May 20, 1969 D. J. DONOHOO 3,445,810

ALERTING APPARATUS

Filed May 27, 1966

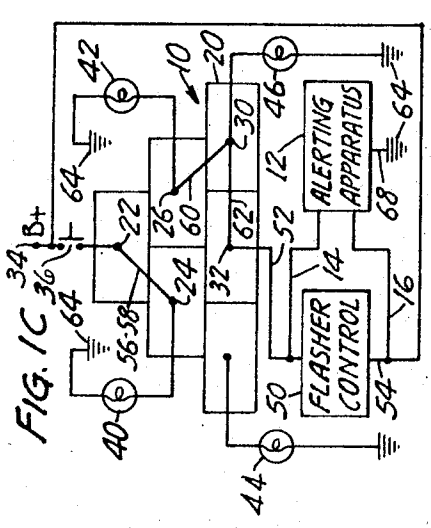


FIG. 1C

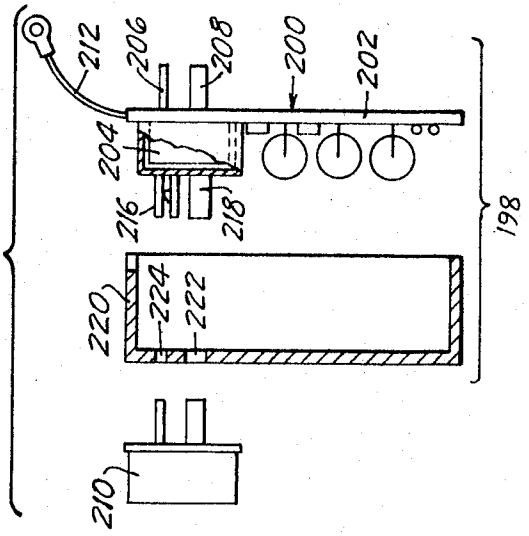


FIG. 4

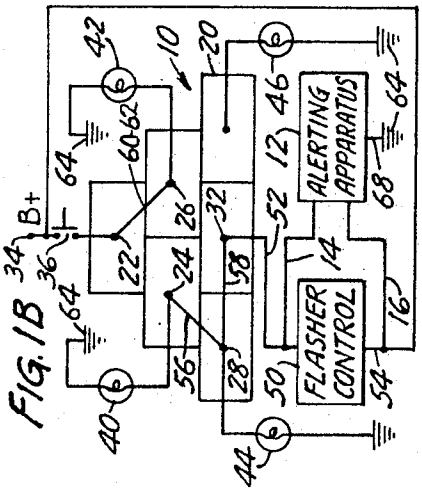


FIG. 1B

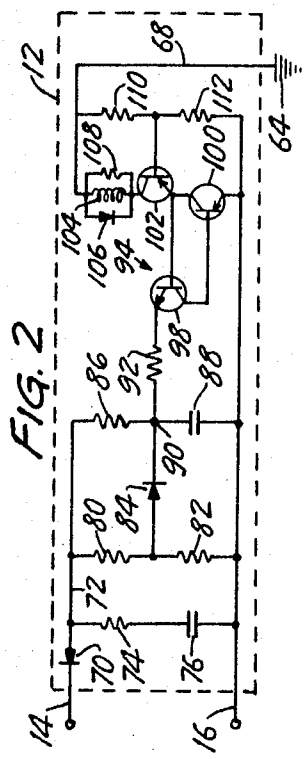


FIG. 2

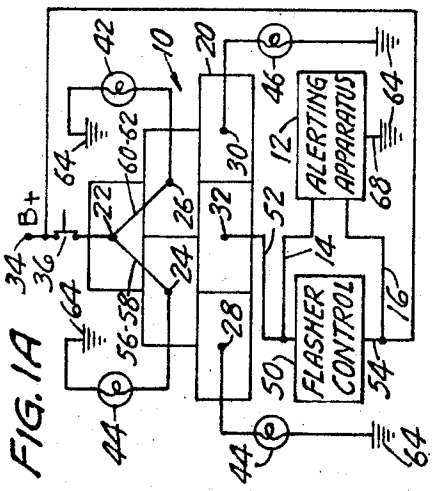


FIG. 1A

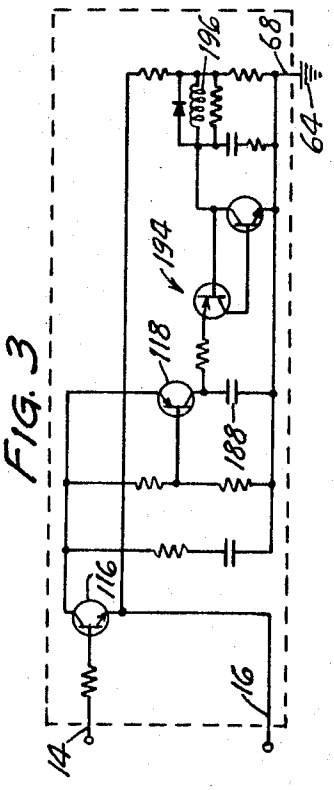


FIG. 3

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ALERTING APPARATUS

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This invention relates to apparatus for indicating an uncancelled directional indicator and more particularly to alerting apparatus adapted for use with a vehicle directional signalling system for warning a driver of an operating uncancelled directional indicator.

Vehicle directional signalling systems in nearly all motor vehicles utilize a directional indicator which is actuated by a driver moving a directional control lever to a predetermined position to indicate a change in vehicle direction. In many motor vehicles, the actuated directional indicator is self-cancelling in response to the vehicle completing a change in the indicated direction; however, to insure operation of the self-cancelling directional indicator, it is necessary that the steering wheel of the vehicle be turned sufficiently in the indicated direction so that upon reverse turning of the steering wheel the directional indicator is cancelled and the directional control lever returned to its cancelled position. Thus, in certain situations such as when changing lanes or making a slight turn, the steering wheel of the vehicle is not rotated sufficiently to cancel the directional indicator. When this occurs, a driver is usually unaware that the directional indicator is operating even though pilot lights on the instrument panel may be flashing to indicate the uncancelled indicator, and even though the flasher control, which typically is a thermal strip operative as a switch, may continue to produce a low level audible click to warn the driver that the indicator is still operative.

