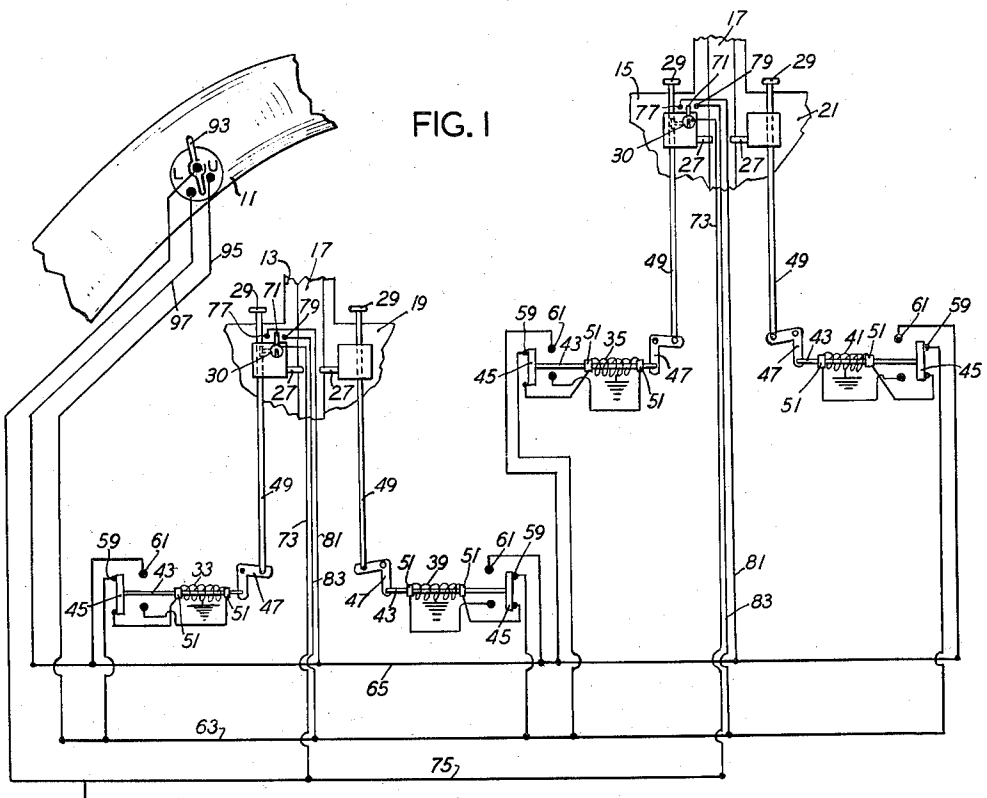
July 15, 1958 W. J. TROUDT 2,842,953

AUTOMOBILE DOOR LOCK CONTROL CIRCUIT

Filed Dec. 6, 1954

FIG. 1



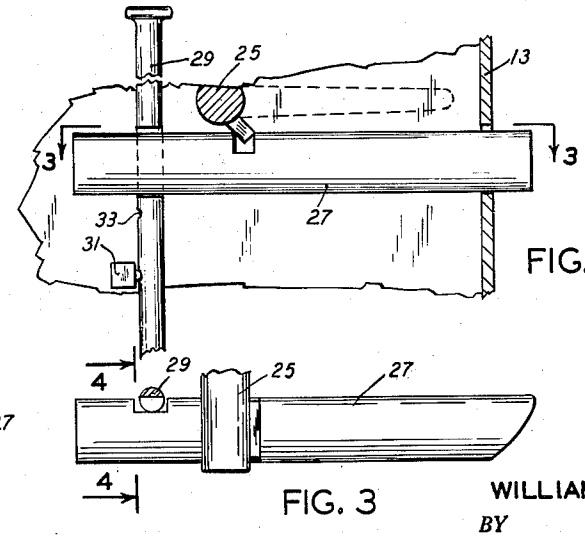


FIG. 2

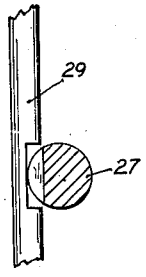


FIG. 4

FIG. 3

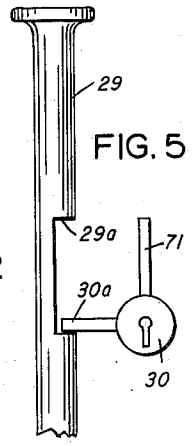


FIG. 5

INVENTOR.
WILLIAM J. TROUDT
BY
Buckhorn and Cheatham
ATTORNEYS

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AUTOMOBILE DOOR LOCK CONTROL CIRCUIT

William J. Troudt, Portland, Oreg.

