

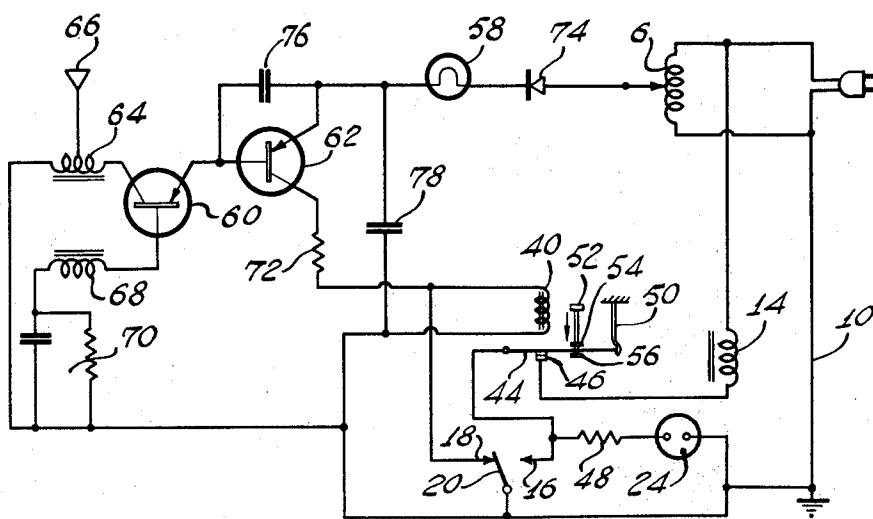
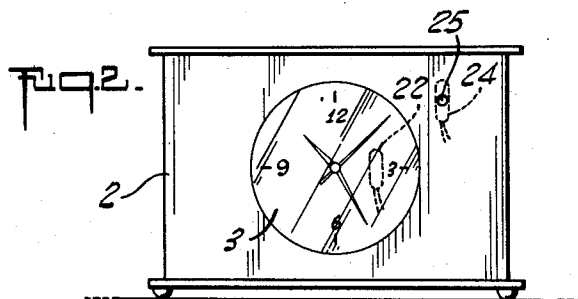
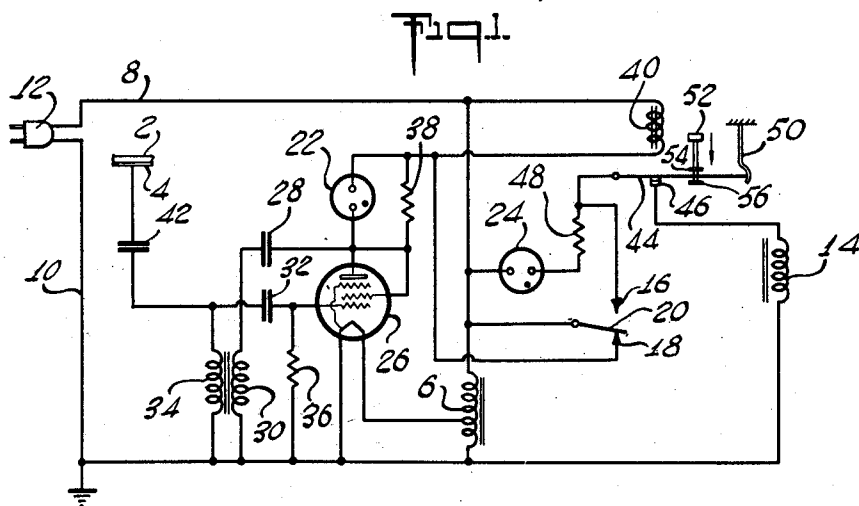
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TOUCH CONTROLLED ELECTRIC ALARM CLOCK

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TOUCH CONTROLLED ELECTRIC ALARM CLOCK

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The present invention relates to touch control circuits for electric alarm clocks and the like and comprises novel touch controlled clock face illuminating and alarm circuits for electric alarm clocks.

Because people waking at night frequently want to know the time many bedside electric or mechanical clocks have radium painted hands and radium painted dial indicia. It is not only difficult to determine the time correctly from the feeble luminescence of the radium paint, particularly when one is drowsy, but the continued presence of radiation, even if small, is now considered as possibly hazardous. The alternative, groping for a light switch and then adjusting one's eyes to the sudden glare, effectively prevents easy return to sleep. Moreover, it often happens that one awakes at night and can not recall whether or not the alarm was set and this requires either feeling around for the alarm button in the dark or lighting the light to find the button.

