

April 27, 1965

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3,180,669

DOOR CONTROL MECHANISM

Original Filed July 2, 1959

5 Sheets-Sheet 1

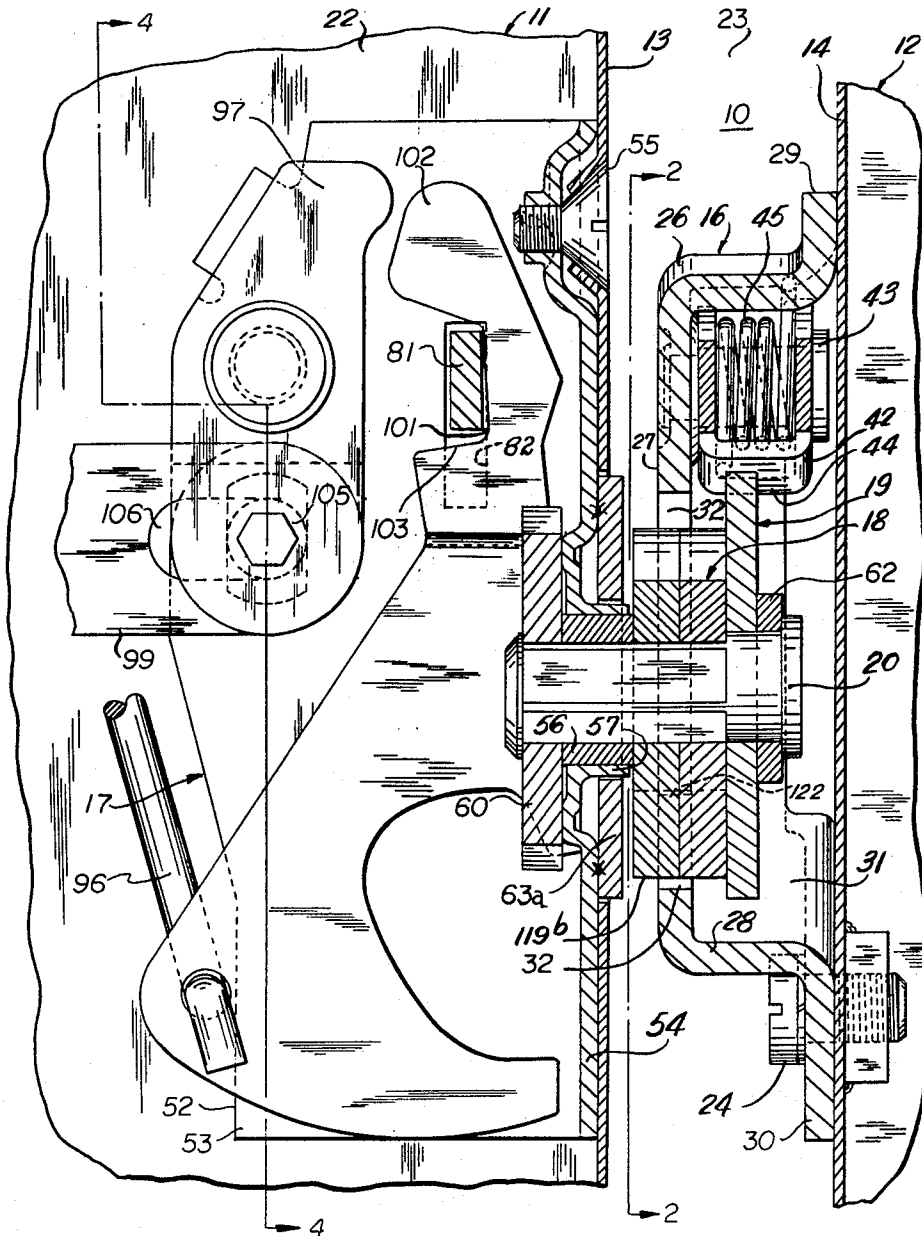


FIG 1

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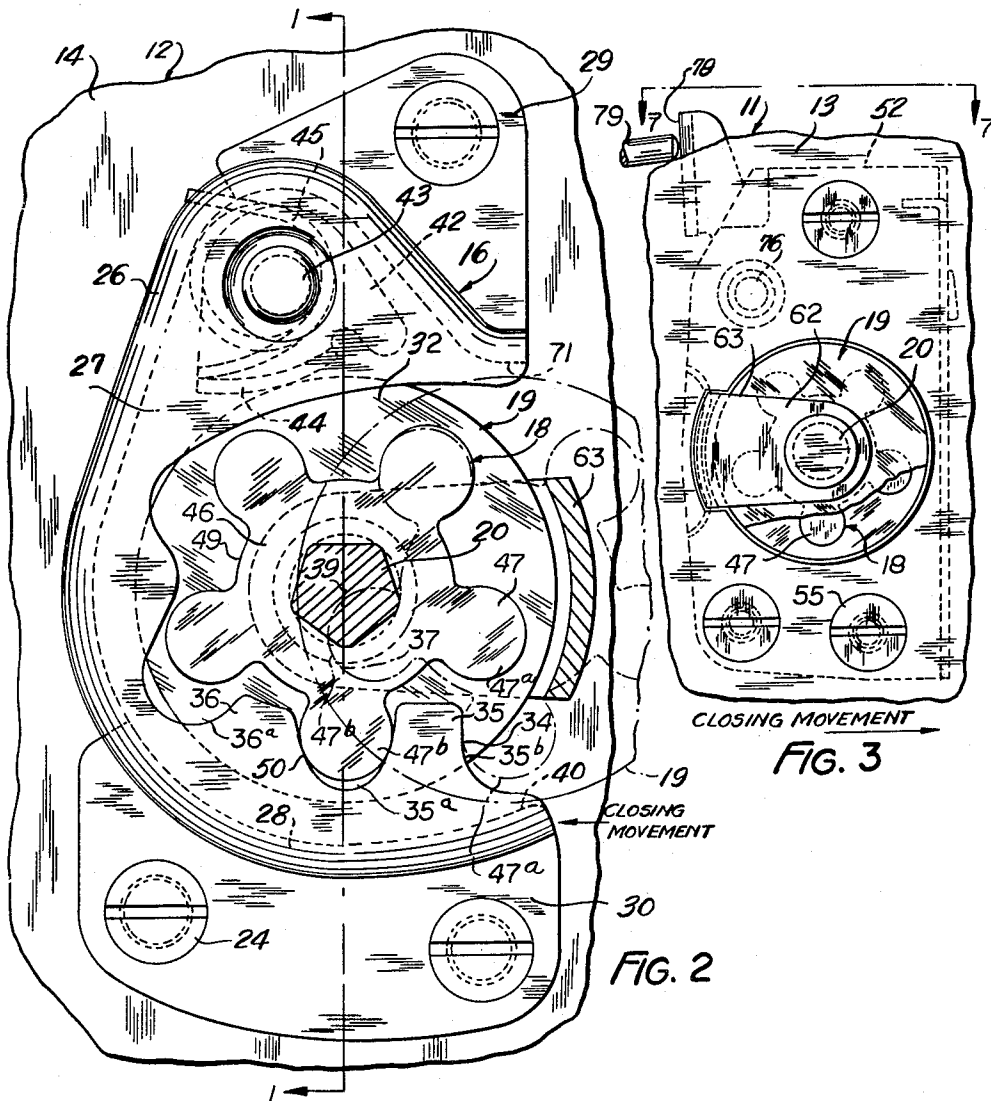
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5 Sheets-Sheet 2



