

Dec. 16, 1969

W. J. EHNER

3,484,769

TIMING DEVICE WITH OPTIONAL SIGNAL

Filed Oct. 12, 1966

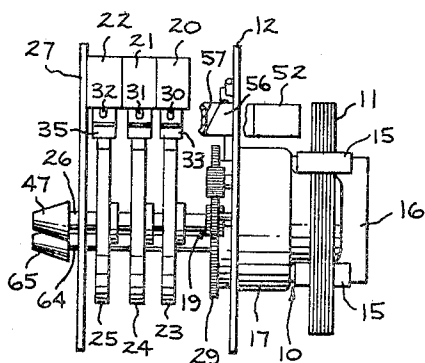


FIG. 3

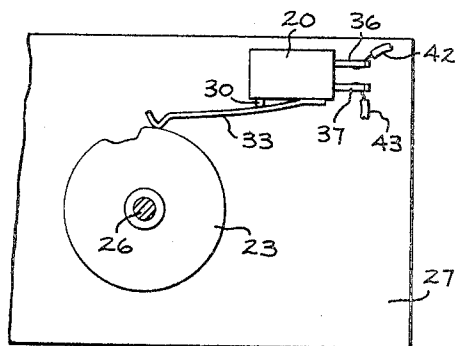


FIG. 5

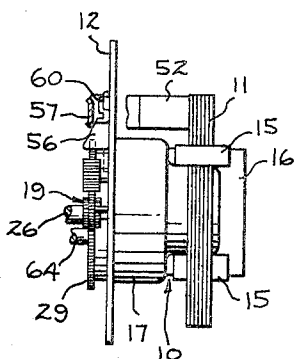


FIG. 4

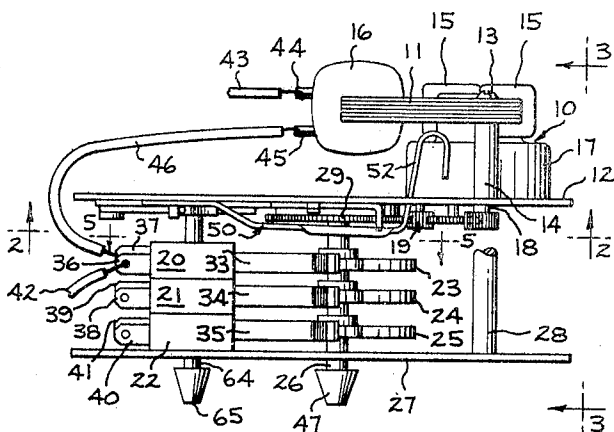


FIG. 1

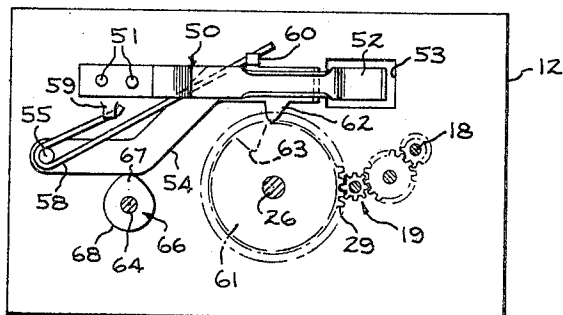


FIG. 2

INVENTOR
WILLIAM J. EHNER

BY *Rodford M. Kearns*
HIS ATTORNEY

1

2

3,484,769

TIMING DEVICE WITH OPTIONAL SIGNAL

William J. Ehner, Louisville, Ky., assignor to General Electric Company, a corporation of New York

Filed Oct. 12, 1966, Ser. No. 586,229

Int. Cl. G08b 1/00; H01h 43/10, 7/08

U.S. Cl. 340—309.1

6 Claims

ABSTRACT OF THE DISCLOSURE

A timing device with optional end of cycle signal includes an alternating current motor having a leakage flux field associated therewith when connected to a source of electrical energy. The motor drives circuit control means adapted to control an associated mechanism. A vibratory signal means is provided to emit an audible signal under the influence of leakage flux from the motor, and a signal control means is provided to prevent the signal means from emitting an audible signal until a first predetermined period of motor operation has taken place. The circuit control means additionally includes a switch operative after a second predetermined period of time to de-energize the motor and thereby terminate the audible signal by elimination of the leakage flux.

