

May 17, 1949.

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2,470,581

LOCKING SYSTEM

Filed June 15, 1946

3 Sheets-Sheet 1

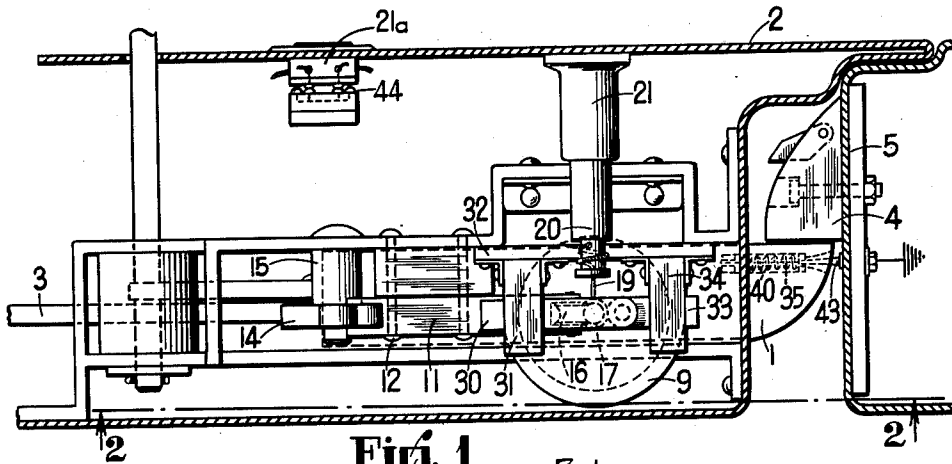


Fig. 1

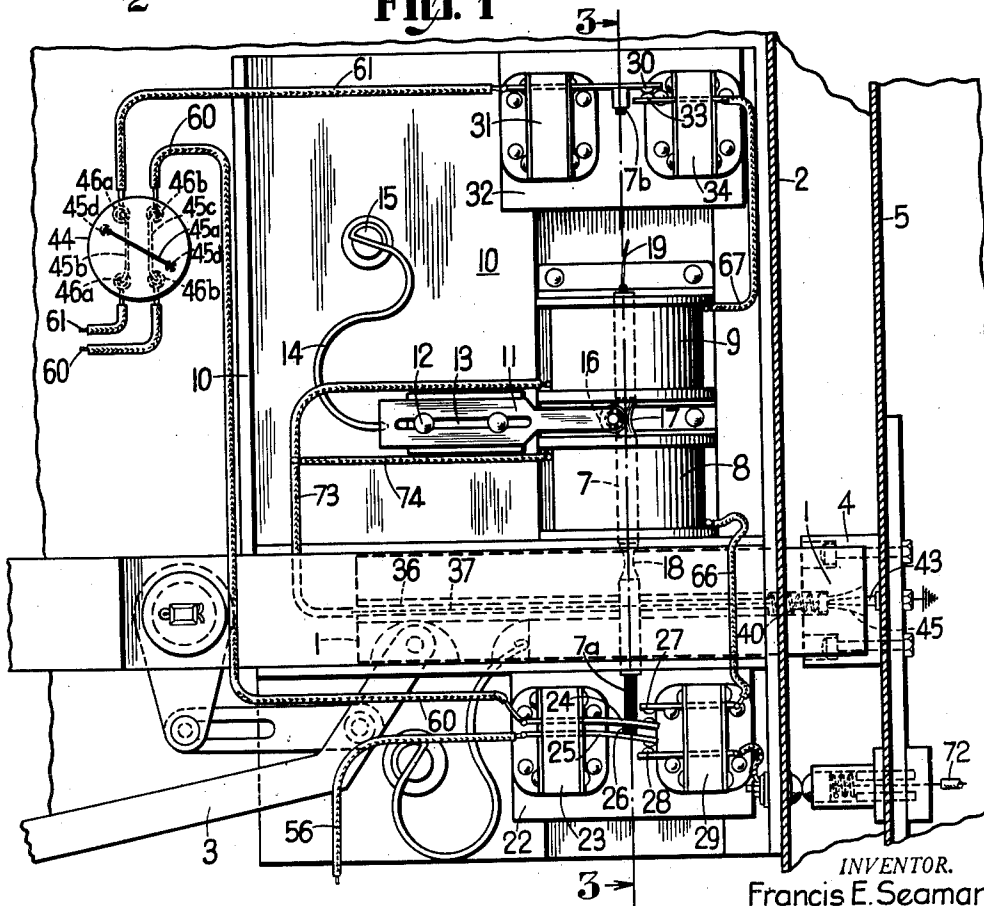


Fig. 2

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3 Sheets-Sheet 2

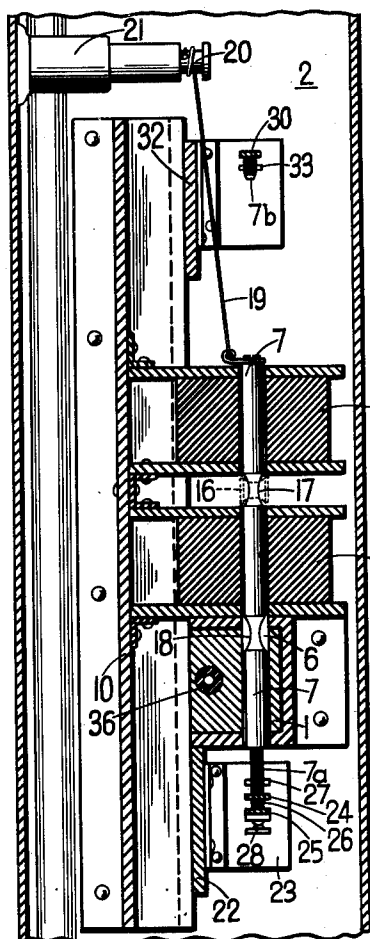


Fig. 3

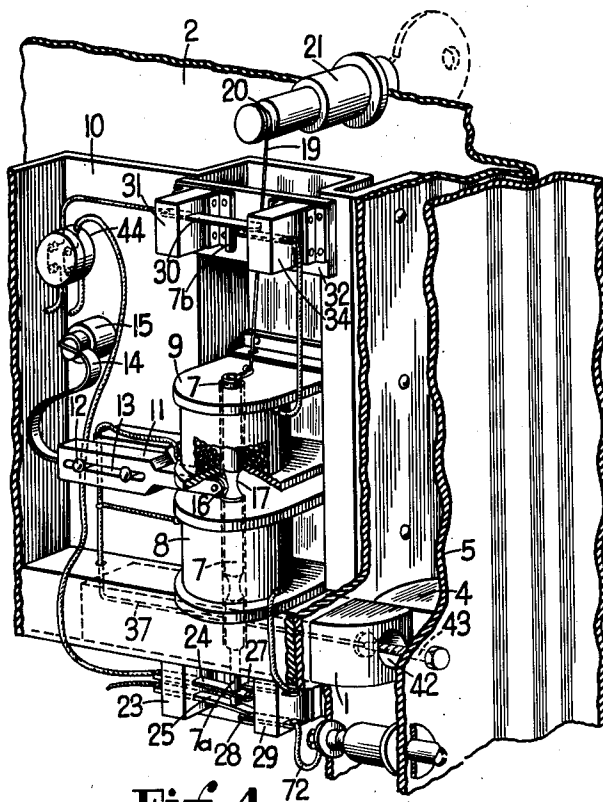


Fig. 4

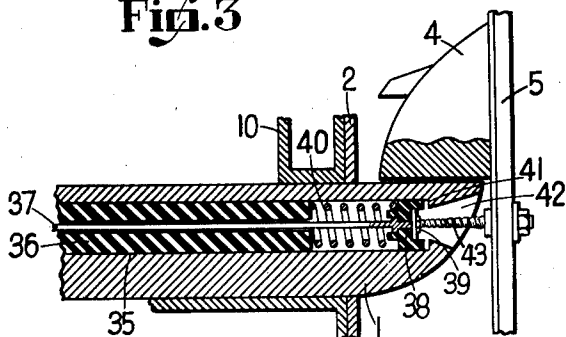


Fig. 5

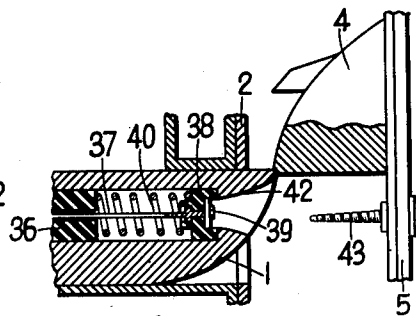


Fig. 6

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LOCKING SYSTEM

3 Sheets-Sheet 3

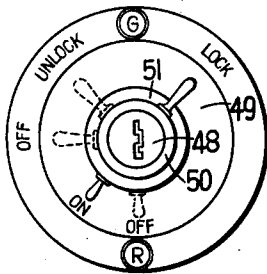


Fig. 8

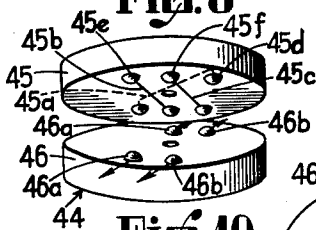


Fig. 10

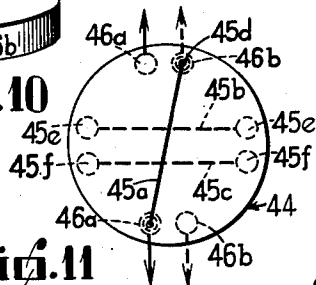


Fig. 11

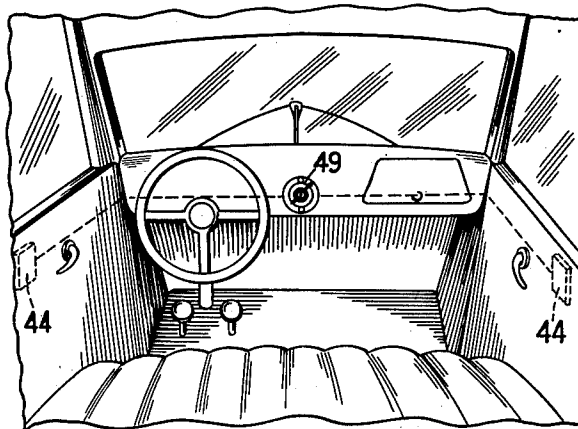


Fig. 9

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UNITED STATES PATENT OFFICE

2,470,581

LOCKING SYSTEM

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Application June 15, 1946, Serial No. 677,069

11 Claims. (Cl. 70-264)

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My invention relates to a locking system. It has to do, more particularly, with a locking system which is especially adaptable to the doors of an automobile, although it is not limited thereto.

One of the objects of my invention is to provide a thoroughly reliable and positive system for locking a plurality of doors from a central point.

Another object of my invention is to provide such a system which may be applied to the doors of an automobile in such a manner that the system is under the sole control of the driver of the automobile at all times.

Another object of my invention is to provide a locking system of the type indicated which may be set by the driver when the driver and passengers are inside to lock all of the doors, as a safety measure, it being impossible for anyone inside the car to unlock any of the doors, except from a central control point adjacent the driver's position, and it being impossible for anyone outside the car to open the doors.