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5 Sheets-Sheet 3

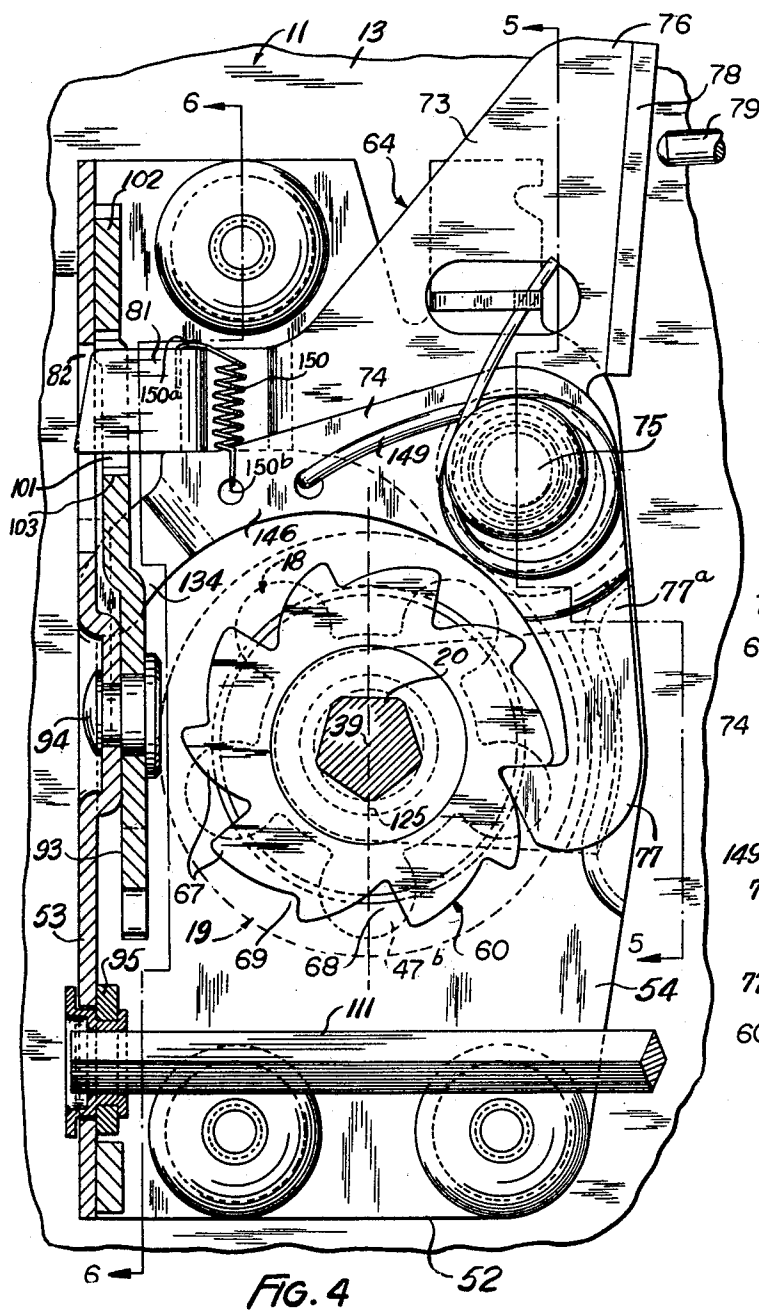


FIG. 4

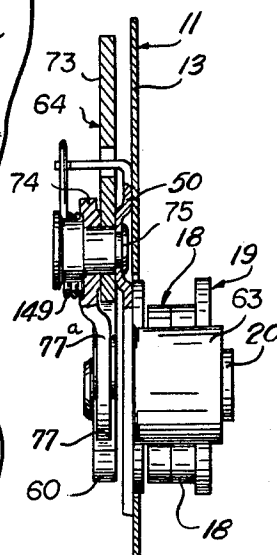


FIG.5

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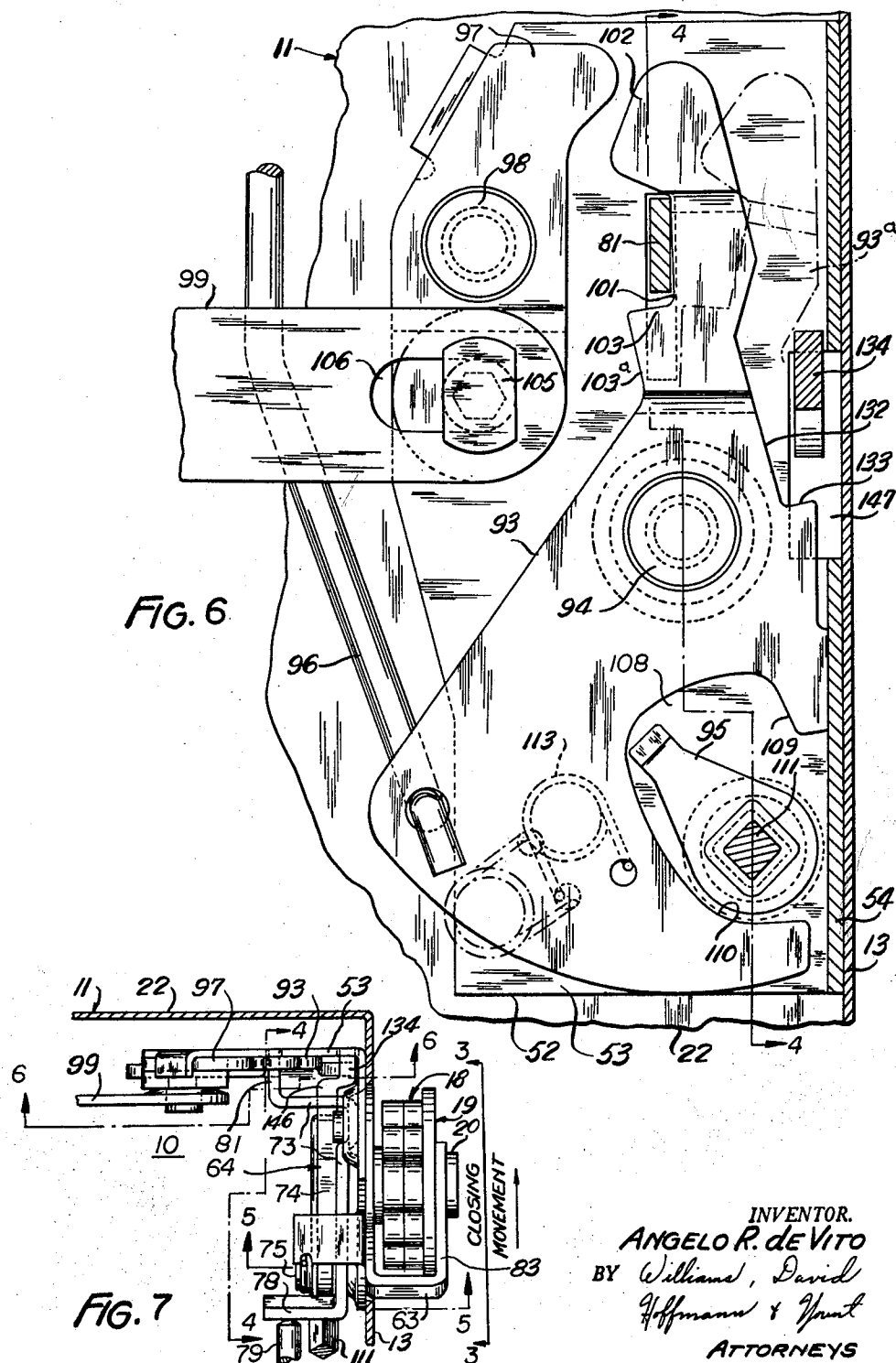
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DOOR CONTROL MECHANISM

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DOOR CONTROL MECHANISM

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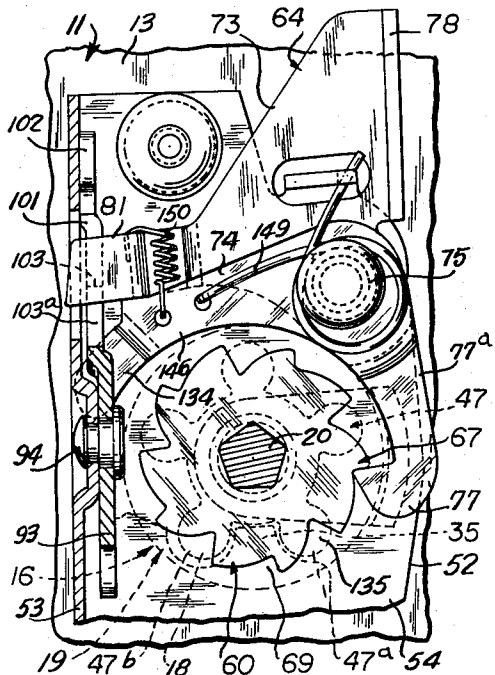