It is known in prior art lamp signalling systems to provide an audible signal during the time the signalling system is actuated to warn the driver that the signalling lamps are actuated. Certain other prior art devices adapted for use with a vehicle lamp signalling system produce a loud audible noise each time the signal lamp is energized by the flasher unit. Another known device produces a continuous audible sound a predetermined time after actuation of the directional indicator. This latter device employs a flasher control comprising a thermal strip operative as a switch which closes and actuates a buzzer about ten seconds after the indicator is actuated. Yet another known device employs mechanical integrating means for actuating a signal means after the vehicle has traversed a given distance from the place of initiation of the directional signal.

Each of the prior art devices has the disadvantage that either an audible signal is continuously emitted during the entire time a lamp indicator is energized or only a single discontinuous audible sound is produced to alert a driver of an operating directional indicator upon each energization. An audible signal, produced each time the signal lamp is energized, becomes monotonous and is easily disregarded by the driver.

The present invention overcomes the above disadvantages of the prior art devices by providing apparatus which operates to provide a delayed reminder warning signal a predetermined time interval after actuation of the directional indicator to alert the driver that his directional indicator remains uncancelled. The apparatus repeats the warning signal thereafter at predetermined spaced intervals so as to continuously alert the driver until the directional indicator is cancelled.

By utilizing the teachings of this invention, a conventional vehicle directional signalling system can be easily

modified to produce a pleasing audible reminder signal at spaced intervals for alerting a driver to an operating uncancelled directional indicator. The reminder signal provided herewith greatly reduces the possibility of inadvertent operation of an uncancelled directional indicator thereby providing safer driving.