This invention relates to timing devices and more particularly to an improved timing device with an optional end-of-cycle signal.

The usual shaded pole type timer used with appliances such as cooking ranges may be set to give an end-of-cycle signal. However, such timers generally cause the signal to continue indefinitely and do not function to discontinue the range's operation. Action of this type is desirable with cooking appliances since the end-of-cycle signal normally heralds a situation which needs the user's immediate attention. Such signals are not desirable for other appliances, such as clothes dryers, which do not necessarily need the user's immediate attention upon the completion of a normal cycle of operation. Such other appliances need an end-of-cycle signal which sounds for only a short time at the end of a cycle of operation of the machine and then is automatically terminated. Such machines normally use an induction motor timer and the end-of-cycle signal is provided by a mechanism separate from the timer. Such constructions add significantly to the complexity of the overall control mechanism of the machine; thus adding to its cost and increasing the possibility of failures. Moreover, such signals normally do not incorporate an option feature; that is, the user is not free to determine whether there will be a signal.

An object of this invention is to provide an improved integrated timing and signal device of the shaded pole motor type.

Another object is to provide such a device which provides an end-of-cycle signal and then automatically terminates the signal.

A further object of this invention is to provide such a device in which the end-of-cycle signal is optional.

In accordance with one embodiment of my invention I provide a timing device of the shaded pole motor type. Circuit control means are operatively connected to the motor and adapted to control an associated mechanism in response to operation of the motor. The device further includes vibratory signal means adapted to emit an audible signal under the influence of leakage flux from the motor. A follower is provided, being biased to a first position, allowing the audible signal, and movable to a second position in engagement with the signal means preventing the audible signal. Cam means are operatively connected to the motor rotor and include a cam surface

engageable with the follower, normally to hold the follower in its second position. The cam surface is designed to allow the follower to move to its first position after a first pre-determined period of motor operation, starting the audible signal, and the control means includes switch means effective after a second pre-determined period of motor operation to de-energize the motor, automatically terminating the audible signal. A first manual means is operatively connected to the motor rotor to turn the rotor sufficiently to cause the switch means to re-energize the motor, the cam surface being designed so that such turning of the rotor causes the follower to be returned to its second position. A second manual means is provided and is selectively operable to engage the follower and hold it in its second position regardless of the position of the cam means.

Other objects and attendant advantages of this invention will be apparent from the following description taken in connection with the accompanying drawing in which:

FIGURE 1 is a partial plan view of a timing device designed in accordance with one embodiment of this invention;

FIGURE 2 is a view taken along line 2—2 of FIGURE 1;

FIGURE 3 is a view taken along line 3—3 of FIGURE 1;

FIGURE 4 is a view similar to FIGURE 3, the view being partially broken away for purposes of illustration; and

FIGURE 5 is a fragmentary view taken along line 5—5 of FIGURE 1.

Referring now to the drawing, there is shown therein a new and improved timing device in accordance with one embodiment of my invention. The timing device is powered from a shaded pole motor, generally indicated at 10, which includes a laminated stator 11 supported from a base plate 12 by some suitable means such as bolts 13 which are attached to the plate and extend through elongated spacers 14. As is usual in shaded pole motors, the stator forms a pair of spaced, opposed pole faces and half of each face is encircled by a low resistance copper ring 15. An excitation coil 16 is wound around a leg of the stator remote from the pole spaces and a rotor, generally indicated at 17, is mounted on the base 12 and extends between faces. Thus, in the usual way for motors of this type, energization of the coil 16 from a suitable source of alternating current electrical energy will cause the rotor to rotate.