FIG. 8

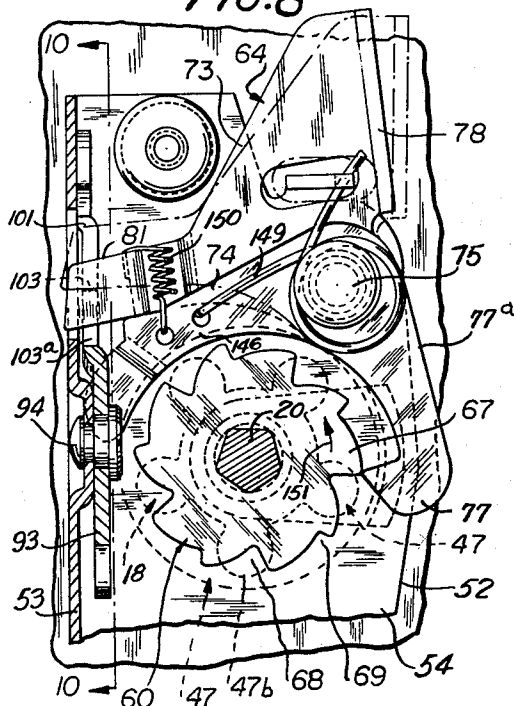


FIG. 9

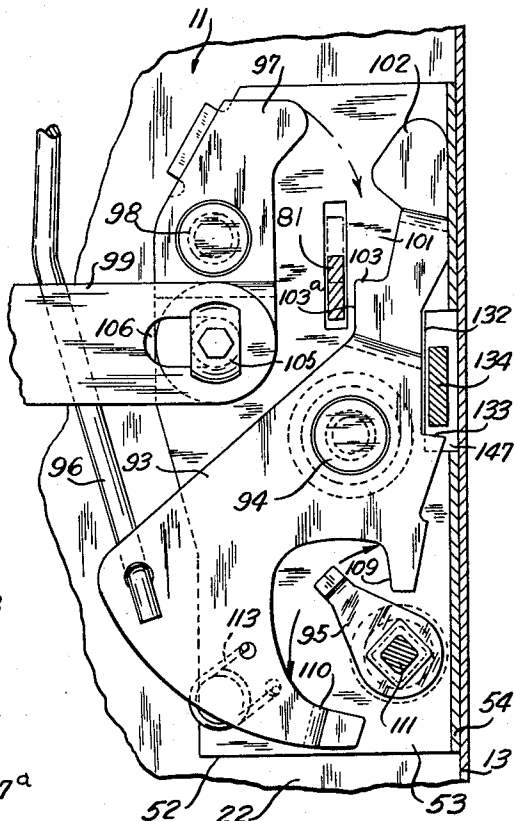


FIG. 10

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1

3,180,669

DOOR CONTROL MECHANISM

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Original application July 2, 1959, Ser. No. 824,689, now 5
Patent No. 3,047,325, dated July 31, 1962. Divided
and this application Dec. 8, 1961, Ser. No. 160,689
5 Claims. (Cl. 292-280)

This invention relates to door control mechanisms of the co-operating latch and keeper type and provides a 10
simple and practical construction for control mechanisms of this kind and which, when applied to vehicle doors, affords a more positive and satisfactory control than has been obtainable heretofore.

This application is a division of original application 15
Serial No. 824,689, filed July 2, 1959, now Patent No. 3,047,325, granted July 31, 1962.

An object of this invention is to provide a new and improved door lock mechanism of the cooperating latch and keeper type having co-operating ratchet and detent 20
means for releasably retaining the latch in its door-latched and door-supporting engagement with the keeper, and also having locking means for co-operation with the detent means for establishing a door-locked condition of the mechanism, the toothed latch and ratchet having a full circumferential complement of teeth and the locking means being actuable by either an inside or outside manual means, to a blocking position relative to the detent means.

Another object of this invention is to provide a novel door lock mechanism having a pivoted latch connected with a ratchet wheel and detent means co-operating with the ratchet wheel, the latch and ratchet wheel each having a full circumferential complement of teeth and the ratchet wheel also having intervening full-depth and shallow-depth tooth spaces in alternating relation between the teeth thereof, the lock mechanism also comprising locking means which is manually operable to establish a locked condition of the mechanism when the the ratchet wheel also having intervening full-depth and is manually inoperable when the detent means is engaged in a shallow-depth tooth space.

Yet another object is to provide a door lock mechanism of the character mentioned above wherein the detent means includes an unlocking finger for automatically unlocking the locking mechanism in response to closing of the door in the event the door control mechanism was actuated to a locked condition while in an open position so as to prevent damage to any of the parts and also to prevent the operator from unintentionally locking himself out.

Yet another object is to provide a novel door lock construction in which all of the features and advantages of the foregoing objects are obtained in an organization comprising a minimum number of cooperating parts.

Other objects and advantages of this invention will be apparent in the following detailed description and in the accompanying drawings forming a part of this specification and in which,

FIG. 1 is a longitudinal vertical section through door control mechanism provided by this invention, the view being a large-scale view taken as indicated by section line 1-1 of FIG. 2 and showing the latch of a left-side vehicle door in a door-latched position of engagement with the associated keeper;

FIG. 2 is a large-scale transverse vertical section taken through the mechanism and looking toward the keeper as indicated by section line 2-2 of FIG. 1;

FIG. 3 is a normal-scale elevational view looking toward the latch and edgewise of the door, as indicated by the directional line 3-3 of FIG. 7;

2

FIG. 4 is a large-scale transverse vertical section taken on section line 4-4 of FIGS. 1 and 7, and showing the cooperating ratchet and detent means;

FIG. 5 is a normal-scale partial vertical section taken on section line 5-5 of FIGS. 4 and 7;

FIG. 6 is a large-scale vertical section taken on section line 6-6 of FIGS. 4 and 7;

FIG. 7 is a normal-scale partial plan view of the mechanism and showing adjacent portions of the door in section, the view being taken as indicated by the directional line 7-7 of FIG. 3;

FIG. 8 is a partial transverse vertical section similar to that of FIG. 4 but showing the positions of the movable parts when the mechanism is in the safety-latched condition;

FIG. 9 is another such partial transverse vertical section illustrating the self-unlocking action of the mechanism; and

FIG. 10 is a vertical section taken on section line 10-10 of FIG. 9, and showing the locking lever as having just been moved to its unlocking position.

One practical embodiment of the door control mechanism 10 of this invention is shown in the drawings as applied to a vehicle door 11 and an associated doorpost 12, in this case a left-hand side door of the vehicle. The door 11 is a swingably mounted door having an upright free rear edge represented by the edge wall or face 13 which, in the closed position of the door, is located in a substantially fore-and-aft opposed relation to an upright wall or face 14 of the doorpost 12.

The door control mechanism 10 comprises, in general, a keeper 16 mounted on the doorpost 12 and a latch device 17 mounted on the door 11 and having as components thereof a pivoted latch 18 and a guide roller 19 which are movable into the keeper when the door is swung to its closed position. The latch device 17 includes a pivot shaft 20 to which the latch 18 is secured and on which the roller 19 is journaled.

The door 11 is here shown as being of the kind having spaced side walls 22 and containing a space or chamber between such walls and in which the latch device 17 is located with the pivot shaft 20 of the latter projecting through an opening of the edge wall 13. The space 23 between the edge walls 13 and 14 of the door and doorpost, when the door is in its closed position as shown in FIG. 1, is a cleavage crevice lying in, or extending in the direction of, a vertical transverse plane of the vehicle. The keeper 16 is here shown as being located in the cleavage crevice 23 and mounted on the doorpost 12 by means of suitable attaching screws 24.