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1 Claim. (Cl. 70—264)

This invention relates to a lock control circuit for locking or unlocking the doors of an automobile.

It is a main object of the present invention to provide a lock control circuit for the door lock system of a conventional automobile which will not interfere with the normal operation of the door lock system in case the circuit becomes inoperative.

It is another object of this invention to provide a circuit as described immediately above which includes an electromagnetic device for each door, the electromagnetic devices being so connected to one another and to the battery of the automobile that a break in the circuit in one electromagnetic device will have no effect on the other electromagnetic devices.

Another object of the present invention is to provide such a lock control circuit having electromagnetic devices operable upon closure of a switch for simultaneously locking or unlocking the doors of an automobile, the circuit being designed so that the electromagnetic devices are automatically de-energized immediately after actuation thereof, independently of the operation of the switch.

A further object of the present invention is to provide a circuit of the type just described above having a control switch within the automobile, the switch being of the type which remains in its thrown position, wherein the position of the switch handle or lever indicates whether the door locks are locked or unlocked.

Various other objects of the present invention will be pointed out in connection with the following specification and drawings, wherein:

Fig. 1 is a schematic view showing fragmentarily an automobile having a lock control circuit embodying the concepts of the present invention incorporated therein, the door locks being shown in their locked conditions;

Fig. 2 is a fragmentary sectional view showing on an enlarged scale part of a conventional door lock disclosed in Fig. 1, showing the door lock in its unlocked condition;

Fig. 3 is a sectional view taken along line 3—3 of Fig. 2;

Fig. 4 is a sectional view taken along line 4—4 of Fig. 3; and

Fig. 5 is an elevational view of the upper portion of a latch showing the relationship of the latch and part of a door lock.

Referring to the accompanying drawings wherein similar reference characters indicate similar parts throughout, an automobile is fragmentarily disclosed and includes a dashboard 11, front doors 13 and 15, door jambs 17, and rear doors 19 and 21. The arrangement of the portions of the automobile disclosed is such as to indicate that doors 13 and 19 are located at the left-hand side of the automobile, and that doors 15 and 21 are located at the right-hand side of the automobile.

The front doors 13 and 15 are shown as being provided with key-operated locks, each lock including a bolt 27, a handle 25 having a shaft provided with a finger for engaging within a notch formed in the associated bolt 27, and a vertically movable latch 29 and a key operated lock

device 30 which has a finger 30*a* fitting in a notch 29*a* formed in the associated latch 29 for moving the latch to and from a latching position. The latch and bolt are notched in a conventional manner as shown so that, when the latch is elevated, the bolt 27 may be moved to and from a locked position by the handle 25. When the latch 29 is depressed, the notches in the latch and bolt are out of register and thus movement of the bolt 27 is prevented.

Since the door locks are of conventional construction, only the portions thereof that are necessary for understanding the control circuit of the present invention have been disclosed. Associated with each latch 29 is a spring-biased detent device 31 of conventional construction which cooperates with recesses 33 in the latch to releasably hold the latch in either its upper or its lower position to whichever it is moved.

The lock control circuit of Fig. 1 includes four double-acting electromagnetic devices, one device for each door, each device including a solenoid or coil and a plunger which is actuated upon energization of the coil. Each coil and the parts associated therewith are mounted in the associated door in a position so as not to interfere with operation of the window glass. The coils are numbered 33, 35, 39 and 41 for doors 13, 15, 19 and 21, respectively.

Each solenoid plunger includes a rod 43 extending through the associated coil, said rod in the particular embodiment of the invention disclosed in Fig. 1 being of nonferrous material, and carrying in insulated relation at one end a contact bar 45. The other end of each plunger rod is pivotally connected to one arm of a bell crank 47, which is pivotally mounted within the door and has its other arm pivotally connected to an extension 49 of the associated latch 29. The extension may be an integral part of latch 29 or may be a separate part secured to the lower end of the latch.

Each plunger rod has two spaced ferrous elements 51 mounted thereon and arranged to occupy positions at the ends of the associated coil. Each of the coils is center tapped to ground, as shown in Fig. 1.