The rotor includes a drive shaft 18 which rotates with the rotor and is connected by a suitable gear train 19 to a circuit control means adapted to control an associated mechanism in response to operation of the motor. The control means for example may include a plurality of switches such as those illustrated at 20, 21 and 22 which are adapted to be opened and closed by cooperating cams 23, 24 and 25 respectively. To this end, the cams are mounted on a rotatable shaft 26 supported on a front plate 27 which is, in turn, supported from the base plate by any suitable means such as spacer bars like the one illustrated at 28. The inward end of shaft 26 is drivingly connected to the last gear 29 of the gear train 19 so that rotation of the motor rotor causes the shaft 26 and cams 23, 24 and 25 to be rotated.

As best seen in FIGURE 3, the switches include stationary contacts 30, 31 and 32 respectively and cooperating flexible contacts which may take the form of leaf springs 33, 34 and 35 respectively. The flexible contacts 33, 34 and 35 are formed so as normally to be out of engagement with stationary contacts 30, 31 and 32 and always to ride on the circumferential edge of cams 23, 24 and 25 respectively. Thus, by proper selection of the configuration of the circumferential edges of the cams the

flexible contacts may be caused to selectively engage the corresponding stationary contacts so as to close circuits through the switches to control the operation of an associated mechanism. For this purpose the switches are provided with terminals 36 and 37, 38 and 39, and 40 and 41 respectively so that the switches of the circuit control means may be connected to any desired associated device. It will be understood that the cams and switches shown herein are for illustrative purposes only and any one of a number of other suitable circuit control means may be utilized. For instance, the rotor shaft 18 could be connected to a suitable printed circuit device, many of which are well known in the art.

As one aspect of my invention, I utilize the control means to control the energization of the timer motor 10. For this purpose the timer motor may be connected to a suitable source of electrical energy by a circuit including a first conductor 42 conducted to terminal 36 of switch 20 and a second conductor 43 connected to one terminal 44 of the coil 16, with the conductors 42 and 43 being adapted to be connected to the source of electrical energy. The other terminal 45 of the coil is connected to the other terminal 37 of switch 20 by means of a third conductor 46. Thus, with conductors 42 and 43 being connected to a source of electrical energy, the coil 16 will be energized when flexible contact 33 is in engagement with stationary contact 30 and the motor will be completely de-energized when cam 23 is rotated to a position allowing flexible contact 33 to move out of engagement with stationary contact 30. This arrangement is best shown in FIGURE 5.

In order to restart the operation of the timing device, shaft 26 is provided with a knob 47 which the shaft, and the cams, may be rotated manually with the timer motor being de-energized. Cam 23 is formed so that, after it has de-energized motor 10, a relatively slight manual rotation of the shaft 26 will cause flexible contact 33 to re-engage stationary contact 30, thus energizing the motor 10 so that the timing device is set to control a subsequent sequence of operation of any associated mechanism.

As an important aspect of this invention the timing device is provided with an automatically de-energized, selectively operable vibratory signal means. The signal means includes a flexible arm 50 which is attached at one end to the base plate 12 by some suitable means such as rivets 51. The flexible member is elongated so as to extend partially across the base plate and then is formed with a U-shaped end portion 52 which extends through an opening 53 in the base plate into close proximity to the stator 11. The flexible member is made from a metallic material so that, when the U-shaped end 52 is adjacent the stator 11 and the motor is energized, leakage flux from the stator will cause the flexible member 50 to vibrate. This causes the end 52 repeatedly to strike the side of the stator and emit an audible signal. For best results, flexible arm 50 should be designed so its natural frequency is approximately equal to the excitation frequency of the coil. With a standard 60 cycles per second alternating current, the natural frequency of 50 should be 7200 cycles per minute.

