United States Patent [19]

Wiechert

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[45] **Jan. 16, 1973**

[54] **BIMETALLIC SIGNAL DEVICE FOR APPLIANCES**

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[73] Assignee: **Whirlpool Corporation,** Benton Harbor, Mich.

[22] Filed: **Feb. 2, 1972**

[21] Appl. No.: **223,000**

Related U.S. Application Data

[63] Continuation of Ser. No. 48,150, June 22, 1970.

[52] **U.S. Cl.** **307/117,** 219/364, 337/16

[51] **Int. Cl.**.....**H01h 61/04**

[58] **Field of Search** 307/117; 34/45; 219/364; 337/16

[56] **References Cited**

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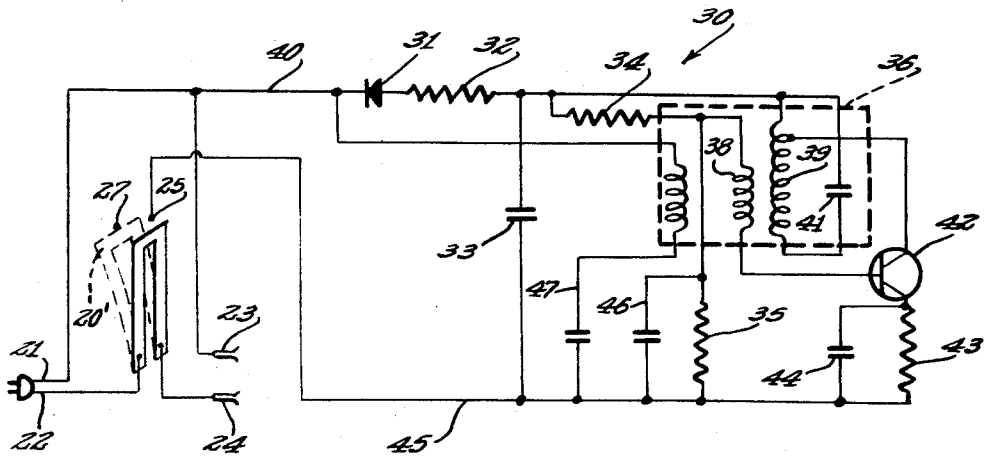
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Assistant Examiner—William J. Smith
Attorney—Hill, Sherman, Meroni, Gross & Simpson

[57] **ABSTRACT**

A control means for providing a signal indicating a shutdown of an appliance, the control means including a bimetallic element connected in series with the power line to the appliance, the bimetallic element being arranged to deflect substantially upon passage of the current from the source and to return to its original condition upon cessation of the current, the bimetallic element being engageable with a stationary contact for actuating a signal generating device.

