Feb. 13, 1962 L. L. WEBER 3,021,520

ELECTRIC SIGNALING DEVICE

Filed Dec. 12, 1960

FIG.1

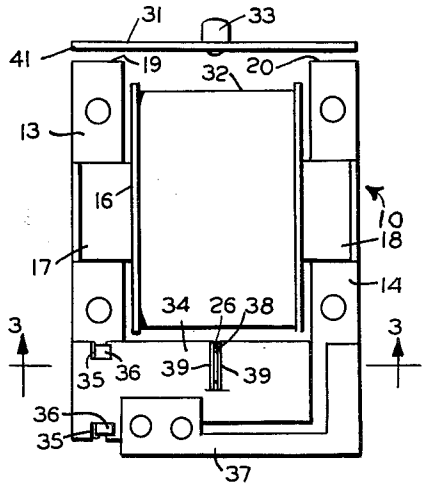
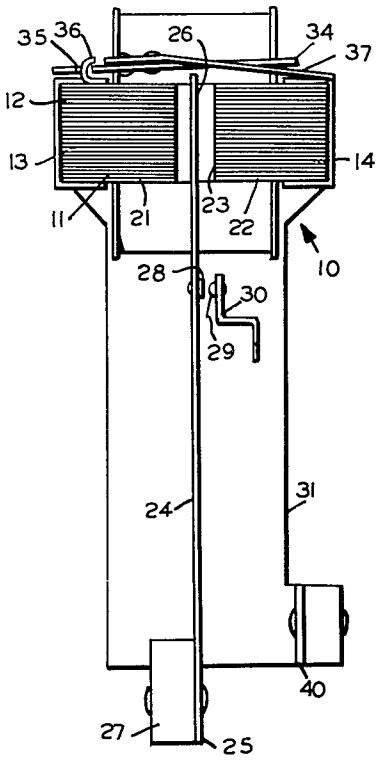


FIG.2



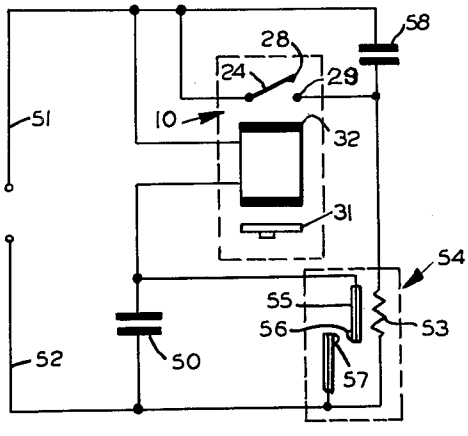


FIG.4

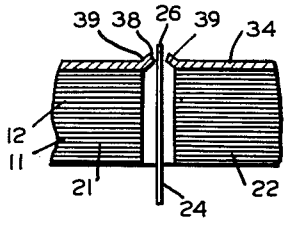


FIG.3

INVENTOR.
LEO L. WEBER

BY

Robert D. Sommer

AGENT

United States Patent Office 3,021,520 Patented Feb. 13, 1962

3,021,520

ELECTRIC SIGNALING DEVICE

Leo L. Weber, Logansport, Ind., assignor to Essex Wire Corporation, Fort Wayne, Ind., a corporation of Indiana

Filed Dec. 12, 1960, Ser. No. 75,276
3 Claims. (Cl. 340—384)

This invention relates to an electric signaling device comprising a combination sounder and vibrating reed relay.

Signaling devices of this type are intended for use in electrical signaling systems employing a signal current of a predetermined frequency superimposed on power supply lines. In one such system which has been proposed for warning of an impending disaster, means are provided for superimposing a 240-cycle signal on the 60-cycle power lines. Frequency-responsive receivers connected to the power lines provide an audible warning in response to a 240-cycle signal.

One form of receiver for such signaling systems employs an inductor connected in series with a capacitor across the power lines in a circuit that is resonant at the 240-cycle signal frequency. The inductor has an air gap in which a reed mechanically resonant at the 240-cycle frequency vibrates when the signal current is applied to the power lines. The vibrating reed closes a circuit to a timing device which energizes a sounder if the 240-cycle signal is maintained for a predetermined period of time. It has been proposed to also use the inductor to operate a sounder clapper with 60-cycle power by shorting the series capacitor. Because the magnetization of the inductor is considerably greater when energized by the full power line voltage, the reed is subjected to excessive and destructive forces.

