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(54) TIMER FOR WINDSCREEN WIPERS

(71) We, F.A.A.B. FABBRICA ACCESSORI AUTO BOLOGNESE S.p.A., of 5, Via Sarti, 40054 Budrio (Bologna), Italy, an Italian Company, and DARIO FAVA, of 55 Via Cesare Battisti, 46026 Quistello (Mantova), Italy, an Italian citizen, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to an electronic timer for windscreen wipers in motor vehicles and the like for producing a continuous or intermittent operation of the windscreen wiper.

According to the invention a timer for windscreen wipers, including a control relay for controlling a windscreen wiper driving motor, is characterized in that the relay coil is controlled by a normally open solid state switch whose control electrode is connected through a capacitor to a cut-off voltage, through a first variable resistor to one of a normally open pair of contacts of the relay, which pair of contacts are arranged to be closed only when the relay is energized to close a cut-off voltage circuit, and through a second variable resistor and a closable switch to an energizing voltage.

A preferred embodiment of the invention will now be described by way of example and with reference to the accompanying drawing in which the only Figure is a circuit diagram of the timer and windscreen wiper driving motor.

The drawing shows a windscreen wiper driving motor 10 of the automatically operating type having an electromagnetic brake and a ground terminal 12, a positive feed terminal 14 and limit switch terminals 16 and 18 energized intermittently in a known manner during operation of the windscreen wiper by rotation of the motor 10 to keep the windscreen wiper automatically working.

In a conventional circuit without a timer, the terminals 12, 14, 16, 18 of the motor 10 would be connected to the terminals 20, 22,

24, 26 of a four-pole two-position switch 28 to connect the motor, on the one hand, to earth 30 and, on the other hand, to the positive voltage of the battery 32.

With the use of the timer, as proposed according to the invention, such timer comprises two pairs of terminals indicated by 34, 36 and 38, 40, respectively. The terminal 34 of the timer is connected both to the terminal 14 of the motor and the terminal 22 of the switch 28. The terminal 36 is connected both to the terminal 16 of the motor and the terminal 24 of the switch 28. The terminals 38 and 40 of the timer are connected to the terminal 18 of the motor and the terminal 26 of the switch 28, respectively, whereas the terminal 12 of the motor and the terminal 20 of the switch are connected to each other. The two terminals 34 and 36 link up with normally open contact 42 of a relay 46 while the two terminals 38 and 40 link up with normally closed movable contact 44 of the same relay. In the energized position of the relay, the movable contact 44 engages an auxiliary fixed contact 70 for purposes to be described hereinafter.

The timer further comprises a first transistor 50 whose emitter is connected to a common line 61 and whose collector is connected to the coil 48 of the relay 46 and in parallel to a diode 52. The opposite end of the coil 48 is connected to the terminal 34 of the timer through a switch 54.

The base of the transistor 50 is connected to the emitter of a second transistor 56 whose collector is polarized by a resistor 58 and whose base is connected to a resistive-capacitive divider comprising a capacitor 60 connected to the common line 61, and a variable resistor 62, 64 connected to the switch 54. Further, the base of the transistor 56 is series-connected to the fixed contact 70 of the relay 46 through another variable resistor 66, 68.

When voltage is applied to the timer from the terminal 34 by closing the switch 54 when switch 28 is set to OFF, the capacitor 60 is charged with a time constant determined by the resistor 62 until the transistor

56 becomes conductive and supplies voltage to the transistor 50 which in turn becomes conductive to energize the relay 46. Such energization on the one hand produces closure of the movable contact 42 to form a continuous feed circuit to the motor 10 and, on the other hand, causes the movable contact 44 to switch over to interrupt the electrical connection between the terminals 38 and 40 of the relay 46, thus interrupting the ground connection to the terminal 18 of the motor which is connected to an auxiliary winding for exerting a braking action on the motor (in this manner the braking action on the motor is removed, such braking action on the motor being required each time when at the end of a windscreen wiper stroke the main positive voltage supply is interrupted.)