Another advantage of the present invention is that when an operating uncancelled directional indicator is indicating a change of vehicle direction in a first direction, the driver can move the directional control lever to indicate a change in a second direction and cancel operation of the alerting apparatus relating to the first direction. In cancelling operation of the alerting apparatus, the predetermined time interval between warning signals is adjusted such that a change of vehicle direction in the second direction resulting in an uncancelled directional indicator allows the operating uncancelled directional indicator to operate for a predetermined time interval beginning at the time when the directional indicator is actuated to indicate the change of vehicle direction in the second direction.

The above and further advantages of the present invention will become more fully apparent when viewed in light of the following detailed description and drawing.

FIGURES 1A, 1B and 1C are schematic diagrams illustrating a typical vehicle directional signalling system having the alerting apparatus of this invention electrically connected thereto with the directional control level thereof in the cancelled, right and left positions, respectively;

FIGURE 2 is a schematic diagram showing one embodiment of the alerting apparatus of FIGURE 1 having diode steering switching;

FIGURE 3 is another embodiment of the alerting apparatus of FIGURE 1 having transistor steering switching; and

FIGURE 4 is a diagrammatic representation of the printed circuit embodying the circuitry of either FIGURE 2 or FIGURE 3 adapted to have a conventional flasher control removably connected to said alerting apparatus.

Briefly, the alerting apparatus of this invention is used for warning a driver of an operating uncancelled directional indicator. The alerting apparatus, in one embodiment, is adapted for use with a vehicle directional signalling system. The alerting apparatus includes means which is responsive to actuation of the directional indicator, such as for example a signal lamp and the like, for registering indicator operation for a predetermined time interval. A control means is operatively coupled to the registering means and the control means actuates a control circuit after the indicator has been operating for a predetermined time interval. The control means at the end of a predetermined time interval resets the registering means to register a subsequent predetermined time interval. Further, the control means includes means for resetting the registering means when the directional indicator is cancelled before the end of a predetermined time interval. An alerting means is operatively coupled to the control means and is responsive to actuation of the control circuit by the control means. The alerting means, upon actuation of the control circuit, produces a warning signal to alert the driver that the directional indicator is uncancelled. The alerting means produces the warning signal each time the control circuit is actuated by the registering means at the completion of each predetermined time interval.

Referring now to the schematic diagrams of FIGURES 1A, 1B and 1C, a vehicle directional signalling system designated generally as **10** is electrically connected to an alerting apparatus designated as **12** via conductors

14 and 16. The signalling system 10 comprises a wiring block 20 having a plurality of wiring terminals 22 through 32. Such a wiring block may be found, for example, in a 1963 Oldsmobile F–85 automobile. Wiring terminal 22 is electrically connected to the vehicle's electrical power source designated as 34 via a master brake cylinder switch 36. Wiring terminals 24 and 26 are electrically connected to a pair of directional indicators, for example, rear signal lamps 40 and 42 respectively. Wiring terminals 28 and 30 are electrically connected to front signal lamps 44 and 46 respectively.

Wiring terminal 32 is electrically connected to a conventional flasher control 50 via a conductor 52. The flasher control may be, for example, a conventional 12-volt flasher type 536, which is used as a flasher control on the 1963 Oldsmobile F–85 automobile circuit chosen here for illustration. The flasher control has a thermal strip operative as a switch, which strip is heated by the current flowing therethrough to energize either lamps 40 and 44 to indicate a left turn or lamps 42 and 46 to indicate a right turn. When the thermal strip is heated to a predetermined temperature, the strip opens the circuit to disconnect the power source from the lamps. The thermal strip, upon cooling to a lower temperature, closes the circuit to connect the power source 34 to the signal lamps. The flasher control 50 operates to intermittently energize the lamps until the lamps are cancelled. The flasher control is electrically connected to the vehicle's electrical power source 34 via a conductor 54. Conductors 14 and 16 of the alerting apparatus 12 are electrically connected to conductors 52 and 54 respectively of the vehicle directional signalling system 10.

