Oct. 18, 1966 TADASHIGE KAWABE 3,279,227

MOTORCAR DOOR LOCK MECHANISM

Filed May 5, 1964

3 Sheets-Sheet 1

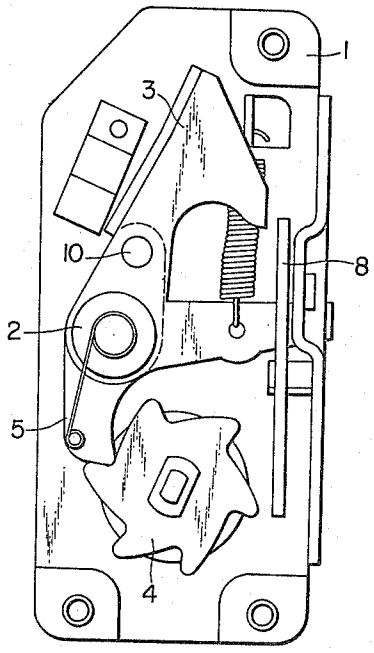


Fig. 1

Fig. 2a

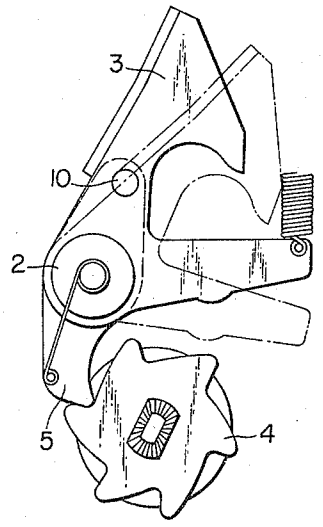
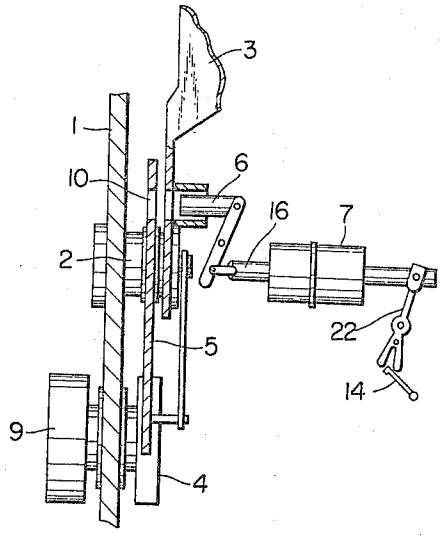


