April 16, 1957 M. LEICHSENRING 2,788,966

WINDOW-OPERATED VEHICLE DOOR LOCK

Filed Oct. 7, 1955 2 Sheets-Sheet 1

Fig. 1

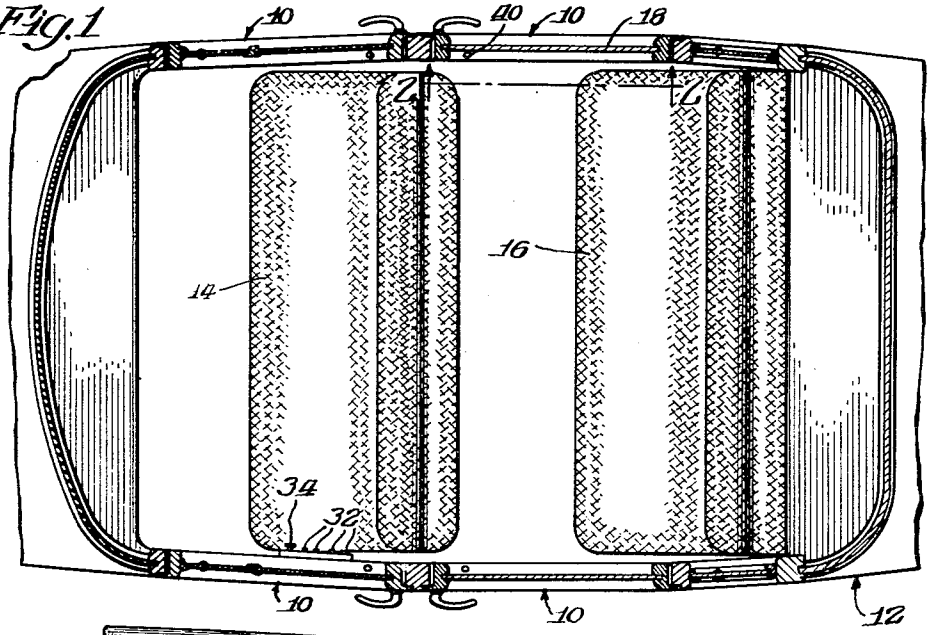
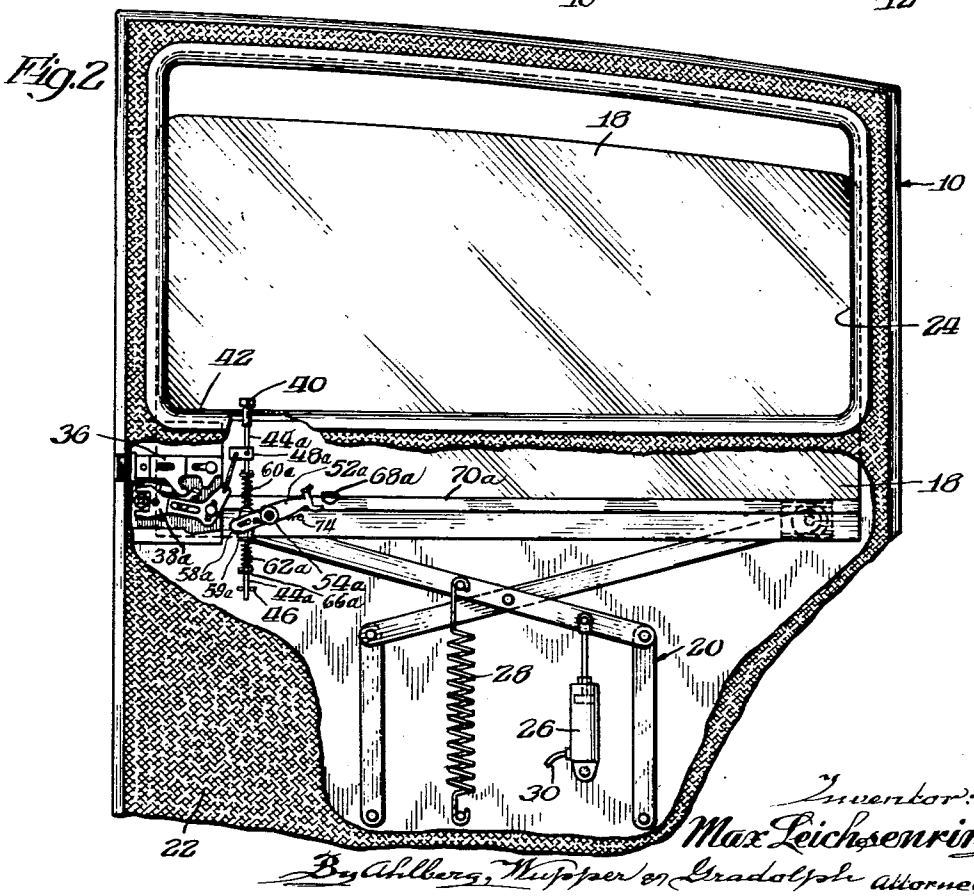


