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LATCH MECHANISM

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3 Sheets-Sheet 1

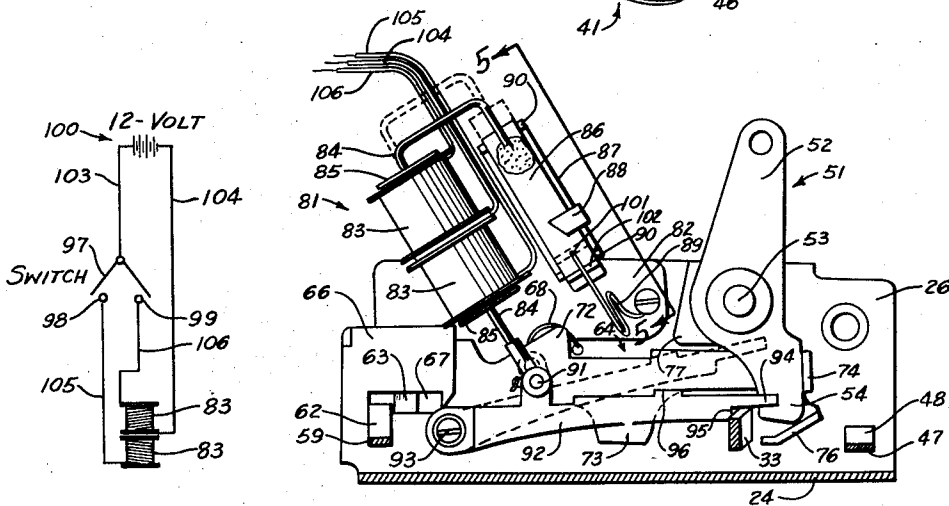
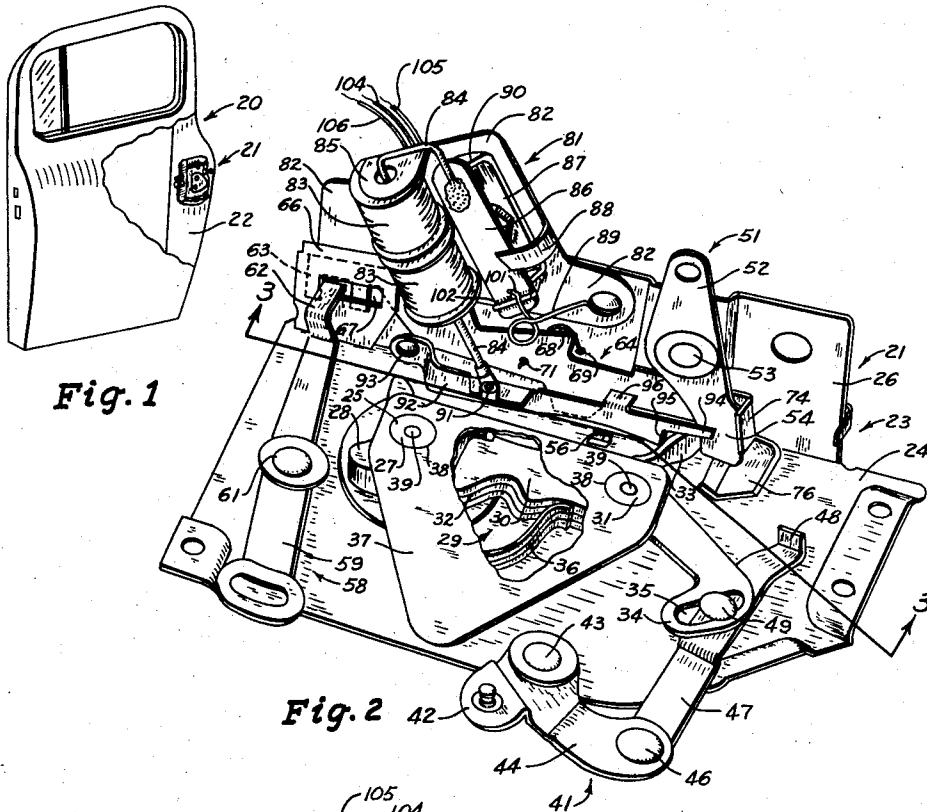