Associated with the contact bar 45 of each solenoid is a set of fixed contacts comprising a first pair 59 and a second pair 61. The ends of each solenoid are connected to the two lower contacts of the associated set of contacts. Upper contact 59 of each set of contacts is connected to a common conductor 63, and each upper contact 61 is connected to a common conductor 65. Thus, the sides or portions of the coils adjacent the contact bars of the various electromagnetic devices are connected in one parallel circuit, and the other sides or portions of the coils are connected in a second parallel circuit.

Associated with each front door lock is a double-throw key-operated switch, which may be considered as a first control means. Each switch includes a contact arm or finger 71 which is mounted in insulated relation on the rotatable portion of the associated key operated locking device 30, and is connected by a conductor 73 to a common current supply line 75. Associated with each contact arm or finger is a pair of fixed contacts 77 and 79, which are connected by conductors 81 and 83 to common conductors 65 and 63, respectively. It is pointed out at this time that no showing has been made of pigtails or contacts arranged between the door and the body of the vehicle whereby current may be conducted to and from the solenoid coils and the two key-operated switches. This is believed unnecessary since such construction is conventional in all lock control circuits which have elements to be energized mounted on or within the doors of an automobile.

Common current supply line 75 is connected to the

automobile battery **91** and is also connected to the switch lever or arm **93** of a double-throw, manually operable switch which is shown as being mounted on the dashboard **11** of the automobile. This switch may be considered as a second control means. The switch could be otherwise located within the automobile if desired. Associated with arm or lever **93** is a pair of fixed contacts which are connected by conductors **95** and **97** to common conductors **63** and **65**, respectively.

The dashboard switch is of the type which will remain in the position to which it is thrown. Associated with the handle or exposed end of the switch lever **93** are the letters L and U which indicate which way the switch lever need be thrown in order to lock or unlock the doors, and when the switch lever is thrown, indicate the condition of the door locks. The switch lever has a neutral position where the contact part thereof is located between the associated fixed contacts, and two operative positions; one where it is in contact with one of the associated fixed contacts and the other in which it is in contact with the other of the associated fixed contacts.

The operation of the lock control circuit is as follows. The doors are shown in their locked condition in Fig. 1 and it may be assumed that the driver and one or more companions desire to enter the automobile. The driver inserts the front door key in the key operated lock device **30** of the left front door **13** and turns the lock in the conventional manner in a clockwise direction, as the parts are shown in Fig. 1, to bring contact arm or finger **71** into engagement with contact **79**. When this key operated lock device is so operated, the associated latch is elevated to unlock the door. A closed circuit is now completed from supply conductor **75** through the switch **71** and conductor **83** to common conductor **63**.

Common line **63** now becomes a current supply line and thus the side of each of the remaining coils closest the contact bar of the associated plunger is energized to force the associated plunger in a direction to elevate the associated latch **29**. Therefore, opening of the left front door **13** simultaneously causes all of the doors to be unlocked. The driver and his companions may, therefore, readily enter the car through all four doors.

Movement of a plunger in a direction to unlock the associated door causes a break in the engagement between the associated contact bar **45** and fixed contacts **59** to thus automatically de-energize the associated solenoid independently of any operation of the key-operated switch for door **13**. The arrangement of the parts is such that when the latches **29** reach their uppermost positions and detents **31** snap into the recesses provided for holding the latches in their elevated positions, the contact bar for each solenoid is disposed in engagement with the fixed contacts **61** associated with the solenoid.

After entering the automobile, the driver or anyone else adjacent the dashboard switch may throw the same toward the letter L, that is, counterclockwise, as the parts are depicted in Fig. 1, to bring contact arm **93** against the contact of conductor **97**, thus making common conductor **65** in effect a supply conductor, resulting in the completion of a circuit through the side of each solenoid remote from the associated contact bar, through the associated fixed contacts **61** and contact bar **45**. This energization forces the plunger for each coil in a direction to pull the associated door lock latch downwardly to simultaneously lock all the doors of the automobile.

