Nov. 8, 1960 J. W. DYER ET AL 2,959,238

COINCIDENTAL DOOR LOCKING APPARATUS FOR AN AUTOMOBILE

Filed Sept. 28, 1959 3 Sheets-Sheet 1

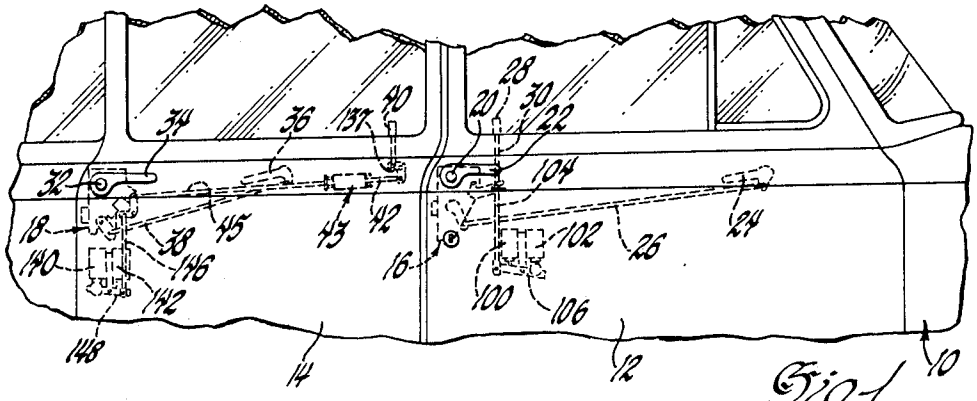


Fig. 1

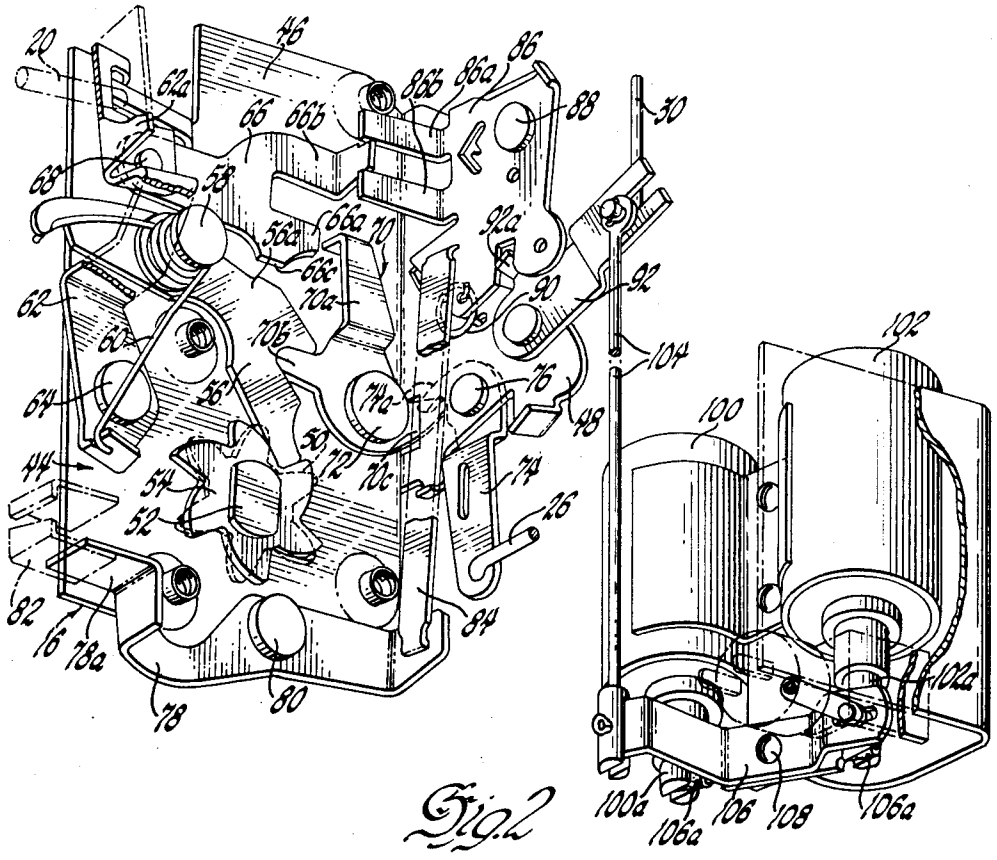


Fig. 2

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Filed Sept. 28, 1959 3 Sheets-Sheet 2