Fig. 2



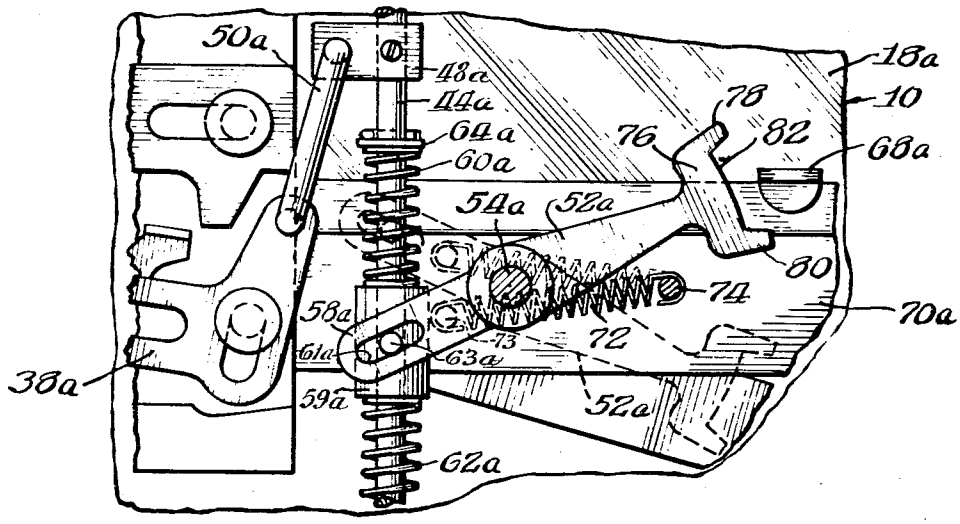
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Filed Oct. 7, 1955 2 Sheets-Sheet 2

Fig. 3.



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United States Patent Office 2,788,966
Patented Apr. 16, 1957

2,788,966

WINDOW-OPERATED VEHICLE DOOR LOCK

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Application October 7, 1955, Serial No. 539,143

7 Claims. (Cl. 268—122)

The present invention relates to automotive vehicles and more particularly to improved means for controlling the locking of vehicle doors by the positioning of movable window structure mounted on the doors.

One object of the invention is to provide in a vehicle door for automatic locking of the door as an incident to the approach to closed position of movable window structure mounted on the door and for automatic unlocking of the door as an incident to movement of the window structure away from closed position using improved, window actuated door lock control means which provides at once for manual unlocking of the door by conventional controls at any time and for automatic locking of the door, unless restrained by active manual force on manual lock control structure, at all times when the door is shut with the window structure located proximate to its closed position.

Other objects and advantages will become apparent from the following description of the exemplary embodiment of the invention shown in the drawings, in which:

Figure 1 is a fragmentary plan view, largely in section, showing in a generally schematic manner a four-door automobile incorporating the invention;

Fig. 2 is a fragmentary sectional view taken along the line 2—2 of Fig. 1, with certain parts broken away for clearness in illustration; and

Fig. 3 is a fragmentary vertical view showing the window operated door lock control structure on an enlarged scale.

