Nov. 6, 1962 J. D. LESLIE 3,062,034

COINCIDENTAL DOOR LOCKING SYSTEM

Filed Sept. 8, 1959 4 Sheets-Sheet 1

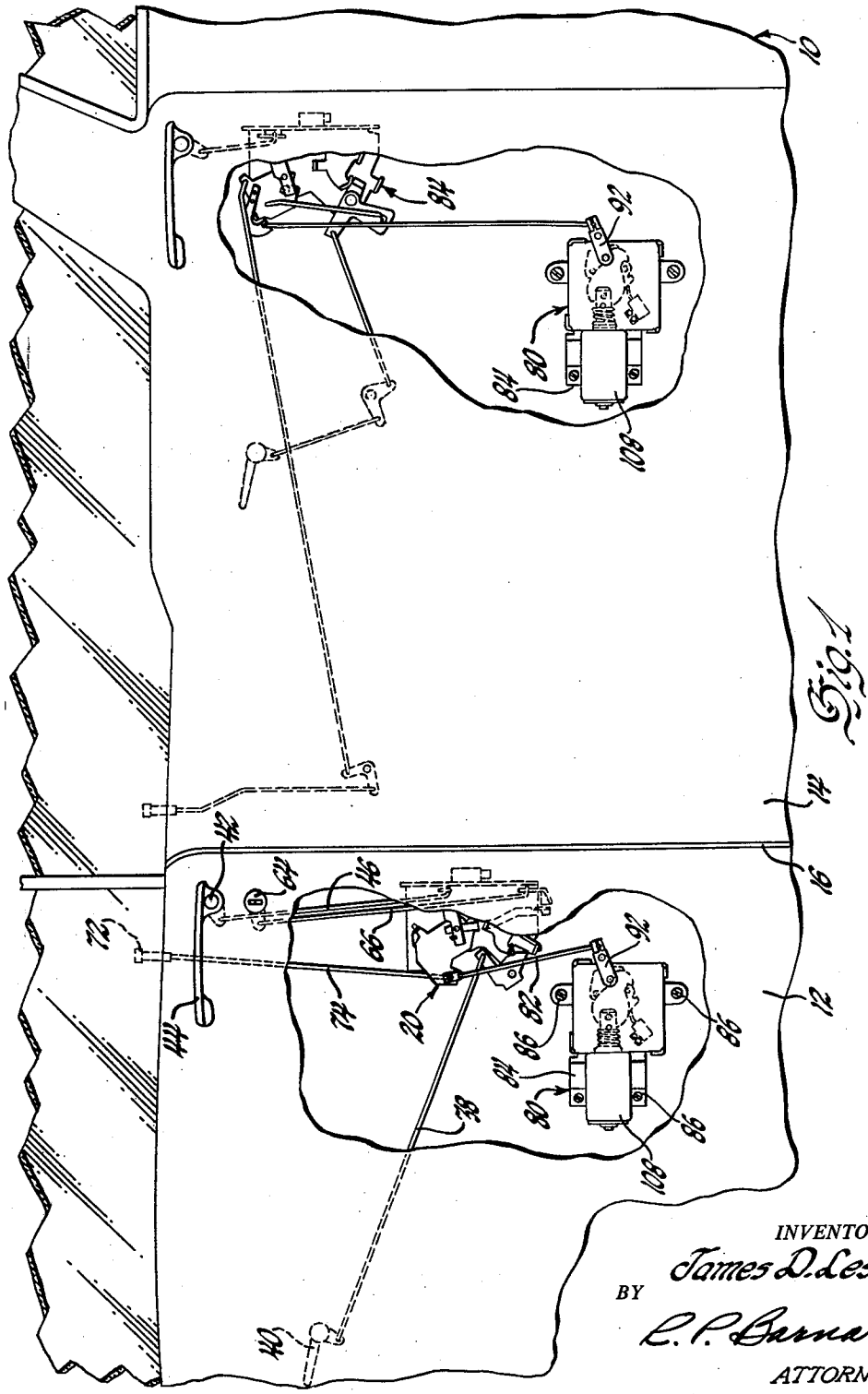

Fig. 1