The keeper 16 comprises a hollow body 26, in this case a stamped sheet metal body having connected front and edge wall portions 27 and 28 and also having upper and lower attaching lugs 29 and 30 adapted to be clamped against the edge wall 14 of the doorpost so that the body of the keeper co-operates with the latter in defining therebetween a keeper pocket 31. The keeper 16 is provided with an opening for receiving the latch 18 and which opening is here shown as being in the form of a notch 32 extending in a lateral direction into the front wall 27 from the outer edge of the keeper, such notch being in communication with the pocket 31. The edge wall 28 has an access opening which communicates in a lateral direction with the pocket 31 and the notch 32.

The keeper 16 also comprises a rack 34 formed on the front wall 27 and having a plurality of teeth or partial teeth. The rack 34 is located on one side of the notch 32, in this case on the lower side thereof as shown in FIG. 2. The rack 34 is here shown as having two full teeth 35 and 36 and adjacent tooth spaces or recesses 35^a and 36^a, of which the tooth recess 35^a is located between

the teeth 35 and 36 and is substantially centered on a vertical line 37 which passes through the pivot axis 39 of the shaft 20 when the latch 18 is in its door-latched position as shown in FIGS. 1, 2 and 4. The edge wall 28 of the keeper is a curved wall spaced below the lower end of the tooth recesses 35^a and 36^a, as shown in FIG. 2, but the portion of this edge wall which is located at or adjacent the entry side of the keeper forms a guide surface 40 which is engageable by the roller 19 during movement of the latch 18 into and out of the keeper, as will be further explained hereinafter.

The keeper 16 is provided on the side thereof opposite to the rack 34, in this case in the upper portion of the pocket 31, with a thrust member or door support pawl 42 which is engageable by the periphery of the roller 19 for preventing chatter or rattle of the door when the latter has been moved to its closed position. The pawl 42 is swingable on a pivot pin 43 mounted in the front wall 27 and is here shown as being a stirrup-shaped member having a camming portion 44 on the underside thereof adapted to be pressed against the roller 19 by a torsion spring 45 surrounding the pivot pin.

The latch 18 is in the form of a gear or gear wheel, as shown in FIG. 2, and comprises a hub or body portion 46 secured on the pivot shaft 20 and a full complement of teeth 47, preferably five such teeth, separated by intervening tooth recesses 49. The latch can be of a solid or one-piece construction, or as shown in the drawings, may comprise two plate members in a face-to-face relation.

The body portion 46 of the latch is of a size and shape as to be freely movable into the notch 32 of the keeper 16 when the door 11 arrives at its closed and door-latched position shown in FIGS. 1 and 2.

The phantom-line showing of the latch 18 in FIG. 2 represents the position of the latch when the closing movement of the door has brought the latch into initial contact with the keeper 16. At this time the tooth 47^a is in engagement with the outer side face 35^b of the tooth 35 but the tooth 47^b has not yet been moved into the tooth recess 35^a. As the door moves to its fully-latched position, the tooth 47^b assumes the fully-engaged position shown in full lines in FIG. 2 at which time this tooth is in door-supporting engagement with the rack 34 at two points of contact 50 located on opposite sides of the tooth recess 35^a.

The roller 19 is disposed in a substantially coaxial relation with the latch 18 and, as the latch moves into the notch 32 to its door-latched position in engagement with the rack 34 in the manner just explained above, the roller moves into the pocket 31 to a corresponding door-latched position for the roller as shown in full lines in FIG. 2. The roller 19 is of a diameter such that when it has arrived at its door-latched position, its lower peripheral edge portion will be spaced a substantial distance above the concavely-curved upper surface of the lower edge wall portion 28 of the keeper body so that the engaged latch tooth 47^b will be in a load-carrying and door-supporting engagement with the rack 34, as is here represented by the two points of bearing contact 50 between the side faces of this tooth and the side faces of the tooth recess 35^a.

The diameter of the roller 19 is also such that during the movement of the latch 18 into the keeper opening 32 the lower segment of the periphery of the roller will usually come into engagement with the guide portion 40 of the keeper, as is indicated by the phantom-line position of the roller in FIG. 2. This will occur particularly if the door 11 is somewhat misaligned or has sagged, and such engagement of the roller with this guide portion will automatically lessen the detrimental effect of such misalignment or sagging of the door and will also facilitate the movement of the latch into the keeper opening. Furthermore, the guiding co-operation thus obtained by means of the roller 19 during closing of the door prevents

objectionable bumping of the latch 18 against the keeper 16, such as might result in noise and damage. The guiding co-operation between the roller 19 and the portion 40 of the keeper will usually also occur during the opening movement of the door to facilitate the movement of the latch 18 out of the keeper. It will thus be recognized that the co-operation of the roller 19 with the keeper 16 achieves a smooth roll-in and roll-out movement of the latch into and out of the keeper, thereby causing smooth and easy door closing and door opening actions with less wear and jar on the latch and keeper and consequently resulting in a longer life for the door control mechanism.

The roller 19 is also of a diameter in relation to the transverse width of the keeper notch 32 such that portions of the roller, when in its door-latched position shown in full lines in FIG. 2, will lie in back of the portions of the keeper front wall 27 which border the notch 32 laterally thereof as well as on the vertically opposite sides thereof. This enables the roller 19 to also serve as an antispread member for preventing spreading apart of the door 11 and doorframe 12 such as frequently occurs when a vehicle is involved in a collision.

From the construction of the parts and their relative arrangement in the door control mechanism 10 as thus far described, it will be seen that when the door is in its closed and fully-latched position, as shown in FIGS. 1 and 2, the upper peripheral edge portion of the guide roller 19 is in a door-holding or door-supporting engagement with the pawl 42 of the keeper 16 and the lower peripheral edge of the roller is spaced above the lower edge wall portion 28 of the keeper. The door 11 will then be supported and held against rattle or chatter with the lower peripheral edge portion of the roller 19 in a free condition and in a spaced relation above the lower edge wall 28 of the keeper.

The latch device 17 comprises a support or mounting plate 52 having substantially right-angularly disposed flange portions 53 and 54, the latter of which is attached to the edge wall 13 of the door as by means of suitable connecting screws 55. The pivot shaft 20 is mounted in the flange 54 by means of a bushing 56 supported in a sleeve portion 57 of the flange. The latch device 17 includes a ratchet 60 secured on the shaft 20 and a detent means 64 for holding co-operation with the ratchet 60, as will be more fully described hereinafter. With reference to the mounting of the pivot shaft 20 on the support plate 52, it should be explained that the outer end of this shaft extends through an arm 62 of a U-shaped support bracket 63. This bracket includes a flat ring-shaped portion 63^a which is attached, as by welding, to the flange 54.