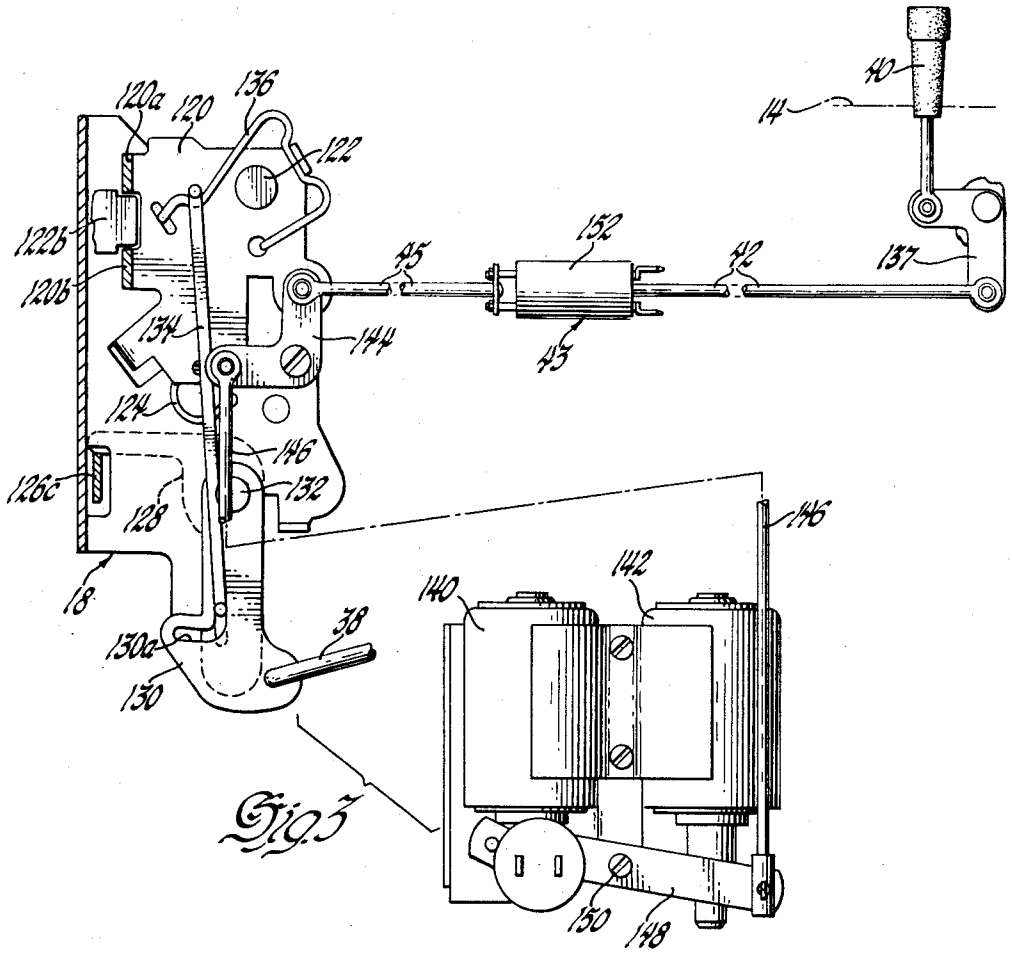


Fig. 3

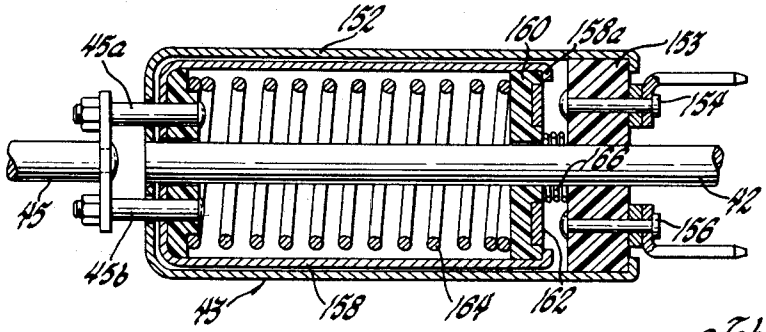


Fig. 4

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Filed Sept. 28, 1959 3 Sheets-Sheet 3

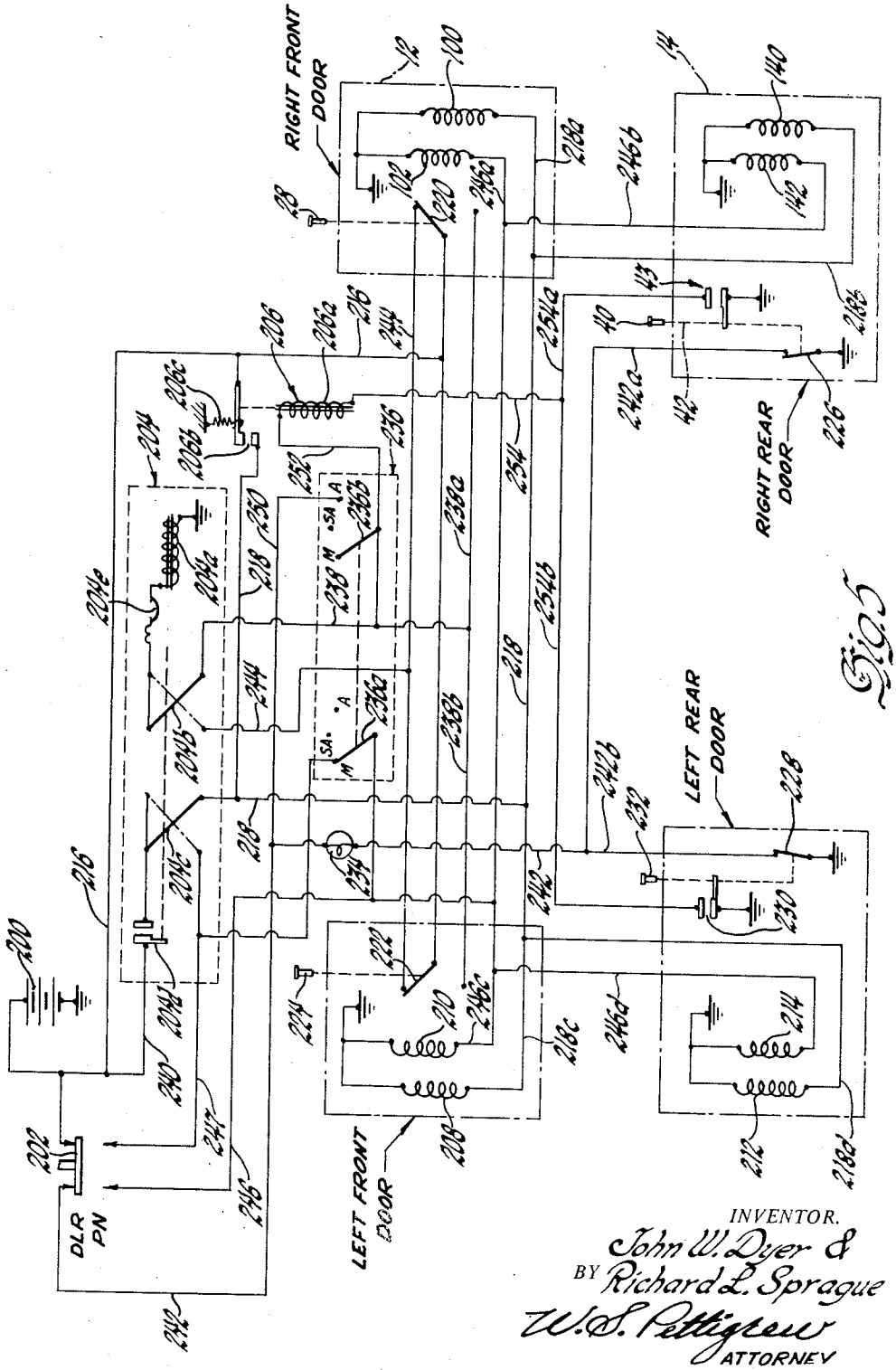


Fig. 5

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2,959,238

COINCIDENTAL DOOR LOCKING APPARATUS FOR AN AUTOMOBILE

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Filed Sept. 28, 1959, Ser. No. 842,723

8 Claims. (Cl. 180—82)

This invention relates to vehicle door locking means, and more particularly to coincidental door locking apparatus for an automobile.