Fig. 2b



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Fig. 3a

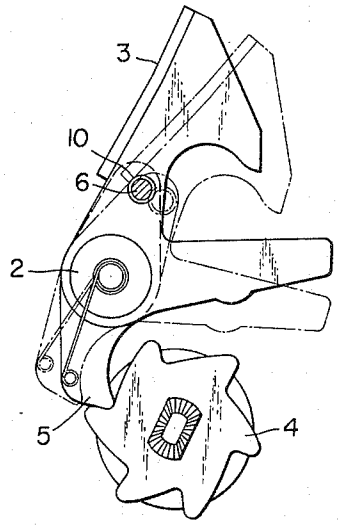


Fig. 3b

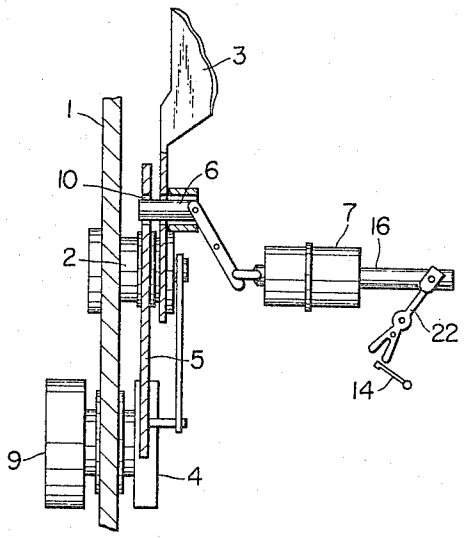
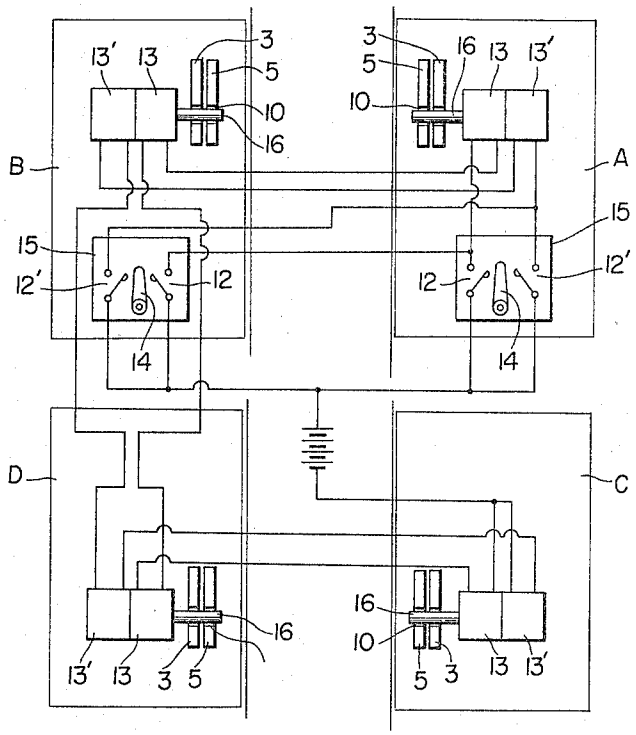


Fig. 4



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Fig. 5

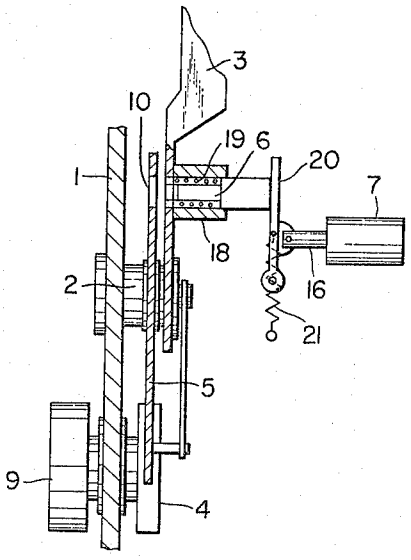


Fig. 7

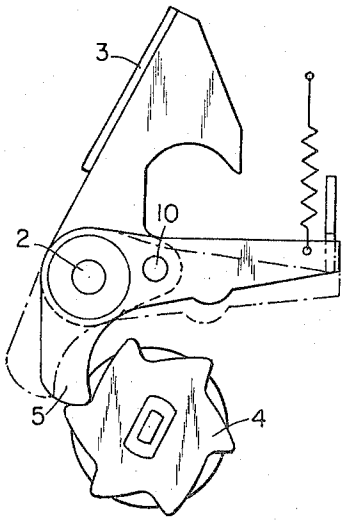
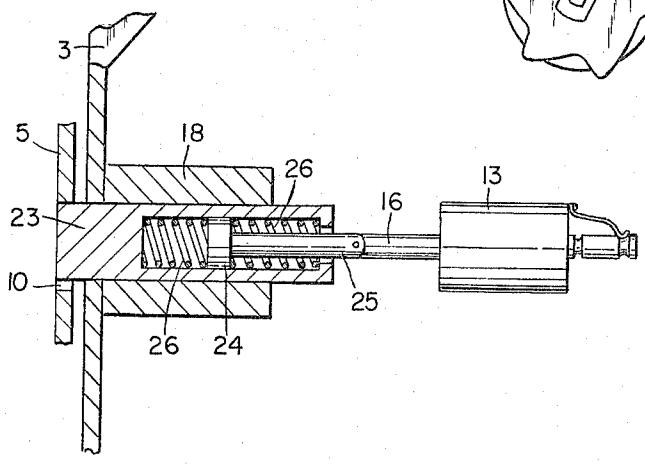


Fig. 6



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MOTORCAR DOOR LOCK MECHANISM

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7 Claims. (Cl. 70—264)

The present invention relates to a motorcar door lock mechanism. Conventional motorcar door locks of any kind have been operated independent at each door with the handle thereof, so that trouble results, in getting off, to examine the locked condition in detail at each door. Furthermore there has been a fear of the motorcar being stolen because the conventional lock has had such a simple structure that it can be unlocked from the outside when the window panel is broken or left open carelessly.