Another object of my invention is to provide such a door locking system which may be set by the driver before leaving the car so that all the doors will be locked automatically upon slamming the doors.

Another object of my invention is to provide a locking system of such a nature that the bolt of the door lock cannot be locked in locking position unless the door is closed, thereby, eliminating danger of damage to the lock mechanism which would occur if the bolt was locked and the door was slammed.

Another object of my invention is to provide such a door locking system which is electro-magnetically operated and is particularly applicable to an automobile, which is provided with means whereby at least one of the doors may be mechanically opened in case of failure of the electrical system of the automobile.

Another object of my invention is to provide an electrically operated door locking system which will require current only momentarily during the locking and unlocking operations and, therefore, will consume only a minimum amount of current.

Another object of my invention is to provide such a locking system which includes means for signalling to the driver each time the locking mechanism functions properly to lock or unlock all the doors and signalling means, which after initially being turned on, will function constantly to indicate to the driver at a glance whether or not the doors are in locked or unlocked condition.

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Various other objects will be apparent herein-after.

In its preferred form, the locking system which I have devised comprises an electro-magnetic unit which is associated with each door to be locked, for example, the doors of an automobile. One of these units may be applied to each of the passenger doors and, if desired, to the baggage compartment door and to the hood. Each of the electro-magnetic units comprises a pair of solenoids which control a single soft iron bar that serves as a shear pin, which can be moved into locking position relative to the main lock bolt of the door to prevent such bolt being withdrawn from the door catch or into unlocking position to permit withdrawal of the bolt