Each door of an automobile conventionally is provided with a door latch, each of which can be independently locked manually from inside the automobile, preferably by means of a garnish molding button. In addition, each front door can be locked from the outside by means of a key, and many automobiles also incorporate a keyless locking feature whereby, upon depression of the garnish molding button when the door is open and subsequent operation of the outside push button as the door is being closed, the door will be locked as the occupant leaves the vehicle.

This invention relates to improved coincidental lock operating means whereby more than one door can be locked and unlocked in a single operation.

An important feature of the invention is that it provides switch means whereby the driver can choose among three types of operation of the coincidental lock operating means, these three types of operation being identified as manual, semi-automatic, and automatic.

When manual operation is selected, all door locks are controlled by the front door inside lock operating means (garnish molding buttons in the apparatus illustrated) or by the front door outside key locks. The system is so arranged that a warning light comes on if a rear door is unlocked when the transmission selector lever is placed in a drive position, as drive, low, or reverse in a conventional type of automatic transmission. The rear door locks are capable of individual manual operation without effect on the other doors. In the event one or more doors are unlocked when the transmission selector lever is in a drive position, relocking is accomplished by raising a front door garnish molding button or operating key lock to unlock all doors, and then lowering the button or turning the key to relock all doors.

When the semi-automatic type of operation is selected, all doors are locked by operation of the front inside or outside lock operating means. Simultaneous unlocking of the doors may be accomplished only when the transmission selector lever is in a neutral position, as park or neutral in a conventional type of automatic transmission. The rear door locks are independently individually operable as in the manual system. Relocking an unlocked door when the transmission selector lever is in a drive position is accomplished by raising a front door garnish molding button to operate a switch which is connected thereto and then lowering the button to relock the doors. The locked doors will not become unlocked during this operation.

If automatic operation is selected, the front door garnish molding buttons or the front door key locks control all door locks so long as the transmission selector lever is in park or neutral. When the transmission selector lever is placed in a drive position, all doors are automatically locked and the lever must be moved

back to a neutral position in order to unlock any door.

Among other features of the invention, it incorporates time delay means which operate after a predetermined lapse of time to disconnect the system from the power source, thus avoiding the expenditure of power except during the short periods of time when coincidental locking and unlocking actually occur. In the event of power failure, the system is under manual control as in conventional automobile door lock arrangements. The improved system operates through lock and unlock solenoids in each door, each of these solenoids being so located that it is relatively invulnerable to the effects of inertia during rapid acceleration and deceleration of the automobile.

Other features of the improved arrangement are that in the event one of the door lock manual control means (that is, one of the garnish molding buttons in the type of system shown in the drawings) gets in the opposite lock condition from the condition of the other doors through manual operation, it will not be moved to the other lock condition upon automatic operation, but will fall into step with the rest of the system. Manual operation of either front door lock does not require as much force as is necessary to lock the door in a conventional manual system because during manual operation of either of the front door garnish molding buttons or either front door key lock, electrical contact is made so that the solenoids take over and complete the operation after the exercise of only enough manual force as is necessary to bring the parts into an intermediate position where the electrical circuit is completed. Also, our improved system is so arranged that it will not "machine gun" unless one control button is held up and one is held down throughout a complete cycle. In such an event, the system will machine gun at the relatively slow rate of approximately one cycle per second.

Other features and advantages of the invention will be apparent from the following description and from the drawings, in which:

Fig. 1 is a partial side elevational view of a 4-door automobile having the improved coincidental door locking system incorporated therein, the basic components of the locking arrangement being shown inside each door in broken lines;

Fig. 2 is an isometric view, partly broken away, of the front door latch of Fig. 1, together with the operating solenoids therefor;

Fig. 3 is an enlarged sectional view showing the rear door locking apparatus shown in Fig. 1;

Fig. 4 is a longitudinal section through the switch unit of Fig. 3; and

Fig. 5 is a diagrammatic representation of the coincidental lock operating apparatus.

Latch structure

Referring now more particularly to the drawings, the reference character **10** designates generally an automobile having a front door **12** and a rear door **14**. As is conventional, the opposite side of the automobile is provided with similar front and rear doors. Each door carries between its inner and outer panels a door latch which may be similar to the latches shown and described in detail in Patent 2,871,049, which issued on January 27, 1959, to S. D. Cockburn, et al., and which is assigned to the assignee of this application. In the front door this latch is designated generally as **16** and in the rear door the latch is designated generally as **18**. The front door latch may be operated from outside the automobile by a push button assembly **20** slidably carried in a fixed gripping handle **22** which is mounted on the outer door panel. From the inside the door may be operated by a turn handle **24** which is connected by a

rod 26 to the latch. Locking and unlocking may be accomplished from the outside by a conventional key-operated cylinder which is carried in the push button 20. From the inside the door may be locked and unlocked by a garnish molding button 28 which is connected to the latch by a rod 30.

Similarly, the rear door latch 18 may be operated from the outside by a push button assembly 32 which is slidably mounted in a fixed gripping handle 34 secured to the outer panel of the door 14. A turn handle 36 is mounted on the inner panel of the door and is connected to the latch by a rod 38 for operation of the latch from inside the automobile. In the rear door there is usually no outside key-operated lock and the only means for locking the door is a conventional garnish molding button 40 which is connected by a rod 42, a switch 43 and a rod 45 to the door latch 18.