The principal object of the present invention is to prevent the motorcar, or the articles therein, from being stolen, by using a uniquely adapted master key which enables one to lock all the doors of the motorcar at the same time, so that the inconvenience of examining all the doors in detail is obviated, and which makes it positively impossible to open the doors from the inside as well as the outside, once the doors are locked.

Another object of the present invention is to provide motorcar doors with novel door lock devices associated with an electromagnetic circuit uniquely wired so that the lock devices of all the doors may be operated at the same time. Thus, all the lock devices are operated simultaneously, and all the doors are locked simultaneously, when a movable piece is motivated by closing the electromagnetic circuit through a control switch.

Still another object of the present invention is to enable one to enter the motorcar easily, even if the electric source should become lower in power, or if any circuit trouble should cause the loss of the door switch function, and thus to provide a motorcar door lock mechanism having a structure which may be manipulated in the same manner as when the switch operation is effected electromagnetically.

Still a further object of the present invention is to provide a motorcar door lock mechanism having a structure which can maintain a locked condition even if force is exerted on an outer door handle with the intention of unlocking the doors from the outside. Furthermore, in the locked condition, parts are released so that there is no possibility of breaking a latch by force exerted from the outside in an attempt to force entrance. Thus, the door lock mechanism of the invention remains intact even if a strong force is applied to the inner or outer door handles in an attempt to force an unlocking of the door. As is known, in conventional motorcars such a force imparted to an outer or inner handle of a locked door can result in damage or breaking of the lock mechanism. On the other hand, with the lock mechanism of the present invention, no force is transmitted to the door lock or latch when the mechanism is in the door locking condition.

Another object of the present invention is to provide a motorcar door lock mechanism which maintains a locked or unlocked condition as set by the driver and irrespective of any independent or attempted independent operation by a passenger. Thus, if the driver operates the mechanism to unlock the doors, a passenger cannot prevent such door unlocking merely by holding a door lever or a push button. Furthermore, if the driver sets the mechanism in the locking position, the locking of the door cannot be prevented by a passenger holding an operating handle in the door opening position as, immediately the passenger releases the handle, the door will automatically be locked.

In the present invention, this is effected by utilizing a movable member which, in its movement to either the door locking position or the door unlocking position stores energy in a spring in the event that such movement is interrupted, so that the movement of the member takes place as soon as the obstruction is removed.

In conventional lock mechanisms, it has not been possible to lock the car when the driver has to leave the car momentarily with a passenger therein. An object of the present invention is to provide a locking mechanism having such a structure that, when the driver leaves the car, he inserts a key into the lock on either the left or right front door to activate the mechanism to the locking position. Thereby, as soon as the doors are closed, they are locked closed and cannot be unlocked until the driver returns and inserts the key. This is effected, in the present invention, by a movable latching member which is engageable with the ratchet wheel controlling opening and closing of the car doors.

Further objects of this invention will become apparent as the description proceeds, and the features of novelty will be pointed out in particularity in the appended claims.

The structural details and operation of the improved construction are illustrated in the accompanying drawings, which illustrate a representative embodiment of the motorcar door lock mechanism of the present invention.

Referring to the drawings:

FIG. 1 is a front view of the motorcar door lock mechanism embodying the invention.

FIG. 2*a* is a partial front view of the same, showing an operational condition when the door is locked and impossible to be opened.

FIG. 2*b* is a side view of the same partially cut away.

FIG. 3*a* is a front view similar to FIG. 2*a*, showing the condition when the door is unlocked, possible to be opened.

FIG. 3*b* is a side view of FIG. 3*a*, parts of which are cut away.

FIG. 4 is a schematic wiring diagram of its electric circuit, and

FIGS. 5–7 illustrate alternative embodiments of the motorcar door lock mechanism of the present invention.