The present application is a continuation-in-part of my application of the same title, Serial No. 440,944, filed July 2, 1954, now abandoned.

For the purpose of illustration, the present invention is incorporated into the four doors **10** of an automobile **12**, Fig. 1, having front and rear seats **14**, **16**. As shown in Fig. 2, a window **18** in the right rear door **10**, which is typical of all four doors, is raised and lowered by a conventional power operated mechanism comprising a four bar linkage **20** mounted in the door paneling **22** below the window opening **24** and connected with the lower edge of the window. The linkage **20** is raised by a hydraulic power cylinder **26** which works in opposition to a return spring **28** that lowers the window as operating fluid is exhausted from the cylinder.

A hydraulic line **30** connects each window actuating cylinder **26** with a power driven fluid supply system which can be operated by a plurality of controls **32** (one for each window) grouped together on the left front door **10**, Fig. 1, for convenient operation by the driver. Hydraulic window operating systems of this type are in general commercial use and need not be described here.

Even though the incorporation of the present invention into the vehicle doors **10** requires no modification of the power or other means used to raise and lower the windows **18**, some advantage can be realized by adding a master control **34** to close the windows of all four doors simultaneously. The master control may be of

any suitable design that can be devised readily by a person skilled in the art.

It should be mentioned here that as the description continues many of the reference numerals are used with the subscript "*a*" in order that the merger of subject matter from the original application, Serial No. 490,944, now abandoned, into the present application can be followed more easily.

A conventional latch **36** on each door **10** is locked by a conventional locking linkage including a locking and unlocking element **38***a* interconnected with the mechanism of the latch, Figs. 2 and 3. The locking and unlocking element can be operated manually from the inside of the door by a control button **40** extending up through a panel member **42** at the lower edge of the window opening **24**. As shown, the button **40** is attached to the upper end of a vertical rod **44***a* slidably mounted at its lower end in a bracket **46** supported within the door paneling **22**. Suitable means, such as a clamp **48***a* and link **50***a*, connect the rod **44***a* with the locking element **38***a*.

The structure thus described by way of illustration, operates in a conventional manner to lock the door when the rod **44***a* and control button **40** are moved to a lower position, and to unlock the door upon movement of the rod and button to a raised position.

In accordance with the present invention, freedom for manual operation of the locking structure by means of the control button **40** on a typical door is maintained while providing for an improved control of the locking structure automatically, except as modified by manual control force actively applied to the manual lock control, in accordance with the position of the window means (including the window **18** together with its actuating structure) to the end that locking and unlocking of the door is effected automatically by movements of the window structure in opposite directions and a locked condition of the door is automatically assured when it is shut with the window structure located proximate to its closed position. Mechanical lock operating means used for this purpose can be specifically adapted for cooperation with door locks and window operating mechanisms of different designs.

As shown in Figs. 2 and 3, the mechanical structure provided for controlling the locking element **38***a* in accordance with the position of the window **18** comprises a generally horizontal lever **52***a* medially supported on a horizontal pivot **54***a* suitably mounted on the door paneling **22**. The end **58***a* of the lever **52***a* adjacent the rod **44***a* is bifurcated to embrace a shiftable lock control element formed by a short vertical sleeve **59***a* slidably mounted on the rod. A slidable connection between the lever **52***a* and the sleeve **59***a* is formed by longitudinal slots **61***a* in the bifurcated end **58***a* of the lever which receive trunnions **63***a* on the sleeve.

The lock control element **59***a* is yieldably interconnected with the locking and unlocking element **38***a* by resilient means which yieldably urges the locking and unlocking element to follow the shifting movements of the lock control element with forces sufficient to actuate the locking and unlocking element.