from the catch. One of the solenoids moves the bar to locking position while the other solenoid moves it to unlocking position. The locking solenoids are connected in a locking circuit and the unlocking solenoids are connected in an unlocking circuit, both of which are controlled by a master control switch located at a central control point readily accessible to the driver. This switch is preferably associated with the ignition switch of the car. Associated with the locking and unlocking circuits is a signalling circuit which signals, by causing a pilot light to flash, whenever the locking or unlocking solenoids are energized and the bolt locking pins move properly into locking or unlocking positions. The system also includes an indicating circuit which is connected to all of the electro-magnetic units. This indicating circuit includes a switch which is associated with the master switch and a pilot light which will remain on constantly, after the switch of the indicating circuit is turned on, as long as the master switch is turned on and the locking system is functioning properly to maintain all of the doors locked.

In addition to the master switch associated with the ignition key, I provide a key-operated switch on the exterior at each side of the car for actuating the unlocking circuit from the outside of the car. Either of these outside switches may be employed for gaining access to the car. Also, I provide key-operated means on at least one of the units whereby it is possible to mechanically withdraw the shear pin from the locking bolt in case the electric system of the car fails.

The foregoing and other objects and advantages of the present invention will appear from the following description and appended claims when considered in connection with the accompanying drawings forming a part of the specification wherein like reference characters designate

corresponding parts in the several views and wherein:

Figure 1 is a plan view of one of the electro-magnetic units of my locking system.

Figure 2 is a side elevational view of the unit taken from the position indicated by line 2—2 of Figure 1.