Figure 2 shows the front door latch in perspective. The latch comprises a frame designated generally as 44 and having a base portion 46 which, when the latch is mounted in the door, lies closely adjacent and parallel to the jamb face of the door. A right angle flange portion 48 of the frame lies adjacent and parallel to the inner door panel and carries certain of the latch operating parts. The latch includes a rotary bolt 50 formed generally as a gear and adapted to cooperate with complementary teeth in a striker which is mounted on the body. The striker is not shown but it may be similar to the striker shown and described in Patent 2,871,049. The bolt 50 is fixedly mounted on a bolt shaft 52 which extends through and is rotatable in the base 46 of the latch frame. On the opposite surface of the frame from the bolt, there is a cam or ratchet member 54 which is also fixedly mounted on the shaft 52 so that the bolt 50, shaft 52, and ratchet 54 are effectively an integral unit.

The bolt assembly 50, 52, 54 is held against rotation in a door opening direction to retain the door in latched position with the bolt teeth in engagement with the complementary striker teeth by a detent 56 which is pivotally mounted on a stud 58 extending from the latch frame. A spring 60 is coiled about the stud 58 and has one end hooked into the detent to urge the detent into engagement with the ratchet 54, and when the detent engages the ratchet as shown in Figure 2, the bolt assembly is held against rotation in a counterclockwise direction so that the door is latched and cannot be opened. Since the ratchet teeth each has a sloping back side, the detent is cammed out of the way when the door is being closed and the bolt rolls over the striker teeth in a door closing direction.

Means for operating the detent from outside the automobile comprises a detent release lever 62 which is pivotally mounted at 64 on the latch frame and which is urged toward a normal retracted position by the other end of the spring 60 which is hooked over the end of the release lever. At its free end, the release lever has a flange 62*a* bent therefrom at right angles for engagement by the push button 20 so that upon operation of the push button from outside the automobile, the release lever is swung in a clockwise direction as the parts appear in Figure 2. An intermittent link 66 is pivotally mounted at 68 on the release lever 62 and has an arm 66*a* which is adapted to engage one arm 70*a* of a multi-armed multiplier lever 70 which is pivoted on the latch frame at 72. Another arm 70*b* of the multipler lever is connected to the detent so that when the push button 20 is pushed in, the multiplier lever is picked up by the intermittent link 66 and moved in a clockwise direction to swing the detent 56 in a counterclockwise direction out of engagement with the ratchet 54 to permit free rotation of the bolt assembly in a door opening direction. The door may now be pulled open, the both teeth riding over the complementary teeth of the striker.

For inside operation, there is a remote lever 74 pivotally mounted at 76 on the flange portion 48 of the frame.

This lever is connected to the rod 26 which, as shown in Fig. 1, is connected at its other end to the turn handle 24. Operation of the turn handle will pull on the rod 26 to swing the remote lever 74 in a counterclockwise direction so that a finger 74*a* on this lever which overlies a third arm 70*c* of the multiplier lever 70 will pick up the multiplier lever and swing the detent out of engagement with the ratchet 54.

The door latch illustrated is adapted to be locked against outside operation by uncoupling the intermittent link 66 from the multiplier lever 70 so that upon operation of the push button 20, the intermittent link merely "free wheels" and does not move the multiplier lever 70 or the detent 56. Even though the door is locked against outside operation it is never locked against inside operation since the remote lever 74 is always coupled to the multiplier lever 70.

In order to lock the door from the outside, there is a rock lever 78 which is pivotally mounted at 80 on the latch frame and which terminates at its outer end in a flange 78*a* which is received in the bifurcated end of a member 82 which is connected to and moved by the key cylinder in conventional and well known manner. When a proper key is inserted into the key cylinder and turned, the member 82 is moved to swing the rock lever 78 about its pivot 80. A link 84 is connected to the inner end of the rock lever 78 and extends upwardly where it is connected to a shiftable locking member 86 which is pivotally mounted at 88 on the flange portion 48 of the latch frame. The locking member 86 has bifurcated arms 86*a* and 86*b* which receive between them a flange bent from the end of a second arm 66*b* of the intermittent link 66. When the key is turned the rock lever 78 is swung to pull down on the link 84 and swing the locking member 86 in a counterclockwise direction. The bifurcated arms pick up the intermittent link and swing it downwardly so that its coupling arm 66*a* is out of the way of the multiplier lever, and when the push button 20 is operated the intermittent link merely free wheels and does not pick up the multiplier lever. An overcenter spring 90 yieldably holds the locking member 86 in either locked or unlocked position.

Locking from the inside is accomplished through the garnish molding button 28 which is connected to the locking member 86 through the rod 30 and through a lever 92 which is pivoted on the flange 48 of the latch frame and is coupled by a tab 92*a* to the locking member 86. Depression of the garnish molding button 28 pushes down on the rod 30 and swings the lever 92 in a clockwise direction. This in turn picks up the locking member 86 and swings it in a counterclockwise direction to swing the intermittent link down out of coupling engagement with the multiplier lever and lock the door.

As explained more fully in Patent 2,871,049, the latch shown in Figure 2 has an undogging feature, whereby, if the garnish molding button 28 is depressed to place the latch parts in locked position while the door is open and the door is then closed, the latch parts will be returned to their unlocked position so that the operator of the automobile will not inadvertently lock himself out of the car should he leave the keys in the ignition. On the other hand the latch is so arranged that if desired the door can be locked without a key upon the performance of a conscious act by the operator. The undogging function is accomplished by interengagement of an abutment 66*c* on the intermittent link 66 with a complementary abutment 56*a* on the detent. When the latch parts are in locked position, the intermittent link 66 is swung clockwise from the position shown in Figure 2 so that the abutment 66*c* lies closely adjacent the detent abutment 56*a*. When the door is closed with the parts in this position, the detent is cammed over the sloping back side of one or more of the ratchet teeth, pivoting the detent in a counterclockwise direction so that the detent abutment 56*a* picks up the intermittent link abutment 66*c* and swings

the intermittent link **66** counterclockwise past a point where the overcenter spring **90** takes over and completes the movement of the parts back to unlocked position. On the other hand, should the operator consciously desire to lock the door without the use of a key, he merely pushes down on the garnish molding button **28** when the door is open and while the door is being closed he pushes in on the push button **20**. This latter operation shifts the release lever **62** and the intermittent link **66** to the right in Fig. 2 so that the intermittent link abutment **66***c* is out of the path of movement of the detent abutment **56***a*. When the door is closed with the parts in this position, there is no undogging action to shift the latch parts back to unlocked position.

