July 17, 1956 T. C. DINGMAN ET AL 2,754,671

DOOR LOCK

Filed June 22, 1950 2 Sheets-Sheet 1

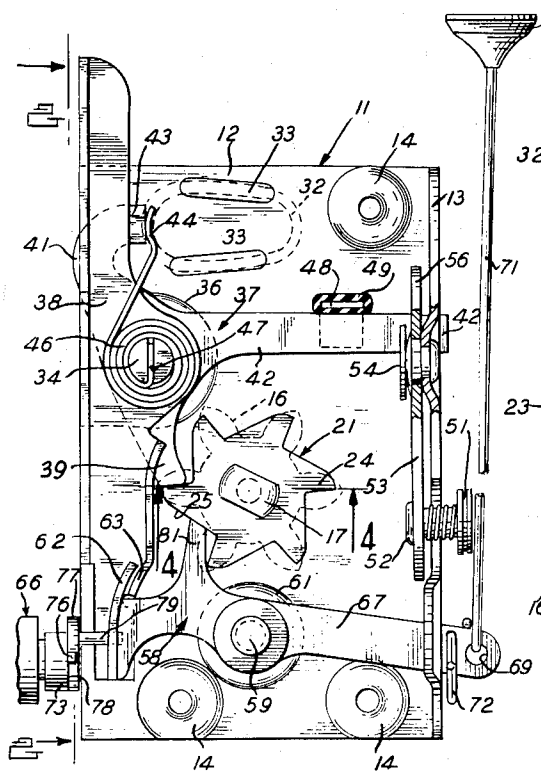


Fig. 1

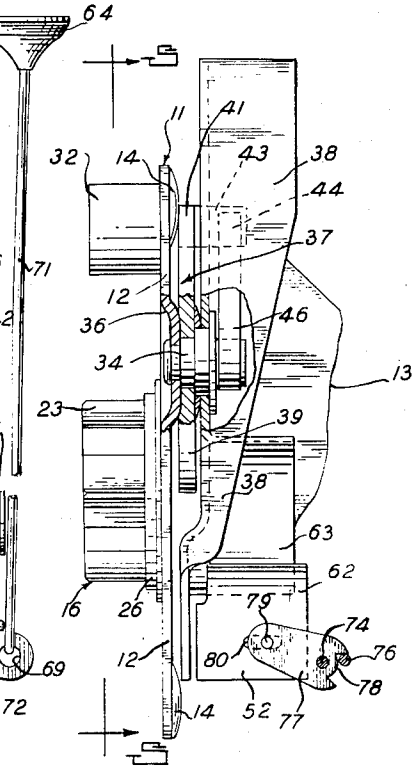


Fig. 2

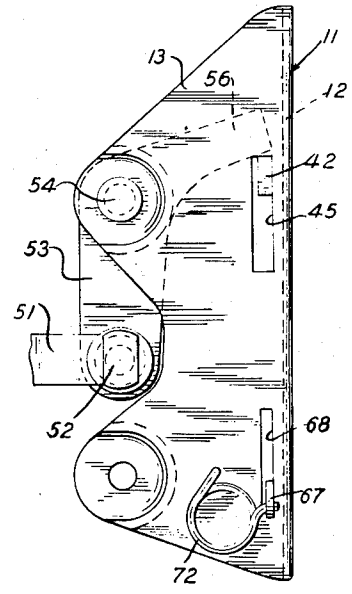


Fig. 3

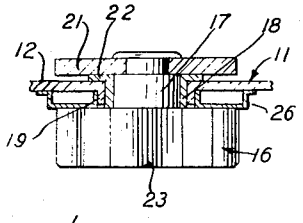


Fig. 4

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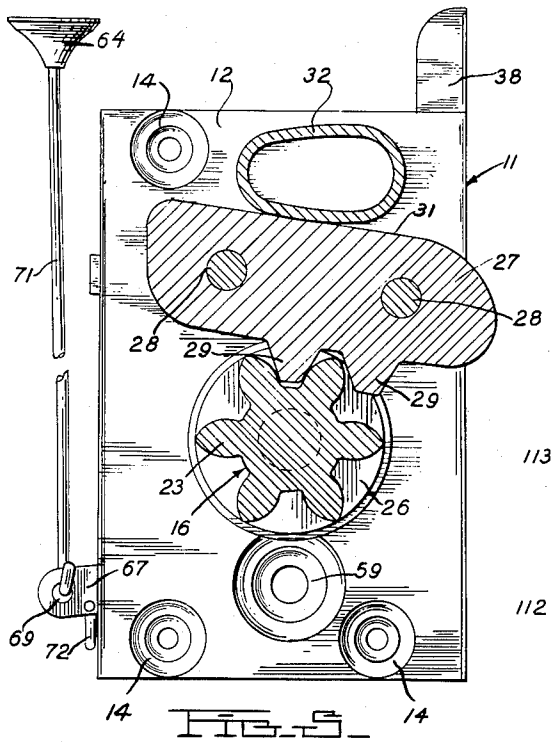


Fig. 5