As shown, this interconnection between the lock control element **59***a* and locking element **38***a* is made through the control rod **44***a*. The resiliency desired in the connection is provided by two helical springs **60***a* and **62***a* encircling the rod **44***a* in abutting relation, respectively, to the upper and lower ends of the lock control element **59***a*. The upper end of the upper spring **60***a* abuts against an adjustable spring seat **64***a* on the rod **44***a*, Fig. 3, and the lower end of the lower spring **62***a* rests against an adjustable spring seat **66***a* on the rod, Fig. 2. Both springs **60***a*, **62***a* act on the sleeve

59*a* in opposition to each other to bias the sleeve toward a normal centered position with respect to the spring seats 64*a*, 66*a*.

The end of the lever 52*a* opposite the rod 44*a* is made somewhat longer than the bifurcated lever end 58*a* and extends into the path of vertical movement of a bracket or actuator 68*a* projecting laterally from a vertically movable channel 70*a* secured to the lower edge of the window 18.

Preferably, the end of the lever 52*a* adjacent the actuator 68*a* is circumferentially widened into a head 76 shaped to define two circumferentially spaced projections 78 and 80 extending radially away from the pivot 54*a* into the vertical path of movement of the actuator 68*a*. Between the projections 78 and 80 the head 76 is recessed at 82 to clear the actuator 68*a*.

As the window 18 is moved upwardly, approaching its closed position, the actuator 68*a* engages the upper projection 78 and swings the lever 52 counterclockwise, with reference to Figs. 2 and 3, from the position shown in phantom to the position shown in solid lines in Fig. 3. This shifts the lock control element 59*a* downwardly from an unlocking position to a locking position in which it acts through the springs 60*a* and 62*a* to yieldably urge the rod 44*a* downwardly with sufficient force to move the rod and the connected locking element 38*a* to locking positions.

In the preferred construction shown the positional relationship of the lever 52*a* to the actuator 68*a* is such that the lock control element 59*a* is shifted to its locking position before the window 18 reaches its fully closed position. Hence, closing movement of the window may be terminated after locking the door to leave a ventilating opening at the top of the window as shown in Fig. 2.

Downward movement of the window 18 away from closed position engages the actuator 68*a* with the lower projection 80 on the lever 52*a* to swing the lever clockwise back to the position shown in phantom in Fig. 3. This shifts the lock control element 59*a* back to unlocking position where it acts through the spring 60*a* and 62*a* to yieldably move the locking element 38*a* back to unlocking position.

Thus the mechanical operating means for the door locking structure automatically locks the door as the window structure approaches closed position and automatically unlocks the door as the window structure moves away from closed position.

In conjunction with this action the present invention provides automatic assurance that the door is locked when shut with the window closed—except as the lock is temporarily disabled by manual force actively applied to the manual control structure for the locking means. For this purpose retaining means is connected to the lock control element 59*a* to automatically retain the element in locking position (shown in solid lines in Fig. 3) until it is forcibly shifted to unlocking position by the mechanical lock operating means as actuated by movement of the window structure away from closed position.

As shown, the retaining means used for this purpose comprises an over-center helical spring 72 connected in tension between a spring anchor 73 on the end portion 58*a* of the lever 52*a* and a stationary spring anchor 74 located on the opposite side of the pivot 54*a* and suitably mounted fixedly on the door paneling 22.

The positional relationships of the spring anchors 73, 74 to the pivot 54*a* and the strength relationship of the retaining spring 72 to the interconnecting springs 60*a*, 62*a* are such that the retaining action of the spring 72 effective to hold the lock control element 59*a* in either locking or unlocking position against shifting movement to the other position is greater than the strength capacity of the springs 60*a*, 62*a* to shift the lock control element from one position to another. However, the retaining spring 72, as interconnected through the lever 52*a* with the lever head 76, is forcibly overcome by the actuator

68*a* on either of the projections 78, 80 to release the control element 59*a* for shifting movement by the lever from one position to another.