The ratchet 60 is in the form of a ratchet wheel having a full circumferential complement of ratchet teeth 67 separated by alternating full depth and shallow depth intervening recesses or tooth spaces 68 and 69, respectively. The ratchet 60 has twice as many teeth as the latch 18, namely ten teeth, and the ratchet is secured on the shaft 20 in an angular relation such that the holding cooperation with the detent means 64 will properly locate the teeth of the latch 18 with respect to the rack 34 for producing the door-latched condition described above for the door 11. The cooperation of the detent means with the teeth of the ratchet for holding the latch 18 in its different positions will be explained hereinafter.

It should be explained with respect to the door control mechanism 10, that the provision of the latch 18 having a full tooth complement and the use of the ratchet 60 in association therewith result in the advantage that the latch can never be in an incorrect or out-of-time position which would prevent it from meshing properly with the rack 34 when the door 11 moves to its closed position. Because of the full circumferential complement of teeth provided on the latch 18 and on the ratchet 60, with the teeth of the ratchet being twice as numerous as those of the latch, the latch and ratchet will always be self-adjusting with

5

respect to a proper angular setting or positioning thereof for their intended co-operation respectively with the rack 34 and a hook-shaped detent element 77 of the detent means 64.

The detent element 77 of the detent means 64 is engageable in either a full-depth recess 68 (see FIG. 4) or a shallow-depth recess 69 (see FIG. 8) depending upon the rotative position of the ratchet 60 and of the latch 18 but, when the detent element is engaged in a full-depth recess 68 the latch will always be held in a door-latched position, that is to say in a position with the latch tooth 47^b centered on the vertical line 37 passing through the rotation axis 39 of the pivot shaft 20. When the detent element 77 is engaged in a shallow-depth recess 69 of the ratchet 60 a partial engagement of the latch tooth 47^b in the tooth space 35^a of the rack 34 takes place. This latter condition of the control mechanism 10 will be its safety-latched position by which the door will be held in a safety-latched position by the partial engagement of the tooth 47^b in the tooth recess 35^a. Release of the tooth 47^b from the tooth recess 35^a at this time by riding up and over the tooth 35 will be prevented by the upper portion of the roller 19 coming into engagement with the upper edge wall portion 71 of the keeper 16.

FIG. 8 illustrates the safety-latched condition of the door control mechanism 10, at which time the teeth 47^a and 47^b of the latch 18 straddle the tooth 35 of the keeper 16 and the detent element 77 is holdingly engaged in the shallow depth tooth recesses 69 of the ratchet 60. The close proximity of the upper portion of the roller 19 to the guide wall portion 71 of the keeper 16 at this time will prevent either of the ratchet teeth 47^a and 47^b from riding over the keeper tooth 35.

The detent means 64 comprises two levers 73 and 74 swingably mounted on a common pivot pin 75 of the flange 54. The lever 73 is a detent operating lever having an outside actuating arm 76 carrying a contact portion 78 engageable by a push-button stem 79 of an outside control means of the vehicle door, and an inside control arm 81 whose free end extends through and is swingable in a slot 82 of the flange 53.

The latch device 17 also includes a locking lever 93 swingably mounted on the flange 53 by means of a pivot pin 94. The locking lever 93 is shown in its locking position in full lines in FIG. 6 and is swingably movable to a releasing or unlocking position represented by the phantom-line showing 93^a of this view. The movement of the locking lever 93 from one to the other of its locking and releasing positions is accomplished either by a key-actuable finger 95, or by a link 96 connected with a garnish molding button or the like (not shown). The locking lever 93 is also movable to its unlocking position by the action of a lever 97 which is both an unlocking lever and an unlatching lever. The lever 97 is swingably mounted on the flange 53 by a pivot pin 98 and is adapted to be actuated by a pulling force transmitted thereto by a link 99 connected with an inside handle (not shown).

As shown in FIG. 6 the locking lever 93 is provided with a notch 101 on one edge thereof and with head and shoulder portions 102 and 103 located respectively above and below the notch. The notch 101 is of a size and shape to receive the inside control arm 81 of the detent means 64 when the locking lever has been swung to its full-line locking position shown in FIG. 6. When the locking lever is in this position, the shoulder 103 is in a blocking position relative to the control arm 81 to thereby prevent actuation of the detent means 64 by the push button 79 of the outside control means, as will become apparent hereinafter, and the door control mechanism 10 is then in its locked condition. From the co-operation just described between the locking lever 93 and the control arm 81, it will be recognized that this control arm also functions as a locking arm and can be referred to as such.

The shape of the unlocking lever 97 is such that a

6

rounded free end portion 104 thereof will co-operate with the head portion 102 of the locking lever 93 with a camming action, in response to a pulling force transmitted through the link 99, to impart clockwise swinging to the locking lever to move the latter to its unlocking position 93^a. The link 99 is shown as having its adjacent end connected with the unlocking lever 97 by an attaching pin 105 of the latter. A slot 106 formed in this end of the link 99 is provided for assembly purposes so that the link can be easily connected with, or disconnected from, the attaching pin 105.

The lower portion of the locking lever 93 is relatively wide, as shown in FIG. 6, and is provided with a recess 108 and with edge portions forming locking and releasing cams 109 and 110 on opposite sides of the recess. The finger 95 is located in the recess 108 by being pivotally mounted on the flange 53 and is connected with a rotatable actuating spindle 111 which extends into the structure of the door 11 from a key-actuable lock cylinder (not shown) mounted on the outer wall of the door 11.