As the movable contact 44 is switched over, the base of the transistor 56 is also connected to the common line 61 through the resistor path 66, 68 which in cooperation with the capacitor 60 causes cut-off of the transistor 56 after a predetermined time determined by the variable resistor 68. Such predetermined time corresponds to the time of desired energization of the windscreen wiper motor 10 and can be adjusted so that the windscreen wiper will carry out the desired number of strokes for each actuation.

As soon as the capacitor 60 is discharged and has caused cut-off of the transistor 56, the relay is de-energized and, on the one hand, interrupts the continuous voltage supply path to the motor 10 and, on the other hand, interrupts the resistor path 66, 68 which serves for discharging the capacitor 60. The de-energized relay closes the terminals 38 and 40 of the relay 46 and thus re-establishes the continuous voltage path toward the terminal 18 of the motor which is thus slowed down by putting on the brake which ensures its stopping at the end of each windscreen wiper stroke, which otherwise would be uncertain because of its moment of inertia which might be sufficient to cause it to continue its rotation and allow the windscreen wiper to somewhat exceed its predetermined stroke. Then the capacitor 60 is allowed to recharge through the resistors 62 and 64 with an adjustable time constant and finally, after a predetermined time which corresponds to the time interval between two actuations of the motor 10, switches over again the transistor 56 to the conductive state. Such time interval can, of course, be curtailed by reducing the resistance in the voltage supply to the capacitor 60 until it becomes practically zero, when the windscreen wipers will operate substantially continuously.

Therefore, the variable resistor 62 may be provided with a control knob on the dashboard of the motor vehicle so that the driver

can adjust the frequency of operation of the windscreen wipers as desired at any time during the use of the vehicle.

Due to the arrangement of the timer on the contacts of the windscreen wiper motor and switch it will be evident that the timer is grounded by a contact of the switch 28 which is grounded only in the inoperative (OFF) position of the switch 28. This affords the advantage that when the windscreen wiper motor is actuated by its switch, the circuit of the timer is automatically interrupted (by interruption of the ground connection).

The timer according to the invention can be connected to any type of windscreen wiper motor even if it is already provided with a timer operating at a fixed frequency without preventing the operation of the latter. It can also be connected to windscreen wiper motors which have no electromagnetic brake which is operated each time the windscreen wiper stop control is actuated, and have a mechanical brake instead. In this latter case the connection of the timer may even be more simple if only the normally open contact 42 is used which ensures the continuous supply of positive voltage to the motor 10. In fact, these latter windscreen wiper motors have control means with only one contact which serves to establish a continuous supply of positive voltage.

It will thus be evident that, on the one hand, the timer according to the invention affords the user the possibility of adjustment of the frequency of intermittent operation of the windscreen wipers, as required to adapt this operation to atmospheric conditions, for which a selection between continuous and intermittent operation as is now afforded by conventional windscreen wipers is not sufficient, and on the other hand, the present timer permits the duration of actuation of the windscreen wipers to be adjusted according to the characteristics of the windscreen wiper motor and the mechanical apparatus driven thereby, for example, when the windscreen wipers are mounted on the motor vehicle.

#### WHAT WE CLAIM IS:—

1. A timer for windscreen wipers including a control relay for controlling a windscreen wiper driving motor, characterized in that the relay coil is controlled by a normally open solid state switch whose control electrode is connected through a capacitor to a cut-off voltage, through a first variable resistor to one of a normally open pair of contacts of the relay, which pair of contacts are arranged to be closed only when the relay is energized to close a cut-off voltage circuit, and through which a second variable resistor and a closable switch to an energizing voltage.

2. A timer as claimed in claim 1, char-

acterized in that the solid state switch comprises a pair of cascaded transistors.

5 3. A timer as claimed in claim 1 or 2 when mounted on a motor vehicle for controlling a windscreen wiper, characterized in that at least said second variable resistor is manually operable by the driver during use of the vehicle.

10 4. A timer as claimed in claim 3, characterized in that the second variable resistor is adjustable to an extent such as to substantially eliminate the time interval between

two successive actuations of the windscreen wiper.

15 5. A timer for windscreen wipers in motor vehicles, the timer being substantially as hereinbefore described with reference to and as illustrated by the accompanying drawing.

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COMPLETE SPECIFICATION

1 SHEET

This drawing is a reproduction of the Original on a reduced scale