Fig. 4

Fig. 3

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3 Sheets-Sheet 2

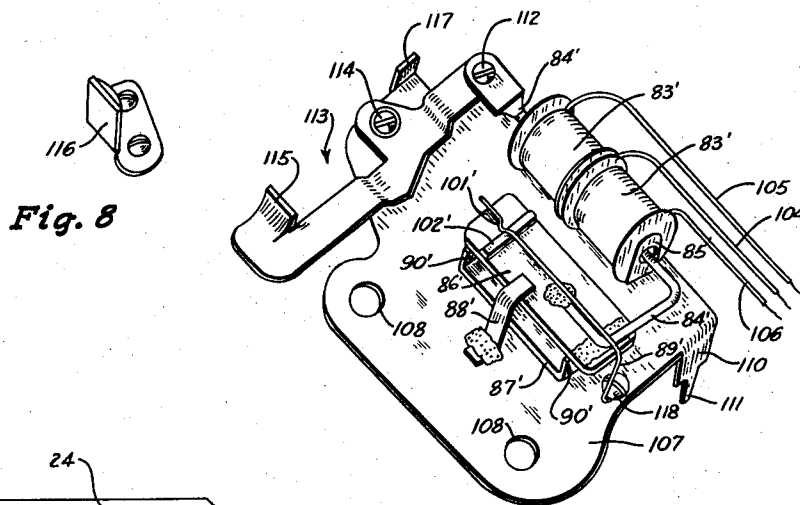


Fig. 7

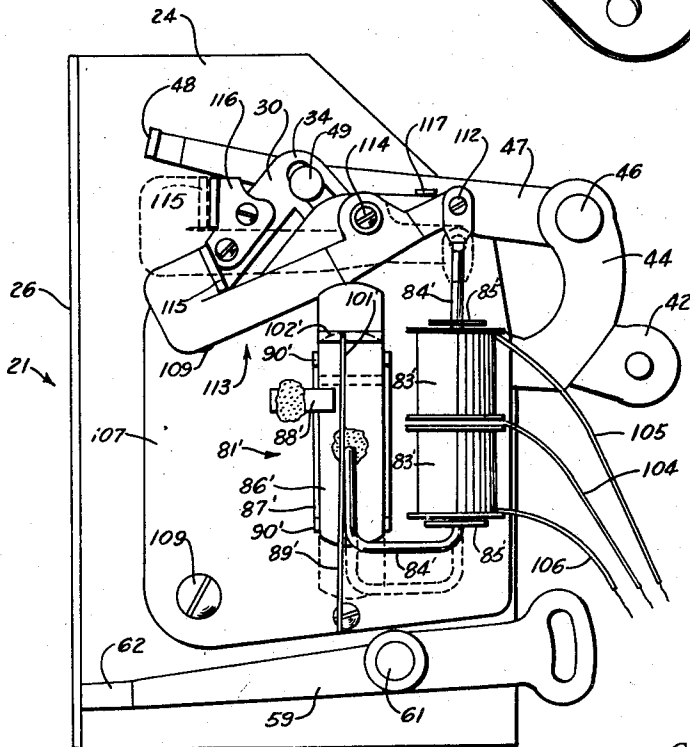


Fig. 6

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LATCH MECHANISM

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The present invention relates to latch mechanisms for swinging doors and is directed particularly to an improved mechanism for the latch mechanism of a vehicle door.

An object of the present invention is to provide a remotely controlled locking mechanism for a vehicle door latch mechanism having an inner door handle releasing mechanism and an outer door handle releasing mechanism, operable independently of each other, and wherein a selective control of the locking mechanism permits a normal operation of the releasing mechanisms or concurrently renders both releasing mechanisms inoperative and ineffective.

Another object of this invention is to provide a remotely controlled locking mechanism for a door latch mechanism having a rotatable pawl assembly and a pair of independently operable releasing mechanisms adapted to release the pawl assembly, wherein the locking mechanism is movable to block a releasing movement by the pawl assembly thereby rendering the pair of releasing mechanisms ineffective.