The signalling system 10 includes a plurality of movable switch members 56 through 62 which are connected directly to the directional control level of the signalling system. The switch members 56 through 62 are utilized to connect certain of the wiring terminals 22 through 32 together in a predetermined manner depending on the position into which said switch members are set by the driver to indicate a change in vehicle direction.

When the switch members 56 through 62 are in a position wherein the directional indicators are cancelled as in FIGURE 1A, switch members 56 and 58 are electrically connected between terminals 22 and 24 while switch members 60 and 62 are electrically connected between terminals 22 and 26. With the switch members 56 through 62 in the cancelled position, actuation of the master brake cylinder switch in response to the driver utilizing the vehicle brakes connects the wiring terminal 22 via switch 36 to the source of energy 34 causing the rear signal lamps 40 and 42 to be energized. When cylinder switch 36 is closed, an electrical circuit is completed from the source of energy 34, switch 36 and through on parallel circuit comprising switch members 56 and 58 and lamp 40 to chassis ground 64 and another parallel circuit comprising switch members 60 and 62 and lamp 42 to chassis ground 64. The alerting apparatus 12 also has a grounding lead 68 connected to chassis ground 64 thereby insuring that the alerting apparatus 12 utilizes the chassis ground 64 as a common reference potential.

When the signalling system 10 is actuated to indicate a right change of vehicle direction as illustrated in FIGURE 1B, the switch members 56 and 58 are reconnected to different wiring terminals of the wiring block 20 in response to movement of the directional control lever which directly operates the members 56 through 62. Switch member 56 is physically connected between terminals 24 and 28 while switch member 58 is electrically connected between terminals 28 and 32. Switch members 60 and 62 remain connected between terminals 22 and 26. With the switch members 56 and 58 in position to indicate a change of vehicle direction to the left, the signal lamps 40 and 44 are operated at intermittent intervals by the flasher control 50 to indicate the change in vehicle direction from both the rear and the front. An electrical circuit to lamps 40 and 44 is completed from source 34, conductor 54 and flashed control 50, conductor 52, wiring terminal 32, switch member 58, wiringn terminal 28 directly via lamp 44 to ground 64 and via switch member 56 via lamp 40 to ground. At any time, each lamp has its filament connected to chassis ground 64.

Upon actuation of the signal lamps 40 and 44, the flasher control 50 has its thermal strip in the closed position energizing the lamps. The thermal strip in the flasher control remains closed until it is heated to a predetermined temperature by the current flowing therethrough to the lamps 40 and 44. When the thermal strip is heated to the predetermined temperature, it opens de-energizing the lamps 40 and 44. The thermal strip remains open until it cools to a lower predetermined temperature whereupon the lamp circuit is energized from source 34.

When the thermal strip in the flasher control 50 is in its closed position, the potential applied to conductors 14 and 16 are substantially the same. Conversely, when the flasher control 50 has its thermal strip in the open position it de-energizes lamps 40 and 44 and a potential difference is established between conductors 14 and 16. Conductor 14 is electrically connected to chassis ground 64 through the filaments of signal lamps 40 and 44. Additionally, alerting apparatus 12 is connected to the chassis ground 64 via grounding lead 68.

If the change in vehicle direction is less than that required to actuate the self-cancelling operation, the directional indicators will remain uncancelled and after a predetermined time interval, say for example a time interval selected from a range of about fifteen seconds to about twenty-five seconds, the alerting apparatus 12 produces a warning signal to alert the driver that the directional indicator is uncancelled. In the event the first alert is ignored, a second predetermined time interval elapses and the alerting apparatus 12 again produces a warning signal to alert the driver of the uncancelled directional indicator. The alerting apparatus 12 will continue to produce the warning signal at intermediate intervals until either the driver cancels the directional indicator or resets the directional indicator to indicate an opposite change in vehicle direction.

Still referring to FIGURE 1B, if the driver slows the vehicle using the vehicle braking system, the cylinder switch 36 will be closed and only signal lamp 42, or the left rear signal lamp, will be energized while the right rear signal lamp 40 is intermittently operated by the flasher control 50 to indicate the change in vehicle direction.