A signal control means is included to cause the flexible member to emit an audible signal at a predetermined time, such as approximately the end of the cycle of operation of an associated device. The signal control means includes a follower 54 which is rotatably mounted at one end to the base plate 12 by some suitable means such as pin 55 and extends laterally and upwardly, as shown in FIGURE 2, so that the other end is disposed adjacent the mid-section of flexible member 50. This other end is provided with an inclined tang 56 which is adapted to selectively engage a cam surface 57 formed in the flexible member 50 so as to move the U-shaped end 52 away from the stator 11 and thus prevent generation of the audible signal. The follower is biased toward a position where the tang 56 is out of engagement with the cam surface 57 by means of a U-shaped spring 58 which is mounted around

pin 55 with one end bearing against a projecting tab 59 formed on the base plate 12 and the other end bearing against a projecting tab 60 formed toward the tang end of the follower.

This spring serves to bias the follower downwardly (as seen in FIGURE 2) so that the tang 56 is out of engagement with the cam surface 57 and the U-shaped end 52 is adjacent the stator 11 (as shown in FIGURE 4). In order selectively to move the follower so that the tang engages the cam surface, an additional cam member 61 is mounted on shaft 26 and positioned to engage a protruding portion 62 of the follower. The cam 61 is designed so that the vast majority of its circumference has a radius sufficient to force the follower upwardly (as seen in FIGURE 2) against the force of spring 58 so that the tang 56 engages the cam surface 57 to hold the U-shaped end 52 away from the stator 11 (as seen in FIGURE 3). A small portion of the cam 61 is provided with a recess, as indicated at 63, so that, when the cam has rotated to the position at which the recess 63 is in register with the follower protrusion 62, the spring will force the tang 56 away from the cam surface 57. When this occurs, the flexible member moves and brings its end 52 adjacent the stator 11 and, assuming the motor to be energized, an audible signal is generated. In a preferred embodiment of my invention recess 63 is designed so that the audible signal begins approximately at the end of the cycle of operation of whatever associated mechanism is being controlled by the timing device. For instance, in the case of automatic clothes dryers, a suitable time to have the audible signal begin would be approximately 30 seconds before the end of the dryer operation.

Cam 23 controlling the energization of the motor 10 is designed to cause the motor to be de-energized immediately after the completion of the cycle of operation of any associated mechanism. Since the audible signal depends upon flux leakage of the stator of the motor, de-energization of the motor causes the audible signal to be discontinued. The recess 63 in cam 61 is made relatively small so that a subsequent manual rotation of shaft 26 to re-energize motor 10 causes the recess 63 to be moved out of register with follower protrusion 62 the tang is again to be forced into engagement with the cam surface 57 to remove the U-shaped end 52 from the vicinity of stator 11. Thus, the re-energization of motor 10 will not cause any significant audible signal.

In order to provide for optional operation of the signal I provide a second manually rotatable shaft 64 which is mounted between base plate 12 and front plate 27 and is provided with a knob 65 so that it may be manually rotated. A cam 66 is mounted on the shaft 64 in alignment with the follower 54 and is provided with a first section 67 having a large radius and a second section 68 having a small radius. Thus, by proper manual manipulation of the knob 65, either the large radius section 67 or the small radius section 68 of the cam 66 may be brought into juxtaposition with the follower 54. The section 67 has a radius sufficiently large to hold the follower in a position causing the tang 56 to engage cam surface 57 of the flexible member 50 regardless of the position of the cam 61. On the other hand, the section 68 is provided with a radius sufficiently small that it will not engage follower 54 in any position of cam 61 so that the follower is under the control of the cam 61.