4 Claims, 6 Drawing Figures



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SHEET 1 OF 2

Fig. 1

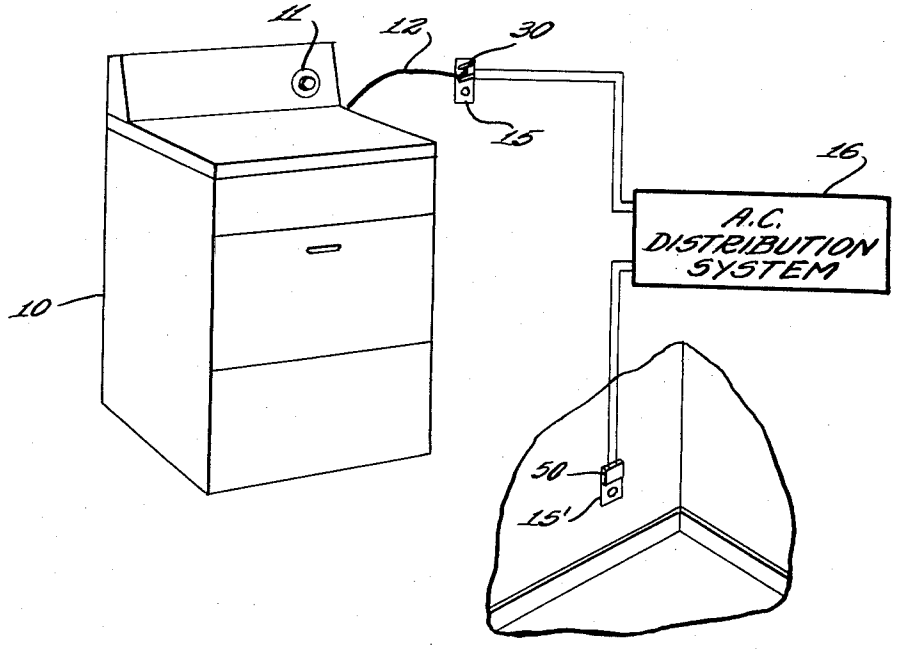
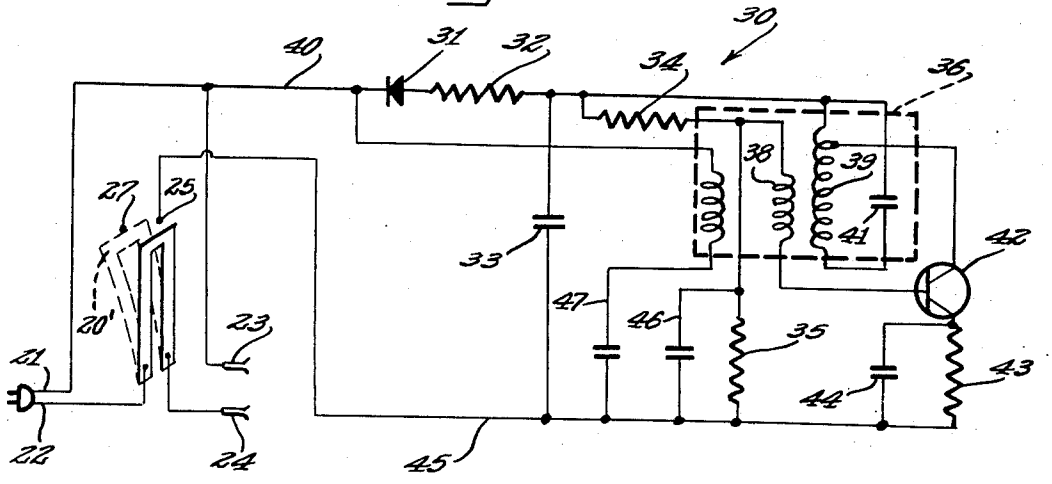