FIGURE 1C shows the relationship of the switch members 56 through 62 for indicating a left turn. When the signalling system 10 is actuated by the directional control lever to indicate a left turn, switch members 60 and 62 are physically connected to different wiring terminals while switch members 56 and 58 are connected to the same terminals. Switch member 60 is electrically connected between terminals 26 and 30 while switch member 62 is electrically connected between terminals 30 and 32. When the switch members 56 through 62 are set for indicating a left turn, left rear signal lamp 42 and left front signal lamp 46 are operated at intermediate intervals by the flasher control 50 to indicate a change to the left in vehicle direction. Operation of the alerting apparatus 12 is substantially the same as that in FIGURE 1B.

Referring now to the schematic diagram of FIGURE 2, the circuitry of the alerting apparatus 12 is illustrated, the external conductors 14 and 16 and grounding lead 68 to facilitate connecting the alerting apparatus to the conventional signalling system 10 being exposed for ready connection into the vehicle turn signal circuit. Interiorly, the alerting apparatus 12 includes a diode 70 with the cathode thereof connected to conductor 14. The anode

of diode 70 is connected to a common conductor 72. A resistor 74 is connected to conductor 72 and in series circuit with a capacitor 76, which capacitor is electrically connected between resistor 74 and conductor 16. A voltage dividing network comprises resistors 80 and 82 and is also connected between conductors 72 and 16. A diode 84 has its anode connected to the common junction terminal between resistors 80 and 82 and its cathode connected to a common junction between a resistor 86 and a capacitor 88. Resistor 86 has its other end connected to common conductor 72 while the other terminal of capacitor 88 is connected to conductor 16.

Voltage dividing resistors 80 and 82 establish a relatively low voltage on the anode of diode 84. Resistor 86 and capacitor 88 normally establish a relatively high voltage on the cathode of diode 84 keeping diode 84 normally back biased. However, when conductor 14 is disconnected from ground by the switch members 56 through 62 and capacitor 88 has a charge thereon, diode 84 will be forwardly biased until that charge is substantially depleted. In this embodiment, capacitor 88 may be referred to as a registering means since it accumulates a charge only when the directional indicator is actuated.

One end of a resistor 92 is connected to the common junction terminal 90 of diode 84, resistor 86 and capacitor 88 while the other end of resistor 92 is connected to a control means, for example a switching device designated generally as 94. Device 94 may be any device capable of exhibiting nonlinear characteristics, and in this embodiment device 94 comprises NPN transistor 98 and PNP transistor 100. The other end of resistor 92 is connected to the emitter of transistor 98, which transistor has its collector connected to the base of transistor 100. The base of transistor 98 is electrically connected to the collector of transistor 100 while the emitter of transistor 100 is electrically connected to conductor 16. Transistors 98 and 100 form a switching device which becomes conductive when capacitor 88 charges to a predetermined voltage level. The collector of transistor 100 and base of transistor 98 are connected to the emitter of a PNP transistor 102 which functions as a switch for a control circuit. The collector of transistor 102 is connected to an alerting means, illustrated as a coil 104 of a buzzer capable of producing an audible signal. A diode 106 is electrically connected across the coil 104 in a direction to be conductive when the coil is de-energized to discharge the inductive transient voltage produced by the coil 104. The other end of coil 104 is connected to grounding lead 68. A resistor 108 is electrically connected in parallel to the coil 104 and diode 106. Resistor 108 discharges any voltages inducted into the coil 104 from operation of other accessory in the vehicle thereby eliminating any inadvertent operation of the buzzer due to inductive coupling picked up by coil 104. Control circuit switch, transistor 102, is connected to a common junction terminal between voltage dividing resistors 110 and 112, which resistors are connected in series circuit between grounding lead 68 and conductor 16 respectively. When device 94 is nonconductive, the base of transistor 102 is biased at the predetermined voltage required to drive device 94 into conduction. The transistor 102 keeps the potential of coil 104 from floating over a range of potentials prior to operation of device 94.

