion spring 140 to return the ratchets 131, 132 and the sleep shaft 18 to their starting positions.

It can therefore be seen that the sleep shaft 18 may be selectively positioned by depressing the operator 100 a desired number of times. Should the user of the timer desire to interrupt the sleep period at any time during the "sleep" interval, the operator 100 is simply depressed one more time than is required to fully set the sleep shaft, whereupon the locking pawl 137 is released and the sleep mechanism returns to its neutral starting position.

We claim as our invention:

1. A timer comprising, in combination, a frame including a plate, a timing train mounted in said frame, a dial face mounted on said frame over said plate, time indicating hands coupled to said timing train and mounted for movement over said dial face, a positionable function shaft on said frame, sleep mechanism driven by said timing train and including a rotatable sleep shaft mounted in said train, drowse mechanism driven by said timing train and including a shiftable drowse actuator mounted on said frame, an operator mounted for movement adjacent said frame plate, means coupling said operator and

said function shaft so that sliding movement of the operator along a first line selectively positions the function shaft, means coupling said operator and said sleep shaft for rotating said sleep shaft upon sliding movement of the operator parallel to a second line, and means coupling said operator and said drowse actuator when the operator is in one position along said first line, said last named means being effective to shift said actuator when said operator is in said one position and moves parallel to said second line.

2. In a timer having a positionable function shaft, a rotatable sleep shaft and a shiftable drowse actuator, the combination comprising, a frame plate, an operator mounted for movement adjacent said frame plate, a crank arm coupling said operator and said function shaft so that sliding movement of the operator along a first line selectively positions the function shaft, a plunger slidably mounted on said frame plate and coupled to said drowse actuator, said operator and said plunger having interengaging portions which come into alinement when the operator is in one position along said first line, said interengaging portions, when alined, permitting movement of said operator along a second line to shift said drowse actuator, a ratchet wheel coupled to said sleep shaft, a pawl mounted on said frame plate for cooperation with said ratchet wheel, and a bar coupled to said pawl for stepping said ratchet wheel upon movement of the bar, said bar being positioned adjacent said operator so as to be moved thereby whenever the operator is moved in the direction of said second line.

3. In a timer having a positionable function shaft, a rotatable sleep shaft and a shiftable drowse actuator, the combination comprising, a frame plate, an operator mounted for movement adjacent said frame plate, means coupling said operator and said function shaft so that sliding movement of the operator along a first line selectively positions the function shaft, a plunger slidably mounted on said frame plate and coupled to said drowse actuator, said operator and said plunger having interengaging portions which come into alinement when the operator is in one position along said first line, said interengaging portions, when alined, permitting movement of said operator along a second line to shift said drowse actuator, a ratchet wheel coupled to said sleep shaft, a pawl mounted on said frame plate for cooperation with said ratchet wheel, a bar coupled to said pawl for stepping said ratchet wheel upon movement of the bar, said bar being positioned adjacent said operator so as to be moved thereby whenever the operator is moved in the direction of said second line, and means for returning said sleep shaft to its starting position following a predetermined number of movements of said bar.

4. In a timing device, the combination comprising, a journaled shaft having a neutral position, a slip drive for rotating said shaft in a driven direction back to said neutral position when said shaft is rotated from the neutral position in a setting direction that is opposite said driven direction, a setting ratchet secured to said shaft, a locking ratchet journaled on said shaft adjacent said setting ratchet, said locking ratchet being biased in said driven direction, a one-way connection between said ratchets allowing said setting ratchet to move in said driven direction independently of said locking ratchet, each of said ratchets having a plurality of equally spaced teeth, a biased locking pawl engaging the teeth of said locking ratchet, a manually shiftable setting pawl positioned adjacent said setting ratchet, a stop in the path of said setting pawl so that shifting of the setting pawl against the stop rotates the ratchets in the setting direction sufficiently far to step an additional tooth in the locking ratchet past said locking pawl, and means for selectively releasing said locking

pawl so that the biased locking pawl over-rides said slip drive and returns the shaft to neutral position.

5. In a timing device, the combination comprising, a journaled shaft having a neutral position, a slip drive for rotating said shaft in a driven direction back to said neutral position when said shaft is rotated from the neutral position in a setting direction that is opposite said driven direction, a ratchet mechanism for successively stepping said shaft in said setting direction past a biased locking pawl, a manually shiftable setting pawl for driving said ratchet mechanism, a release arm connected to said locking pawl, and a guide positioned by said ratchet mechanism for shifting said setting pawl into alinement with said release arm after the ratchet mechanism has been stepped a predetermined number of times, whereby successive movements of the setting pawl angularly steps said shaft until said guide causes the pawl to engage said release arm and release said locking pawl.

6. In a timing device, the combination comprising, a journaled shaft having a neutral position, a slip drive for rotating said shaft in a driven direction back to said neutral position when said shaft is rotated from the neutral position in a setting direction that is opposite said driven direction, a setting ratchet secured to said shaft, a locking ratchet journaled on said shaft adjacent said setting ratchet, said locking ratchet being biased in said driven direction, a one-way connection between said ratchets allowing said setting ratchet to move in said driven direction independently of said locking ratchet, each of said ratchets having a plurality of equally spaced teeth, a biased locking pawl engaging the teeth of said locking ratchet, a manually shiftable setting pawl positioned adjacent said setting ratchet, a stop in the path of said setting pawl so that shifting of the setting pawl against the stop rotates the ratchets in the setting direction sufficiently far to step an additional tooth in the locking ratchet past said locking pawl, a release arm connected to said locking pawl, and a guide carried by said setting ratchet for shifting said setting pawl out of alinement with said stop and into alinement with said release arm after the setting ratchet has been stepped a predetermined number of times, whereby successive movements of the setting pawl angularly steps said shaft until said guide causes the pawl to engage said release arm and release said locking pawl so that the biased locking ratchet overrides said slip drive and returns the shaft to neutral position.

7. A timer comprising, in combination, a frame, a timing train mounted in said frame, a dial face mounted on said frame, time indicating hands coupled to said timing train and mounted for movement over said dial face, a positionable function shaft on said frame, sleep mechanism driven by said timing train including a rotatable sleep shaft mounted in said frame, drowse mechanism driven by said timing train and including a shiftable drowse actuator mounted in said frame, and a single manually positionable operator on said frame for selectively manipulating said shafts and said actuator.

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