Fig. 2



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Fig. 3

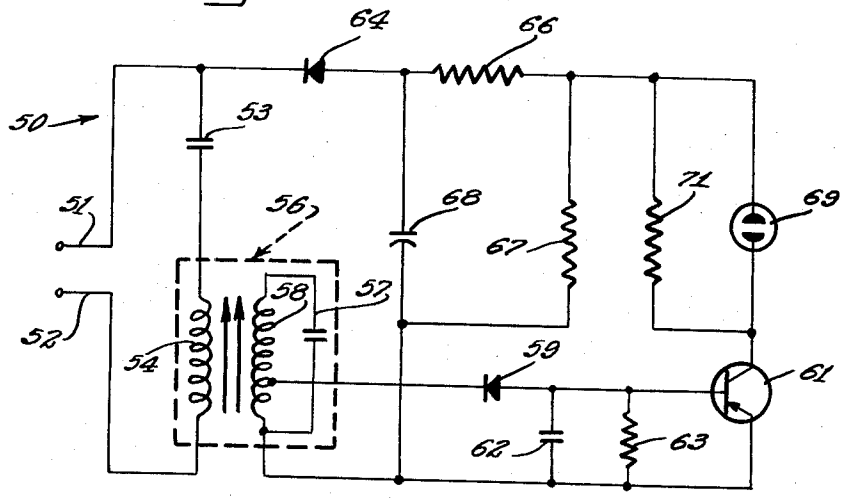


Fig. 4

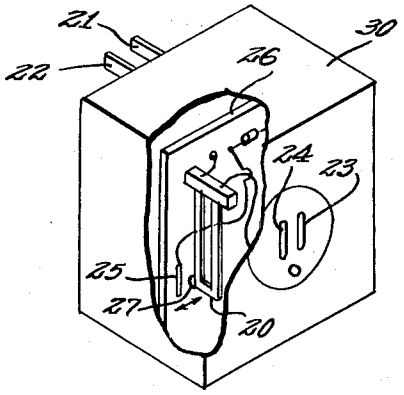


Fig. 5

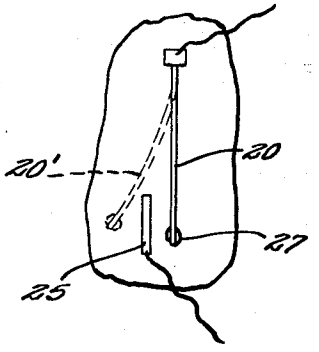
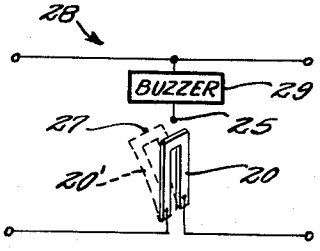


Fig. 6



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BIMETALLIC SIGNAL DEVICE FOR APPLIANCES

This is a continuation of application Ser. No. 48,150 filed June 22, 1970.

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention is in the field of signal generating devices which provide an audible or visual signal to inform an operator that an appliance has completed its cycle and is de-energized.

2. Description of the Prior Art

Many appliances have circuitry which provides "end-of-cycle" signals. For example, many dryers operate to actuate a buzzer which is connected to a centrifugal switch on the drive motor. A timer contact normally keeps the buzzer de-energized. At the end of the dryer cycle, however, when the timer-operated switch opens, the buzzer is energized until the centrifugal switch has transferred to its "at rest" position.

In U.S. Pat. No. 3,132,003, there is disclosed a dryer control circuit including an end-of-cycle signal solenoid. This solenoid is shunted by a bimetal switch which is part of the temperature-sensing thermostat. This thermostat operates at a pre-determined temperature and upon opening, the thermostat de-energizes the motor and briefly energizes the end-of-cycle signal.

U.S. Pat. No. 3,334,340 describes an end-of-cycle signal which can be located at a remote location from the appliance. The signalling device includes a transmitter which is associated with the appliance, and the remote receiver, which can be plugged into the same alternating current distribution system as the appliance. At the end of the cycle, or at other appropriate times, the transmitter is briefly energized, causing a signal to be sent out over the power distribution system for the home. The receiver is plugged into this system so is triggered into activity by the signal sent out by the transmitter. The receiver can then actuate either a visual or audiable means to indicate to the operator that a particular condition exists in the appliance.

SUMMARY OF THE INVENTION

The present invention provides a signal device which is arranged to be connected between the line cord energizing the appliance and the wall receptacle so that the signal device can be used with any continuously running appliance to indicate that the appliance has finished the particular cycle or has stopped. The control unit of the present invention is self-contained, and does not take up space in the appliance control console or complicate the control circuit. The actuator mechanism of the improved control system is a simple low-cost element which can function with various types of end-of-cycle signals, including remotely operated signalling devices.