When the vehicle directional signalling system 10 is actuated to indicate a change in vehicle direction, for example a right turn, flasher control 50 will immediately energize the directional indicator's signal lamps 40 and 44 of FIGURE 1B. When this occurs, conductors 14 and 16 are connected at substantially the same potential, which is that of the source 34. However, when the flasher control 50 de-energizes the signal lamps, conductor 14 is connected to chassis ground through the filaments of the signal lamps 40 and 44. When this occurs, the cathode of diode 70 is connected to ground with respect to conductor 16 thereby forwardly biasing diode 70. Immediately capacitor 76 charges because of the small RC time constant between resistor 74 and capacitor 76. However, resistor 86 and capacitor 88 form a long RC time constant circuit whereby capacitor 88 charges at a rate substantially slower than that of capacitor 76. As capacitor 88 charges, the potential of the common junction terminal 90 begins to decrease. However, capacitor 88 can charge only as long as conductor 14 is connected to ground through forwardly biased diode 70. When the flasher control 50 closes its thermal strip re-energizing the signal lamps 40 and 44, the potential of conductor 14 is immediately raised to substantially the potential of conductor 16. Diode 70 immediately becomes back biased and the charge on capacitor 76 begins to dissipate through resistors 82, 80 and 74 keeping diode 84 back biased. When this occurs, capacitor 88 continues to charge while diode 84 remains back biased. When the flasher control 50 again de-energizes signal lamps 40 and 44, conductor 14 is again connected to chassis ground and capacitor 88 continues to accumulate a charge and capacitor 76 is recharged to the potential of source 34. Capacitor 76 is recharged by each intermittent off period of the lamps 40 and 42 keeping a sufficient potential difference between conductors 14 and 16 such that the capacitor 88 continually charges. After a predetermined time interval, capacitor 88 is charged to a predetermined voltage level which causes device 94 to be rendered conductive. The predetermined voltage level is determined by the voltage established on the base of transistor 102 by voltage dividing resistors 110 and 112. Device 94 is rendered conductive by making the potential of common junction terminal 90 negative with respect to conductor 16 such that the potential difference between the emitter and base of transistor 98 is reduced sufficiently to render transistor 98 conductive. When transistor 98 is driven into conduction, transistor 100 is also rendered heavily conductive driving transistor 102 into saturation. When transistor 102 is in saturation, the potential across the buzzer coil 104 is substantially the potential on conductor 16. Thus current flows through the emitter-collector of transistor 100, emitter-collector of transistor 102 and through coil 104 to grounding lead 68 back to chassis ground 64. The coil when thus energized activates the buzzer. The device 94 remains in its conductive state until the charge on capacitor 88 is dissipated.

The charge on capacitor 88 dissipates through resistor 92, the emitter-collector of transistor 98 and the base-emitter of transistor 100. The device 94 remains conductive until the charge on capacitor 88 drops below a minimum voltage level where the device 94 cannot be maintained in conduction. This minimum voltage level is determined by the characteristics of transistors 98 and 100. When device 94 becomes nonconductive, the control circuit which actuated coil 104 is regeneratively de-energized. When coil 104 is de-energized, the transient voltage developed thereacross is discharged by means of diode 106 to prevent the transient voltage from exceeding the voltage ratings of transistors 98 and 100. Resistor 108 prevents false triggering of transistors 98 and 100 due to induced transients picked up by coil 104.

If the directional indicators remain uncancelled, capacitor 88 is again recharged through its associated resistor 86 and when the charge thereon reaches the predetermined voltage, the device 94 is again rendered conductive energizing coil 104 to produce the warning signal to the driver. When the uncancelled directional indicator is cancelled, conductor 14 is electrically disconnected from the chassis ground and is raised to substantially the potential of the source 34. The charge on capacitor 76 is dissipated through resistors 82, 80 and 74. When the charge on capacitor 76 is substantially dissipated, diode 84 is then forwardly biased. Any charge on capacitor 88 is then very quickly dissipated through resistor 82 and diode 84. When capacitor 88 is discharged, the alerting apparatus 12 is ready to be actuated when

the directional indicator is actuated to indicate a change in vehicle direction.