Figure 3 is a vertical sectional view taken substantially along line 3—3 of Figure 2.

Figure 4 is a perspective view, partly broken away, of one of the units.

Figure 5 is a detail, in section, illustrating an electric grounding contact which is provided in the bolt.

Figure 6 is a similar view, but showing the grounding contact in a different position.

Figure 7 is a diagram showing the circuit of the system.

Figure 8 is a view of the face of the master control switch of the system.

Figure 9 is a view of the interior of a car illustrating diagrammatically how the system is applied thereto.

Figure 10 is a perspective view of the unlocking switch operated from the exterior of the car.

Figure 11 is a plan view of the unlocking switch.

With reference to the drawings, in Figures 1 to 4, I have illustrated the electro-magnetic unit of my door locking system. One of these units will be associated with each door it is desired to control.

The bolt 1 of the door lock is mounted for reciprocation in the usual manner on the hinged door 2 and is controlled in the usual way by handles connected to the lever mechanism 3. When the door is closed, the projecting end of the bolt 1 engages a keeper or catch 4 of the usual type which is attached to the door jamb 5, as shown best in Figures 5 and 6.

I provide the bolt 1 with a vertical bore 6 which is adapted to receive a vertically reciprocable shear pin 7 to lock the bolt 1 in position, when desired, after the bolt engages the catch 4. This shear pin 7 provides the soft iron bar for a pair of superimposed solenoids 8 and 9 which are positioned directly above the bolt 1, as shown best in Figures 2 and 3. As will be apparent hereinafter, the solenoid 8 serves as the locking solenoid, while the solenoid 9 serves as the unlocking solenoid. The solenoids are attached by suitable brackets to a vertically disposed part 10 of the door structure. In its lower or locking position, the pin 7 will extend downwardly through the bore 6 and lock the bolt 1 in locking position. In its upper or unlocking position, the lower end of the shear pin 7 will be withdrawn upwardly from the bore 6.

In order to aid the solenoids in accurately locating the shear pin in either locking or unlocking positions and in order to hold it in either of such positions, a spring operated plunger 11 is provided, as shown best in Figures 2 and 4. This plunger 11 is mounted for horizontal sliding movement by means of a pair of supporting pins 12 which are carried by the door and which extend into a slot 13 formed in plunger 11. A leaf spring 14, anchored to the door by member 15, has its opposite end attached to the inner end of plunger 11. This spring normally tends to force the plunger 11 outwardly. The plunger carries on its outer end a small grooved roller 16. This roller is always held in embracing engagement with the side of the shear pin 7 by means of the spring 14. The plunger extends between the two solenoids 8 and 9, as shown best in Figure 2. The

pin 7 is reduced in diameter to form a locating recess 17, for cooperating with roller 16, and this recess will be located between the two solenoids when the shear pin 7 is in locking position. At a point spaced a substantial distance below the recess 17 is a similar recess 18 formed by reducing the diameter of the pin 7. When the shear pin 7 is in its uppermost or unlocking position, the roller 16 will engage this recess 18 and maintain the pin in such position.

In order to provide means for moving the pin 7 to unlocking position in case of power failure, I provide means for mechanically lifting the pin to withdraw it from the bolt 1. This means comprises a cord or wire 19 which is connected to the upper end of the pin 7. The upper end of this cord 19 is wound around and anchored to a rotatable pin 20 which is suitably mounted for rotation on the door. The pin may be rotated from the outside by means of a key inserted into the lock 21 in which the pin is mounted. This lock 21 is preferably of such a type that after the pin has been rotated to lift the shear pin 7 so that the door may be opened, the key must be rotated reversely to its original position before permitting removal of the key. Subsequently, movement of the pin 7 between locking and unlocking positions will not be interfered with by the cord 19.

In its lower position, the lower end of pin 7 engages the upper end of a pin 7a, formed of insulating material, which is suitably mounted for vertical sliding movement on a bracket 22 supported by the door directly below bolt 1. This bracket 22 carries an insulating block 23 from which projects leaf springs 24 and 25. The lower end of pin 7a engages the upper spring 24 and insulating spacer 26 is provided between the spring contacts 24 and 25. The spring contacts 24 and 25 are adapted to cooperate with contacts 27 and 28, respectively, which are supported by an insulating block 29 that is carried on the bracket 22. When pin 7 is in its lowermost position, it forces the spring contacts 24 and 25 downwardly through the medium of pin 7a. This causes contact 24 to break away from contact 27 and causes contact 25 to engage contact 28. When the pin 7 is moved upwardly, contact 25 will break away from contact 28 and contact 24 will engage contact 27.