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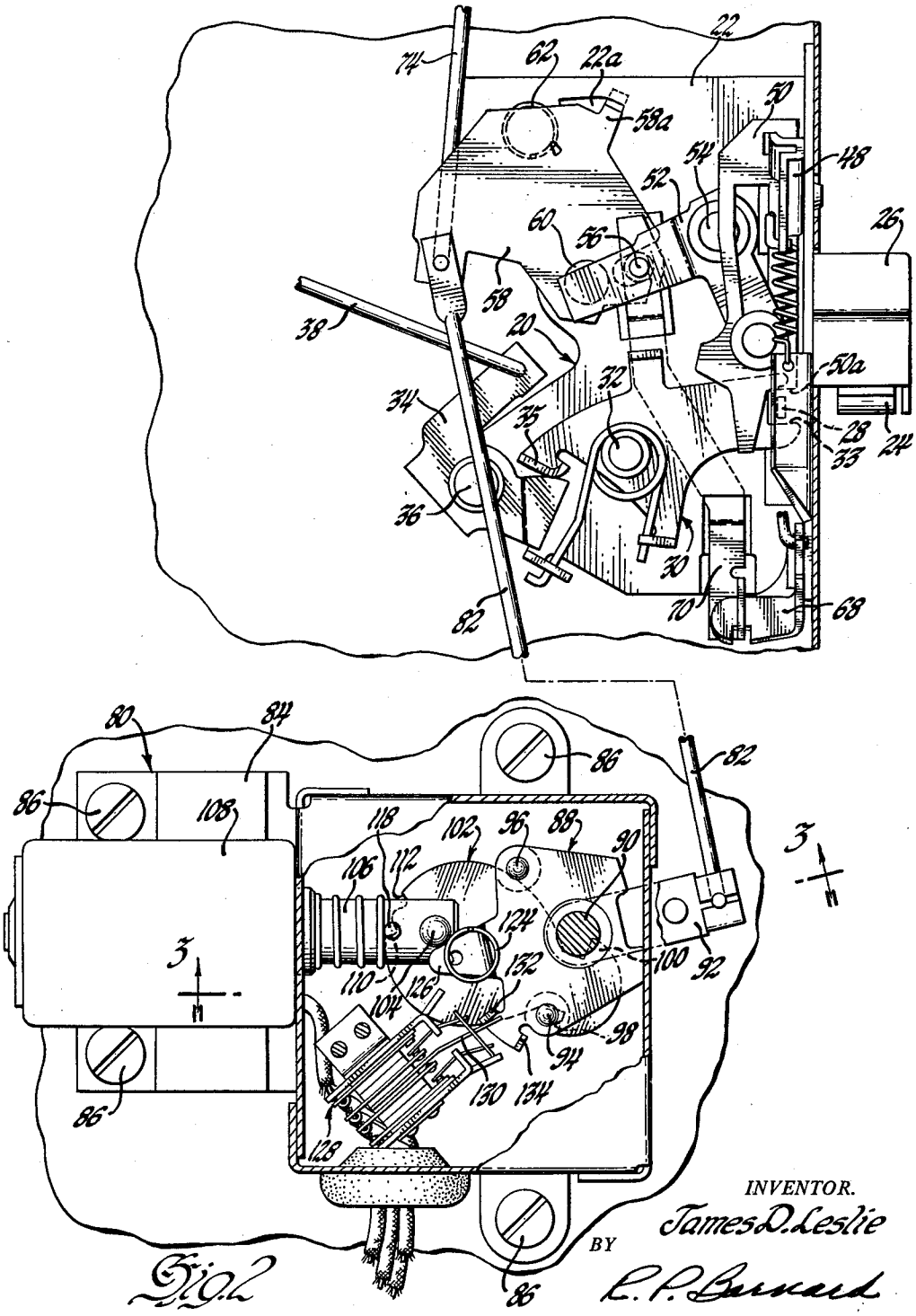

Fig. 2

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COINCIDENTAL DOOR LOCKING SYSTEM