In this embodiment, the capacitor **88** functions as a means for registering a predetermined time interval beginning when the directional indicator is actuated. The switching device **94** functions as a control means which is responsive to the registering means for operating the alerting means after a predetermined time interval to produce a warning signal to the driver to indicate the uncancelled directional indicator. When the capacitor **88**, the registering means, operates the switching device **94**, the control means, the capacitor **88** is quickly discharged, and when so discharged, is reset to record a subsequent predetermined time interval. Further, when the directional indicator is cancelled the registering means, capacitor **88**, is immediately reset or discharged without actuating the device **94**.

In one embodiment of FIGURE 2, the elements were selected as follows.

Element:	Type or value
Diode **70**	1N456.
Resistor **74**	220Ω.
Capacitor **76**	1000 μf., 16 volts.
Resistors—	
80	150Ω.
82	1500Ω.
Diode **84**	1N456.
Resistor **86**	10,000Ω.
Capacitor **88**	1000 μf., 16 volts.
Resistor **92**	68Ω.
Transistors—	
98	2N2430.
100	2N404.
102	2N404.
Coil **104**	12-volt D.C., 40Ω.
Diode **106**	1N456.
Resistors—	
108	100Ω.
110	220Ω.
112	220Ω.

The circuitry of FIGURE 3 differs from that of FIGURE 2 in that pulses produced in response to conductor **14** being abruptly changed in potential between chassis ground and the potential of the power source are switched by an NPN transistor **116**. The signal is applied to a second PNP transistor **118** to charge a capacitor **188**. Capacitor **188** controls a device **194** to energize the buzzer coil **196**. In this embodiment the voltage rating of the coil **196** is reduced to about one-half of that for the coil **104** in FIGURE 2.

In FIGURE 4, the alterting apparatus **12** is illustrated as an assembly **198** having a printed circuit board **200**. Circuit board **200** has an insulating base **202** which supports the capacitors, resistors, diodes, transistors and buzzer in addition to the printed circuitry which interconnect the components. A buzzer **204** is illustrated as being mounted at one end thereof. The printed circuit board **200** may include plug members **206** and **208** which are adapted to plug into a receptacle in a control panel normally utilized for a conventional flasher control unit **210**. A grounding conductor **212** is provided for connection to any conveniently located fastener connected to the vehicle frame. The circuit board **200** further includes receptacle plugs **216** and **218** into which the flasher control unit **210** can be inserted. A cover **220** having openings **222** and **224** therein encloses the printed circuitry on board **200**.

An alerting apparatus assembly **198** can be easily installed into the late model motor vehicles my merely removing the flasher control unit **210** from the fuse block, inserting the alerting apparatus assembly **198** into the flasher control receptacle plug, and remounting the flasher control unit **210** into the receptacle plugs **216** and **218** provided on the alerting apparatus assembly **198**. The installation is completed by securing grounding conductor **212** to the chassis frame by a fastener.

What is claimed is:

1. Apparatus for alterting a driver to an operating uncancelled directional indicator for use with a vehicle directional signalling system comprising:

means responsive to actuation of a directional indicator for registering indicator operation over a predetermined time interval;

control means operatively coupled to said registering means and including a control circuit which is actuated when the indicator remains operative for said predetermined time interval, said control means resetting said registering means following actuation of said control circuit to immediately register a subsequent predetermined time interval, said control means including means for resetting said registering means when said directional indicator is cancelled before the end of a predetermined time interval; and

alterting means operatively coupled to said control means and responsive to actuation of said control circuit for producing a warning signal to alert said driver that said directional indicator is uncancelled, said alerting means producing said signal each time said control circuit is actuated by said registering means at the completion of each predetermined time interval.