The invention provides means for illuminating the dial of an electric clock while and only while the casing over a relatively large area is touched by an individual. Thus a drowsy person need only place his hand on the clock casing, read the time and then remove his hand. The invention provides also a signal light which is small enough not to be conspicuous and yet can be readily seen and which is an indication that the alarm has been set. Furthermore, in the circuit of the invention, a touching of the clock casing not only illuminates the clock face but also, during and only during, sounding of the alarm will open the alarm circuit.

The circuit of the invention includes a simple oscillatory circuit the oscillation of which is stopped when the circuit is loaded by a touch of an operator and which when loaded energizes the clock face dial lighting means, a second circuit including a small neon lamp which is lighted when the alarm is set, and a latching relay which is only energized when the clock casing is touched during sounding of the alarm, energization of the relay opening the alarm circuit. When, as is preferably the case, the main lighting means for the clock face is a neon lamp, the neon lamp of the alarm circuit serves not only as an indication that the alarm is set but also provides a source of illumination for the lamp which lights the clock face. Neon lamps, when kept in the dark, require higher starting voltages for energization. The small neon lamp of the alarm circuit thus serves the additional purpose of reducing the starting voltage of the neon lamp used for lighting the clock face.

For a better understanding of the invention and of circuits embodying the same reference may be had to the accompanying drawings of which:

FIG. 1 is a circuit diagram of a touch responsive system embodying the invention and showing neon lamps provided for illumination of the clock face and for signaling that the alarm is set;

FIG. 2 is a front view of an electric alarm clock equipped with the circuit of FIG. 1 and showing suitable locations of the neon lamps with relation to the clock face; and

FIG. 3 is a circuit drawing of an alternative arrangement in which the oscillatory circuit includes transistors

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and in which an incandescent lamp is provided for illuminating the clock face.

In the circuit of FIG. 1, to which reference may now be had, a portion of the clock casing is indicated diagrammatically at 2. The casing may be of plastic material and provided on its inner surface with a conductive layer 4. The clock casing and dial 3 are shown in FIG. 2. The other mechanical parts of the clock have not been shown in the drawing as forming no part of the present invention. The clock motor is illustrated diagrammatically at 6 in FIG. 1 and is connected across leads 8 and 10 connected to the plug 12 for coupling to household alternating current supply lines of say 110 v. 60 cycles, lead 10 being the grounded lead. The alarm buzzer is indicated diagrammatically in FIG. 1 as a winding 14 and contacts controlled by mechanical movement of the clock hands are indicated at 16 and 18, with a movable arm thereof indicated at 20. It will be understood that when the alarm is set arm 20 engages contact 18 and when the time arrives for which the alarm is set, arm 20 moves into engagement with contact 16. A neon lamp is shown at 22 and this lamp as shown in FIG. 2 is positioned within the clock casing to illuminate the clock face when energized. Preferably the dial 3 of the clock is of suitable translucent plastic material that will glow uniformly when illuminated from the rear. A second neon lamp 24 is positioned within the clock casing behind the front opaque frame plate which is provided with a small hole 25 (see FIG. 2) through which light from the neon lamp will be visible. The neon lamp 24 is also so positioned within the clock casing as to have light from it fall upon the lamp 22 for the purpose of preventing deterioration of the lamp 22.

A self-blocking oscillatory circuit is provided for control of the lamp 22. This circuit includes a pentode 26, the anode of which is connected through a capacitor 28 and feedback coil 30 to the cathode. The control grid of pentode 26 is connected through a capacitor 32 and tank coil 34 to the cathode, coils 34 and 30 being inductively coupled together. A high resistor 36 is connected between the control grid and the cathode. The screen grid and anode of the tube are connected together and through a dropping resistor 38, and normally closed contacts 18 and 20 to the ungrounded lead 8 of the power supply. The pentode has a filamentary cathode that is connected across a few turns of the clock motor 6 to provide an energizing voltage of about 3 volts. The neon lamp 22 is connected across the dropping resistor 38 in the anode circuit of the pentode. The conductive lining 4 of the casing 2 is connected through a capacitor 42 to the grid circuit of the pentode.