A further object of the present invention is to provide an improved remotely controlled locking mechanism for rendering ineffective the usual inner and outer releasing mechanisms for a vehicle door latch mechanism, and which is simple in construction, economical in manufacture and efficient in operation.

Yet another object of this invention is to provide an improved remotely controlled locking mechanism for a vehicle door wherein the locking mechanism is unaffected by the usual tension of the door weather stripping which acts to bias the door to an open position.

Another object of this invention is to provide a system of control for a plurality of improved vehicle door latch locking mechanisms, individually utilized, wherein the plurality of mechanisms are concurrently actuated by a single control member.

These and other objects will become readily apparent by reference to the following description and the accompanying drawings, wherein:

Fig. 1 is a perspective view of a conventional vehicle door, broken away to show the location of the door latching mechanism with which this invention is concerned;

Fig. 2 is an enlarged perspective view disclosing the structure of a latch mechanism assembled with one embodiment of the locking mechanism of this invention;

Fig. 3 is a reduced sectional view taken along the line 3—3 of Fig. 2 and showing the locking mechanism in elevation;

Fig. 4 is a schematic showing of the electrical circuitry for a pair of solenoids utilized in the invention;

Fig. 5 is a view taken along the line 5—5 of Fig. 3;

Fig. 6 is a plan view of a modified form of the locking mechanism of this invention;

Fig. 7 is a reduced perspective view of the locking mechanism of Fig. 6;

Fig. 8 is a detail perspective view of a portion of the automatic locking mechanism of Fig. 6;

Fig. 9 is a perspective view of another modified form of the invention; and

Fig. 10 is a sectional view as seen along the line 10—10 in Fig. 9 and showing in elevation the electrical apparatus arrangement for the structure of Fig. 9.

Referring to Fig. 1, an automobile door 20 of a usual construction is shown as having a latch mechanism 21, with which this invention is primarily concerned, secured to one side 22 and within the car door 20. The latch mechanism 21 is adapted to respond to the usual locking and releasing mechanisms found on conventional automobile door locks.

In the embodiment of the invention (Figs. 2—5) the latch mechanism 21 comprises a supporting plate 23 having a base 24 and a side member 26 extending substantially at right angles to the base 24. A rotatable bolt unit 27 includes a shaft 25 secured to and extended through the base 24 on which is rotatably mounted a star gear 28 with points or teeth arranged to one side of the base 24 and a gear (not shown) arranged on the opposite or outer side of the base 24 for engaging the usual striker plate (not shown) carried on the vehicle frame. A laminated pawl assembly 29 is secured to the base 24 by means of a pivot pin 31 and includes a series of laminations 32 adapted to engage a tooth of the star gear 28. An outer lamination 30 of the pawl 29 further includes an ear 33, and a foot 34 separated therefrom, a slightly curved, elongated slot 35 being formed in the foot 34. As indicated, the lamination 30, the ear 33, and the foot 34 lie approximately in the same plane. It is to be noted that movement of the lamination 30 results in like movement of the other laminations 32.

A set of biasing springs 36, one for each lamination 32, is secured in a conventional manner to the base 24 so as to bias the pawl assembly 29 in a normal position where the laminations 32 are engaged with the teeth of the star gear 28 to hold the bolt unit 27 in a door-latched position. A triangular cover plate 37 has a pair of openings 38 formed therein for placement over the ends of the stationary shaft 25 and the pivot pin 31, and is secured thereto by means of screws (not shown) threadably inserted in threaded holes 39 formed in the ends of the shaft 25 and pin 31.

