United States Patent

[11] 3,571,665

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[54] **LONG INTERVAL TIMING CIRCUIT**
2 Claims, 2 Drawing Figs.

[52] **U.S. Cl.** **317/142,** 317/151, 317/154, 317/148.5
[51] **Int. Cl.** **H01h 47/32**
[50] **Field of Search** ..... 307/293, 269, 132; 317/142, 148, 148.5, 148.5 (TD), 148.5 (B)

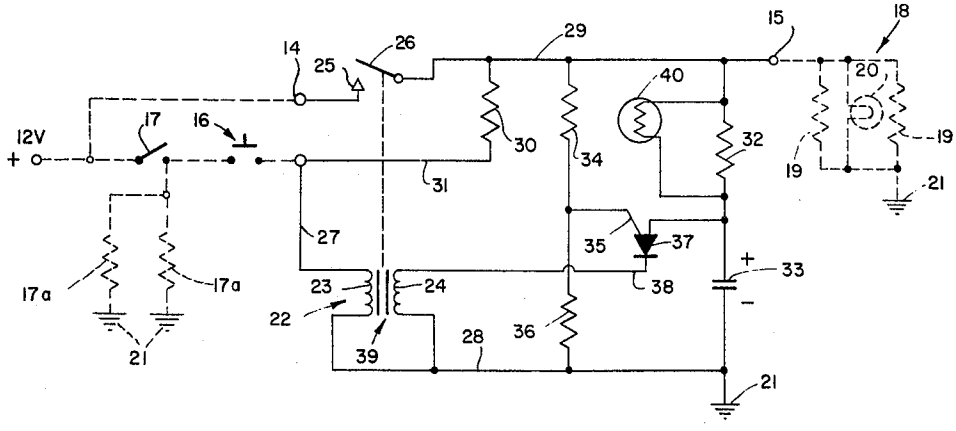
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ABSTRACT: This is a timing device having only electrical terminals and using a relay with a bucking coil. One of the coils of the relay activates the timing cycle while the bucking coil, after a predetermined time cancels the cycle.