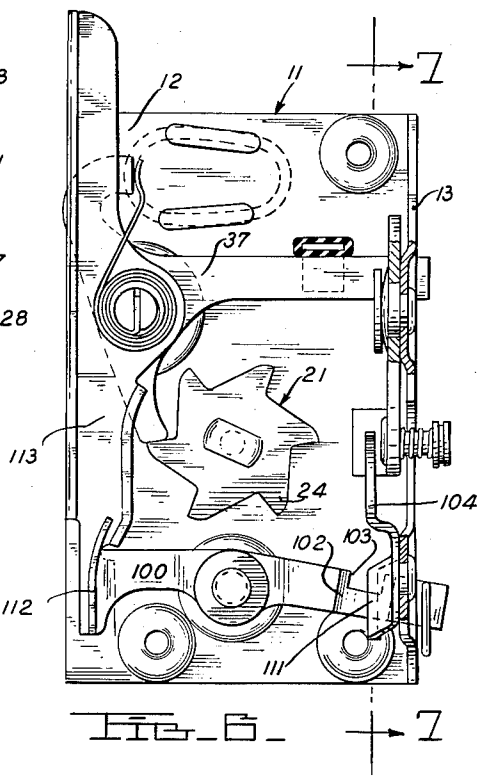


Fig. 6

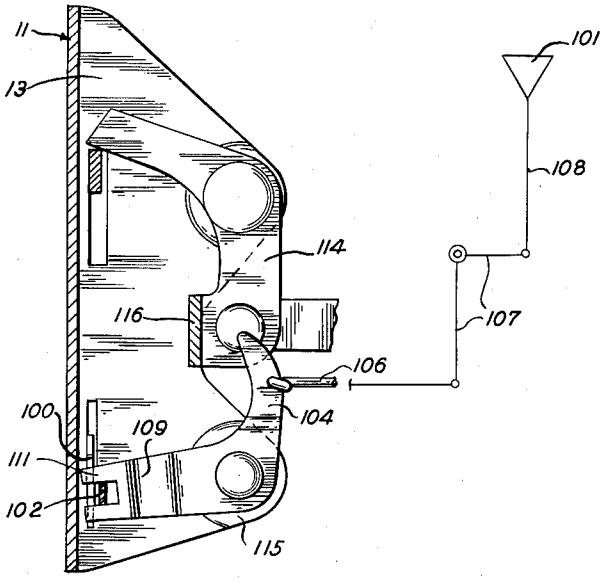


Fig. 7

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DOOR LOCK

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Application June 22, 1950, Serial No. 169,568

5 Claims. (Cl. 70—135)

This invention relates generally to latch mechanisms for doors and particularly to latch mechanisms of the rotatable bolt type for motor vehicle doors.