A first retracting or releasing mechanism 41 (Fig. 2) for an outer door handle (not shown) for moving the pawl assembly 29 out of the bolt-locking position comprises a lever member 42 pivotally secured to the base 24 by a pivot pin 43. A link member 44 is also secured to the pivot pin 43 and in turn is pivotally attached at 46 to a link 47, the end of which has an upstanding contact portion 48. A pivot pin 49 is secured to the upper surface of the link 47 at a location for insertion through the slot 35 in the foot 34 of the lamination 30, whereby a lost motion relation between the link 47 and the lamination 30 is obtained. Due to the normal bias of the lamination 30 and the normal bias of the releasing mechanism 41, the normal position of the pin 49 relative to the slot 35 is in its upper end, or at the heel of the foot 34. With this arrangement, it may be seen that by pivoting the lever member 42 in a counter-clockwise direction about the pivot pin 43, the link 47 will move in a direction substantially aligned with its longitudinal axis, thereby rotating the pawl assembly 29, by means of the pivot pin 49, in a counter-clockwise direction opposite to the bias of the springs 36, wherein the laminations 32 will be removed from their engagement with the teeth of the star gear 28. The gear may then be rotated counter-clockwise to allow the door 20 to open. It is to be noted that the movement of the link 47 is limited by the distance between the upstanding portion 48 and the back 26 of the supporting plate 23.

A second releasing mechanism 51 (Fig. 2) for an inner door handle (not shown) comprises a pivotable member 52 secured to the side member 26 by means of a pivot pin 53, the member 52 having a lower portion 54 which lies, due to the normal bias of the member 52, adjacent the ear 33 of the lamination 30. Upon a clockwise movement of the member 52, the forward edge of the lower portion 54 will contact the ear 33 thereby moving the pawl assembly 29 in a counter-clockwise direction against the bias of the springs 36, wherein the laminations 32 again move out of engagement with the teeth of the star gear 28. The movement of the pawl assembly 29 in no way affects the first releasing mechanism 41, due to the lost motion arrangement therebetween. Thus, the actuation of the second releasing mechanism 51 is completely independent of the actuation of the first releasing mechanism 41, and vice versa. A blocking flange 56 (Fig. 2) integral with the base 24 is so located as to prevent movement of the ear 33, and thus the pawl assembly 29, beyond a point sufficient to remove the cams 32 from engagement with the star gear 28.

A mechanism for locking the car door 20 from the inside thereof, commonly called a "baby lock," comprises a safety mechanism 58 (Fig. 2) which includes a pivotable member 59 secured to the base 24 by means of a pivot pin 61 and having at one end thereof an offset element 62. The element 62 is inserted between a pair of depending legs 63, which form one end of a member 64 reciprocable by pivotable movement of the member 59. The legs are relatively flat and are movable in a slot formed by a plate member 66 attached to and faced outwardly from the side 26 and having an elongated slot 67 formed therein in which the offset element 62 is inserted. The member 64 is biased so as to quickly assume either one of two positions by means of a spring 68 having one end inserted in an opening 69 formed in the back 26 and the other end inserted in an opening 71 formed in the member 64. The member 64 has a projection 74 at the end opposite the legs 63 and a shelf member 76 extending below the projection 74.

In the position as indicated in Fig. 2, the safety mechanism 58 is in an inoperative position with the end projection 74 closely adjacent the rear of the portion 54 thereby restraining the counter-clockwise movement of the member 52 due to its normal bias. Upon a clockwise rotation of the pivotal member 59, the reciprocable member 64 is moved to the right (Fig. 2) a distance determined by the length of the slot 67. In this position, the shelf plate 76 is moved into a position directly in front of the portion 48 of the link 47. This arrangement obviously prevents effective movement of the outer door handle mechanism 41; however, it does not prevent movement of the pawl assembly 29 out of the rotary bolt locking position due to actuation of the inner door mechanism 51.