Referring more particularly to the drawings, particularly to FIG. 1, to an axis **2**, mounted on the inner side of a lock base **1**, there is pivoted an operating handle or lever **3** to which is connected a restoring spring stressed responsive to operation of lever **3**, which latter is mounted on the exterior of the door. An engaging lever or pawl **5** is also pivoted on axis **2** and is operatively associated with a ratchet wheel **4** mounted on the locked base, the lever **5** being also stressed by the restoring spring when connected to the lever or handle **3**. When the doors are unlocked, handle **3** and pawl **5** are interconnected by a movable member or plunger **6**, so that they are operated conjointly to release pawl **5** from ratchet wheel **4** thus permitting the doors to be opened. The plunger **6** may be moved to a position interconnecting handle **3** and pawl **5**, or retracted from such position, by suitable means which may be either electromagnetic means, fluid pressure means, or a combination of the same, as indicated at **7** in FIG. 2*b*. When the doors are to be locked, the plunger **6** is withdrawn from engagement with lever or handle **3** and pawl **5**, thus leaving the lever **3** free to be operated without effecting release of pawl **5** from ratchet wheel **4**.

Furthermore, in accordance with the present invention, spring power may be used to operate the plunger **6**. A second lever **8** is operatively associated with the pawl **5** to operate the same to disengage the ratchet wheel **4**. Lever **8** operates on pawl **5** through the lever **3** so that, when plunger **6** is withdrawn from the apertures **10** in handle **3** and pawl **5**, the door cannot be opened by operation of lever **8**.

In this invention, when desired to make the doors impossible to be opened, motive power, such as an electromagnet or a fluid pressure device, is actuated through some switch device, which retracts plunger 6 from engagement with handle or lever 3 and engaging lever or pawl 5. Then, for instance, when the lever 3, which is exposed to the door outside, is pushed it runs idle without operating the engaging lever or pawl 5 cooperable with the ratchet wheel 4, so that it can not release the ratchet wheel 4, that is, the doors can not be opened.

Also there is observed the same effect when the lever 3 is pushed through the operating lever 8.

Thus, in picnicking or otherwise leaving the motorcar, there is no fear of its being stolen even if it is parked with its windows open, which latter also has the effect of preventing the inner temperature from being raised too much.

Next when the doors are to be freely opened, lever 3 and pawl 5 are connected with each other by projecting plunger 6 by means of the device 7 such as an electromagnet or fluid pressure actuator and the handle or lever 3 is pushed.

The movement is transmitted to pawl 5, by which pawl 5 is released from engagement with ratchet wheel 4, which, as a result becomes freed, allowing the doors to be opened.

According to the present invention, as distinguished from conventional or prior art locking mechanisms, a locked condition of the motorcar doors can be effected easily by releasing the connection between pawl 5 and handle 3 by retracting plunger 6. This allows idling of handle 3 without any effect on pawl 5, so that the mechanism has a long life without disruption.

Furthermore, the conventional mechanism has had faults in that either or both of the inner lock system and/or button and lever are apt to be easily broken, when a strong shock is given to the outside lever or button for the object of unlocking from the outside, resulting in lack of safety against burglary.

In the locked condition of the present mechanism, on the other hand, all interconnections between the outside operating handle 3 and the pawl 5 are in a state of separation or release. Thus even if a strong shock is given to the mechanism, it is not transmitted to any part of the inner lock system, so that the outside button and lever as well as the inner lock mechanism can be surely and completely protected from any deformity or damage, which makes the doors absolutely impossible to be opened. Then even though the locked portion thereof is broken, it is impossible for the doors to be opened.

Further, whenever any of the doors are opened or closed ratchet wheel 4 is always able to rotate normally, so that it offers no resistance to the door closing.

Thus the advantage of the invention is that there is no need to pay any attention or to take any trouble with respect to the other doors, when only one of them is handled. Also the locking or unlocking of the doors is effected solely by moving plunger 6, so that no high capacity electromagnet is required therein. Thus, it becomes possible to minimize the device in size, which has providing functions equal to those of the conventional mechanism while running.

In addition, there is no need to provide any kind of emergency escape apparatus for the motorcar. This is another advantageous feature unique to the present invention.