It is, therefore, the object of this invention to provide an improved combination sounder and vibrating reed relay device of the foregoing type in which the reed is protected from damage when the device is operated as a sounder.

Another object is to provide an improved signaling device of the foregoing type which is relatively inexpensive to manufacture.

The signaling device in accordance with this invention comprises, in addition to the inductor, the resonant reed and the clapper, an armature associated with the inductor which locks the reed in a fixed position when the inductor is energized by the full voltage of the supply lines. The locking means of the armature are shaped to guide the reed to its locked position despite the reed's having a large amplitude of vibration when initially engaged by the armature.

Other objects and features of the invention will appear as the invention is described in connection with the accompanying drawing in which:

FIG. 1 is a plan view of an electric signaling device embodying the invention;

FIG. 2 is a side elevation of the signaling device;

FIG. 3 is a fragmentary sectional view taken along the line 3—3 of FIG. 1; and

FIG. 4 is a schematic diagram of an electrical control of which the signaling device may be an element.

Referring now to the drawing in detail, the numeral 10 indicates a signaling device constructed in accordance with this invention. The device 10 has a magnetic core 11 comprising a stack of laminations 12 secured together by clamping members 13 and 14. The core 11 is of generally H shape having a cross piece 16 and two legs 17 and 18 terminating at one end in poles 19 and 20, respectively, and at the other end in perpendicularly disposed extensions 21 and 22, respectively, whose spaced ends define pole faces separated by an air gap 23. A flat

spring reed 24 of magnetic material supported by one end at 25 has its other end 26 disposed within the air gap 23. The reed 24 may be polarized by a permanent magnet 27 and carries a contact 28 which intermittently engages a relatively fixed contact 29 on bracket 30 whenever the reed 24 vibrates with sufficient amplitude. A clapper 31 of resilient, magnetic material is positioned adjacent the poles 19 and 20 and is free to vibrate when coil 32 on cross piece 16 of the core is suitably energized. The clapper 31 may carry a button 33 for striking against a suitable sounding element (not shown), such as the side wall of an enclosure for the signaling device.

The leg 17 of core 11 carries a movable magnetic armature 34 which overlies the extensions 21 and 22. At one end the armature 34 has two notches 35 disposed to accommodate bent-over projections 36 with sufficient clearance to permit movement of the free end of the armature 34 relative to the core 11. A bent spring member 37 of non-magnetic material is secured at one end to armature 34 and has its other end in engagement with core leg 18 to normally bias the free end of armature 34 away from the core 11. The armature 34 is formed with a notch 38 in longitudinal alignment with the free end of the reed 24. The sides of the notch are defined by converging spaced lugs 39 bent approximately at an angle of 30 degrees from the plane of the armature 34 in a direction away from the free end of the reed 24. When the armature 34 is attracted to the core 11, the inclined faces of the lugs 39 engage the free end of reed 24 and guide it to a position where it fully enters the notch 38 as shown in FIG. 3.

The reed 24 is mechanically resonant at a selected frequency which, for example, may be 240 cycles. When the coil 32 is energized by a signal of that frequency, the reed vibrates in core gap 23 and repeatedly closes contacts 28 and 29. The clapper 31 which may be a flexible, flat strip of magnetic material fixed at one end 40 and having its other end 41 positioned adjacent the poles 19 and 20 of the core 11 is so constructed that the required energizing power to vibrate it is considerably greater than that required to vibrate reed 24. In addition, the clapper preferably should have a natural frequency of vibration lower than the operating frequency of reed 24.

In FIG. 4, there is shown the control system of a receiver for a signaling system employing the signaling device of this invention. The coil 32 is connected in series with a capacitor 50 between conductors 51 and 52 which, for purposes of illustration, may be assumed to be the usual 120-volt, 60-cycle household supply lines. The reactance value of capacitor 50 is selected so that the capacitor 50 and coil 32 are tuned to series resonance at the signal frequency. Thus, this circuit has a high impedance to the 60-cycle voltage and insufficient 60-cycle current flows through coil 32 to operate either reed 24 or clapper 31. The heater 53 of an electric timing device 54 is also connected across the conductors 51, 52 and is energized whenever the reed 24 causes the contacts 28, 29 to close. The timing device 54 includes a bimetal member 55 responsive to heat developed by heater 53 to close contacts 56 and 57. The contacts 56 and 57 are connected in a circuit-shunting capacitor 50 and when they close the coil 32 is energized by the full line voltage of conductors 51, 52. A capacitor 58 may be connected across contacts 28, 29 to minimize contact arcing.