2. The apparatus of claim **1** adapted for use with a vehicle directional signalling system including a directional control lever which actuates said directional indicator and wherein said resetting includes

means responsive to said directional control lever being moved from a first position indicating a change of vehicle direction in a first direction into a second position indicating a change of vehicle direction in a second direction for resetting said registering means to establish a new predetermined time interval between actuation of said control circuit which begins when the directional control lever is moved from said first position to said second position to indicate a change of vehicle direction from said first direction to said second direction.

3. Apparatus set forth in claim **1** wherein said registering means is a storage capacitor and said alerting means is a sound producing means.

4. The apparatus of claim **1** wherein said registering means is a resistor connected in series circuit with a capacitor wherein the charging characteristics of said resistor-capacitor circuit determine said predetermined time interval, and wherein said control means is a device exhibiting a nonlinear characteristic and is capable of being driven into conduction to energize said control circuit when said capacitor is charged to a predetermined level.

5. The apparatus of claim **1** wherein said alerting means produces said warning signal at an interval in the range of about fifteen seconds to twenty-five seconds until said directional indicator is cancelled.

6. Apparatus for alerting a driver to an operating uncancelled directional indicator for use with a vehicle directional signalling system employing front and rear signal lamps energized from the vehicle electrical power source, which lamps have their filaments electrically connected to chassis ground, said apparatus comprising

a printed circuit which is mounted on an insulating base, said printed circuit comprising

means responsive to actuation of a directional indicator for registering indicator operation over a predetermined time interval,

control means operatively coupled to said registering means and including a control circuit which is actuated when the indicator remains operative for said predetermined time interval, said control means resetting said registering means following actuation of said control circuit to immediately register a subsequent predetermined time interval, said control

means including means for resetting said registering means when said directional indicator is cancelled before the end of a predetermined time interval,

alerting means operatively coupled to said control means and responsive to actuation of said control circuit for producing a warning signal to alert said driver that said directional indicator is uncancelled, said alerting means producing said signal each time said control circuit is actuated by said registering means at the completion of each predetermined time interval;

a first conductor adapted to be connected to said vehicle electrical power source and to said printed circuit for energizing said registering means, said control means and said alerting means;

a second conductor connected to said printed circuit and adapted to be connected to the chassis ground through the filament of at least one signal lamp; and

a third conductor connected to said printed circuit and adapted to be connected directly to said chassis ground.

7. The apparatus of claim **6** further including a mounting means adapted to receive a flasher control which operates signalling lamps as the directional indicator in said vehicle directional signalling system.

8. An electrical circuit for producing a warning signal at predetermined intervals to indicate an operating uncancelled lamp directional indicator adapted to be connected across a flasher control of a vehicle directional signalling system, said flasher control being connected to the vehicle source of potential, said circuit comprising

a capacitor adapted to be electrically connected to the flasher control source of potential;

a first resistor electrically connected in series circuit with said capacitor at a common junction terminal for establishing a timing circuit;

means connected across said series connected capacitor and said first resistor for connecting said source of potential thereacross when said lamp directional indicator is actuated;

a first diode having a cathode and an anode, said cathode being electrically connected to said common junction terminal;

a second resistor electrically connected in parallel to said capacitor and having one end thereof connected to said source of potential and its other end connected to the anode of said first diode for providing a discharge circuit for said timing circuit when said diode is forwardly biased in response to said indicator being cancelled;

said capacitor being charged through said first resistor by said connecting means while said lamp directional indicator is actuated;

a device exhibiting nonlinear characteristics being electrically connected between said common junction terminal and said source of potential, said device being driven into conduction when said capacitor charges to a predetermined level from said source of potential and becoming nonconductive after the charge on said capacitor is discharged through said device; and

signalling means electrically connected to said device for producing an audible signal the duration of which is determined by the amount of time required for said capacitor to discharge rendering said device nonconductive.

9. The electrical circuit of claim **8** wherein said signalling means is a buzzer having an inductive coil, said circuit further including

a second diode electrically connected across said coil in a direction to be conductive when said coil is deenergized to discharge the inductive transient voltage produced by said coil.

10. The circuit of claim **8** further including a printed circuit which is mounted on an insulating base.

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ALVIN H. WARING, *Primary Examiner.*

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