In order to accomplish the coincidental locking which is the subject of this invention, there is a locking solenoid **100** and an unlocking solenoid **102** connected through a lever arrangement to the lever **92**. A rod **104** extends from lever **92** to a rock lever **106** which is pivotally mounted at **108** on a bracket in the door. The rock lever **106** is connected on one side of its pivot to the armature **102***a* of the solenoid **102** and is connected on the other side of its pivot **108** to the armature **100***a* of the solenoid **100**.

The connection between the respective solenoid armatures **100***a* and **102***a* and the lever **106** is made by means of an open-ended slot in each of the armatures into which an end of the rock lever **106** is loosely received. Vinyl tubing as shown at **106***a* is mounted on each end of the lever to reduce the noise of impact. As shown in Fig. 2, the solenoids are mounted with the plungers hanging down to reduce the possibility that dirt and moisture will jam the moving parts. Since the latch parts are aided in movement between locked and unlocked positions by the overcenter spring **90**, the solenoids **100** and **102** are so located and arranged that their plungers carry the lever **106** just past a center position. The door locking parts complete their travel under the influence of the overcenter spring **90**.

Solenoid **100** is the locking solenoid and upon energization of the solenoid, its armature **100***a* is moved downwardly to swing the link **106** in a counterclockwise direction, moving the rod **104** downwardly and swinging the lever **92** in a clockwise direction and the locking member **86** in a counterclockwise direction to place the latch parts in locked position. Conversely, when the unlocking solenoid **102** is energized, its armature **102***a* moves downwardly, swinging the rock lever **106** in a clockwise direction and moving the latch parts to unlocked position.

Figs. 3 and 4 show the apparatus which is mounted in the right rear door **14**. The rear door latch **18** is substantially identical with the front door latch **16** which has been previously described. The principal differences in the construction of the latch are, first, the omission of the outside key locking apparatus; and, second, the provision of a so-called selective free wheeling arrangement. The latch parts which are mounted on the body portion of the frame facing the jamb face of the door are identical with the front door latch described above.

As is more fully disclosed in Patent No. 2,871,049, on the flange portion of the latch frame, the rear door latch has a locking member **120** pivotally mounted at **122** and having bifurcated arms **120***a* and **120***b* which straddle an arm **122***b* of an intermittent link which is similar to the intermittent link **66** of Fig. 2. Upon counterclockwise swinging movement of the locking member **120**, the intermittent link is swung downwardly to a free wheeling or door locked position as described in connection with Fig. 2. An overcenter spring **124** yieldably holds the locking member **120** either in locked or unlocked position.

As in the front door latch **16**, the rear door latch **18** has a detent operating multiplier lever with an arm **126***c* which underlies a remote lever **128**. One of the differences between the rear door latch and the front door latch is that the remote lever is not connected directly to the remote operating rod **38**, but instead the rod **38** is connected to a selective free wheeling lever **130** which is pivoted coaxially with the remote lever at **132**. A free wheeling selector rod **134** is connected between the locking member **120** and the levers **128** and **130**, being held in a selected position by a spring **136**. With the rod **134** in the position shown, the levers **128** and **130** are tied together only when the locking member **120** is in door unlocked position as illustrated. Now, if the inside handle **36** is turned, both levers **128** and **130** are swung in a counterclockwise direction and the lever **128** picks up the multiplier lever arm **126***c* to swing the detent out of engagement with the bolt ratchet. On the other hand, if the locking member **120** is swung in a counterclockwise direction to place the latch parts in locked condition as described in connection with Fig. 2, the rod **134** moves down adjacent the horizontal portion of an L-shaped slot **130***a* in the lever **130**. With the parts in this position, the lever **130** may swing relative to the lever **128**, and when the inside operating handle **36** is turned, only the lever **130** moves and the door cannot be opened by operation of the inside handle. If desired, the rod **134** and spring **136** can be moved upwardly by a proper tool so that the lower end of the rod **134** never is in alignment with the horizontal portion of the slot **130***a* and the levers **128** and **130** are tied together regardless of whether the parts are in locked or unlocked position. Under this condition of operation, the rear door can always be opened by the inside handle.

The locking member **120** is connected to the garnish molding button **40** through the rod **45**, the switch **43**, the rod **42** and a bell crank **137**, the vertical movement of the garnish molding button being translated into horizontal movement of the rods **42** and **45** by the bell crank. When the garnish molding button is depressed, the locking member **120** is swung in a counterclockwise direction to lock the door.

For coincidental operation of the locking means, there is a locking solenoid **140** and an unlocking solenoid **142** which are mounted in the door below the door latch and which are connected to the mechanical locking means of the door latch by means including a bell crank **144** which is pivoted on the latch frame and is connected at one end to the locking member **120** and at the other end to a rod **146**. The other end of the rod **146** is connected to one end of a rock lever **148** which is pivoted at **150** and which is connected by a slot arrangement similar to the structure of Fig. 2 to the armatures of the respective locking and unlocking solenoids **140** and **142**.

Fig. 4 shows the internal construction of the switch **43**. The rod **42** extends through the switch casing and its end is peened or otherwise secured to the base of a cup-shaped outer casing **152** of the switch **43**. An insulating washer **153** is mounted in the other end of the casing **152** and holds spaced contacts **154** and **156**, each of which carries a connector extending out of the casing. An inner cup-shaped casing **158** is slidable in the outer casing **152**. At its open end, the inner casing has an insulating washer **160** into which a ring of conductive material **162** is inlaid. The washer **160** is slidable in the casing **158** and is retained in the casing by an inwardly turned annular flange **158***a* at the open end of the casing. A spring **164** yieldably urges the washer **160** against the flange **158***a* and a smaller spring **166** is seated between the two insulating washers **153** and **160**. The rod **45** is connected by pins **45***a* and **45***b* to the base of the inner casing **158**. If the garnish molding button **40** is depressed, the switch will not be closed because the entire switch unit will move as the rod **42** is pulled to the right in Figs. 3 and 4. On the other hand, when the garnish molding button is lifted, the switch closes against the force of spring **166** and the contacts **154** and **156** are shorted by the conductive ring **162**. This condition is maintained until the door unlocking solenoid takes over the unlocking operation, at which time the ring **162** is moved out of shorting engagement with the

contacts 154 and 156 as the unlocking solenoid pulls on the rod 45.