An object of the invention is to provide an improved door latch mechanism of the type having a rotatable bolt and a rotatable ratchet controlled by means of a pivotally mounted pawl, the latter being engaged by a suitable actuating member to release the bolt from the associated keeper.

A further object of the invention is to provide a lock of this type capable of performing the required functions of a motor vehicle door lock and yet having fewer parts. In addition to thus being more economical to manufacture the present lock is considerably smaller in size and consequently enables door design to be more flexible. An important size factor is the thickness of the door lock measured from the jamb face of the door, since this thickness determines the necessary position of the glass run mounted in the vehicle door guiding the window therein. It is desirable to locate this glass run as close as possible to the jamb face of the door so that the window area may be larger and the door post at each side of the door frame narrower. The particular design and construction of the present lock enables this dimension to be considerably smaller than in conventional door locks.

Another object of the present invention is to provide a door lock operable with a low button or handle pressure from the exterior of the door. Still another object is to provide a direct acting door lock which requires a minimum travel of the outside push button or handle to release the lock. Another feature of the invention is the provision of a short direct connection between the key actuated mechanism and the lock mechanism operated thereby, thus eliminating the usual long shaft which spans the lock.

Other objects and advantages of this invention will be made more apparent as this description proceeds, particularly when considered in connection with the accompanying drawings, wherein;

Figure 1 is a elevational view looking toward the flange of the door lock case adapted to be mounted upon the door jamb.

Figure 2 is an elevational view, partly in section, taken on the line 2—2 of Figure 1, and as viewed from the exterior of the door.

Figure 3 is a side-elevational view of the construction shown in Figure 1 as viewed from the right side thereof, or from the interior of the door.

Figure 4 is a cross-sectional view taken on the line 4—4 of Figure 1.

Figure 5 is a cross-sectional view taken on the line 5—5 of Figure 2, and illustrating the opposite side of the lock mechanism from that shown in Figure 1.

Figure 6 is a view similar to Figure 1 but showing a modified form of the invention as adapted for use particularly on the rear door of a motor vehicle.

Figure 7 is a cross-sectional view taken on the line 7—7 of Figure 6, with the linkage to the inside locking button shown diagrammatically.

The embodiment of the invention shown in Figures 1 to 5 inclusive is designed particularly for the right front door of a motor vehicle. The lock mechanism is mounted upon an L-shaped mounting plate 11 having flanges 12 and 13 extending substantially at right angles to each other. The plate 12 is provided with three screw bosses 14 by means of which the mounting plate may be secured to the inner side of the jamb face of the door. The flange 13 of the plate extends along the inner door panel.

The lock is provided with a rotatable toothed latch of rotor 16, Figures 4 and 5, having an integral shank 17 rotatably mounted in a bushing 18 carried in an annular flange 19 struck out from the flange 12 of the mounting plate 11. The end of the shank 17 of the rotor is flattened and extends through a correspondingly shaped aperture in a rotatable toothed ratchet 21 and is riveted thereto. It will be noted that the bushing 18 has a flange 22 forming a bearing surface for the ratchet 21.

The rotor 16 is formed with six equally spaced peripheral teeth 23 and the ratchet 21 is likewise formed with an equal number of teeth 24. It will be noted that the rotor and ratchet are thus mounted on opposite sides of the flange 12 of the mounting plate for rotation together as a unit. A sheet metal shield 26 is loosely mounted between the flange 12 of the mounting plate and the rotor 16.

The rotor 16 is adapted to be engaged by a keeper 27 rigidly mounted on the jamb face of the adjacent door pillar by means of a pair of bolts 28. The keeper 27 is formed along its lower edge with two integral projecting teeth 29 adapted to mesh with the teeth 23 of the rotor 16 to hold the vehicle door in either a locked or a safety position. The upper edge of the keeper 27 is formed with an inclined face 31 engaged by a dove-tail 32 formed of sheet metal and having tongues 33 projecting through slots in the flange 12 of the mounting plate and riveted thereto. The lower surface of the dovetail 32 is curved to provide a line engagement with the upper edge 31 of the keeper.