The capability of the retaining spring 72 to hold the control element 59*a* in locking position against the force of the springs 60*a* and 62*a* affords assurance that a door equipped with the invention will not remain unlocked inadvertently if shut with the window in or near closed position, even though the door may have been manually unlocked or temporarily opened after the window has been moved sufficiently near to closed position to shift the door lock control element 59*a* to locking position. More specifically, after the lock control element 59*a* has been shifted to locking position by closing movement of the window 18, the control button 40 and rod 44*a* can be raised against the action of the springs 60*a* and 62*a* to temporarily unlock the door. As soon as active manual force is released from the control button 40, the springs 60*a* and 62*a*, stressed by the control element 59*a* which remains in locking position, immediately shift the rod 44*a* back to its original locking position to move the locking element 38*a* to locking position.

In this connection it will be understood that conventional latching structure used in some automotive vehicle doors is unlocked (even if previously locked) if the door is swung shut without active manual force being continuously applied to the latch releasing control structure. This action of such latching structure is transformed by the present invention into one in which the door latch is automatically relocked when the door is swung shut with the window located proximate its closed position. The automatic locking action in this instance is similar to that following a temporary unlocking of the door by manual control force.

To minimize the possibility of a driver being inadvertently locked out of his automobile without his key, it may be desirable to apply the invention only to those doors of the vehicle other than the "driver's" door.

The added convenience to the driver afforded by the invention is illustrated by the ease with which the driver is assured upon parking of the vehicle that all doors are locked even though passengers leave the vehicle after the driver. Thus, upon parking a vehicle equipped with the invention the driver has merely to note that all windows are closed and to lock his own door. The previously mentioned power actuating structure for the windows may simplify closing of the windows by the driver. However, rear windows usually are not opened unless the rear seat is occupied by passengers in convenient position for closing the windows if open.

With the windows closed, the driver after locking his own door may immediately leave the vehicle with the assurance that all doors will be securely locked—even though passengers are still emerging. Passengers can be relied on to swing doors shut after emerging. Locking of the doors is automatic. Hence, the need for checking of the individual doors by the driver to assure proper locking is obviated.

Another illustrative advantage arises when children are riding in the rear seats of vehicles having rear doors which must be unlocked before they can be opened by handles on the inside of the doors. The purpose of such latch and locking arrangements (which are of a standard construction requiring no specific description here) is to make opening of the rear doors by children more difficult. However, they may soon learn to actuate the manual lock control and the door handle in sequence—which is all that is necessary to open the door.

The present invention adds to this safety expedient real effectiveness by making it necessary, when the window is proximate its closed position, for the child to move the lock control to unlocked position and actively hold it continuously in unlocking position while operating the door handle to open the door. By the time he can

do this, the child has sufficient maturity to be relied on not to open the doors when the vehicle is in motion.

While I have shown and described a preferred embodiment of my invention, it will be apparent that numerous variations and modifications thereof may be made without departing from the underlying principles of the invention. I therefore desire, by the following claims, to include within the scope of the invention all such variations and modifications by which substantially the result of my invention may be obtained through the use of substantially the same or equivalent means.

I claim:

1. In a door for an automotive vehicle, the combination of swingable door structure, door locking means mounted on said door structure and including a locking and unlocking element, a manual control for said locking means accessibly located on the inner side of said door structure and connected to said locking and unlocking element, mechanical operating means for said locking means including a lock control element shiftable between an unlocking position and a locking position, resilient means interconnecting said lock control element with said locking and unlocking element to yieldably urge the latter to follow shifting movement of said lock control element between said unlocking and locking positions thereof with a force sufficient to actuate said locking and unlocking element, retaining means coacting with said lock control element for operation upon movement of the latter into locking position to retain it in locking position and having an effective strength relative to that of said resilient interconnecting means sufficient to hold said lock control element against movement even though said locking and unlocking element be manually operated into unlocking position, window means including operating means therefor movable between open and closed positions, said window means including thereon lock actuating means, said mechanical lock operating means including means positioned for coaction with said lock actuating means on the window means to shift said lock control element to locking position as said window means approaches closed position and to shift said lock control element to unlocking position as said window means moves away from closed position, and said retaining means being interconnected with said mechanical lock operating means to release said lock control element as an incident to actaution of said mechanical lock operating means by said actuating means on said window means.