The above described device is applied to the motorcar in this way:

First of all the lock devices of the invention are applied on all the doors of the motorcar, and an electromagnetic circuit 11 is wired so that all the devices are actuated at the same time. Switches 12 and 12′ in electromagnetic circuit 11 are respectively associated electrically with an electromagnet 13 and an electromagnet 13′ each electromagnet 13 is associated with electromagnet 13′, so that magnets 13 and 13′ conjointly control the operation of an armature 16. In FIG. 2, the armature 16

is illustrated as so connected to the plunger 6 that, when armature 16 is moved to the left or projected, it will retract plunger 6 from openings 10 and, when armature 16 is retracted to the right, it will project plunger 6 through openings 10. In the schematic wiring diagram of FIGURE 4, however, the plunger 6 has been omitted and the armature 16 is illustrated as engaging in the openings 10. This has been done to simplify the illustration of the wiring diagram in FIG. 4.

Between the switches 12, 12′, there is positioned a switch operator 14 which is operated by the master key to selectively energize electromagnets 13 or electromagnets 13′. A base plate 15, provided with said switches 12, 12′ and tumbling piece 14, is generally fixed to either or both the left front door and the right front door. After the driver dismounts from the motorcar, the door A of the driver's side is closed, and then switch 12 is closed by turning the operator 14 to one side by means of the master key. As a result, all the electromagnets 13 of the respective doors are actuated, and their respective armatures 16 are projected, biasing plungers 6 to retract from the respective holes 10 of lever 3 and pawl 5, which leads all the doors to be in a locked condition.

However, high accuracy of skill is required in assembling for the arrangement thereof wherein the combining piece 6 can engage without fail into the holes 10 of lever 3 and pawl 5.

In the present invention, for the purpose of making its assembling easy, as seen in FIG. 5, plunger 6 with a spring 19 is inserted into a guide cylinder 18 which is fixed in alignment with hole 10, at the side of the actuating lever 3. Plunger 6 is operated by armature 16, and is in pressure contact with a pivoted push plate 20, so that its outer end may slide in continuous engagement with the surface of push plate 20 when plunger 6 is moved with the rotation of lever 3. Thus, high accuracy is not required, in assembling the present mechanism, for the position of the motive power 7 and the combination of the plunger 6 and the armature 16, resulting in easiness of assembly of the present mechanism.

The numeral 21 designates a control spring having the function of biasing plunger 6 to engage in the hole 10 when spring 19 is under tension.

The lock mechanism of the present invention is unique in that, in case the electromagnets 13 and 13′ cannot function, due to accidental loss of power of the source of electric potential, or due to circuit trouble, locking or unlocking of the doors can be effected manually. As best seen in FIG. 2*b*, a lever 22, pivoted intermediate its ends, has one end connected to armature 16 and the other end forked for engagement with switch operator 14. Thus, whenever switch operator 14 is operated by the master key, to swing in one direction or the other, lever 22 is swung in the reverse direction and in the proper direction to effect the desired movement of armature 16.

There is also the possibility that, when the driver actuates the switch 12 or 12′ by means of the master key, he may not be aware that the locking plunger is under too much pressure to move since a passenger may be pressing on the door operating lever or handle. An arrangement for automatically obviating inoperability such a case is illustrated in FIG. 6 as comprising an armature 16.

Thus in FIG. 6, the structure comprises the movable piece 16; a hollow cylinder 23; a slide rod 25 possessed of a head 24 and inserted into the hollow cylinder 23; and a spring 26 sealed into said hollow cylinder in which the head 24 serves as boundary for it. The cylinder of 23 is substituted, in the example of FIG. 6, for the plunger 6. Even when the locking plunger, by any chance in locking, is under too much pressure to move, the slide rod 25 connected to the armature 16 can move, as the armature 16 moves, which compresses the spring 26 situated at one end of said head 24. The stored spring power biases cylinder 23 to retract from hole 10, so that the moment the pressure on the door lever or the button is relaxed, the pressure imposed upon the locking plunger

is removed. As a result cylinder 23 can retract from the hole 10, which finally results in a securely locked condition of the doors. At times it happens that the driver leaves the motorcar before the fare. In such a case, the conventional mechanism has been impossible to be locked before the closing of the doors.