Referring now to Figures 1 and 2, a shoulder rivet 34 is mounted upon the flange 12 of the mounting plate 11 centrally of an embossment 36 formed thereon. The shoulder rivet 34 forms a pivotal mounting for a pawl 37 and also for a release lever 38.

The pawl 37 is formed with three generally radially extending arms 39, 41 and 42. The downwardly depending arm 39 is engageable with the teeth 24 of the ratchet 21 to hold the ratchet and the rotor 16 locked against rotation in a clockwise direction as viewed in Fig. 1. Arm 42 extends generally horizontally and protrudes through a vertical slot 45, Figure 3, formed in the side flange 13 of the mounting plate 11. This arm is adapted to be engaged by means hereinafter described to permit the lock to be released by operation of a handle located inside the door. A tongue 48 struck out from the flange 12 of the mounting plate 11 is encircled by a rubber grommet 49 to provide a resilient stop for the inwardly extending arm 42 of the pawl 37 to limit the counter-clockwise rotation of the pawl under the action of coil spring 46. In this position the arm 42 of the pawl is at the upper extremity of slot 45 in the flange 13 of the mounting plate.

Arm 41 extends generally upwardly from the pawl 37 and is formed at its extreme upper end with a flange 43 extending at right angles to the arm. The flange 43 engages the inner edge of the release lever 38, and is in turn engaged by the upwardly extending end 44 of a coil spring 46 coiled around the shank of the shoulder rivet 34 with the inner end of the spring being anchored

in a slot 47 formed in the rivet. It will be seen that the coil spring 46 urges both the pawl 37 and the release lever 38 in a counterclockwise direction as seen in Figure 1.

It will be seen that the release lever 38 is pivotally mounted intermediate its ends upon the shoulder rivet 34. The upper end of the release lever 38 may be engaged by a conventional push button operator or a suitable turn or pull type exterior door handle, and is adapted to be rotated in a clockwise direction by means of this conventional mechanism (not shown). It will be apparent that clockwise movement of the release lever 38 under the actuation of the door handle or push button is effective to simultaneously and instantaneously rotate the pawl 37 in a clockwise direction since the flange 43 of the upper arm 41 of the pawl is constantly in contact with the release lever. This movement swings the lower arm 39 of the pawl out of engagement with the adjacent tooth 24 of the ratchet 21, permitting the ratchet and rotor to be rotated in a clockwise direction as seen in Figure 1, or a counterclockwise direction as seen in Figure 5, to permit the vehicle door to be opened by rolling the teeth 23 of the rotor 16 over the toothlike projections 29 of the stationary keeper 27.

When the pressure on the release lever 38 from the outside push button or door handle is released, the lever 38 and pawl 37 are returned by the coil spring 46 to the position shown in Figure 1 in which the arm 39 of the pawl is again in engagement with the teeth 24 of the ratchet 21. It will be seen that closing movement of the door and the resulting counterclockwise rotation of the ratchet and rotor as seen in Figure 1 can be effected since the ratchet teeth 24 can temporarily swing the pawl 37 against the action of the spring.

The locking mechanism can also be released by a suitable conventional handle located inside the vehicle door. This handle conventionally reciprocates a remote control link 51, Figures 1 and 3, the end of the link being connected to a stud 52 mounted upon the lower arm of a bell crank lever 53. The bell crank lever 53 is pivotally mounted by means of a shoulder rivet 54 to the inner flange 13 of the mounting plate 11, the flange 13 being embossed at this point to provide clearance at this point between the bell crank lever and the flange. The upper arm 56 of the bell crank lever 53 extends over the arm 42 of the pawl 37, and it will be seen that clockwise rotation of the bell crank 53 under the actuation of the interior door handle, as viewed in Figure 3, is effective to depress the pawl arm 42 in the slot 45 and consequently to swing the pawl 37 in a clockwise direction as viewed in Figure 1 to release the pawl arm 39 from the ratchet teeth 24.