Coincidental lock operating means

Referring to Fig. 5, the components of the coincidental lock operating circuit include a battery 200 which may be the usual automobile battery. A double pole, double throw switch 202 is arranged to be operated by the transmission selector lever in a manner similar to the switch disclosed in the copending application of Adams et al., entitled "Automobile Door Latching System," which was filed March 25, 1957, as Serial No. 648,209, and which was assigned to the assignee of this application. This switch is so arranged that it completes one circuit when the transmission selector lever is in a drive position (as drive, low or reverse in a conventional automatic transmission) and the switch completes another circuit when the transmission selector lever is in a neutral position (as park or neutral in a conventional automatic transmission).

A switching unit designated generally as 204 comprises a solenoid-operated combination switch including a solenoid coil 204*a*, a pair of ratchet type reversing switches 204*b* and 204*c*, and a pair of switch contacts 204*d*. The contacts 204*d* are arranged to close when the solenoid is energized and the ratchet type reversing switches 204*b* and 204*c* are arranged to be operated by the release movement of the spring loaded solenoid plunger. The reversing switch 204*b* is connected to the solenoid coil 204*a* through a self-closing circuit breaker 204*e* which may be of the type conventionally used to control automobile turn signal flasher devices. This circuit breaker is normally closed. In the operation of the switching unit 204 when a circuit is closed through the reversing switch 204*b*, the solenoid is energized and its plunger moves to close the normally open switch contacts 204*d*. After a predetermined time delay which is inherent in the operation of the normally closed circuit breaker 204*e*, the circuit breaker opens and the circuit to the solenoid coil 204*a* is broken. The spring-pressed solenoid plunger is released, opening the switch contacts 204*d* and causing the ratchet type reversing switches to operate to their opposite position. With the parts in this position, the switching unit will operate again if a circuit is closed through the other terminal of the reversing switch 204*b*. The switch contacts 204*d* are connected to the reversing switch 204*c* so that a circuit is closed whenever the solenoid coil 204*a* is energized to one of two terminals depending upon the position of the movable armature of the reversing switch 204*c*. This circuit is broken when the circuit breaker 204*e* operates approximately one second after initial energization.

The reference character 206 designates a rear door safety relay which has a coil 206*a* and a pair of contacts 206*b* which are held open when the coil is not energized by a spring 206*c*. When the coil 206*a* is energized, the contacts 206*b* connect the locking solenoids in each door directly to the battery. As pointed out earlier, each door mounts a locking solenoid and an unlocking solenoid, the right front door carrying locking solenoid 100 and unlocking solenoid 102, and the right rear door carrying locking solenoid 140 and unlocking solenoid 142. The left doors are similar, the left front door having a locking solenoid 208 and an unlocking solenoid 210, and the left rear door having a locking solenoid 212 and an unlocking solenoid 214. One contact of the switch 206*c* of the relay 206 is connected to the battery by a lead 216 and the other contact of the switch is connected by a lead 218 to each of the locking solenoids, the lead 218 having branch leads 218*a*, 218*b*, 218*c*, and 218*d* which connect respectively to the locking solenoids 100, 140, 208, and 212.

In addition to the solenoids above described, the right front door mounts a single pole, double throw switch 220 which is connected to and operated by a garnish molding button 28. Similarly, the left front door has a single pole, double throw switch 222 which is connected to and operated by its garnish molding button 224. In the right rear door, in addition to the switch 43 which is described above, there is a single pole, single throw warning switch 226 which is operated by the garnish molding button 40. In the left rear door there is a similar single pole, single throw switch 228 and a switch 230 which is similar to the right rear door switch 43, both switches 228 and 230 being operated by the garnish molding button 232.

The other elements of the system include an indicator which is illustrated as a lamp 234 arranged in a circuit to give an indication to the driver if a rear door is unlocked when the transmission selector lever is in a drive position. A selector switch designated generally as 236 comprises a two-gang, three-position switch having switch units 236*a* and 236*b*. This switch, which is manually operable, is mounted on the automobile dash or in some other location where it is readily accessible to the driver. Each of the two movable poles of the switch has three positions designated as M for manual, SA for semi-automatic, and A for automatic in Fig. 5. The left hand portion of the ganged switch, when in manual position, is connected in a lead 246 later to be described, and the semi-automatic and automatic contacts of this portion of the switch are open. The right hand portion of the switch has open manual and semi-automatic contacts, and the automatic contact, together with the povable pole of the switch, is connected in a by-pass circuit later to be described.

Manual type operating means

If either one of the switches 220 or 222 is operated by one of the front door garnish molding buttons or by the key lock for that door, a circuit is completed from the battery to the locking coils 100, 140, 208, and 212 in the respective doors. Closure of the switch 220, for example, in the other direction from that shown completes a circuit from the battery 200 through lead 216 and the armature of switch 220 to a lead 238*a*. This lead, together with a branch lead 238*b* which extends from the switch 222, connects with a lead 238 extending to the armature of switch 204*b* which is connected to the coil 204*a* of the switching unit. When the solenoid becomes energized, a circuit is completed from the battery through lead 216 and a lead 240 to the switch contacts 204*d* of the switching unit. These contacts are closed while the coil 204*a* is energized so that the battery is connected to all the door locking solenoids 100, 140, 208, and 212 through the lead 218 and its respective branches 218*a*, 218*b*, 218*c*, and 218*d*. After a delay of approximately one second during which time the mechanical door locks operate, the circuit breaker or flasher unit 204*e* opens, deenergizing the coil 204*a* and the spring-loaded armature of this solenoid is released, opening the contacts 204*d* and causing the reversing switches 204*b* and 204*c* to change to the positions shown in broken lines. Since contacts 204*d* are open, the energizing circuit for the locking solenoids is broken, and since reversing switch 204*b* is in its dotted line position, solenoid coil 204*a* will not again become energized when flasher unit 204*e* closes.