In FIG. 7, connected to the movable piece 16 of the electromagnet is an engaging latch 27 of which function is only to halt directly or indirectly the reverse of said latch wheel on which the opening and closing of the doors are solely dependent. The driver does the switch 12 before the fare gets off the motorcar, to actuate the electromagnet 13, which engages the engaging latch 27 with said latch wheel 4. Even after these, when the doors are closed, it is possible for the latch wheel 4 to be rotated in the right direction, so that each door can be independently closed without any trouble accompanied, of course after which all the doors cannot be opened or closed either from the inside or the outside of the motorcar.

Having thus described the invention, what is desired protected by Letters Patent is as set forth in the following claims.

I claim:

1. A vehicle door locking mechanism comprising, in combination, a latching element movably mounted on the door and movable in a first direction to latch the door and in a second and reverse direction to unlatch the door; a detent means movably mounted on the door and normally engaged with said latching element and preventing movement of the latter in a door unlatching direction; a manually actuable door operator movably mounted on the door for free movement relative to said detent means, said operator, when connected to said detent means, moving the latter to disengage its associated latching element; means biasing said detent means to engage its associated latching element; a connector separate from and selectively engageable with both said operator and said detent means to mechanically interlock the same for conjoint operation, and selectively disengageable from both said operator and said detent means for manual and idle actuation of said operator independently of said detent means; electromagnetic means controlling such engagement and disengagement of said connector relative to said operator and said detent means; and a key operated switch controlling connection of said electromagnetic means to a source of potential.

2. A vehicle door locking mechanism, as claimed in claim 1, wherein there is a vehicle door locking mechanism associated with each of plural vehicle doors; said key operated switch conjointly controlling all of the electromagnetic means to said source of potential, and being provided only upon a door opening from the driver's seat of the vehicle.

3. A vehicle door locking mechanism, as claimed in claim 1, in which said latching element is a rotary latching element having a ratchet wheel fixed to rotate therewith; said detent means comprising a pawl engaged with said ratchet wheel; a pivot pin; said pawl being pivotally mounted on said pivot pin; said door operator comprising a lever mounted on said pivot pin for free oscillation relative to said pawl; said connector, when engaged with said lever and said pawl, interconnecting the same for conjoint oscillation about the axis of said pivot pin.

4. A vehicle door locking mechanism, as claimed in claim 3, in which said manually actuable lever is accessible from the exterior of the door; said biasing means comprising a spring stressed by actuation of said manually actuable lever.

5. A vehicle door locking mechanism, as claimed in claim 3, wherein said electromagnetic means comprising an electromagnet and an armature reciprocable by said electromagnet, said armature being connected to said connector to operate the same in the engaging and disengaging directions in accordance with selective energization of said electromagnet; said key operated switch comprising an oscillatably mounted switch operator movable from a neutral position to either of a pair of operated positions by actuation of a key; and mechanical means interconnecting said switch operator and said armature and effective to mechanically move said armature in the proper direction responsive to operation of said switch operator by a key, whereby said door locking mechanism is operable in the event of power failure.

6. A vehicle door locking mechanism, as claimed in claim 3, in which said lever and said pawl include portions juxtaposed with each other, each of said portions being formed with an aperture and said apertures being aligned when said lever is not manually actuated and when said pawl is in the ratchet wheel engaging position; said connector comprising a plunger mounted for longitudinal reciprocation to engage simultaneously through both apertures or to be retracted from both apertures; said electromagnetic means comprising an electromagnet and a relatively elongated armature reciprocated longitudinally in accordance with selective energization of said electromagnet; means mechanically connecting said armature to said plunger; said plunger comprising a hollow cylinder, a slide rod reciprocable within said cylinder and having a head; and spring means disposed between said head and either end of said cylinder; said slide rod being mechanically connected to said armature whereby, if said electromagnet is energized to retract said plunger from said apertures while said plunger is under stress due to manual pressure on said lever, said spring will store energy to retract said cylinder when the manual pressure is released.

7. A vehicle door locking mechanism, as claimed in claim 3, including a second operator accessible from the interior of said door and selectively engageable with said pawl to disengage said pawl from its associated ratchet wheel.

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