2. In a door for an automotive vehicle, the combination of swingable door structure, door locking means mounted on said door structure and including a locking and unlocking element, a manual control for said locking means accessibly located on the inner side of said door structure and connected to said locking and unlocking element to actuate the latter, mechanical operating means for said locking means including a lock control element shiftable between an unlocking position and a locking position, resilient means interconnecting said lock control element with said locking and unlocking element to cause the latter to follow shifting movement of said lock control element between said unlocking and locking positions with a force sufficient to actuate said locking and unlocking element, yieldable retaining means coacting with said lock control element to retain the latter in locking position with a yieldable retaining force in excess of the strength capacity of said resilient interconnecting means to transmit shifting force from said locking and unlocking element to said lock control element tending to move the latter toward unlocking position, window means including operating means therefor mounted on said door structure for movement between open and closed positions, said window means including lock actuating means thereon, and said mechanical operating means for said locking means including means positioned for coaction with said lock actauting means on said window means to mechanically shift said lock control element from unlocking position to locking position as an incident to movement of said window means to closed position and to shift said lock control element from locking position to unlocking position as an incident to movement of said window means away from closed position, movement of said mechanical lock operating means by said lock actuating means serving to overcome said yieldable retaining means in effecting shifting of said lock control element.

3. In a door for an automotive vehicle, the combination of swingable door structure, door locking means mounted on said door structure and including a locking and unlocking element, a manual control for said locking means accessibly disposed on the inner side of said door structure and connected with said locking and unlocking element, mechanical operating means for said locking means including a pivoted lever shiftable between an unlocking position and a locking position, resilient means interconnecting one end of said lever with said locking and unlocking element to yieldably urge the latter to follow shifting movements of said one end of the lever with forces sufficient to actuate said locking and unlocking element, over-center spring means interconnected with said lever to yieldably retain the latter in either said locking or unlocking position therefor, said over-center spring means having strength sufficient to restrain shifting movement of said lever with a retaining force in excess of the strength capacity of said resilient interconnecting means to transmit shifting force to the lever from said locking and unlocking element, window means including operating means therefor mounted on said door structure for movement between open and closed positions, said window means including lock actuating means thereon, and said lever including means positioned for coaction with said actuating means on said window means to shift said lever to locking position as an incident to movement of said window means toward closed position and to shift said lever toward the unlocking position therefor as an incident to movement of said window means away from closed position, movement of said lever by said lock actuating means serving to overcome the lever retaining action of said over-center spring means.

4. In a door for an automotive vehicle, the combination of swingable door structure, door locking means mounted on said door structure and including a locking and unlocking element, a manual control for said locking means accessibly disposed on the inner side of said door structure and connected with said locking and unlocking element, mechanical operating means for said locking means including a pivoted lever shiftable between an unlocking position and a locking position, means interconnecting one end of said lever with said locking and unlocking element to move the latter to follow shifting movements of said one end of the lever, said interconnecting means including resilient means integrated therewith to be stressed upon movement of said lever into locking position to yieldably urge said locking and unlocking element toward locking position with sufficient force to move said last mentioned element to locking position, window means including operating means therefor mounted on said door structure for movement between open and closed positions, said window means including lock actuating means thereon, and the end of said lever opposite said one end thereof being bifurcated to form a first projection engageable by said actuating means to shift said lever into locking position as an incident to movement of said window means toward closed position and to form a second projection engageable by said actuating means to shift said lever toward unlocking position therefor as an incident to movement of said window means away from closed position.