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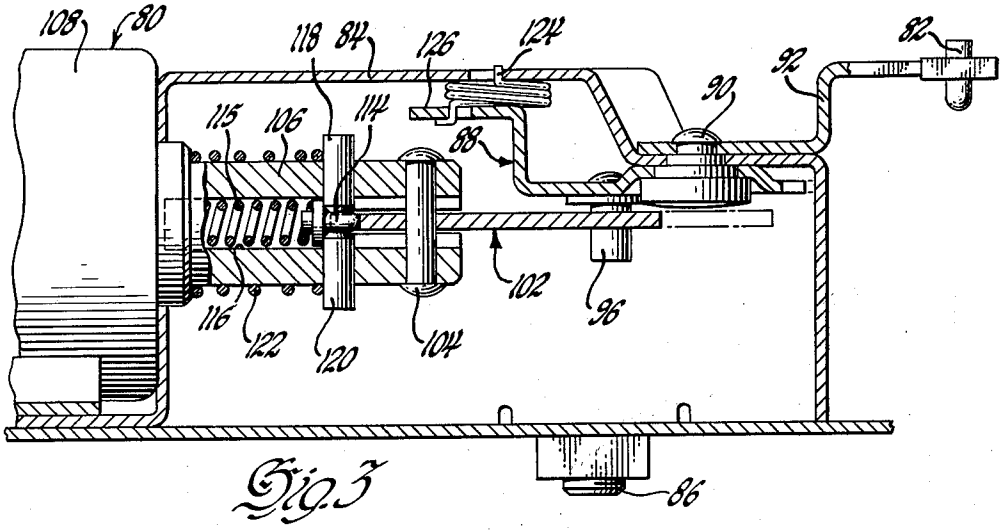

Fig. 3

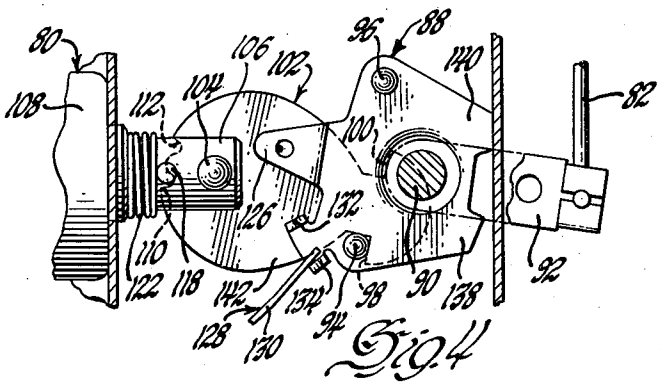

Fig. 4

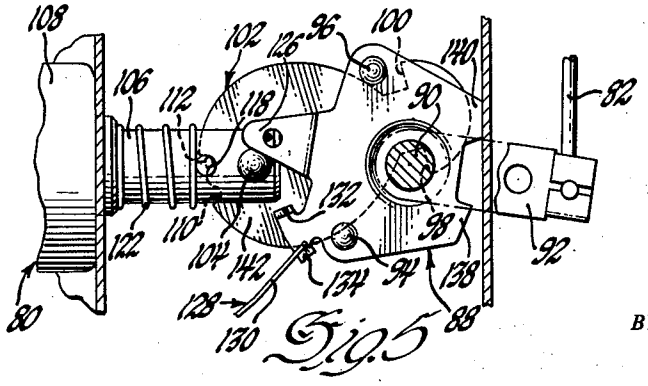

Fig. 5

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COINCIDENTAL DOOR LOCKING SYSTEM

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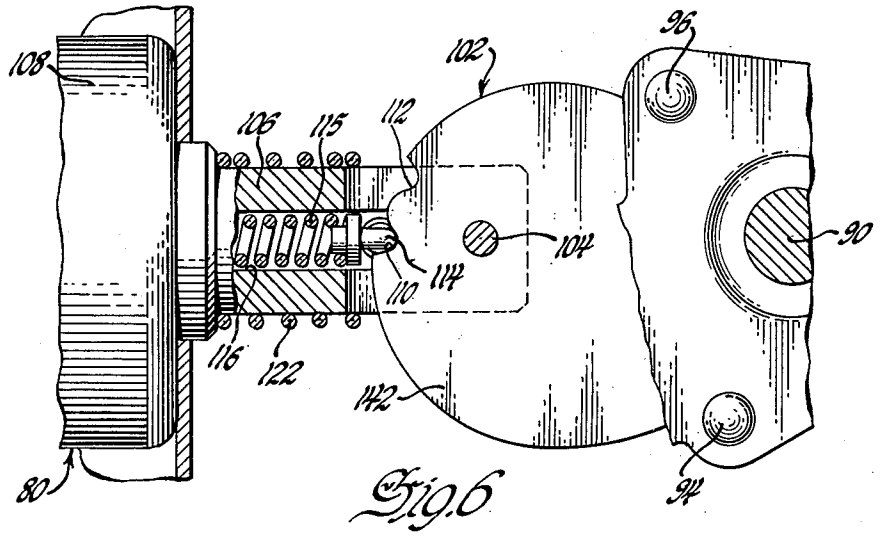