When the pin 7 is in its uppermost position, it engages an insulating pin 7b, shown in Figures 2, 3 and 4, that depends from a spring contact member 30. This member 30 is carried by an insulating block 31 which is supported on a bracket 32. The contact 30 cooperates with a contact 33 which is carried by an insulating block 34 which is also attached to the bracket 32. Normally spring contact 30 is in contact with contact 33. However, when pin 7 moves upwardly and engages pin 7b, the spring contact 30 is forced upwardly away from the contact 33.

The bolt 1, as shown in Figures 5 and 6, has a socket 35 formed within its outer end. An insulating sleeve 36 is disposed within this socket and a pin 37 is reciprocally mounted in the sleeve. The outer end of the pin 37 carries an annular insulating member 38 which has a recess within its outer end in which a contact 39 is disposed, this contact being connected electrically to pin 37. A compression spring 40 is disposed within the outer end of socket 35 and engages member 38 to normally force this member and the pin 37 outwardly. A stop shoulder 41

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is provided, for limited outward movement of member 38, at the inner end of a throat 42 which communicates with socket 35. A flexible pin or contact member 43 is adapted to enter through the throat 42 and to contact contact 39. This member 43 is carried by the door jamb behind the catch 4. As will later appear, contacts 39 and 43 function as grounding contacts. As shown in Figure 6, until the door reaches closed position with the bolt 1 behind catch 4, the contacts 43 and 39 will be separated. However, as illustrated in Figure 5, as soon as the bolt passes the catch and moves behind it, the contact pin 43 enters the throat 42 and engages contact 39, moving member 38 inwardly slightly. Since contact 43 is slightly flexible and contact 39 is movably mounted, positive contact with these members will be insured each time the door is closed.

Associated with the electro-magnetic unit is an unlocking switch 44. This switch is preferably made a part of a lock 21a (Figure 1) similar to the lock 21 and must be rotated by means of a key which is inserted from the exterior of the door. The lock 21a is also preferably of such a type that it must be returned to its original position before permitting removal of the key. The switch 44 includes an upper plate 45 and a lower plate 46 which are relatively rotatable. The upper plate 45 carries on its upper surface a conducting strip 45a and on its lower surface a pair of conducting strips 45b and 45c. The strip 45a is disposed almost at right angles to the strips 45b and 45c. Strip 45a is connected to the contact points 45d provided at its ends, while strip 45b is connected to the points 45e at its ends and strip 45c is connected to the points 45f at its ends. The upper surface of lower plate 46 carries a pair of spaced contact points 46a and a pair of points 46b. Normally the switch 44 is in inoperative position, as shown in Figure 7, with contact points 45e engaging points 46a and points 45f engaging points 46b. Points 45d, at the end of strip 45a, will be out of engagement with all the other points. When it is desired to operate the unlocking solenoids 9, the circuit may be crossed by rotating the switch 90° only from the position shown in Figure 11. This causes points 45d to engage one of the points 46a and one of the points 46b. This will actuate the unlocking solenoids, as will later appear. Switch 44 is then returned to its original position by a reverse turn of the key through 90°.

In Figure 8, I illustrate a dial which will be located at the central control point, for example, in association with the ignition lock 48 of the car. The dial 49 is provided with proper indications to show when the master control switch 50 is in locked, unlocked or off positions and when the indicating circuit switch 51 is off or on. The switch 50 is in the form of a ring which closely surrounds the ignition switch 48. Although no electrical connection is made between the ignition system and the locking electrical system, the juxtaposition of the ignition key (also door unlocking key) with the door locking switch and the necessary procedure in locking the doors before exit is made from the car, greatly reduces the possibility of locking the keys within the car, as will be more clearly apparent hereinafter. The switch 51 is also in the form of a ring which closely surrounds ring 50 and is independently rotatable. The dial 49 also carries a green pilot light G and a red pilot

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light R. As shown in Figure 9, the master control switch will be located adjacent the driver and each of the doors of the car will be provided with one of the electro-magnetic units. The locking mechanism 21 and associated pin lifting cord 19 need be provided on only one of the units. One of the switches 44, for unlocking the door from the outside, is preferably provided at each side of the car. Although I illustrate a system for a two door car in Figures 7 and 9, it is to be understood that the system can be applied to any number of doors.