Swinging of the finger 95, in a clockwise direction as seen in FIG. 6, by manual rotation of the lock cylinder of the door causes the finger to co-operate with the locking cam 109 to shift the locking lever 93 to its locking position. Swinging of the finger 95 in the opposite direction engages the same with the unlocking cam 110 to thereby shift the locking lever 93 to its unlocking position. Similarly, a downward pushing force transmitted to the lower portion of the locking lever 93 through the wire link 96 from the garnish molding button will swing the locking lever to its locking position, and an upward pulling force transmitted through the link 96 will swing the locking lever 93 to its unlocking position. A spring 113 operably disposed between, and suitably connected with, the flange 53 and the locking lever 93 functions as an over-center spring means during the swinging of the locking lever for releasably holding the latter in its locking and unlocking positions.

The locking lever 93 is also provided with a notch 132 in the edge of the upper portion thereof and a shoulder 133 facing toward the notch at the lower end thereof. The notch 132 accommodates a kick-out finger portion 134 of the detent means 64 and the shoulder 133 is engageable by such finger portion under certain conditions as will be explained hereinafter.

The lever 74 of the detent means 64 is a combined detent and control lever having a detent arm 77^a carrying a hook-shaped portion forming a detent element 77, and a co-operating control arm 146 extending into co-operating relation to the control arm 81 and the locking lever 93. As shown in FIGS. 4 and 7, the co-operating control arm 146 of the lever 74 extends beneath an offset portion of the control arm 81 so as to be engageable by the lower edge of the latter in response to a counterclockwise or downward manual swinging of the lever 73 by the push button stem 79. This actuating engagement of the control arm 81 with the co-operating control arm 146 causes a corresponding counterclockwise swinging of the lever 74 for disengaging the detent element 77 from the ratchet 60. The co-operating control arm 146 also has at the free end thereof the above-mentioned finger 134 which extends into, and is operable in, a clearance slot 147 of the flange 53 and has a rounded end engageable with the shoulder 133 of the locking lever 93 (see FIG. 10) to produce the kick-out unlocking movement of the latter.

A spiral spring 149 is mounted on the pivot pin 75 and is effective for biasing the co-operating control arm 146 in an upward direction to normally maintain the same with the upper edge thereof in engagement with the control arm 81 of the lever 73. This action of the spring 149 on the co-operating control arm 146, tending to cause clockwise swinging of the lever 74, also biases the detent element 77 of the detent arm 77^a toward engagement with the ratchet 60.

The detent means 64 also includes a tension spring 150 having hook ends 150^a and 150^b connected respectively with the levers 73 and 74. The hook end 150^a is here shown as being engaged with the offset portion of the control arm 81 and the hook end 150^b is shown engaged in a hole of the co-operating control arm 146. The tension spring 150 permits a temporary separation of the arm 146 from the arm 81 (see FIG. 9), when the detent lever 77^a is swung in a counterclockwise direction by the ratchet 60 for producing the above-mentioned kick-out unlocking movement of the locking lever 93, and provides an actuating force for moving the control arm 81 to its lowered position on FIGS. 8, 9 and 10 in which this control arm is in a blocking relation to the locking lever.

As long as the detent element 77 is engaged in a shallow-depth recess 69 the lever 74 will be in the position shown in FIG. 8 and the control arm 81 will be maintained in its lowered blocking position by the tension spring 150. When the control arm 81 is in this blocking position it will prevent movement of the locking lever 93 to its locking position because any attempt to so move the locking lever, by means of the link 96 or the key-actuatable finger 95, will cause the shoulder portion 103 to engage this control arm as is apparent in FIG. 10.

It will now be understood that whenever the locking lever 93 is in its unlocking position shown in FIG. 10, to which position it may have been moved by either the link 96 or the unlocking lever 97, or by the key-operated finger 95, the inside control arm 81 of the detent means 64 will be released from the notch 101 so that the actuating lever 73 can be manually swung by means of the push button stem 79 to cause the detent element 77 to release the ratchet 60. The vehicle door will then be in a closed but unlatched condition and can be swung open. When the door is reclosed, the detent element 77 will be engaged in one or the other of the tooth recesses 68 or 69 of the ratchet 60, depending upon whether the door has been fully closed to its door-latched position or only partially closed to its safety-latched position.

As the door approaches its closed position and the latch 18 engages the keeper 16, the ratchet 60 will be driven by the latch in a counterclockwise direction as indicated by the arrow 151 of FIG. 9 and the teeth of the ratchet moving past the detent element 77 will impart a forced counterclockwise swinging to the lever 74 to produce a downward actuating movement of the co-operating control arm 146. The position in which the lever 74 is shown in FIG. 9 is with the detent element 77 resting on the crest of one of the ratchet teeth which represents the maximum extent of the forced downward actuating movement of the co-operating control arm 146 by the action of the ratchet 60. The lever 74 can however be swung farther in a counterclockwise direction, by the lever 73 in response to actuation of the latter by the push button stem 79, and until the inside periphery of the arm 146 contacts the teeth of the ratchet 60.

If the door 11 has been closed only to its safety-latched position, the detent element 77 will become engaged in one of the shallow-depth recesses 69 of the ratchet 60 immediately following the counterclockwise swinging of the lever 74 by the ratchet. Under the circumstances, the pulling action of the tension spring 150 causes the control arm 81 to be moved downwardly to its lowered blocking position. Therefore, as long as the door control mechanism 10 is in a safety-latched condition, the control arm 81 will be held in its lowered position where it will function as a preventer means engageable by an edge portion 103^a of the locking lever 93 located beneath the notch 101 to prevent movement of the locking lever 93 to its locking position. Under these conditions of the door control mechanism 10, neither the key-actuated finger 95 nor the link 96 will be operable to swing the locking lever 93 to its locking position and the operator will be made aware of the fact that the door has not been fully closed because

of his inability to actuate the mechanism to its locked condition.

If, however, the door 11 has been moved to its fully-closed position the detent element 77 will become engaged in one of the full-depth recesses 68 of the ratchet 60, as shown in FIG. 4, and the rotative position of the lever 73 will then be such that the control arm 81 will be in its lifted position and will be receivable in the notch 101 of the locking lever 93. Under these conditions the locking lever will be freely swingable to its locking position shown in FIG. 6, either by the key operable finger 95 or by the link 96, to establish a locked condition of the mechanism.