Fig. 6

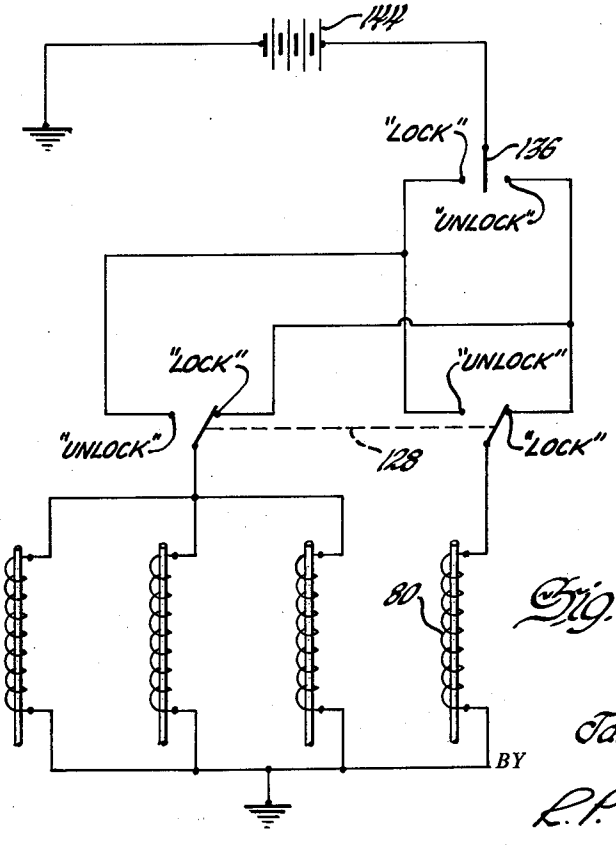

Fig. 7

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3,062,034

COINCIDENTAL DOOR LOCKING SYSTEM

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Filed Sept. 8, 1959, Ser. No. 838,574
7 Claims. (Cl. 70—264)

The present invention relates to an improved door locking mechanism and more particularly one in which it is possible to automatically lock or unlock all vehicle doors from a single position within the vehicle.

Under many vehicle operating conditions it is advantageous for the operator or another person in the front seat of the vehicle to be able to automatically lock or unlock the remaining doors of the vehicle. This is particularly true where the vehicle includes rear doors. Such coincidental door locking systems have long been desired and many have been built. However, in general, these systems have been costly and subject to various operating difficulties. One of the major factors contributing to both cost and operating difficulties has been the necessity for using a pair of solenoids on each door locking mechanism, one solenoid for locking and another for unlocking.

In the present invention a unique operating linkage system has been developed which enables a single solenoid to be utilized on each door locking mechanism to achieve both locking and unlocking. In the present invention a master solenoid is provided on one door of the vehicle and which when operated is adapted to in turn control a switch device which operates the remaining door solenoids so that the door lock operation will be coincidental.

Other objects and advantages of the present invention will be apparent from a perusal of the detailed description which follows.

In the drawings:

FIGURE 1 shows a vehicle embodying the subject locking system;

FIGURE 2 is an enlarged view showing the front door lock controlling system of FIGURE 1;

FIGURE 3 is a view along line 3—3 of FIGURE 2;

FIGURES 4 and 5 show the solenoid controlled overcenter linkage mechanism in its various operating positions;

FIGURE 6 is an enlarged view of the overcenter linkage detent mechanism; and

FIGURE 7 is a schematic diagram of the electrical control system.

This invention provides a novel coincidental door locking system particularly designed for a four-door automobile wherein each door may be individually locked or unlocked by conventional mechanical means, or wherein the doors may simultaneously be locked or unlocked by electrical means the control apparatus for which may be associated with each front door.

Referring now more particularly to the drawings, an automobile designated generally at **10** has a front door **12** and a rear door **14**. The front door is hingedly mounted in a conventional manner at its front edge on the automobile body and the rear door is hingedly mounted at its front end on a body center pillar **16**. Such doors are, of course, provided on each side of the automobile.