If the garnish molding button in one of the rear doors subsequently is raised, one of the warning switches 226 or 228 will be closed. If the transmission selector lever controlled switch 202 is placed in the drive position shown in Fig. 5, the indicator 234 will be energized to warn the driver that a rear door is unlocked. The circuit for the warning device extends from a battery through a lead 242 which incorporates the "drive" contacts of the switch 202 and the warning lamp 234. Branch leads 242*a* and 242*b* extend to the respective warning switches 226 and 228.

In order to unlock the doors, one of the switches 220 or 222 is operated back to the position illustrated in Fig. 5 by the garnish molding button or key lock in one of the front doors. This operation connects lead 216 to a lead 244 which is connected to the other terminal of re-

versing switch **204***b* so that solenoid coil **204***a* becomes energized and contacts **204***d* close, completing the circuit through the switch **204***c*, which is in its broken line position, to a lead **246** which incorporates the "manual" contact of selector **236***a*. Lead **246** has branches **246***a*, **246***b* **246***c*, and **246***d* which connect respectively to the door unlocking solenoids **102**, **142**, **210**, and **214**. When these solenoids are energized, the mechanical locking apparatus of each door lock is shifted to unlocked position and the switches **220** and **222** are operated thereby. After a delay of approximately one second, the flasher unit **204***e* deenergizes solenoid coil **204***a* and reverses **204***b* and **204***c*. If the gear shift lever is in a drive position, the warning light **234** will operate as described above.

Semi-automatic lock operating means

For semi-automatic operation the manual selector switch is moved to "SA" position. The locking operation is identical to the manual locking operation described above. To unlock the doors when the selector switch is set to its semi-automatic (center) position, the operation is similar to the manual procedure except that closing of contacts **204***d* does not close a circuit directly through lead **246** since switch **236***a* is open. Instead, a circuit is completed through a by-pass lead **247** which incorporates the "neutral" contacts of switch **202** and then connects with lead **246** on the other side of switch **236***a*. When the transmission selector lever is in a drive position, the "neutral" contacts of switch **202** are open and the doors will not be unlocked. However, during the operation, the switching unit solenoid coil **204***a* is energized and switches **204***b* and **204***c* are reversed after a one second delay. Subsequent lowering of a front door garnish molding button will relock an unlocked door. As in the manual system, the warning light **234** operates if a rear door is unnlocked while the transmission selector lever operated switch **202** is in a drive position.

Automatic type coincidental operation

If the selector switch **236** is set to the automatic position, which is the position at the extreme right in Fig. 5, locking and unlocking operations are identical to the manual and semi-automatic operations so long as the transmission selector operated switch **202** is in its neutral position. When the switch is placed in its drive position, a connection is made from the battery and lead **242** to a lead **250** which extends to the right hand portion **236***b* of the selector switch. From the selector switch a connection is made with lead **238** and thence through switch **204***b* and flasher unit **204***e* to the solenoid coil **204***a*. This energizes the coil and the locking operation is accomplished automatically.

If a front door garnish molding button is raised or if a front door key lock is operated while the transmission selector lever is in a drive position, a connection is made from lead **216** through one of the switches **220** or **222** and lead **244** to the switch **204***b* which is now reversed and through this switch and the flasher unit **204***e* to the solenoid coil **204***a* to energize this coil and reverse the switches **204***b* and **204***d*, but since the transmission selector lever controlled switch **202** remains in the position shown, the doors will lock again automatically. There is a short period under this condition of operation when the manually unlocked front door can be opened before it is relocked automatically. This period depends upon the cycle time of the flasher unit **204***e* and is preferably of the order of one second. In other words, the front door garnish molding button which has been manually raised will automatically go down again after a delay of about one second.

If a rear door garnish molding button is raised while the transmission selector lever controlled switch **202** is in its drive position, one of the switches **43** or **230** is closed at the start of the travel of the garnish molding button which is being raised as explained in connection with Fig. 4. This grounds the coil **206***a* of the rear door safety relay **206** since one end of this coil is connected to the battery through a lead **252** which extends to the switch **236***b* and thence to the battery through the leads **250** and **242** and the switch **202** and the other end of the coil is connected to ground through a lead **254** and branch leads **254***a* and **254***b* which are connected respectively to the rear door safety switches **43** and **230**. When the normally open contacts **206***b* of the relay **206** close, the locking solenoids **100**, **140**, **208**, and **212** are connected to the battery through the lead **216**, contacts **206***b* and lead **218** and its respective branches **218***a*, **218***b*, **218***c*, and **218***d*. As the garnish molding button is raised to its full unlocked position, the spring **164** in the switch **43** is further compressed, but the locking solenoid in the door which is being operated holds the lock parts down so that the rod **45** does not follow and the switch **43** opens. The rear door therefore cannot be unlocked while the transmission selector lever controlled switch **202** is in its drive position.

While we have shown and described certain embodiments of our invention, it is capable of many modifications. Changes, therefore, in the construction and arrangement may be made without departing from the spirit and scope of the invention as set forth in the appended claims.

What is claimed is:

1. In an automobile having a source of power and having a plurality of doors, each of which has a door latch with mechanical locking means therefor, coincidental apparatus for operating said locking means in a plurality of doors simultaneously, comprising: motor means in each door connected to the locking means thereof; a transmission selector switch movable between drive and neutral positions and connected to said motor means; power relay means connected to said motor means for controlling the energization thereof; control circuit means adapted to connect said power relay means in circuit with the source of power, said control circuit means including control switch means connected to and operated by said mechanical locking means; time delay means connected to said power relay means, said time delay means including delay switch means for breaking the circuit to said power relay means at a predetermined time after energization thereof; and selector means operable to condition said coincidental apparatus for a selected one of three types of operation, the first type being manual, whereby coincidental locking and unlocking are completely under the control of said control switch means, the second type being semi-automatic, whereby coincidental locking is under the control of said control switch means but coincidental unlocking is under the control of said transmission selector switch when in neutral position, and the third type being automatic, whereby coincidental locking and unlocking are completely under the control of said transmission selector switch when in drive position and are under the control of said control switch when the transmission selector switch is in neutral position.