5. In a door for an automotive vehicle, the combination of swingable door structure, door locking means mounted on said door structure and including a locking and unlocking element, a manual control for said locking

means accessively disposed on the inner side of said door structure and connected with said locking and unlocking element, mechanical operating means for said locking means including a lock control element shiftable between an unlocking position and a locking position, means interconnecting said lock control element with said locking and unlocking element to force the latter to follow shifting movement of said lock control element between said positions therefor, said interconnecting means including resilient means integrated therewith to be stressed upon movement of said lock control element into locking position to yieldably urge said locking and unlocking element toward locking position with sufficient force to move said locking and unlocking element to locking position, automatic retaining means coacting with said lock control element for operation upon movement of the latter into locking position to retain it in locking position, said retaining means having an effective strength in relation to the strength of said resilient interconnecting means sufficient to restrain movement of said lock control element out of said locking position with a retaining force in excess of the maximum force which said resilient interconnecting means is capable of exerting on said lock control element from said locking and unlocking element, window means including operating means therefor movable between open and closed positions, said window means including thereon lock actuating means, said mechanical lock operating means including means positioned for coaction with said lock actuating means on the window means to shift said lock control element to locking position as said window means approaches said closed position and to shift said lock control element to unlocking position as said window means moves away from closed position, and said retaining means being interconnected with said mechanical lock operating means to release said lock control element for shifting movement to unlocking position as an incident to actuation of said mechanical lock operating means by said actuating means as said window means moves away from closed position.

6. In a door for an automotive vehicle, the combination of swingable door structure, door locking means mounted on said door structure and including a locking and unlocking element, a manual control for said locking means accessibly disposed on the inner side of said door structure and connected with said locking and unlocking element, resilient mechanical operating means for said locking means including a part shiftable between an unlocking position and a locking position and interconnected with said locking and unlocking element to move the latter to follow shifting movement of said part, window means including operating means therefor mounted on said door structure for movement between open and closed positions, said window means including lock actuating means thereon, said resilient operating means having a bifurcated portion connected to said first named part to form a first projection engageable by said actuating means to shift said bifurcated portion into locking position as an

incident to movement of said window means toward closed position and to form a second projection engageable by said actuating means to shift said bifurcated portion toward unlocking position thereof as an incident to movement of said window means away from closed position, and said mechanical operating means including a resilient element interposed between said bifurcated portion and said locking element to be stressed upon movement of said bifurcated portion into locking position yieldably to urge said locking and unlocking element toward locking position with sufficient force to move said last mentioned element to locking position.

7. In a door for an automotive vehicle, the combination of swingable door structure, door locking means mounted on said door structure and including a locking and unlocking element, a manual control for said locking means accessibly disposed on the inner side of said door structure and connected with said locking and unlocking element, mechanical operating means for said locking means including a pivoted lever shiftable between an unlocking position and a locking position and including means interconnecting a portion of the lever spaced from the pivotal axis thereof with said locking and unlocking element to transmit actuating force to the latter upon movement of said lever portion between the unlocking and locking positions thereof, window means including operating means therefor mounted on said door structure for movement between open and closed positions, said window means including lock actuating means mounted thereon to move through a predetermined path as an incident to movement of said window means between open and closed positions, said lever being shaped, dimensioned, and located at the side of said actuating means facing the closed window position thereof to project into said predetermined path, said actuating means and said lever thus operating during movement of said actuating means toward closed window position to swing the portion of said lever adjacent said actuating means into a door locking position, said last mentioned lever portion being spaced a substantial distance along the lever from said first mentioned lever portion connected to said locking and unlocking element, said mechanical operating means including a resilient connecting component integrated therewith to be stressed upon movement into locking position of said portion of said lever adjacent said actuating means yieldably to urge said locking and unlocking element toward locking position with sufficient force to move said last mentioned element to locking position, and means connected with said mechanical operating means to move said locking and unlocking element out of locking position as an incident to movement of said actuating means toward the open window position thereof.

References Cited in the file of this patent

UNITED STATES PATENTS

1,877,836	Flynn	Sept. 20, 1932
2,707,127	Parsons	Apr. 26, 1955