The fact that the switch lever **93** remains in the position in which it is thrown, will always indicate to the driver and the other occupants of the automobile the condition of the doors, that is, whether they are locked or unlocked. It is, of course, possible to use a switch having a switch lever which returns to its neutral position after being thrown to one of its operative positions, but of course such a switch does not have the advantage of indicating the condition of the doors as does the switch disclosed in Fig. 1. It is pointed out that there will be no constant energization of the solenoids when switch lever **93** remains in a closed position with one of the associated fixed contacts, because movement of the plungers **43**, following closure of the dashboard switch, operates to automatically de-energize the portions of coils which have been energized to cause such movement.

With the lock control circuit of the present invention, the current drain on the battery of the automobile is kept to a minimum because the solenoids are energized only for a brief instant at the time of closure of any of the switches. The automatic de-energization feature of the control circuit is also important from the fire danger standpoint, because if the coils were constantly energized when the doors were either locked or unlocked, a condition would be set up whereby overheating of the coils conceivably could occur under certain conditions. It is pointed out that, because each of the electromagnetic devices is within a separate portion of parallel circuitry, a break in the portion of the circuit in one door will have no effect on the operation of the electromagnetic devices in the other doors. Therefore, if for any reason a break in the circuit in one door should occur, the driver can simultaneously lock and unlock the remaining doors until he has the defective circuit repaired. The parallel circuit arrangement disclosed also enables the full voltage drop of the battery to be applied across each solenoid, thus permitting the employment of solenoid devices having substantial pulling power but being of relatively small physical size.

Another important feature of the circuit of the present invention is that with the doors locked, any door will automatically relock itself should a child or other passenger accidentally raise one of the latches **29**. This is so because switch lever **93** will be disposed in its "locked" position, thus making line **65** a current carrying line. Therefore, if the latch **29** for any door, say door **21** for instance, should be elevated, the associated solenoid rod **43** would be pulled to the right and bring the contact bar **45** against contacts **61**, the upper of which is connected to line **65**. This action would energize the associated solenoid and thus snap the elevated latch **29** back downwardly to its locked position.

It is further pointed out that in case of a dead battery, the mechanical structure of any car front door lock will allow the key to manually unlock the door. Also, manual operation of the other doors by elevation or depression of the latches **29** is of course possible in case of a dead battery. Thus, with the circuit of the present invention, the door locks of a conventional vehicle can be operated in a normal manner despite the fact that the circuit may become inoperative in either one or the other of its two conditions of operation. The driver of the automobile is thus assured that he will never be locked out of the automobile because during his absence the circuit becomes inoperable.

Having described the invention in what is considered to be the preferred embodiment thereof, it is desired that it be understood that the invention is not to be limited by the specific details shown, unless they constitute critical features of the present invention, all of which will be apparent by reference to the following claim.

I claim:

In combination with the door locks of a conventional automobile wherein each door lock is of the type including a key operated lock device and a vertically movable plunger operable when raised to cause said door lock to assume an unlocked condition permitting the associated door to be opened by manipulation of the associated outside handle and being operable when depressed or lowered to cause said door lock to assume a locked condition preventing the associated door from being opened by manipulation of the associated outside handle, said plungers being permanently mechanically connected to other portions of said door locks to permit at all times manual locking and unlocking of said door locks by operation of said plungers, the key operated lock devices being operatively connected

to the associated plungers whereby the latter may be raised or depressed from the outside by turning the keys for said key operated lock devices in the desired direction, the invention comprising plural solenoid means for the plungers, the plural solenoid means being operable when energized in one manner for simultaneously raising said plungers and when energized in a different manner for lowering said plungers, said plungers adapted to be manually operated to place said door locks in locked or unlocked conditions whenever such solenoid means are inoperative for any reason whatsoever, first switch means connected to said solenoid means and being operated by turning of a key in said key operated lock devices for connecting said solenoid means to a source of electrical energy in said one manner to raise said plungers or for connecting said solenoid means in said different manner to such source of electrical energy to lower said plungers depending on the direction of turning of said key in said lock devices, second switch means located within said automobile and having a locking position, an unlocking position and a neutral position for causing energization of said solenoid means for simultaneously raising or lowering said plungers depending into which position said

second switch means is moved, and contact means associated with said solenoid means for effecting de-energization of said solenoid means after a door locking or door unlocking operation and being connected to said second switch means and being operable when said second switch means is left in its locking position to cause energization of said solenoid means in the event said door locks are manually unlocked thereby returning said door locks to such locked condition, said plural solenoid means being connected in parallel with one another so that if one solenoid means becomes inoperable the remaining solenoid means will not be affected.

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