A latch designated generally at **20** is mounted within the front door **12**. This latch is basically similar to the latch which is described in detail in the copending application of Stanley D. Cockburn et al., entitled "Rotary Gear Bolt Door Latch," filed November 16, 1953, as Serial No. 392,266 now Patent No. 2,871,049 issued

January 27, 1959. In latches of this general type there is an intermittent link mounted for movement in two directions. When the latch is in its unlocked condition operation of the outside push button works through this intermittent link to move the detent out of engagement with a ratchet unitarily mounted with the latch bolt. When the latch is in locked condition, the intermittent link is swung to an out-of-the-way position so that upon operation of the outside push button, the link merely free wheels, being uncoupled from the detent and effectively locking the door against outside operation. A latch identical with latch **20** is shown and described in copending application Serial No. 534,034 Leslie, filed September 13, 1955, now Patent No. 2,877,043, issued March 10, 1959.

Referring particularly to FIGURES 1 and 2, latch **20** comprises a frame **22** mounted inside door **12** between the outer and inner panels thereof. A latch bolt **24** in a bolt housing **26** projects through an opening in the jamb face of the door for engagement with a keeper mounted on the body pillar **16**. This keeper may be similar to the keeper shown in Patent No. 2,871,049. The bolt is held against rotation in one direction to prevent the door from being opened by engagement of a detent which is mounted on the latch frame with a ratchet which is mounted for rotation with the bolt, an end of the detent being shown at **28** in FIGURE 2. For operation from inside the automobile, there is a multi-armed lever **30** pivoted at **32** on the latch frame. One arm of this lever terminates in a notch **33**, the walls of which straddle the detent **28**. Another arm of the lever terminates in a turned flange **35** which lies adjacent one arm of a remote bell crank **34** which is pivoted at **36** on the latch frame and which is connected by a rod **38** to turn a handle **40** swingably mounted on the door inner panel. When handle **40** is turned in a door opening direction, it pulls on the rod **38**, swinging the remote bell crank **34** in a counterclockwise direction as viewed in FIGURES 1 and 2. The bell crank **34** picks up a multi-armed lever **30** and swings it in a clockwise direction swinging the detent **28** downwardly out of engagement with the bolt ratchet. The bolt is now freely rotatable and the door may be opened. For operation from outside the automobile, there is a push button **42** slidably mounted in a gripping handle **44** which is fixedly mounted on the door outer panel. A rod **46** connects the push button mechanism with a lever **48** which, as shown in FIGURE 2, is connected to an intermittent link **50**. Operation of the push button **42** causes downward movement of the intermittent link **50** so that a shoulder **50***a* thereon picks up the detent **28** to swing it out of engagement with the bolt ratchet.

To lock the door against outside operation, the intermittent link **50** is swung in a clockwise direction, as viewed in FIGURE 2, to move the shoulder **50** to the left so that the detent **28** lies out of the path of downward movement of the shoulder **50***a* when the push button **42** is depressed. In other words, the intermittent link is uncoupled from the detent so that it merely free wheels when the push button is operated, and the detent left undisturbed. Intermittent link **50** is connected to one arm of a bell crank **52** pivoted at **54** on the latch frame. The other arm of bell crank **52** is connected by a rivet **56** in a slot formed in a locking member **58** which is pivotally mounted at **60** on the latch frame. This locking member is movable between locked and unlocked positions, being yieldably held in either position by an overcenter spring **62** which is connected between the locking member **58** and the latch frame. The locking member is limited in its range of pivotal movement and blocked against overtravel in either direction by stop means here shown as a tab **58***a* bent from the member **58** and extending through a slot

22*a* in the latch frame. In order to lock the door from the outside, there is a conventional key cylinder arrangement 64 mounted on the door outer panel and connected by a rod 66 to a rock lever 68 which is pivotally mounted on the latch frame and which is connected to a link 70, the upper end of which is connected by the rivet 56 to the locking member 58. Rotary movement of a key in the key cylinder will shift the locking member 58 between its locked and unlocked positions. For locking from inside the car, there is a conventional manual lock operating member comprising a garnish molding button 72 which is connected by a rod 74 to a locking member 58. Depression of the garnish molding button 72 acts through rod 74 to swing locking member 58 counterclockwise and thus move the intermittent link 50 to lock or uncoupled position. For electric coincidental locking as will later be described, there is a solenoid operated device indicated device generally at 80 and connected by a rod 82 to locking member 58.