The operation of the circuit so far described is as follows:

Under normal operation, that is under standby conditions, the circuit oscillates in short bursts of radio frequency energy, and the control grid of tube 26 is held at a high negative potential because the electrons from the filament accumulated by capacitor 32 can not dissipate rapidly through the high resistance 36. Accordingly the tube 26 passes only a very small current, because of this negative bias, and the screen grid and anode potentials are correspondingly high because there is only a small voltage drop across resistor 38. The potential drop across resistor 38 is thus too small to cause illumination of lamp 22. When, however, the casing 2 is touched, high frequency energy flows into the person touching the casing, thus loading the circuit and suppressing the oscillation. The anode-cathode current then rises, reducing the potential of the anode to such an extent that the potential drop across resistor 38 is sufficient to light lamp 22. So long as a person's hand is maintained on the casing 2 the light

22 will illuminate the dial of the clock. When the hand is moved from the casing, oscillation resumes with consequent increase in grid bias on condenser 32 and therefore a reduction in anode-cathode current and extinguishment of the neon lamp.

The part of the circuit controlling energization of the neon indicating lamp 24 and of the alarm will now be described. A winding 40 of a relay has associated therewith an armature 44 which in the released position of the relay engages a contact 46 connected to the alarm buzzer winding 14. The armature 44 is connected through a resistor 48 and the signal lamp 24 to the ungrounded power lead 8. Thus when the armature is in engagement with contact 46 current sufficient to light the lamp 24 but insufficient to energize the buzzer flows in the circuit including the lamp 24, resistor 48 and winding 14. The armature 44 is connected directly to the normally open contact 16 of the clock contacts. Accordingly when the time for which the alarm is set arrives and contacts 16 and 20 close, by virtue of the mechanical elements in the clock, the lamp 24 and resistor 48 are shunted from the alarm circuit thereby increasing the current through winding 14 and the buzzer sounds. Closing of contacts 16 and 20 opens the shunt about winding 40 of the relay and puts this winding in series with the anode circuit of tube 26. Accordingly if at this time the casing 2 is touched to load the oscillatory circuit, the increased current through tube 26 flows through the relay winding and energizes the relay to pick up its armature and open the buzzer circuit.

In order to prevent resumption of sounding of the alarm upon removal of the hand from the clock casing, the relay is provided with means for latching the armature in attracted position. The particular latching means illustrated in the drawing comprises a spring detent 50 over which the armature rides when moving to attracted position, the detent maintaining the armature in attracted position after deenergization of the relay winding. The buzzer circuit is thus held open at contact 46. Any other suitable latching relay could be employed instead of that specifically illustrated.

Manually operable means are provided for resetting the buzzer circuit. These means comprise a plunger 52 carrying spaced buttons 54 and 56 positioned on opposite sides of the armature 44, the armature being suitably apertured for passage of the plunger therethrough. When the plunger is pushed downwardly button 54 engages the armature, releasing it from detent spring 50 and bringing it into engagement with contact 46. If the operator, once he has set the alarm and pushed the plunger 52, decides he does not want to set the alarm, he lifts the plunger 52 whereupon button 56 lifts the armature and brings it into position where it is latched by spring 50 out of engagement with contact 46.

Thus the circuit of FIG. 1 provides not only for illumination of the clock face whenever desired by touching the casing of the clock but also provides for opening of the buzzer circuit upon touching of the casing. The clock face will be illuminated when the buzzer is silenced. This is desirable as it permits the operator to note the time when the buzzer sounds.

An alternative circuit arrangement for use in an electric alarm clock is shown in FIG. 3. In this embodiment of the invention an incandescent lamp 58 is provided for illumination of the clock face and therefore in this circuit the small neon signal lamp serves only for indicating that the alarm is set. In FIG. 3 a transistor oscillatory circuit is shown including a pair of transistors 60 and 62. The collector of transistor 60 is connected through an inductor 64 comprising a feedback coil to the grounded lead 10 of the power supply. The casing of the clock indicated symbolically in FIG. 2 as an antenna 66 is connected to a tap on the inductor 64. The base of transistor 60 is connected through a tank coil 68 and RC circuit 70 to the lead 10. The emitter of transistor

60 is connected to the base of transistor 62. The collector of transistor 62 is connected through a resistor 72 and normally closed contacts 18 and 20 of the clock contacts to the grounded lead 10 of the supply lines. The emitter of transistor 62 is connected through the lamp 58 and rectifier diode 74 to a tap on the clock motor winding 6. A capacitor 76 is connected between the base and emitter of transistor 62 and a capacitor 78 is connected between the emitter of transistor 62 and the grounded lead 10. The winding 40 of the relay controlling armature 44 is connected across contacts 18 and 20 as in the circuit of FIG. 1. Contact 16 of the clock contacts is connected through resistor 43 to the neon signal lamp 24 and to armature 44. The contact 46 associated with armature 44 is connected as in FIG. 1 to the buzzer solenoid 14.