A remotely controlled locking unit 81 is provided for the purpose of maintaining the lamination 30 and thus the pawl assembly 29 in an engaged position with a tooth of the star gear 28, whereby to render ineffective the releasing mechanisms 41 and 51. The unit 81 is secured on a bracket 82 attached to the side member 26 and comprises a pair of oppositely acting solenoids 83 coaxially arranged on a spaced pair of flanges 85 integral with the bracket 82 and having a single plunger member unit 84 extending therethrough. One end of the member 84 is U-shaped and is secured, as by welding, to a member 86 mounted so as to move parallel with the main shaft of the member 84 extending through the solenoids 83. The member 86 rides in magnetic attraction on the upstanding legs 90 of a U-shaped permanent magnet 87 secured to the bracket 82. A leaf spring 88 aids the member in retaining contact with the magnet 87 during vibration of the latch mechanism 21, and a spring 89, secured to the bracket 82, aids the member 86 in maintaining the plunger 84 in one of two positions, as will be explained hereinafter. The other end of

the plunger 84 is pivotally secured at 91 to a stop member 92, one end of which is pivoted at 93 to the side member 26. The other end of the stop member 92 has a finger 94 extending from the main body in a manner to form a catch 95. A tab 96 extending laterally from the stop member 92 contacts and rides on the side of the reciprocable member 64 to maintain the member 92 a spaced distance from the member 64.

An electrical circuit for energizing either solenoid 83 includes a battery 100 from which one conductor 103 leads to a double acting switch 97 and another conductor 104 leads to the adjacent ends of both solenoids 83. Fixed terminals 98 and 99 arranged for selective contact by the switch 97 are connected by conductors 105 and 106 respectively to opposite ends of the solenoids 83.

The arrangement is such that by moving the switch 97 to contact terminal 98, the completed circuit energizes the lower solenoid 83 thus moving the plunger 84 in one direction, while moving the switch 97 to contact terminal 99, the other or upper solenoid 83 is energized to move the plunger 84 in the opposite direction. As the solenoids 83 are not spring returnable or the like, by providing the permanent magnet 87, only a momentary energization of either solenoid is necessary. The attraction of the permanent magnet 87 to the member 86 will aid in retaining the plunger 84 in the last position to which it was moved by either solenoid 83. The free end 101 of the spring 89 coacts with a shoulder 102 formed on the lower end of the member 86, whereby to retain the member in either solenoid-actuated position. Thus, in addition to the maintenance of the plunger 84 in a respective position by the attraction of the member 86 by the magnet 87, the tension of the spring end 101 on either side of the shoulder 102 of the member 86 also tends to positively lock the plunger 84 in either assumed position.

As noted in Fig. 3, when the stop member 92 is in a down position, the catch 95 and finger 94 form an abutment against the ear 33 of the lamination 30 to prevent counter-clockwise movement thereof against the bias spring 36. By assuming this position, the stop member 92 prevents either releasing mechanism 41 or 51 from moving the pawl assembly 29 so as to remove the laminations 32 from engagement with the star gear 28, thus releasing the star gear for counter-clockwise rotation. In the upper position, as indicated by the dotted lines of Fig. 3, the stop member 92 is raised so that the catch 95 is moved out of the path of the ear 33 thereby rendering the stop member 92 inoperative and allowing the releasing mechanisms 41 and 51 their normal function.

A modified form of the invention is disclosed in Figs. 6, 7 and 8, wherein a remotely controlled locking unit 31' is mounted on a bracket 107 secured to the supporting plate base 24. The releasing mechanisms 41 and 51 and the safety mechanism 58 for the latch of Figs. 6, 7 and 8 are identical in structure and operation as previously described; therefore, only the description and showing of those parts as are necessary to understand the operation of the modified locking unit 31' will be given. The bracket 107 is formed with a pair of openings 108 at each inner corner for placement over the respective ends of the stationary shaft 25 and the pivot pin 31, screws 109 being secured through the openings 108 to the respective ends, as hereinbefore described. The bracket 107 is further formed with a pair of depending flanges 110 (only one showing) at the front corners having shoulders contacting the base 24. One flange 110 has a tab 111 insertable through an opening (not shown) formed in the base 24, the tab being bent under the base for locking purposes. By this arrangement, the bracket 107 is secured to and supported above the base 24 a suitable distance so as not to interfere with the operation of the parts located therebetween, such as the star gear 28 and the pawl assembly 29.

The electrical components of the modified locking unit 81' are again identical in structure and operation, and utilize the same circuitry as previously described in Figs. 2-4. It may be noted that the spring 89' is secured to the bracket 107 through an opening 118 (Fig. 7) provided therefor in the bracket 107 adjacent one end of the member 86'.