In Figure 7, I illustrate how the electro-magnetic units are connected together electrically and in circuit with the switches and the battery of the car. The battery 52 is provided with a ground 53 and with a positive lead 54 in which a fuse 55 is incorporated. The line 54 is connected to a line 56 which leads to the main contact 57 of the switch 50. A shunt line 58 is connected to the line 56 at opposite ends of a resistance 59 interposed in line 56. The line 53 has the pilot light R connected therein in series. Connected to the power source in parallel are the locking and unlocking circuits which include the locking solenoids 8 and unlocking solenoids 9 and the lines 60 and 61. The locking circuit is illustrated by the dash lines while the unlocking circuit is indicated by full lines. The movable contact of the switch 50 may be in either of the positions illustrated in Figure 7, the full line position being the unlocking position and the dash line position being the locking position. When in unlocking position, contact 57 of the switch is connected to contact 62 thereof. When in locking position, contact 57 is connected to contact 63. Contact 63 is connected by wire 64 to line 60. Contact 62 is connected by wire 65 to line 61. Each end of the line 60 is connected to one of the contacts 24 which is controlled by the lower end of pin 7. Each end of the line 61 is connected to one of the contacts 30 which is controlled by the upper end of the pin 7. The points 46b of each switch 44 are connected in the line 60. The points 46a of each switch 44 are connected in the line 61. The locking solenoid 8 of each unit is connected by a line 66 to the contact 27. The unlocking solenoid 9 of each unit is connected by a line 67 to the contact 33. The contacts 43 are grounded, while the contacts 39, associated therewith, are connected in series to the locking and unlocking solenoids 8 and 9 of the respective units. Wires 73 and 74 provide this connection.

The switch 51 controls the indicating circuit, a part of which is formed by the line 56. This circuit includes the ground wire 68 which is connected to contact 69 of switch 51. The movable part of the switch 51 will be brought into position when the switch is "on" to connect contact 69 to contact 70. When the switch is "off," these contacts will be disconnected. A wire 71 leads from the contact 70 and is connected in series to the green pilot light G. One end of this wire 71 is connected to one of the contacts 25. Similarly, one end of the wire 56 is connected to the other contact 25. The contacts 28, associated with contacts 25, are connected together by a wire 72. Thus, the indicating circuit, which includes green light G, is connected in series to the locking and unlocking solenoids.

The circuit is in the condition illustrated in Figure 7 with the switch 50 moved to the locking position and with the switch 51 "on," when the passengers and driver are all inside the car and all the doors have been locked. At this time,

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the shear pins 7 will be down in locking position extending through the bolts 1. The green pilot light will be on since the circuit for it will run from ground 68, through switch 51, through wire 71 and light G, through the right hand contacts 25 and 28, wire 72, left hand contact 26, wire 56 and line 54 to battery 52. At this time also, the locking circuit will be broken due to the fact that the contacts 24 and 27 have been separated previously by downward movement of pins 1. The red light R will not be on, due to the fact that its shunt circuit will not normally receive sufficient current to light it, because of the provision of the resistance 59. However, the current which reaches the light G will be sufficient to light it. Although light R will normally not be supplied with sufficient current to light it, when the solenoids 8 or 9 are energized, there will be such a drop in potential between the points where the shunt line 58 is connected to line 56 that sufficient current will be permitted to flow through the shunt line to light the red light R. The switches 44 will be "off." The locking system can be actuated to unlock the doors only from the central control point at the driver's seat. Furthermore, the doors cannot be opened from the outside. If for some reason, while the car is moving along, one of the shear pins 7 accidentally becomes withdrawn from the bolt 1, this will immediately permit the contact 25 to move away from the contact 28 and break the circuit to the green light G at this point. This will indicate to the driver that the locking mechanism is not functioning properly.

If it is now desired to unlock the car, the switch 50 is turned to the unlocking position, shown in Figure 7. Then current will flow from the battery 52 through line 54, line 56, through switch 51, line 65, contacts 30, contacts 33, lines 67, through unlocking solenoids 9, through ground wires 73 and contacts 39 and 43 to the grounding points. This will supply the solenoids 9 with current sufficient to lift the shear pins 7 to unlocking position. The red light R will be on as long as current is supplied to the solenoids 9, since at this time sufficient current will by-pass through line 58 to light the light. The circuit to the light R will be from battery 52, through lines 54, shunt line 58, switch 50, line 65, line 61, contacts 30 and 33, lines 67, lines 73, and ground contacts 39 and 43. However, light R will be on only momentarily because when the pins 7 move upwardly, they engage contacts 30 to move them away from contacts 33, breaking the circuit to the solenoids 9 and light R. At the same time, the circuit to the light G is broken by upward movement of the contact 25 away from the contacts 28. The handles on the door of the car may now be turned to move the bolts 1 to permit opening of the door.

If it is desired now to lock the car from the outside, all the doors are closed with the exception of the one to be used by the driver for exit. Before leaving the car, the driver turns the switch 50 back to locking position after he operates the door handle to pull the door bolt and separate contacts 39 and 43 of that door. The switch 51 is preferably turned to the "off" position so that the green signal light will not function when the car is unoccupied. The circuit through the locking mechanism of the doors which have already been closed will have been completed at this time and the pins 7 thereof will be in locking position. However, the bolt of the particular door used for exit will not be