The latch mechanism is provided with a locking lever 58, Figures 1 and 2, to enable the latch mechanism to be locked against unauthorized operation from the exterior of the vehicle door. The locking lever is pivotally mounted by means of a stud 59 to the flange 12 of the mounting plate 11, the latter being provided with an embossment 61 to provide clearance between the lever and the plate. The outer end of the locking lever 58 carries a generally vertical flange 62, the upper end of which is curved inwardly. This flange 62 is adapted to interlock with a flange 63 formed on the lower portion of the release lever 38. In the position in Figure 1, the flange 62 of the locking lever overlaps the flange 63 of the release lever and effectively prevents clockwise rotation of the latter under the actuation of the push button or outside door handle. The latch mechanism is thus held in locked position.

The locking lever 58 can, however, be rotated in a counterclockwise direction as seen in Figure 1 either under the actuation of an inside button 64 or an outside key actuated device 66. When rotated in a counterclockwise direction by either of these means, the flange 62 of the locking lever 58 drops beneath the flange 63 of the release lever 38, enabling the latter to be operated by the push button or exterior door handle to release the pawl from the ratchet and permit the door to be opened.

The locking lever 58 is formed with an inwardly extending arm 67 projecting through a slot 68 formed in the inner flange 13 of the mounting plate. The inner end of the arm 67 of the locking lever is provided with an aperture 69 and a rod 71 carrying at its upper end the inside locking button 64 is suitably hooked through the aperture. When the locking button 64 is pushed down, the locking lever 58 is held in its locking position, and conversely when the button 64 is raised, the parts are in the unlocked position. An over-center spring 72 is connected between the side flange 13 of the mounting plate and the inwardly extending arm 67 of the locking lever 58 to provide a snap action for the locking lever between its locked and unlocked positions.

Similar movement of the locking lever 58 between its locked and unlocked positions can also be effected by the key actuated device 66. This device comprises a conventional lock cylinder 73 suitably supported in the exterior door panel of a vehicle in the conventional manner. The lock cylinder 73 is adapted to be rotated through a predetermined angular movement by a suitable key. A pair of pins 74 and 76, Figure 2, project inwardly from the inner end of the lock cylinder 73. The pin 74 is centrally located with respect to the lock cylinder and a crank arm 77 is freely pivotally mounted thereon. The inner end of the crank arm 77 is formed with an arcuate groove 78 into which extends the pin 76, the latter being mounted upon the inner end of the lock cylinder in a position radially offest from the center line of the cylinder. It will be seen that the lock cylinder thus has a lost motion connection with the crank arm 77, and that the crank arm is adapted to be rotated by the lock cylinder when the pin 76 has been moved to one extremity of the slot 78. Projecting inwardly from the outer end of the crank arm 77 is an elongated pin 79 which extends through an elongated slot 80 formed in the flange 62 of the locking lever 58. The arcuate slot 78 at the inner edge of the crank arm 77 permits the locking lever 58 to be moved to its unlocked position by raising the inside locking button 64 without affecting the position of the lock cylinder 73.

The locking lever 58 is provided with an upwardly extending arm 81 adapted to engage the rearward edges 25 of the teeth 24 of the ratchet 21. This arm automatically moves the locking lever 58 to its unlocked position whenever the vehicle door is opened, since the opening movement of the vehicle door results in a counterclockwise rotation of the ratchet 21 as seen in Figure 1, swinging the locking lever 58 downwardly out of locking engagement with the release lever 38. With this arrangement it is impossible to leave the car in a locked position except by locking the mechanism with the key after closing the door from the exterior. The rearward edges 25 of the ratchet teeth 24 are formed at such angle that arm 81 of the locking lever 58 is moved with a minimum of friction and effort.