The control device of the present invention includes a bimetallic element which cooperates with a stationary contact. The bimetallic element is heated by means of current directly from the power input to the appliance. The characteristic of the bimetallic element is such that upon initial energization, the bimetallic element is warped at a relatively rapid rate and makes only momentary contact with the stationary contact at this time. When, however, the line current is terminated, the bimetallic element moves back to its original position at a much slower rate, so that it engages a stationary contact for a matter of several seconds, at which time the signal is generated by suitable signalling means.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a somewhat schematic view of a dryer installation employing the improvements of the present invention;

FIG. 2 is a circuit diagram of a transmitter circuit employing a bimetallic element for energizing same;

FIG. 3 is a wiring diagram of a receiver which can be used in conjunction with the transmitter shown in FIG. 2 to generate a visual signal;

FIG. 4 is a view in perspective, partly broken away, of a control unit;

FIG. 5 is a fragmentary view in elevation showing the position of the bimetallic element in its unenergized and fully energized positions; and

FIG. 6 is a schematic view of another circuit which can be employed in accordance with the present invention.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

In FIG. 1, reference numeral 10 has been applied generally to a dryer for purposes of illustration, but it will be recognized that the control circuits of the present invention can be used in any type of appliance. The dryer 10 is shown provided with a programmer 11 and having a line cord 12 receiving energization from a wall receptacle 15. The plugs of the line cord 12 are energized from the alternating current distribution system 16 through a signal control means 30. Other wall receptacles such as that shown at 15' in FIG. 1 are connected to the distribution system 16, and a receiver 50 is plugged into the receptacle to give an audible or visual signal every time the transmitter located in the control unit 30 is energized.

The mechanical structure of the control device 30 is best seen in FIG. 4 of the drawings. This unit is self-contained and includes a pair of male connectors 21 and 22 arranged to be received within a standard wall receptacle. On the opposite side of the housing, there is a socket having terminal receiving portions 23 and 24 into which the line cord of the appliance is connected for operation. Located within the control device 30 is a circuit board 26 on which there is mounted a bimetallic actuator 20. As best seen in FIG. 5, the bimetallic actuator 20 is arranged to cooperate with a stationary contact 25, the latter being positioned between the "at rest" position shown in full line in FIG. 5 and the warped position shown in dotted lines 20' in FIG. 5. Thus, as the bimetallic element 20 is rapidly heated up by the line current going through it, a contact 27 on the bimetallic element makes momentary contact with the stationary element 25. The bimetallic element 20 has the characteristic of fast heating and slow cooling. Accordingly, when the appliance such as the dryer 10 is first energized, it quickly moves to the position shown at 25 in FIG. 5. When the appliance is deenergized, the bimetallic element 20 slowly returns to its "at rest" position, so that the contacts 25 and 27 are engaged for substantially longer periods of time.

In FIG. 2 there is illustrated a transmitter circuit with which the bimetallic element 20 can be combined. It

will be seen that the element 20 is in electrical series with the power input to the appliance. The terminals 21 and 23 are connected to each other and to one side of the distribution line 40. The other line 45 is connected to the stationary contact 25. Accordingly, when the bimetallic element 20 is transferring from the dotted line to the solid line position, contacts 25 and 27 become engaged for a short predetermined period of time to energize the transmitter circuit. 35 When contacts 27 and 25 are engaged, alternating current is impressed across a half wave rectifier diode 31 which is connected in series with a limiting resistor 32. A capacitor 33 is placed across the line to serve as a filter capacitor, and a pair of resistors 34 and 35 is placed in series across the line to serve as a voltage dividing network. An oscillator circuit 36 provides a tuned circuit tuned to a predetermined resonant frequency. This circuit includes coils 37, 38 and 39 in combination with a capacitor 41.

A transistor 42 is provided with a bias resistor 43 across which there is a signal by-pass capacitor 44. Another by-pass capacitor 46 appears across the resistor 35 while a 60-cycle blocking capacitor 47 is connected between one side of the inductance coil 37 on the other side of the line.

The transmitter circuit of FIG. 2 is more or less conventional and is illustrated in the drawings merely for sake of completeness. The circuit is designed to provide a signal at a predetermined frequency which happens to be convenient for a particular installation.