During a typical operation of the timing device in which an end-of-cycle signal is desired the knob 65 would be rotated to bring cam section 68 into juxtaposition with follower 54. Knob 47 would then be rotated sufficiently for cam 23 to move flexible contact 33 into engagement with stationary contacts 30, this movement also being sufficient to bring the large radius portion of cam 61 into engagement with follower protrusion 62. With this setting the timer motor 10 is energized and the U-shaped end 52 of the flexible member 50 is held away from the stator 11 so that the motor runs without an audible signal

being emitted for a period of time sufficient for the circuit control means to control an associated mechanism through a desired cycle of operation. At a point in time close to the end of cycle of operation of the associated mechanism, the recess 63 in cam 61 is brought into register with protrusion 62 and the follower is moved by spring 58 to the position shown in FIGURE 4. This releases the flexible member 50 which moves its end 52 into juxtaposition with stator 11 and the flux leakage from the stator causes the flexible member 50 to vibrate and the end 52 to strike the stator and emit an audible signal. Just after the end of the cycle of operation of the associated mechanism cam 23 allows flexible contact 33 to move out of engagement with stationary contact 30, thus de-energizing the motor 11. The de-energization of motor 11 automatically stops the audible signal.

If it is desired for the timing device to control a mechanism without an audible signal being emitted, knob 65 is rotated to bring cam section 67 into engagement with the follower 54. With this setting the tang 56 of the follower engages cam surface 57 of the flexible member 50 and the end 52 of the flexible member is held away from the stator 11 of the motor (as shown in FIGURE 3). With this setting the timing device may be energized to control a sequence of operation of any associated mechanism without an audible signal being emitted, since the cam section 67 holds the follower in this position regardless of the position of cam 61.

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

1. A timing device including an alternating current motor adapted to be connected to a source of electrical energy and having a leakage flux field associated therewith when so connected; circuit control means operatively connected to said motor and adapted to control an associated mechanism in response to operation of said motor; vibratory signal means adapted to emit an audible signal under the influence of leakage flux from said motor; signal control means normally engaging said signal means to prevent it from emitting an audible signal under the influence of leakage flux from said motor and movable after a first predetermined period of motor operation to a position allowing said alarm means to emit an audible signal under the influence of the leakage flux from said motor; and said circuit control means including switch means effective after a second, predetermined period of motor operation to de-energize said motor to thereby terminate the audible signal by elimination of said leakage flux.

2. A timing device, as set forth in claim 1, further including manual means selectively operable to prevent said alarm means from emitting an audible signal regardless of the action of said signal control means.

3. A timing device including an alternating current motor adapted to be connected to a source of electrical

energy and having a leakage flux field associated therewith when so connected; circuit control means operatively connected to the rotor of said motor and adapted to control an associated mechanism in response to operation of said motor; vibratory signal means adapted to emit an audible signal under the influence of leakage flux from said motor; a follower biased toward a first position allowing the audible signal and movable to a second position in engagement with said signal means preventing the audible signal; cam means operatively connected to said motor rotor and including a cam surface engageable with said follower to normally hold said follower in its second position; said cam surface being designed to allow said follower to move to its first position after a first predetermined period of motor operation; and said circuit control means including switch means effective after a second predetermined period of motor operation to de-energize said motor to thereby terminate the audible signal by elimination of said leakage flux.

4. A timing device, as set forth in claim 3, further including manual means selectively operable to engage said follower and hold it in its second position regardless of the position of said cam means.

5. A timing device, as set forth in claim 3, further including manual means operatively connected to said rotor to turn said rotor sufficiently to cause said switch means to re-energize said motor; said cam surface being designed so that such turning of the rotor causes said follower to be returned to its second position.

6. A timing device, as set forth in claim 3, further including first manual means operatively connected to said rotor to turn said rotor sufficiently to cause said switch means to re-energize said motor, said cam surface being designed so that such turning of the rotor causes said follower to be returned to its second position; and second manual means selectively operable to engage said follower and hold it in its second position regardless of the position of said cam means.

References Cited

UNITED STATES PATENTS

3,320,442	5/1967	Todrank	340—309.4 X
2,721,441	10/1955	Boyles.	
3,078,358	2/1963	Enochs et al.	
3,100,961	8/1963	Bassett.	
3,192,700	7/1965	Walter.	

JOHN W. CALDWELL, Primary Examiner

M. R. SLOBASKY, Assistant Examiner

U.S. Cl. X.R.

200—38; 340—309.3, 309.4