The lock mechanism described above performs the essential functions required of present day motor vehicle door locks, and yet comprises a relatively few parts. The reduction in the number of levers, links, springs, rivets, studs, etc. results in materially improving the operation of the lock since friction is reduced and trouble points eliminated. The utilization of but a single spring and the provision of latch mechanism having a minimum of friction results in a door lock which can be operated by a smaller actuating force upon the release lever. Since there is no lost motion between the release lever 38 and the pawl 37, the lock is direct acting and the movement of the release lever 38 is minimized.

Another advantage of the present construction is the extreme thinness of the lock mechanism as measured from the flange 12 of the mounting plate 11 to the top of the ratchet 21. The glass run for the door window

must extend vertically along the central portion of the latch mechanism and since it is desirable to place this glass run as close to the jamb face of the door as possible, it will be seen that the thinness of the present lock in this zone is advantageous. Another factor contributing to the thinness of the lock is the fact that there is a direct connection between the lock cylinder and the locking lever **58** thus eliminating the necessity of providing a shaft extending from the exterior of the door completely across the face of the lock to the flange of the mounting plate adjacent the inner door panel, as in conventional practice.

Referring now to the construction shown in Figures 6 and 7, a modified form of the lock mechanism is illustrated. This form is particularly adapted for use in connection with the rear doors of motor vehicles. With rear doors of the type hinged at their forward edges, it is desirable to place the inside locking button adjacent the forward edge of the door and it is consequently necessary to provide suitable linkage for inter-connecting this button with the latch mechanism necessarily located at the rearward edge of the door. The form of the invention shown in Figures 6 and 7 is therefore generally similar in overall construction to that shown in Figures 1 to 5 inclusive, except for the means for operating the locking lever **100** by the rear door inside locking button **101**.

The locking lever **100** is formed near its inner end with an offset portion **102** provided with a notch **103** in its upper edge. Pivotally mounted upon the inner flange **13** of the mounting plate **11** is a bell crank lever **104**. The upper arm of the bell crank lever **104** is connected by a link **106** to a bellcrank lever **107** pivotally mounted upon the vehicle body. The bell crank lever **107** in turn is connected by a rod **108** to the inside locking button **101**. This linkage is shown partly in diagrammatic fashion, and it will be understood that it is suitably arranged so that the locking button **101** can be located at the forward end of the rear door while the latch mechanism is mounted at the rear jamb face of the door.

The lower arm **109** of the bell crank lever **104** is provided with a bifurcated end portion **111** adapted to interlock with the notched offset portion **102** of the locking lever **100**, the upper bifurcation **111** fitting into the notch **103**. It will be apparent that raising the locking button **101** in Figure 7 will be effective to rotate the bell crank lever **104** in a clockwise direction and to lift the inner end of the locking lever **100**. Since the locking lever **100** is pivotally mounted upon the locking plate intermediate its ends, the outer flange **112** of the locking lever is lowered out of locking engagement with the corresponding flange of the release lever **113**.

The lower arm of the remote control bell crank lever **114** for the rear door lock is provided with a flange **116** at its extremity. When the inside door handle is operated to swing the remote control lever **114** in a counterclockwise direction as seen in Figure 7, the flange **116** of the lower end of the lever engages the upper arm of the bell crank **104** to actuate the latter and swing the locking lever **100** to its unlocked position thus automatically unlocking the door when the latter is opened from the inside. After the rear door has been opened, however, the inside locking button **101** can be depressed to swing the locking lever **100** to its locked position with its flange **112** interlocking with the adjacent flange on the release lever **113**, and to then close the rear door without automatically unlocking the latch mechanism as would be the case in connection with the front door lock. The omission of an upwardly extending arm such as the arm **81** of the locking lever **58** of the front door lock shown in Figure 1 enables the rear door lock to operate in this manner. When leaving the car it is thus possible to lock the rear doors without using a key but the front doors can only be locked from the exterior by the use of a key.

Insofar as possible the parts of the front and rear door locks are made interchangeable. For example, the mounting plate **11** is identical for each lock, the flange **13** of the plate being provided with a lower embossed portion **115** enabling the bell crank lever **104** to be mounted thereon if the plate is to be used for a rear door lock.