The end of the plunger 84' opposite that end attached to the member 86' is pivotally connected at 112 to a stop member 113, which is secured to the base 107 by means of a pivot pin 114. The end of the stop member 113 opposite the pivot end 112 has a shoulder 115 formed thereon, which in the operative position of the stop member 113 is placed in a complementary position adjacent a shoulder forming element 116 (Figs. 6 and 8) which is secured to the lamination 30 adjacent the foot 34 thereof. An upstanding leg 117 is formed integral with the bracket 107 adjacent the pivot point 112 to limit the counter-clockwise movement of the stop member 113.

By this arrangement, the stop member 113 may be moved by actuation of the plunger 84' from an inoperative position (Fig. 6) to an operative position, as shown by the dotted lines in Fig. 6, wherein the pawl assembly 29 is prevented from being rotated counter-clockwise by actuation of either releasing mechanism 41 or 51 due to the blocking action of the shoulder 115 with respect to the element 116 on the lamination 30. Thus, the modified arrangement 81' is comparable to the first described locking mechanism 81 of Figs. 2-5 as, upon movement of a stop member into a predetermined operative position, both releasing mechanisms 41 and 51 are rendered ineffective to disengage the laminations 32 from their engaging positions with the teeth of the star gear 28.

A second modification of the invention is disclosed in Figs. 9 and 10 wherein again the releasing mechanisms 41 and 51 and the safety mechanism 58, parts of the mechanisms 51 and 58 not being shown for the purpose of clarity, are identical in structure and operation as those disclosed in the two previous embodiments. A remotely controlled locking mechanism 81'' is mounted on a bracket 120 having a bottom flange 121 and a side flange 122 extending at right angles thereto. The bottom flange 121 includes two spaced openings 123 each in an inner corner of the flange, a depending element 124 at a rear corner of the flange having a tap 125 at the end thereof whereby a shoulder is formed, a depending leg 126 at the other rear corner of the flange 121, and another depending leg 127 at one side of the flange having a rubberized bumper device 128 secured thereon for a purpose hereinafter described. The bracket 120 is placed over the base 24 of the supporting plate 23 and secured thereto by placing the openings 123 over the ends of the stationary shaft 25 and the pivot pin 31, and by inserting the tab 125 into an opening 129 formed in the base 24. Securing devices (not shown) are then inserted into the threaded openings 39 in the shaft and pivot pin 25 and 31, respectively. By this arrangement the bottom flange 121 is secured and supported a spaced distance from the base 24 for a purpose hereinafter disclosed.

As previously described, a pair of oppositely acting solenoids 83'' are each energized by the switch 97 (Fig. 4) contacting either terminal 98 or 99 to complete the circuit whereby, depending on which solenoid 83'' is energized, a plunger 84'' is moved to either one of two positions. Here again, only momentary energization of either solenoid 83'' is necessary to move the plunger 84'' to the desired position. Due to one end of the plunger 84'' being formed and secured to a member 86'', which is in contact with the upstanding legs 90'' of a permanent magnet 87'' secured to the side flange 122, and which moves parallel to the direction of movement of the plunger 84'', the assumed position, upon the circuit being broken and the respective solenoid 83'' being de-energized, is maintained with the aid of the attraction

of the member 86'' to the magnet 87''. A spring 89'' secured to the side flange 122, coacts with a shoulder 102'' formed on the member 86'' to aid the magnet retain the plunger 84'' in the desired position.

The other end of the plunger 84'' is secured to the stem 131 of a T-shaped stop member 132 which includes a pivotal member 133 extending at right angles to the stem 131 which is pivoted at 134 to the bottom flange 121. The pivotal member 133 has a depending finger 136 at one end thereof and a depending flange 137 intermediate the ends thereof, both the finger and the flange being adapted to move through an opening 138 formed in the bottom flange 21 of the bracket 120. The pivotal member 133 also has a laterally extending tab 139 intermediate the ends thereof which is adapted to contact the top surface of the bottom flange 121 whereby to limit the amount of downward pivotal movement of the member 133. It is to be noted that when the bracket 120 is secured in place, the supporting leg 127 is placed closely adjacent a leg 140 of the lamination 30 (Fig. 9), for this reason the rubberized bumper 128 is secured about the leg 127 to prevent metal-to-metal contact.