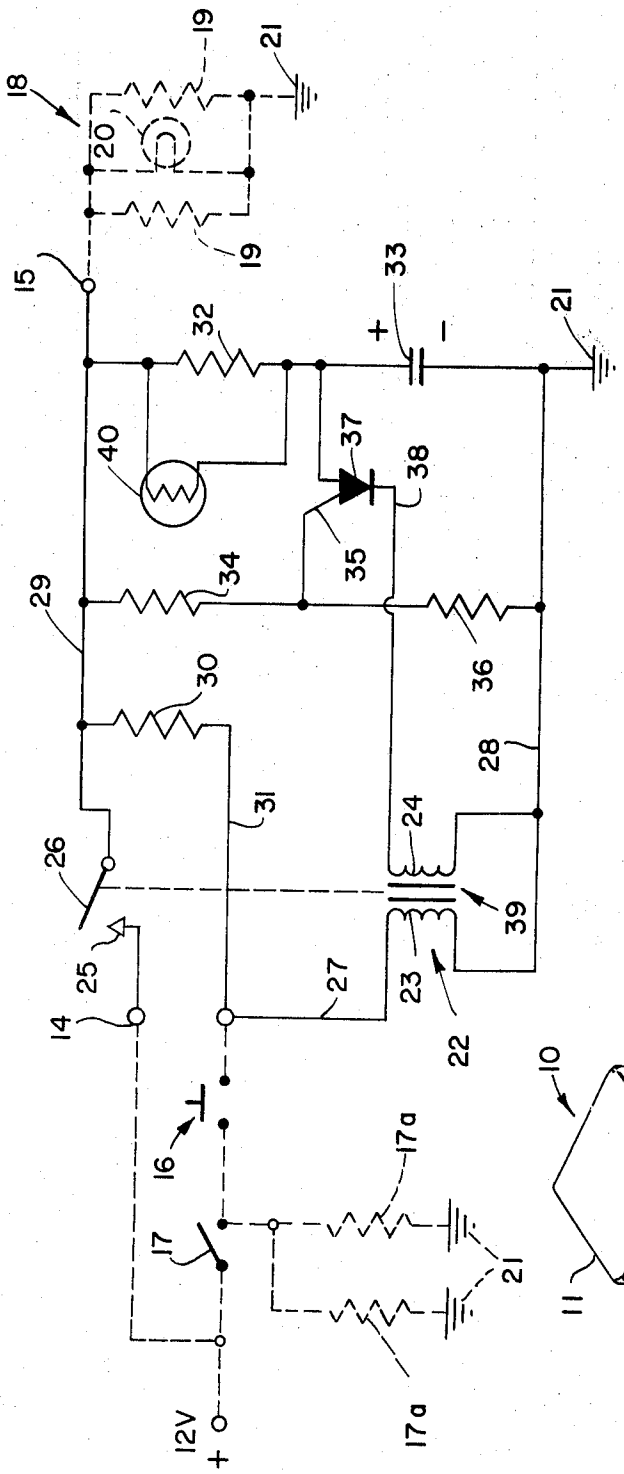


FIG. 1

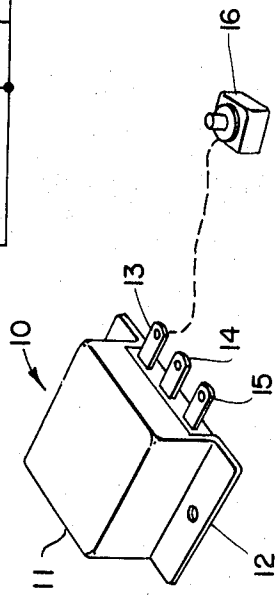


FIG. 2

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LONG INTERVAL TIMING CIRCUIT

SUMMARY OF THE INVENTION

This invention relates to a long time interval heavy direct current timing device for controlling window heaters or the like of the order of about ten minutes in automotive applications.

There is a need for a long interval timer in automotive applications to control and limit the battery drain caused by heavy current devices such as electric heaters driven from the battery source. Manual switching of the prior cut for such heavy current devices results in the operator sooner or later omitting to turn off such a switch. Prior attempts to provide timing circuits for controlling such devices have resulted in inconsistent time periods available from the devices produced as well as a time period which is highly variable with any one device depending on temperature. Again prior devices are relatively complex to install, requiring many electrical connections and fastenings of mechanical parts to the degree that a special installation is required.

It is a main object of the invention to provide a long interval heavy current DC timing device for automotive use in the form of a packaged unit having three electrical terminals only and adapted to provide a timing interval of the order of 10 minutes with a tolerance of the order of ± 2 minutes and having a timing interval greater at −40° F. than at +40° F.

With the foregoing and other objects in view the invention generally concerns a long time interval heavy direct current device for automotive use actuatable by a pushbutton pulse-type switch in the ignition circuit and comprising: a load terminal, a battery terminal, an actuating switch terminal and a chassis ground connection, a relay having a first relay winding, a second bucking winding and normally open contacts; a timing resistor and charging condenser in series between the battery terminal and ground through said normally open contacts; a holding resistor between said load terminal and said switch terminal, said first winding being connected between said switch terminal and said ground connection; a transistor having an anode connected between said timing resistor and condenser; voltage dividing resistor and condenser; voltage dividing resistors in series between said load terminal and said ground connection, said transistor having a gate connected between said voltage dividing resistors to determine the voltage at which said condenser discharges through said transistor, said transistor having a cathode connecting to energize said bucking winding to said ground connection to energize said bucking winding in opposition to said first winding with said condenser discharge thus to open the contacts of said relay after a period of time determined substantially by said timing resistor and said condenser.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is an electrical schematic of the device of the invention showing one manner of connecting same in an automobile circuit shown in part in chain lines; and

FIG. 2 is a perspective view of the mechanical form of the device of the invention.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring to the drawings the device **10** of the invention is generally confined within an enclosure or housing **11** rising from mounting base **12** adapted to be grounded to an automobile chassis. A battery connection terminal **13**, an ignition actuating switch terminal **14** and a load terminal **15** extend exteriorly of the housing **11**. A pushbutton type of switch **16** will normally be used to initiate the time cycle of the device of the invention from the ignition circuit having ignition switch **17** and dead circuit resistance **17***a*. The load terminal **15** is connectable to a load **18** such as heating coils **19** and an indicator light **20** in parallel therewith to chassis ground **21**.