In the rear door 14 there is a latch generally designated at 84, which is similar in most respects to the front door latch 20. The principal differences between the front and rear door latches are that the rear door latches do not have an outside key operated locking device and the rear door latch has a different mechanical hook-up for inside operation to provide a selective free wheeling function which forms no part of this invention and which is shown and described in Patents No. 2,871,049 and No. 2,877,043. Since the front and rear door latches are identical insofar as this invention is concerned and further since the rear door latches are described in a similar environment in copending application Serial No. 752,354 Garvey, filed July 31, 1958, now Patent No. 2,934,930, issued May 3, 1960, no further detailed description thereof is deemed to be necessary.

Solenoid locking device 80 comprises a frame member 84 suitably mounted on the door inner panel through fastening members 86. Device 80 includes an overcenter linkage mechanism which has a lever 88 pivotally mounted through a pin 90 to frame 84. A lever 92 is also fixed to pin 90 and is articulated at its other end to rod 82 which connects with locking member 58. A pair of pins 94 and 96 are fixed on lever 88 on opposite sides of mounting pin 90. Pins 94 and 96 are adapted to sequentially be engaged by projections 98 and 100 formed by suitably notching one end of a camming member 102. Camming member 102 is pivotally secured through a pin 104 to one end of armature 106 of solenoid 108. Member 102 has a pair of recesses 110 and 112 formed on the periphery thereof which are adapted to coact with a movable detent member 114 disposed within a slotted portion 116 of armature 106. Detent 114 is biased by spring 115 into engagement with member 102. Detent 114 coacts with recesses 110 and 112 to retain the member 102 in either of two positions the purpose of which will be more apparent subsequently.

A pair of diametrically extending pins 118 and 120 are mounted in armature 106 and are adapted at their outer ends to provide a seat for one end of a spring 122, the other end of which seats against the solenoid casing. Detent 114 is adapted to extend between the inner ends of pins 118 and 120 which provide means for retaining the detent within the slotted portion 116 of the armature 106.

Spring 122 is adapted to urge the solenoid armature 106 to its extended position, as shown in FIGURES 2 and 5, in which detent 114 is disposed in one or the other of recesses 98 or 100.

An overcenter spring 124 is connected intermediate an arm 126 of lever 88 and frame 84 and is adapted to urge the lever toward one or the other of its positions as the lever passes overcenter, i.e., crosses a line-of-centers drawn between the center of armature 106 and mounting pin 90. Overcenter spring 124 insures that lever 88 will either be in its "lock" or "unlock" position and will not assume an intermediate position.

A single pole-double throw switch 128 is mounted on frame 84 and includes a movable member 130 which extends between tangs 132 and 134 formed on lever 88. Switch 128 is adapted to be actuated each time lever 88 is rotated from one of its positions to the other. The purpose and operation of switch 128 will be considered in greater detail with the description of the electrical control circuit of FIGURE 7.

In the event the vehicle operator or another person in the front passenger compartment desires to coincidentally lock all of the vehicle doors, he would energize solenoid 108 through a switch 136 suitably mounted on the vehicle dash or front door. Switch 136 is shown in the diagrammatic control circuit of FIGURE 7. Energizing solenoid 108 retracts armature 106 against the force of spring 122 and in so doing carries member 102 with it, see FIGURES 2 and 4. At this time projection 98 of member 102 is disposed beneath pin 94 on lever 88 and retained in this position by detent 114 which is seated in recess 110 all as shown in FIGURE 2. The retracting movement of armature 106 and member 102 causes projection 98 to engage pin 94 and thereby rotate lever 88 in a clockwise direction moving rod 82 downwardly. This movement imparts a counterclockwise rotation to locking member 58 which, through bell crank lever 52, rotates link 50 out of operative engagement with detent 28 preventing actuation of the rotary bolt 24. Lever 88 includes two legs 138 and 140 which respectively coact with frame 84 to limit the rotating movement of the lever.

As lever 88 passes overcenter to the position shown in FIGURE 4, switch 128 de-energizes solenoid 80 permitting armature spring 122 to move armature 106 to its extended position. In extending the armature, surface 142 of member 102 cams against pin 94 to rotate the latter member in a counterclockwise direction about pin 104 causing detent 114 to be cammed upwardly against the force of its spring 115 until it passes overcenter and seats within recess 112. Thus rotating member 102 positions projection 100 beneath pin 96 of lever 88. The mechanism is now cycled for the next energization of solenoid 108 in which lever 88 will again be moved back to its "unlock" position.