The operation of the modified latch mechanism disclosed in Figs. 9 and 10 is similar to that of the two previously described latch mechanisms, and comprises the selective energization of either solenoid 83'' by movement of the switch 97, whereupon the stop member 132 will assume either an operative lower position (Fig. 10) or an inoperative upper position, as shown by the dotted lines in Fig. 10.

When the stop member 132 is moved to the lower operative position, the intermediate depending flange 137 is placed adjacent the end tips 144 of the laminations 32 and in their line of counter-clockwise movement, thereby preventing the rotational movement of the pawl assembly 29. By preventing the counter-clockwise movement of the pawl assembly 29, whereby to disengage the laminations 32 of the pawl assembly from the teeth of the star gear 28, both releasing mechanisms 41 and 51 are rendered ineffective to move the pawl assembly 29 until the switch 97 is moved to energize the other solenoid 83'', whereupon the stop member 132 is moved upwardly and out of the path of the pawl assembly end tips 144.

It is to be noted that when the car door 20 closes, the star gear 28 is rotated in a clockwise manner, which causes a counter-clockwise rotation of the pawl assembly 29 without, however, movement of either releasing mechanism 41 or 51. Should the safety mechanism 58 be in its operative position with the lower shoulder 73 in the path of counter-clockwise movement of the pawl ear 33, as in the case of the inner door releasing mechanism 51 hereinbefore described, upon closing the door 20, movement of the ear 33 and the pawl assembly 29 in a counter-clockwise rotation will be impeded but not prevented as the positive line of force of the ear 33 and the opposing line of force of the reciprocable member 64 are along the same axes.

With respect to the latch mechanism disclosed in Figs. 9 and 10, should the stop member 132 be in the lower operative position, wherein the intermediate depending flange 137 blocks the counter-clockwise movement of the pawl assembly 29 via the laminations 32, when the door 20 is open, a clockwise rotation of the star gear 28 to allow the door to close is not prevented due to the function of the depending finger 136. Upon clockwise movement of the teeth of the star gear 28 when the door is closed, the finger 136 will be forced upwardly, overcoming the restraining force of the permanent magnet 87'', and will cause the stop member 132 also to pivot upwardly, thereby removing the flange 137 from the path of the pawl laminations 32, and thus allowing the pawl assembly 29 and the star gear 28 to rotate in a clockwise movement. Of note, the spacing between the end tips 144 of the lami-

nations 32 and the flange 137 is such that a short rotary movement of the star gear 28 is sufficient to raise the finger 136 before the concurrent movement of the pawl assembly 29 contacts the flange 137. Thus, the flange is raised by action of the finger 136 before it is contacted by the pawl assembly upon the closing of the door. The stop member 132, having been forced to its inoperative position, will of course remain there due to the function of the magnet 87". Thus, to replace the stop member 132 in the operative position will again require an energization of the particular solenoid 83".

Although the electric circuit (Fig. 4) shows a selective control of one set of solenoids 83 for one latch mechanism, it is obvious that by including a plurality of solenoid sets in parallel in a circuit, a plurality of latch mechanisms, for example, four for a 4-door sedan, may be concurrently and similarly controlled by one switch operation.

It is to be noted that the locking unit described hereinbefore, for example the unit 81 of Figs. 1-5, is additional to the usual structure of the latch mechanism 21 and does not function to counteract the usual tension of the door weather stripping which acts to bias the door to an open position. The locking unit functions merely to block an unlatching movement of the star gear 28 or the pawl assembly 29 by pivotally moving a stop member 92 into a blocking position relative thereto. As a result, the locking unit may be actuated by low voltage coils operable off either a 6 or 12 volt battery.