In the event that the door control mechanism 10 is actuated to a locked condition either by the key operable finger 95 or the link 96 while the door 11 is in an open position, it is desirable that the mechanism be automatically unlocked in response to closing of the door so as to prevent damage to any of the parts and to also prevent the operator from unintentionally locking himself out of the vehicle. This automatic unlocking is accomplished by the unlocking or kick-out finger 134 of the lever 74 when the latter is forcibly swung in a counterclockwise direction by the rotative movement of the ratchet 60 resulting from the co-operation of the latch 18 with the keeper when the door is moved to its closed position. Under the conditions just mentioned, the finger 134 engages the shoulder 133 and swings the locking lever 93 to its unlocking position shown in FIG. 10.

If the door control mechanism 10 is in a locked condition while the door is in an open position, as has been assumed in the description just above, the control arm 81 will lie in the notch 101 of the locking lever 93 and the shoulder portion 103 of the latter will then prevent downward movement of this control arm while the co-operating control arm 146 is being swung in its downward actuating direction by the action of the ratchet 60 on the detent element 77. Therefore during the downward movement of the co-operating control arm 146, which causes the automatic kick-out movement of the locking lever 93 to its unlocking position and takes place while the shoulder portion 103 is preventing a corresponding downward movement of the control arm 81, the above-mentioned temporary separation of the arm 146 relative to the arm 81 takes place.

In FIG. 9 the phantom-line showing of the lever 73 represents the lifted or locking position of the control arm 81, and the angular displacement between this phantom-line showing and the full-line position shown for the co-operating control arm 146 indicates the temporary gap or separation of the arm 146 relative to the arm 81 as referred to above. The arm 146 is shown in full lines in this FIG. 9 which represents the position it assumes when it is moved by the forced counterclockwise rotation of the ratchet 60 by the latch 18 during the movement of the door to its closed position. This temporary separation further tensions the spring 150 and, as soon as the shoulder portion 103 has been swung clear of the lower edge of the control arm 81 by the kick-out action of the finger 134 of the arm 146 in moving the locking lever 93 to its unlocking position, the pulling action of the tension spring immediately moves the control arm 81 downward to its full-line position in engagement with the co-operating control arm 146.

If the closing movement of the door causes the detent element 77 to come to rest in a full-depth recess 68 of the ratchet 60, the control arm 81 will be left in its lifted position in which it lies opposite the notch 101 of the locking lever. Since this condition of the control mechanism 10 represents a fully closed and latched condition of the door 11, the locking lever 93 will then be readily movable to its locking position. If, however, the door closing movement causes the detent portion 77 to drop into a shallow-depth recess 69 of the ratchet 60 as shown in FIG. 8, the control arm 81 will be left in its partially lowered position in which it is in the above-described

blocking relation to the locking lever 93 and engageable by the edge portion 103a of the latter, and when in such condition, as can readily be understood from the above description, the control arm 81 cannot be locked by the locking lever 93.

From the foregoing description and the accompanying drawings it will now be readily understood that this invention provides door control mechanisms of a simple and practical construction and which will operate in an efficient and satisfactory manner for controlling vehicle doors, or for other door control purposes, and that the mechanisms consist of a relatively small number of parts adapted to be economically produced and assembled into units which can be readily installed. It will now also be understood that the door control mechanisms provided by this invention operate efficiently to control a door, not only with respect to a latched or unlatched condition thereof and with respect to a locked or unlocked condition thereof, but also effectively support the door and hold the same against chatter or rattle when the door is in its closed position, as well as to prevent spreading between the door and associated doorpost in the event of a collision.

Although the door control mechanisms of this invention have been illustrated and described herein to a somewhat detailed extent it will be understood, of course, that the invention is not to be regarded as being limited correspondingly in scope but includes all changes and modifications coming within the terms of the claims hereof.

Having described my invention, I claim:

1. In door control mechanism, a support adapted for mounting on a door, a gear-shaped latch pivoted on said support for engagement with a keeper rack and having a full circumferential complement of teeth, a ratchet connected with said latch, detent means releasably engageable with said ratchet for controlling pivotal movement of said latch, manually operable means for actuating said detent means to release said ratchet, said ratchet having a full circumferential complement of teeth separated by intervening full-depth and shallow-depth tooth recesses in alternating relation, said detent means being effective when engaged in a full-depth recess to retain said latch in a door-latched position and being effective when engaged in a shallow-depth recess to retain said latch in a safety-latched position, a locking member pivoted on said support for swinging to a locking position and including a blocking portion for blocking the ratchet-releasing actuation of said detent means when the locking member is in said locking position, preventer means associated with said detent means and positionable to prevent movement of said locking member to its locking position, said detent means comprising a detent lever spring-biased toward

engagement with said ratchet and an operating lever engageable with said detent lever for swinging the latter in opposition to the spring bias, a first spring means effective to cause said spring bias of said detent lever, said preventer means being a portion of said operating lever, and a second spring means effective between said detent lever and said operating lever for urging the latter in a direction to engage said detent lever and to position said preventer means in its movement-preventing location relative to said locking member for preventing movement of the locking member to its locking position when said detent means is engaged in one of said shallow-depth ratchet recesses.

2. Door control mechanism as defined in claim 1 wherein said operating lever has a first control arm carrying said preventer means, said detent lever having a co-operating second control arm normally in engagement with said first control arm, said second spring means being effective between said operating lever and said detent lever for causing the normally-maintained co-operative engagement between said first and second control arms.

3. Door control mechanism as defined in claim 1 wherein said detent lever and said operating lever are swingable on a common pivot axis, said operating lever having a first control arm carrying said preventer means and said detent lever having a co-operating second control arm normally in engagement with said first control arm; said second spring means acting on said first control arm for urging the same toward the normally-engaged relation with said second control arm but permitting separation of said second control arm from said first control arm when said detent lever is being actuated by said ratchet and said locking member is in said locking position.

4. Door control mechanism as defined in claim 1 wherein said second spring means comprises a tension spring connected between said first and second control arms.

5. Door control mechanism according to claim 4 wherein said second control arm has thrust finger extension means engageable with said locking member in response to the separating movement of said second control arm for automatically moving the locking member to its unlocking position.

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