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locked in position, due to a break in the circuit at the contacts 39 and 43, until after it is slammed shut, but then the locking will take place automatically. When this door is slammed shut, the contacts 39 and 43 of the locking mechanism for that door are automatically engaged. When the contacts 39 and 43 are engaged, the circuit to the locking solenoids 8 is completed from battery 52, through lines 54, 56, switch 50, line 64, line 60, contacts 24, contacts 27, lines 66, lines 74, lines 73 and contacts 39 and 43 to the grounding points. At this time, contacts 24 are in their upper position in engagement with contacts 27. However, as soon as the solenoids 8 are energized, the pins 1 are pulled downwardly and force the contacts 24 away from contacts 27, breaking the circuit at these points. Thus, the locking solenoids will be only momentarily supplied with current. However, this momentary supply of current will also flash the red light R for an instant until the circuit is broken. The circuit for the light R will be from the battery 52 through lines 54, shunt line 58, switch 50, line 64, line 60, contacts 24 and 27, lines 66, lines 74 and 73 and grounding contacts 39 and 43. Although the contacts 25 and 28 will be in engagement, the green light G will not light, due to the fact that its circuit is broken by the switch 51. However, the driver will see the red light flash when he slams his door and this will indicate that the shear pin of the locking mechanism on his door moved into locking position. The light R will go off as soon as locking solenoids 8 are deenergized by separation of contacts 24 and 27.

When it is desired to gain access to the car, one of the switches 44 may be actuated to cause the points 45d at the end of strip 45a to engage one of the points 46a and one of the points 46b. All other contact points of the switch will be disengaged. This crosses the lines 60 and 61 which will cause a circuit to be completed to the unlocking solenoids 9 from the battery 52, through lines 54, 56, switch 50, which will be in locking position, line 64, line 60, points 46b and 45d, strip 45a, points 45d and 46a, line 61, contacts 30 and 33, line 67, through solenoid 9 and through line 73 and contacts 39 and 43 to the grounding point. Thus, the solenoid 9 will be actuated to move the pin 7 upwardly and withdraw it from the bolt 1 of that particular door. The switch 44 is immediately returned to its original position after the door is opened.

When the driver is again inside the car, the switch 50 is kept in locking position and the switch 51 is turned on. If all the doors are closed, they will be locked automatically and the driver need not lock each door individually or check each door to see that it is locked. This can be determined by the driver at a glance at the green pilot light. As long as the driver desires to keep the doors locked they can only be opened from the central point at his seat. None of the bolts of the door locks can be locked until that particular door is closed completing the circuit at the contacts 39 and 43. The green light will be on when all of the doors are closed and will stay on as long as the pins 7 are in locking position. The red light will flash each time the locking solenoids 9 or the unlocking solenoids 8 are energized. A minimum amount of current is used due to the fact that the solenoids are only momentarily energized, the red light is only on momentarily and the green light requires little current.

It will be apparent that I have provided a locking system having a number of advantages. A number of advantages have been referred to in the description and others will be apparent.

Having thus described my invention, what I claim is:

1. A door locking system comprising electro-magnetic units on each door to be controlled, a locking unit on each door controlled by the electromagnetic unit on such door, all of said electro-magnetic units being connected in a main circuit, a control switch for said circuit, and means for indicating each time said electro-magnetic units are energized, said means comprising a shunt circuit connected to the main circuit and including a signal, and a resistance element connected in said main circuit between the points where the shunt circuit is connected thereto so that the shunt circuit will receive sufficient current to actuate the signal only when said circuits are energized.

2. A door locking system comprising electro-magnetic units on each door to be controlled, a locking unit on each door controlled by the electro-magnetic unit on such door, each of said electro-magnetic units comprising a locking solenoid and an unlocking solenoid, a locking circuit and an unlocking circuit connecting the respective solenoids in parallel, a main control switch for controlling said circuits, and an additional switch interposed in both circuits between said main control switch and one of said electro-magnetic units and having conducting elements normally forming parts of said circuits, said additional switch being operable to move said elements into position to break said normal locking and unlocking circuits and having an additional conducting element which will connect said unlocking circuit to said locking circuit when said second switch is operated to break said normal circuits so that the circuit to said locking solenoid of each unit will be broken and the circuit to said unlocking solenoid of such unit will be made.

3. A door locking system comprising electro-magnetic units on each door to be controlled, each of said units comprising a locking solenoid and an unlocking solenoid, a locking circuit and an unlocking circuit connecting the respective solenoids in parallel, a main control switch for controlling said circuits, a power line connected to said control switch, each of the doors being provided with a bolt and a keeper, a locking pin associated with each bolt and movable into and out of a socket provided therein, said locking and unlocking solenoids of each unit being co-axially disposed directly adjacent each of said bolts and said locking pin extending therewithin and being movable in opposite directions by the respective solenoids, and contacts associated with the bolt and so arranged as to engage each other only when the bolt is in association with the keeper, said contacts being connected in circuit with said locking and unlocking solenoids, said locking circuit being provided with a pair of contacts which will be separated by movement of the locking pin to locking position and said unlocking circuit being provided with a pair of contacts which will be separated by movement of the locking pin to unlocking position.