Relay **22** has a first winding **23** and a second bucking winding **24** and normally open contacts **25,26**.

When pushbutton switch **16** is momentarily closed by the operator providing ignition switch **17** is closed, terminal **13** connected by line **27** to the first winding **23** through line **28** to ground **21** causes contacts **25,26** to close thereby connecting battery voltage to line **29** and load terminal **15** to energize the load. Holding resistor **30** connected between the load terminal by line **29** and the switch terminal by line **31** immediately on closure of contacts **25,26** communicates battery voltage to the battery terminal **13** and the first winding **23** even though switch **16** may be quickly opened. Relay **22** will be held energized until released by the timing circuit now to be described.

Timing resistor **32** and charging condenser **33** are connected in series between the load terminal **15** and ground **21**. A positive voltage is applied from line **29** through resistor **34** to gate **35** at a potential determined by voltage dividing series resistor **36** connecting to line **28** and ground **21**. The unijunction-type transistor **37** is idle during the timing cycle of voltage build up in condenser **33**. When the control voltage between the gate **35** and anode of transistor **37** connected between timing resistor **32** and condenser **33** becomes forward biased, the gate fires causing a negative resistance between anode and transistor cathode **38** in series with bucking winding **24** to line **28** and ground. The condenser charge thus passes through the bucking winding **24** to reduce total flux in relay core **39** to zero thereby releasing the relay contacts **25,26** to the normal open position.

The thermistor **40** in parallel with timing resistor **32** is intended to overcompensate for temperature responsive characteristics of condenser **33** to give the longest cycle time at the lowest operating temperature and a lesser cycle time at higher temperatures in order to deliver more total heat from an electric heater at lower temperatures than at higher temperatures. The range of operation characteristics considered with relation to cycle time extends from −40° F. to +40° F. as a convenient range for test, though operation is designed to extend substantially beyond each end of such range.

The resistor **30** may have a value of 200 ohms while a resistor **34** may have a value of 1,000 ohms with the resistance **36** at **22***k* ohms and the resistor **32** at 1.8 ohms. A convenient value for the capacitor **33** is 220 microfarad and the thermistor may have a resistance of 1 M.

I claim:

1. A long time interval heavy direct current device for automotive use actuatable by a pushbutton pulse-type switch in the ignition circuit and comprising; a load terminal, a battery terminal, an actuating switch terminal and a chassis ground connection, a single relay having a first relay winding, a second bucking winding and normally open contacts; a timing resistor and polarized charging condenser in series between the battery terminal and ground through said normally open contacts; a holding resistor between said load terminal and said switch terminal and said ground connection; a transistor having an anode connected between said timing resistor and condenser; voltage dividing resistor in series between said load terminal and said ground connection, said transistor having a gate connected between said voltage dividing resistors to determine the voltage at which said condenser discharges through said transistor, said transistor having a cathode connecting through said bucking winding in opposition to said first winding with said condenser discharge thus to open the contacts of said relay after a period of time determined substantially by said timing resistor and said condenser, the holding resistor forming a part of the circuit sealing in actuation of the first relay winding after actuation of the pushbutton pulse type resistor.

2. A long time interval heavy direct current device for automotive use actuatable by a pushbutton pulse type switch in the ignition circuit as set forth in claim 1 wherein the thermistor is placed in parallel with said timing resistor.

UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

Patent No. 3,571,665 Dated March 23, 1971

Inventor(s) Rodney Hayden

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Column 1, lines 46 and 47, delete "to energize", add - - through - -.

Column 2, lines 54 and 55, add after the word termin - - said first winding being connected between said switch terminal - -: Column 2, lines 61 and 62, add after the word winding - - to said ground connection to energize said bucking winding - -.

Signed and sealed this 2nd day of November 1971.

(SEAL)
Attest:

EDWARD M.FLETCHER,JR.
Attesting Officer

ROBERT GOTTSCHALK
Acting Commissioner of Pat