Referring now to FIGURE 7, the operation of switch 128 will be more apparent. A source of power, such as the vehicle battery, is shown generally at 144. The operator through coincidental locking switch 136 can move the latter to either its "lock" or "unlock" position as shown in the drawing. The diagram assumes the parts to be in the lock position shown in FIGURE 5 of the drawing. Assuming the operator wishes to coincidentally unlock all the doors, switch 136 is moved to the "unlock" position in which solenoid 80 will be energized in view of the position of switch 128. The remaining door solenoids will also be actuated since switch 128 also controls the flow of current thereto through a separate parallel circuit. As lever 88 passes overcenter, switch 128 is actuated to shift the movable contact member 130 to the "unlock" position. This action de-energizes all of the solenoids, however, the movement of overcenter lever 88 is continued by overcenter spring 124, supra. The de-energization of the solenoids and the movement of switch 128 permits the armature spring to extend the armature and thereby recycles the solenoid for subsequent energization which will shift the overcenter lever 88 back to its "lock" position.

I claim:

1. A locking system for a vehicle door including a rotary bolt member, outside and inside operating members, a latch mechanism operatively connecting said operating members with said bolt member and permitting said operating members to open said door, said latch mechanism including a lever adapted to interrupt the op-

erative connections between said operating members and said bolt member, a locking device operatively connected to said lever, said device including an overcenter linkage mechanism, said overcenter linkage mechanism being adapted in one position to move said lever to its lock position and when moved to its other position to move said lever to its unlock position, a solenoid member operatively connected to said overcenter linkage mechanism and adapted to shift said latter mechanism to either of its positions, first switch means for energizing said solenoid member, second switch means associated with said overcenter linkage mechanism and adapted to de-energize said solenoid member as said overcenter linkage mechanism moves overcenter, and an overcenter spring for completing the movement of the linkage mechanism initiated by the solenoid member.

2. A coincidental door locking system for a vehicle having a plurality of front and back doors, each of said doors including a rotary bolt member, outside and inside operating members, and a latch mechanism operatively connecting said operating members with said bolt member and permitting said operating members to open each said door, each said latch mechanism including a lever adapted to interrupt the operative connections between its operating members and bolt member, a locking device operatively connected to said lever, said device including an overcenter linkage mechanism, said overcenter linkage mechanism being adapted in one position to move said lever to its lock position and when moved to its other position to move said lever to its unlock position, a master solenoid member operatively connected to said overcenter linkage mechanism for one of the front doors of the vehicle and adapted to shift said overcenter linkage mechanism to either of its positions, a solenoid operatively connected to the overcenter linkage mechanism for each of the other doors, a first switch for actuating the master solenoid member, and second switch means associated with the master solenoid member overcenter linkage mechanism for controlling the actuation of the other door lock solenoid members.

3. A coincidental door locking system as set forth in claim 2 in which said second switch means is adapted to de-energize said solenoid members when the linkage mechanism passes overcenter and further in which each linkage mechanism includes an overcenter spring for completing the movement of the linkage mechanism after the associated solenoid has been de-energized.

4. A door locking system as set forth in claim 1 in which the overcenter linkage mechanism comprises first lever means pivotally mounted on a fixed pivot, a link interconnecting the first lever means and said latch mechanism lever, said solenoid member including an armature, second lever means articulated to the solenoid armature, a pair of pins fixed to the first lever means and spaced on opposite sides of said fixed pivot, a pair of projections on said second lever means adapted to respectively engage said pins in sequence, detent means for positioning the second lever means so that one of the projections is adapted to engage one of said pins to rotate the first lever means when the solenoid member is energized, and spring means adapted upon de-energization of the solenoid member to rotate the second lever means to a position in which the other projection is adapted to engage the other pin.

5. A door locking system as set forth in claim 4 in which the spring means for rotating said second lever means is also adapted to move the armature to an extended position when the solenoid is de-energized.

6. A door locking system as set forth in claim 4 in which the detent means comprises a pair of recesses formed in the periphery of the second lever means, and a spring biased detent element adapted to coact with said recesses.

7. A door locking system as set forth in claim 4 in which the overcenter spring is connected to the first lever means.

References Cited in the file of this patent

UNITED STATES PATENTS

1,970,807	Lovell	Aug. 21, 1934
2,212,251	Seelinger	Aug. 20, 1940
2,371,370	Ward	Mar. 13, 1945
2,852,927	McCurdy	Sept. 23, 1958