4. A locking system according to claim 3 wherein said power line has a shunt circuit connected thereto and including a pilot light and a resistance element connected in said power line between the points where the shunt circuit is connected thereto.

5. A system according to claim 3 wherein a signalling circuit is connected in series to movable contacts associated with each of said units, said contacts being engageable by movement of the locking pin into locking position, and a control switch for said signalling circuit associated with the main control switch.

6. A locking system according to claim 3 wherein said power line has a shunt circuit connected thereto and including a pilot light, a resistance element connected in said power line between the points where the shunt circuit is connected thereto, and a signalling circuit connected in series to movable contacts associated with each of said units, said contacts being engageable by movement of the locking pin into locking position, and a control switch for said signalling circuit associated with the main control switch.

7. A locking system according to claim 3 wherein an additional switch is interposed in both locking and unlocking circuits between said main control switch and one of said units and has conducting elements normally forming parts of said circuits, said additional switch being operable to move said elements into position to break said normal locking and unlocking circuits and having an additional conducting element which will connect said unlocking circuit to said locking circuit when said second switch is operated to break said normal circuit so that the circuit to said locking solenoid of such unit will be broken and the circuit to said unlocking solenoid of such unit will be made.

8. A locking system according to claim 3 wherein said power line has a shunt circuit connected thereto and including a pilot light, a resistance element connected in said power line between the points where the shunt circuit is connected thereto, a signalling circuit connected in series to movable contacts associated with each of said units, said contacts being engageable by movement of the locking pin into locking position, a control switch for said signalling circuit associated with the main control switch, and an additional switch interposed in both locking and unlocking circuits between said main control switch and one of said units and having conducting elements normally forming parts of said circuits, said additional switch being operable to move said elements into position to break said normal locking and unlocking circuits and having an additional conducting element which will connect said unlocking circuit to said locking circuit when said second switch is operated to break said normal circuits so the circuit to said locking solenoid of such unit will be broken and the circuit to said unlocking solenoid of such unit will be made.

9. A door locking system comprising electro-magnetic units on each door to be controlled, all of said units being connected in a main electric circuit, a control switch for said circuit, each of the doors being provided with a bolt and a keeper, a locking pin associated with each bolt and controlled by one of said units for engaging the bolt and positively securing it in locking position, contacts associated with the bolt and keeper and so arranged as to engage each other only when the bolt is in association with the keeper, said contacts being connected in and controlling the circuit to said units so that the locking pin cannot be actuated to engage the bolt as long as the door is opened, and a signalling circuit associated with said units, said circuit including movable contacts controlled by movement of said locking

pin into and out of locking position relative to the bolt.

10. A door locking system comprising electro-magnetic units on each door to be controlled, all of said units being connected in a main electric circuit, a control switch for said circuit, each of the doors being provided with a bolt and a keeper, a locking pin associated with each bolt and controlled by one of said units for engaging the bolt and positively securing it in locking position, contacts associated with the bolt and keeper and so arranged as to engage each other only when the bolt is in association with the keeper, said contacts being connected in and controlling the circuit to said units so that the locking pin cannot be actuated to engage the bolt as long as the door is opened, a shunt circuit connected to said main circuit and including a signal, and a resistance element connected in said main circuit between the points where the shunt circuit is connected thereto so that the shunt circuit will receive sufficient current to actuate the signal only when said locking or unlocking solenoids are energized.

11. A door locking system comprising electro-magnetic units on each door to be controlled, all of said units being connected in a main electric circuit, a control switch for said circuit, each of the doors being provided with a bolt and a keeper, a locking pin associated with each bolt and controlled by one of said units for engaging the bolt and positively securing it in locking position, contacts associated with the

bolt and keeper and so arranged as to engage each other only when the bolt is in association with the keeper, said contacts being connected in and controlling the circuit to said units so that the locking pin cannot be actuated to engage the bolt as long as the door is opened, a signalling circuit associated with said units, said circuit including movable contacts controlled by movement of said locking pin into and out of locking position relative to the bolt and a main switch for controlling the signalling circuit, a shunt circuit connected in said main circuit and including a signal, and a resistance element connected in said main circuit between the points where the shunt circuit is connected thereto so that the shunt circuit will receive sufficient current to actuate the signal only when said locking or unlocking solenoids are energized.

FRANCIS E. SEAMAN.

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Certificate of Correction

May 17, 1949

Patent No. 2,470,581

FRANCIS E. SEAMAN

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows:

Column 10, line 30, for the words "circuit so that the circuit so" read *circuits so that the circuit to*;

and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 10th day of January, A. D. 1950.

[SEAL]

THOMAS F. MURPHY,
Assistant Commissioner of Patents.