It will be understood that the invention is not to be limited to the exact construction shown and described, but that various changes and modifications may be made without departing from the spirit and scope of the invention, as defined in the appended claims.

What is claimed is:

1. In a latch mechanism for a motor vehicle door, an L-shaped mounting plate adapted to be secured to said door with one flange of said plate adapted to be positioned adjacent the jamb face of the door and the other flange of said plate adapted to be positioned adjacent the inner panel of said door, a toothed rotor rotatably mounted upon said first-mentioned flange on the outer side thereof, a toothed ratchet on the inner side of said flange and mounted for rotation with said rotor as a unit, a pawl mounted on said first flange on the inner side thereof and adapted to engage the teeth of said ratchet to hold said ratchet and rotor against rotation in an unlocking direction, an outer manually operable lever pivotally mounted on said first flange and having a portion operable upon actuation to move said pawl out of engagement with said ratchet, an inner manually operable lever pivotally mounted upon said second flange adjacent said inner door panel and having a portion operable upon actuation to move said pawl out of engagement with said ratchet, a locking lever pivotally mounted upon the inner side of said first flange of said mounting plate and having a portion adapted to interlock with said outer manually operable lever to prevent pivotal movement of the latter in a direction to disengage said pawl from said ratchet, said locking lever extending generally parallel to said first flange and to the jamb face of the door and having a portion positioned adjacent the outer side of said door, a key actuated locking device adapted to be mounted upon the outer side of said door and comprising a lock cylinder rotatable upon key actuation, a part extending inwardly from said lock cylinder and having operative engagement with the outwardly extending portion of said locking lever to swing said lever between locked and unlocked positions upon actuation of said key, said locking lever also having a portion extending through a slot in the second flange of said mounting plate, and inner manually operable control means connected to the last-mentioned portion of said locking lever to swing the latter between locked and unlocked positions.

2. In a latch mechanism for a motor vehicle door, an L-shaped mounting plate having a flange adapted to be positioned adjacent the jamb face of said door and secured thereto and a second flange adapted to extend along the inner panel of said door, a toothed ratchet and a toothed rotor rotatably mounted upon the first flange of said plate for rotation as a unit, a pawl pivotally mounted on said first flange for engagement with said ratchet teeth to hold said ratchet and rotor against rotation in one direction, a vertically extending operable lever pivotally mounted upon the first flange of said plate adjacent the edge of said first flange remote from said second flange and having a common pivotal axis with said pawl, said operable lever having a portion operable upon actuation to move said pawl out of engagement with said ratchet, said operable lever having an elongated arm extending generally vertically downwardly from said pivotal axis, said arm being laterally spaced from said rotor and ratchet and having an integral flange extending at right angles to said first flange of the mounting plate, an inner manually operable lever pivotally mounted upon said second flange and having a portion engageable with said pawl to move the latter out of engagement with said ratchet, a locking lever pivotally mounted upon the first flange of said plate below said rotor and ratchet and having an integral flange at one end

thereof extending at right angles to said first flange of said mounting plate and arranged to overlap the flange on said operable lever to prevent pivotal movement of the latter in a direction to disengage said pawl from said ratchet, said locking lever extending generally parallel to said first flange, and inner manually operable control means connected to said locking lever adjacent the second flange of said plate to swing the lever between locked and unlocked positions.