2. In an automobile having a source of power and having a plurality of doors, each of which has a door latch with mechanical locking means therefor, coincidental apparatus for operating said locking means in a plurality of doors simultaneously, comprising: motor means in each door connected to the locking means thereof; a transmission selector switch movable between drive and neutral positions and connected to said motor means; power relay means connected to said motor means for controlling the energization thereof; control circuit means adapted to connect said power relay means in circuit with the source of power, said control circuit means including control switch means connected to and operated by said mechanical locking means; time delay means connected to said power relay means, said time delay means including delay switch means for breaking the circuit

to said power relay means at a predetermined time after energization thereof; and selector means operable to condition said coincidental apparatus for a selected one of two types of operation, the first type being manual, whereby coincidental locking and unlocking are completely under the control of said control switch means and the second type being automatic, whereby coincidental locking and unlocking are completely under the control of said transmission selector switch when in drive position and are under the control of said control switch when the transmission selector switch is in neutral position.

3. In an automobile having a source of power and having a plurality of doors, each of which has a door latch with mechanical locking means therefor, coincidental apparatus for operating said locking means in a plurality of doors simultaneously, comprising: motor means in each door connected to the locking means thereof; a transmission selector switch movable between drive and neutral positions and connected to said motor means; power relay means connected to said motor means for controlling the energization thereof; control circuit means adapted to connect said power relay means in circuit with the source of power, said control circuit means including control switch means connected to and operated by said mechanical locking means; time delay means connected to said power relay means, said time delay means including delay switch means for breaking the circuit to said power relay means at a predetermined time after energization thereof; and selector means operable to condition said coincidental apparatus for a selected one of two types of operation, the first type being semi-automatic, whereby coincidental locking is under the control of said control switch means, but coincidental unlocking is under the control of said transmission selector switch when in neutral position, and the second type being automatic, whereby coincidental locking and unlocking are completely under the control of said transmission selector switch when in drive position and are under the control of said control switch when the transmission selector switch is in neutral position.

4. Apparatus of the character claimed in claim 1, wherein said motor means comprises at least one solenoid connected to the mechanical locking means of each door latch which is to be coincidentally operated.

5. Apparatus of the character claimed in claim 1, wherein said motor means comprises a locking solenoid and an unlocking solenoid connected to the mechanical locking means of each door latch which is to be coincidentally operated.

6. In an automobile having a battery and having a pluraltiy of doors, each of which has a door latch with mechanical locking means therefor, coincidental apparatus for operating said locking means in a plurality of doors simultaneously, comprising: motor means in each door comprising locking and unlocking solenoids connected to the mechanical locking means of each door latch which is to be coincidentally operated; a transmission selector switch movable between drive and neutral positions and connected to said motor means; power relay means connected to said motor means for controlling the energization thereof; control circuit means adapted to connect said power relay means in circuit with the battery, said control circuit means including control switch means connected to and operated by said mechanical locking means; time delay means connected to said power relay means, said time delay means including delay switch means for breaking the circuit to said power relay means at a predetermined time after energization thereof; and selector means operable to condition said coincidental apparatus for a selected one of three types of operation, the first type being manual, whereby coincidental locking and unlocking are completely under the control of said control switch means, the second type being semi-automatic, whereby coincidental locking is under the control of said control switch means but coincidental unlocking is under the control of said transmission selector switch when in neutral position, and the third type being automatic, whereby coincidental locking and unlocking are completely under the control of said transmission selector switch when in drive position and are under the control of said control switch when the transmission selector switch is in neutral position.

7. In an automobile having a source of power and having a plurality of doors, each of which has a door latch with mechanical locking means therefor, coincidental apparatus for operating said locking means in a plurality of doors simultaneously, comprising: motor means in each door connected to the locking means thereof; a transmission selector switch movable between drive and neutral positions and connected to said motor means; power relay means connected to said motor means for controlling the energization thereof; control circuit means adapted to connect said power relay means in circuit with the source of power, said control circuit means including control switch means connected to and operated by said mechanical locking means; time delay means connected to said power relay means, said time delay means including delay switch means for breaking the circuit to said power relay means at a predetermined time after energization thereof; selector means operable to condition said coincidental apparatus for a selected one of three types of operation, the first type being manual, whereby coincidental locking and unlocking are completely under the control of said control switch means, the second type being semi-automatic, whereby coincidental locking is under the control of said control switch means but coincidental unlocking is under the control of said transmission selector switch when in neutral position, and the third type being automatic, whereby coincidental locking and unlocking are completely under the control of said transmission selector switch when in drive position and are under the control of said control switch when the transmission selector switch is in neutral position; and safety relay means including an actuating switch connected to the mechanical locking means of at least one of said doors for connecting the locking solenoids to the battery in the event said one door becomes unlocked.

8. In an automobile having a battery and having front and rear doors, each of which has a door latch with mechanical locking means therefor, coincidental apparatus for operating said locking means in a plurality of doors simultaneously, comprising: motor means in each door comprising locking and unlocking solenoids connected to the mechanical locking means of each door latch which is to be coincidentally operated; a transmission selector switch movable between drive and neutral positions and connected to said motor means; power relay means connected to said motor means for controlling the energization thereof; control circuit means adapted to connect said power relay means in circuit with the battery, said control circuit means including control switch means connected to and operated by said mechanical locking means; time delay means connected to said power relay means for breaking the circuit to said power relay means at a predetermined time after energization thereof; selector means operable to condition said coincidental apparatus for a selected one of three types of operation, the first type being manual, whereby coincidental locking and unlocking are completely under the control of said control switch means, the second type being semi-automatic, whereby coincidental locking is under the control of said control switch means but coincidental unlocking is under the control of said transmission selector switch when in neutral position, and the third type being automatic, whereby coincidental locking and unlocking are completely under the control of said transmission selector switch when in

drive position and are under the control of said control switch when the transmission selector switch is in neutral position; and safety relay means including a momentary contact actuating switch connected to the mechanical locking means of each rear door for connecting the locking solenoids to the battery in the event one of said rear doors becomes unlocked.

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