A receiver suitable for use with the transmitter of FIG. 2 is shown in FIG. 3. The receiver 50 is energized from an alternating current distribution system 16 by means of conductors 51 and 52. The input voltage appears across the combination of a 60-cycle blocking capacitor 53 and the primary 54 of an input coil generally indicated at 56. Across the secondary 58 of the input coil 56 there is a capacitor 57 forming a tuned circuit therewith. The secondary 58 is tapped off and the signal current passes through a diode 59 to the base of a transistor 61. A signal filter capacitor 62 and a base biasing resistor 63 are connected between the base and the emitter of the transistor 61.

The input line voltage is transformed into a series of half wave pulses by means of a half wave rectifier diode 64. The half wave pulses are smoothed out by means of a voltage divider network consisting of resistors 66 and 67 and a filter capacitor 68. This rectified voltage is used to energize a neon tube 69 which has one of its electrodes connected to the collector of the transistor 61. A collector biasing resistor 71 is connected across the neon tube 69. Accordingly, when the transmitter 30 sends out a signal at a pre-determined frequency, the receiver 50 which is tuned to this frequency will be energized and enough voltage will be generated across the neon tube 69 to provide a visible signal for as long as the transmitter is operating.

An alternate form of the invention is shown in FIG. 6 which is arranged to position a signal source immediately at the appliance rather than remote from the appliance. The signal device 28 can be provided with a self-contained unit such as that shown in FIG. 4. The actuator of the signal device is a bimetallic element 20 having a movable contact 27 adapted to contact a stationary contact 25 when moving between the full line and dotted line positions shown in FIG. 6. Connected to the stationary contact 25 is a buzzer 29 or other signalling device. Accordingly, when contacts 25 and 27 are closed, the buzzer 29 is energized thereby creating an audible signal indicating that the appliance with which the signal device is connected has ceased operation.

The signalling devices of FIG. 4 or FIG. 6 are connected between the line cord of the appliance and the wall receptacle. When a transmitter such as that shown in FIG. 2 is used, a receiver 50 of the type shown in FIG. 3 is plugged into some other receptacle in the alternating current distribution system. When the operator initiates operation of the appliance, the bimetallic element rapidly shifts to its energized position 20', energizing the signal mechanism. When the appliance has finished the cycle at which it has been set and ceases operation, the bimetallic element 20 slowly cools to return to its original position. During this cooling, movable contact 27 makes contact with stationary contact 25, energizing the transmitter of FIG. 2 for the buzzer 29 of FIG. 6. Energization of the transmitter 30 causes a signal to be impressed on the alternating current distribution system, to actuate receiver 50 and provide a visual indication by means of neon tube 69. With the device of FIG. 6, the buzzer 29 is briefly energized to create an audible signal that the appliance has finished its cycle. As the bimetallic element 20 continues to cool, contacts 25 and 27 re-open, thereby de-energizing the signal mechanism.

The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:

1. An appliance energizing system comprising:
means for connecting said appliance to a source of electrical power,
a control means connected between said appliance and said source of electrical power, said control means including
an elongated warp-type bimetallic element connected in series with said source of electrical power and arranged to deflect substantially and rapidly upon passage of the current from said source therethrough, and to return to its original condition substantially more slowly upon cessation of said current,
said element having a first contact thereon at the free end thereof movable through a path of movement of substantial length,
a stationary second contact disposed in the path of movement of said first contact and having an effective width less than the length of the path of movement of said first contact so that it is only momentarily engageable with said first contact during the period of such rapid deflection of said bimetallic element and being engageable in wiping engagement with said first contact for a prolonged period upon cessation of said current, and
signal means actuated upon engagement of said first contact with said stationary second contact.

2. The system of claim 1 in which said signal means includes a transmitter arranged to feed a signal into said source of electrical power and a receiver responsive to signals generated by said transmitter.

3. The system of claim 2 in which said receiver is separate from said transmitter and includes a visual indicator means actuated only upon reception of a signal from said transmitter.

4. The system of claim 1 in which said appliance is a dryer.

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