When a continuous signal of predetermined frequency is superimposed on the normal line voltage of conductors 51 and 52, reed 24 will vibrate and repeatedly close contacts 28 and 29. Closing of the contacts 28, 29 energizes heater 53 and if the signal is maintained sufficiently long, causes bimetal member 55 to close contacts 56, 57, thereby shorting capacitor 50. With full line voltage applied to coil 32, the core is now magnetized at a much higher

level. The clapper 31 will intercept some leakage flux between the poles 19, 20 of the core 11 and will vibrate at a rate corresponding to the flux pulsations which with a 60-cycle line voltage will be 120 vibrations per second.

Because the magnetization of core 11 with full line voltage applied to coil 32 is many times greater than that resulting from the relatively low-voltage, high-frequency signal before the capacitor 50 is shorted, reed 24 would vibrate with a magnitude which could destroy it unless free motion of the reed is prevented. However, leakage flux from the core extensions 21, 22 is effective upon energization of coil 32 by the full line voltage to move the armature 34 toward the core 11 against the force of spring member 37. As the armature 34 moves toward the core 11, the free end of the vibrating reed 24 is engaged by the inclined sides of lugs 39 and guided into notch 38 where it is held. Contacts 28, 29 no longer will close and after bimetal member 55 cools, capacitor 50 will be reconnected in series with coil 32. This removes the full line voltage from coil 32, and the clapper will discontinue its movement. At the same time spring member 37 moves armature 34 away from core 11 to release the reed 24.

It will be apparent that signaling device of this invention may be employed in receiver circuits other than that described above. It is also apparent that various modifications may be made to the specific form of embodiment described herein without departing from the scope of the invention as set forth in the appended claims.

What is claimed is:

1. An electric signaling device comprising, in combination: a vibratory reed mounted to have a predetermined natural frequency of vibration; a magnetic clapper for producing an audible signal; an electromagnet disposed adjacent said reed and said clapper for driving said reed and clapper; the clapper requiring an energizing power for its operation considerably in excess of the power required for driving said reed; a magnetic armature member disposed adjacent said electromagnet so as to be attracted toward the electromagnet by flux therefrom whenever said electromagnet is energized with power considerably in excess of that required for driving said reed; said armature having latching means engageable with said reed to limit the amplitude of vibration of said reed whenever said armature is attracted toward said electromagnet; and means biasing said armature to a position in which said latching means are disengaged from said reed.

2. An electric signaling device comprising, in combination: a magnetic core including two pairs of cooperating poles; an energizing coil for said core; a vibratory reed of magnetic material having a predetermined, natural frequency of vibration; said reed being mounted with a free end positioned intermediate a first pair of said poles whereby energization of said winding will drive said reed; normally open electric contact means associated with said reed and being alternately opened and closed upon vibration of said reed whereby said contact means may be closed when electrical energy at said predetermined frequency is applied to said coil; a magnetic clapper for producing an audible signal; said clapper being mounted adjacent the second pair of said poles and being vibrated in accordance with flux pulsations of said core when said coil is energized with power considerably in excess of that required for driving said reed; a magnetic armature mounted adjacent said first pair of poles and movable from a normal position to an attracted position whenever said coil is energized with power considerably in excess of that required for driving said reed; said armature having a notch into which said free end of the reed moves when said armature moves to its attracted position to limit the amplitude of vibration of said reed whereby said electric contact means are held open; and spring means biasing said armature to said normal position.

3. An electric signaling device according to claim 2 wherein said core is of a generally H shape with two legs and a cross piece; said coil being disposed on said cross piece; the adjacent ends of said legs at one end of the core defining said second pair of poles; said clapper comprising a resilient member fixed at one end and having its other end extending adjacent said second pair of poles so as to be attracted to said second pair of poles by alternating flux therefrom; the ends of said legs at the other end of said core having perpendicularly disposed extensions with spaced end portions defining said first pair of poles; said armature being pivotally mounted on one of said extensions in overlying relation to the air gap between said extensions; said notch in said armature being formed by converging spaced lugs bent from the plane of the armature in a direction away from the free end of said reed.

No references cited.