The operation of the circuit is substantially similar to that given in connection with the description of FIG. 1. In normal operation, with contacts 18 and 20 closed, lamp 24 is illuminated but the current therethrough is insufficient to energize the buzzer. The transistor circuit will oscillate in bursts of high frequency energy due to the coupling between coils 64 and 68. Consequently but small current will flow through the emitter collector circuit of transistor 60 and the potential at the base of transistor 62 will be such that the current through the collector emitter circuit thereof will be insufficient to light the lamp 58. When the oscillatory circuit is loaded by touching the antenna 66 (clock casing) oscillation is suppressed and consequently transistor 60 will draw sufficient current to lower the base potential of transistor 62 and cause sufficient current to flow through the emitter collector circuit of that transistor to light the lamp 58. When the hand is removed from the clock casing oscillation is resumed and the lamp is extinguished. When the mechanical movement of the clock hands opens contacts 18 and 20 and closes contacts 16 and 20 the lamp 24 and resistor 48 are shunted from the circuit of solenoid winding 14. Consequently the current through the solenoid 14 is sufficient to sound the alarm. Opening of contacts 18 and 20 places winding 40 of the relay in the emitter collector circuit of transistor 62. If now the casing is touched the increased current through transistor 62 is sufficient to energize relay 40 to lift armature 44 to open the alarm circuit. Latch 50 thereupon maintains the armature in circuit opening position, ready to be reset under control of the operator.

The invention has now been described in connection with two embodiments thereof. Obviously the invention is not limited to the specific circuit details nor to the particular type of latching relay described. Various changes could be made without departing from the spirit of the invention or the scope of the accompanying claims. For example, a transistor oscillator, using but one transistor could be used instead of the two transistor circuit and either circuit could be employed for energizing a neon lamp rather than an incandescent lamp. Similarly an oscillatory circuit employing a vacuum tube could be employed for control of an incandescent lamp rather than a neon lamp. Also, although it is preferred when a vacuum tube is employed to energize the filament thereof from a tap on the clock motor the filament could be energized directly from the alternating current power lines through a suitable capacitor to provide reactive impedance. Other variations will occur to those skilled in the art.

The following is claimed:

1. In an electric alarm clock having a casing, leads for connection to a power supply, an electrical alarm and an arm moved from a first position to a second position when the alarm is to be sounded, the combination comprising a circuit connecting a signal lamp, a resistor and the alarm in series across the leads, the current through said circuit, when the leads are connected to the power supply, being sufficient to light said lamp but in-

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sufficient to sound the alarm, a shunt circuit for said lamp and said resistor including said arm and a contact engageable by said arm when in said second position, the current through said alarm being sufficient to sound the alarm when said shunt circuit is closed, and means responsive to touch of the clock casing by an operator for opening said first mentioned circuit, said last mentioned means being operable only when said arm is in said second position.

2. The combination according to claim 1 including a lamp for illuminating the face of the clock, said means responsive to touch of the clock casing operating irrespective of the condition of the shunt circuit to energize said last mentioned lamp while and only while the casing is touched.

3. The combination according to claim 2 wherein said last mentioned lamp is a neon lamp and said first mentioned lamp is so positioned that light therefrom when said arm is in said first position illuminates the neon lamp to reduce the starting voltage thereof.

4. The combination according to claim 1 wherein said last mentioned means include a latching relay having a winding shunted by said arm when in said first position, said relay when energized, opening said first mentioned circuit, said means responsive to touch of the casing by an operator causing energization of the relay when said arm is in said second position.

5. The combination according to claim 4 wherein the relay has an armature which is biased to one position in which it closes said first mentioned circuit and when the relay is energized is moved to a second position in which

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said first mentioned circuit is open, said relay being provided with releasable means for latching the armature in said second position, and operator controlled means for releasing the armature from said second position.

6. The combination according to claim 5 wherein said last mentioned means includes a movable plunger extending through an aperture in the armature and carrying stop means positioned at opposite sides of the armature whereby said armature may be moved to or from said second position by appropriate direction of longitudinal movement of the plunger.

7. The combination according to claim 1 wherein the clock casing has a conductive lining and wherein said last mentioned means includes an oscillatory circuit coupled to said lining, the touch of an operator loading the circuit and suppressing oscillation thereof, a latching relay having a winding shunted by said arm in said one position and connected to said oscillatory circuit to be energized therefrom when said arm moves to said second position, the current through said winding being insufficient to actuate said relay when said oscillatory circuit is oscillating and sufficient when oscillations are suppressed to actuate the relay, the relay, when actuated, opening the alarm circuit.

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