In summation, the present invention provides an improved locking structure for controlling the effectiveness of a pair of independently operable releasing mechanisms for an automobile door latch mechanism by means of a remotely controlled device which is handy to the operator. The present invention further encompasses an improved locking system wherein a plurality of latch mechanisms may be concurrently rendered operative or inoperative to the actuation of releasing mechanisms provided therefor. Although three forms of the invention have hereinbefore been described, it is to be noted that this invention is not to be so limited. On the contrary, various modifications and alternate constructions may be made which will not alter the scope of the invention as defined in the appended claims.

I claim:

1. In an automobile door lock having a supporting structure, a rotary bolt means, a pivoted pawl assembly, a biasing means for urging and holding said pawl assembly in engagement with said bolt means whereby to prevent said bolt means from rotating, releasing means operable to move said pawl assembly against said biasing means and out of engagement with said rotary bolt means, and, safety means operable to render said releasing means ineffective, the combination of double-acting solenoid means secured to said supporting structure and including a stop member retractably movable into engagement with said pawl assembly for releasably holding said pawl assembly in a bolt-locking position, and magnetic means permanently attached to said structure and being operably associated with said stop member for maintaining said stop member in any assumed position.

2. An automobile door lock comprising a supporting structure including two sections arranged normal to each other, a latching mechanism on one of said sections including a rotatable bolt having a series of teeth, and a pivoted pawl engageable with said teeth and biased in one direction of pivotal movement into engagement therewith to prevent rotation of said bolt in one direction, a first bolt releasing mechanism, movably supported on said one section and operatively engageable with said pawl to pivotally move the pawl in an opposite direction to

release said bolt, a second bolt releasing mechanism movably supported on the second one of said sections and operatively engageable with said pawl to pivotally move the pawl in an opposite direction, independently of said first bolt releasing mechanism, to release said bolt, safety means mounted on said supporting structure operable to render one of said releasing mechanisms ineffective, a stop member movably mounted on said supporting structure for movement into engagement with said pawl, in a bolt engaging position therefor, to lock said pawl against pivotal movement out of engagement with said bolt to render said two bolt releasing mechanisms ineffective, and remotely controlled means including a double acting solenoid mounted on said supporting structure and being connected to and operable to move said stop member into and out of engagement with said pawl.

3. In an automobile door lock wherein a supporting structure has a rotatable bolt formed with a series of teeth engageable with a pivoted pawl biased in one direction to hold the bolt against rotation in one direction, wherein a pair of releasing mechanisms are operable to move the pawl out of engagement with the bolt independently of each other, and further wherein a safety mechanism is operable to render one of said releasing mechanisms ineffective, a locking device for maintaining the pawl in a bolt engaged position against the operation of said pawl moving mechanisms including a stop member movably supported on such structure and movable into an engaging position with the pawl, when the pawl is in a bolt engaging position, to lock the pawl against movement away from a bolt engaging position, a double acting solenoid unit on said structure for moving said stop member into and out of an engaging position with said pawl including a working member having opposite end portions projected outwardly of said unit, means connecting one of said end portions with said stop member, and permanent magnet means on said structure arranged to apply a continuous magnetic force on the other of said end portions to hold said working member against movement when said solenoid unit is de-energized.

4. An automobile door lock comprising a latching mechanism having a supporting structure and including a rotatable bolt having a series of teeth and a pivoted pawl having a cam for engagement with said teeth and being biased in one direction of pivotal movement whereby said cam engages said teeth to prevent rotation of said bolt in one direction, a first bolt releasing mechanism operatively engageable with said pawl to pivotally move the pawl in an opposite direction to release the bolt, a second bolt releasing mechanism operatively engageable with said pawl to pivotally move the pawl in an opposite direction to release the bolt, a safety mechanism for rendering one of said releasing mechanisms ineffective, and remotely controlled electro-magnetic means including a double acting solenoid having a stop member movable into and out of a position to engage said pawl to hold said pawl against movement in said opposite direction whereby to render said bolt releasing mechanisms ineffective, and means attached to said supporting structure for maintaining said stop member in either of said positions.

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