3. In a latch mechanism for a motor vehicle door, an L-shaped mounting plate having a flange adapted to be positioned adjacent the jamb face of said door and secured thereto and a second flange adapted to extend along the inner panel of said door, a toothed ratchet and a toothed rotor rotatably mounted upon the first flange of said plate for rotation as a unit, a pawl pivotally mounted on said first flange for engagement with said ratchet teeth to hold said ratchet and rotor against rotation in one direction, an outer manually operable lever pivotally mounted upon the first flange of said plate adjacent the edge of said first flange remote from said second flange and having a portion operable upon actuation to move said pawl out of engagement with said ratchet, said outer manually operable lever extending generally vertically and having an actuable part above its pivotal connection with said first flange and a locking portion below its pivotal connection, an inner manually operable lever pivotally mounted upon said second flange and having a portion engageable with said pawl to move the latter out of engagement with said ratchet, a locking lever pivotally mounted upon the first flange of said plate below the pivotal connection of said outer manually operable lever to said first flange, said locking lever having a flange positioned adjacent the edge of the first flange of said plate remote from said second flange for selective interlocking engagement with the locking portion of said outer manually operable lever to prevent pivotal movement of the latter in a direction to disengage said pawl from said ratchet, said flange on the locking lever having a slot formed therein for receiving a key actuated member to swing said locking lever between locked and unlocked positions, said locking lever extending generally parallel to said first flange, and inner manually operable control means connected to said locking lever adjacent the second flange of said plate to swing the locking lever between locked and unlocked positions.

4. In a latch mechanism for a motor vehicle door, an L-shaped mounting plate having a flange adapted to be positioned adjacent the jamb face of said door and secured thereto and a second flange adapted to extend along the inner panel of said door, a toothed ratchet and a toothed rotor rotatably mounted upon the first flange of said plate for rotation as a unit, a pawl pivotally mounted on said first flange for engagement with said ratchet teeth to hold said ratchet and rotor against rotation in one direction, an outer manually operable lever pivotally mounted upon the first flange of said plate adjacent the edge of said first flange remote from said second flange and having a portion operable upon actuation to move said pawl out of engagement with said ratchet, said outer manually operable lever extending generally vertically and having an actuable part above its pivotal connection with said first flange and a locking portion below its pivotal connection, an inner manually operable lever pivotally mounted upon said second flange and having a portion engageable with said pawl to move the latter out of engagement with said ratchet, a locking lever pivotally mounted upon the first flange of said plate below the pivotal connection of said outer manually operable lever to said first flange, said locking lever having a portion extending from its pivotal mounting toward the outer side of said door and terminating in a projection extending generally vertically and at right angles to the first flange of said mounting plate, the second flange of said mounting plate being formed with a slot therein adjacent its lower end, said locking lever having a second portion extending from its pivotal mounting toward the second flange of said mounting plate and through said slot, and inner manually operable control means connected to the last mentioned portion of said locking lever to swing the latter between a position in which the flange at the opposite end of said locking lever is in interlocking engagement with the locking portion of said outer manually operable lever to prevent actuation of the latter to release said pawl from said ratchet and a second position in which said flange of the locking lever is out of interlocking engagement with the locking portion of said outer manually operable lever to permit the latter to be actuated to disengage said pawl from said ratchet.

5. In a latch mechanism for a motor vehicle door having an edge wall and an inner wall, a support having a first flange for disposition adjacent the edge wall and a second flange for disposition adjacent the inner wall of the door, a toothed rotor and a toothed ratchet rotatably mounted upon said first flange for rotation as a unit, a pawl mounted upon said first flange and adapted to engage said ratchet to hold said ratchet and rotor against rotation in one direction, a generally vertically extending outer manually operable lever pivotally mounted intermediate its ends upon said first flange and having a portion operable upon actuation to move said pawl out of engagement with said ratchet, said vertically extending outer manually operable lever having an actuable portion above its pivotal connection with said first flange and a locking portion below its pivotal connection, a locking lever pivotally mounted upon said first flange beneath said rotor and ratchet, said locking lever having a flange at one end for interlocking engagement with the locking portion of said manually operable lever to prevent pivotal movement of the latter in a direction to disengage said pawl from said ratchet, said locking lever extending generally parallel to said first flange, inner manually operable control means engaging said locking lever adjacent said second flange to swing the locking lever between locked and unlocked positions, and means on the flange of said locking lever engageable by a key actuated member to swing said locking lever between locked and unlocked positions.

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