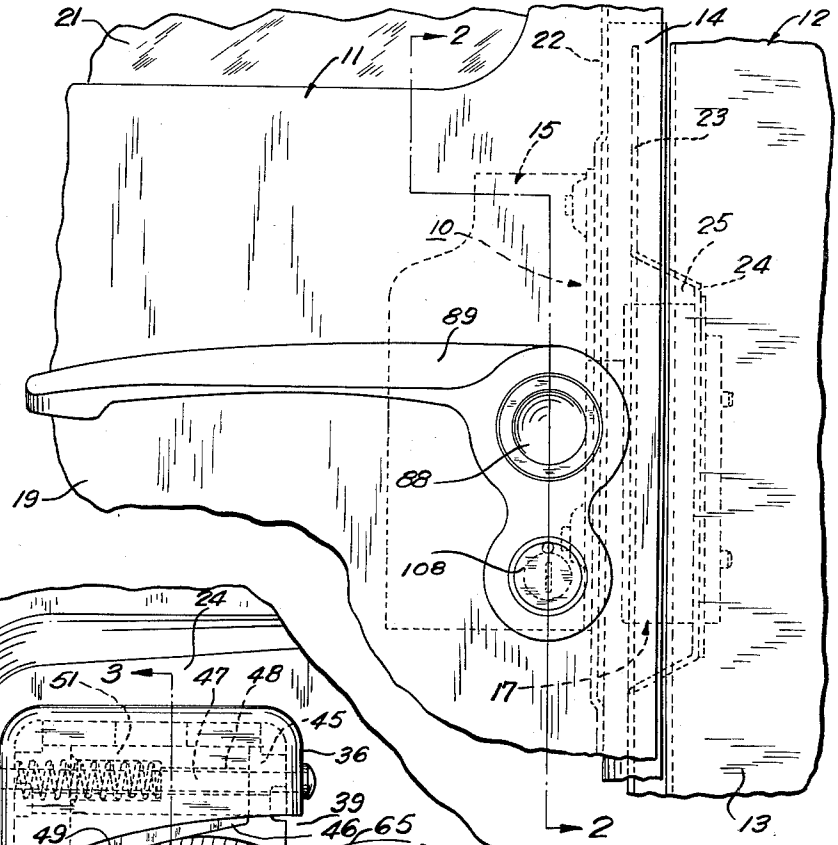
March 27, 1962 E. L. ALLEN ET AL 3,027,185

DOOR CONTROL MECHANISM

Filed Nov. 10, 1958 4 Sheets-Sheet 1

FIG. 1



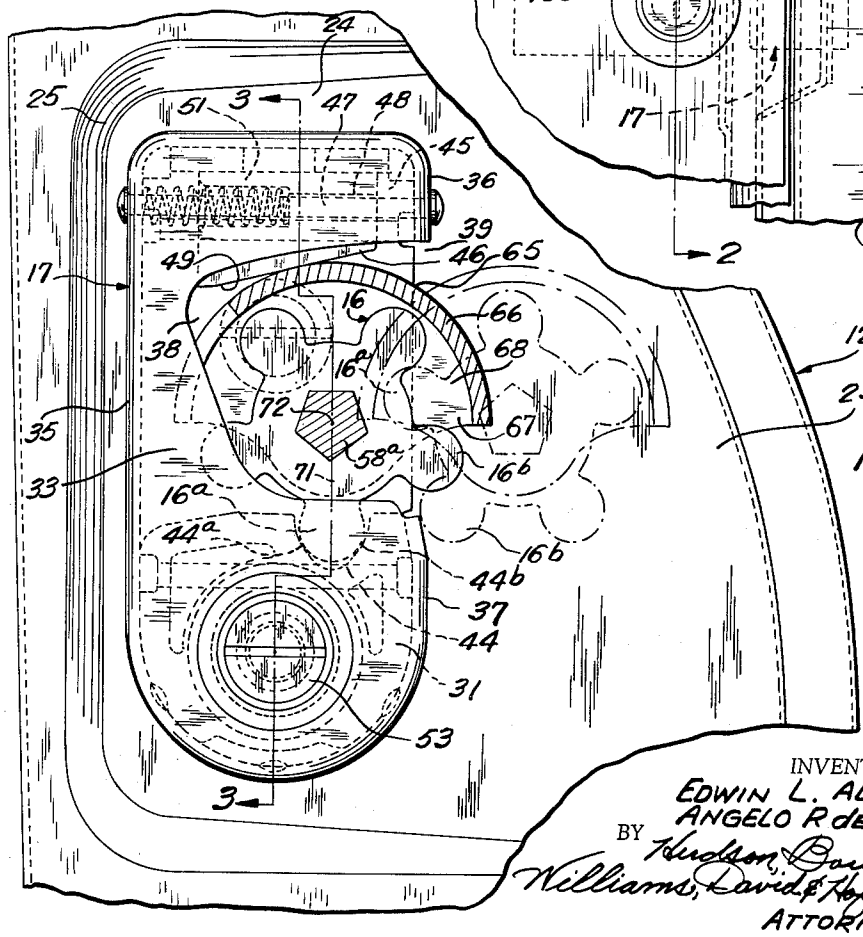


FIG. 4

INVENTORS
EDWIN L. ALLEN
ANGELO R deVITO
BY Hudson, Boughton, Williams, David & Hoffmann
ATTORNEYS

March 27, 1962 E. L. ALLEN ET AL 3,027,185

DOOR CONTROL MECHANISM

Filed Nov. 10, 1958

4 Sheets-Sheet 2

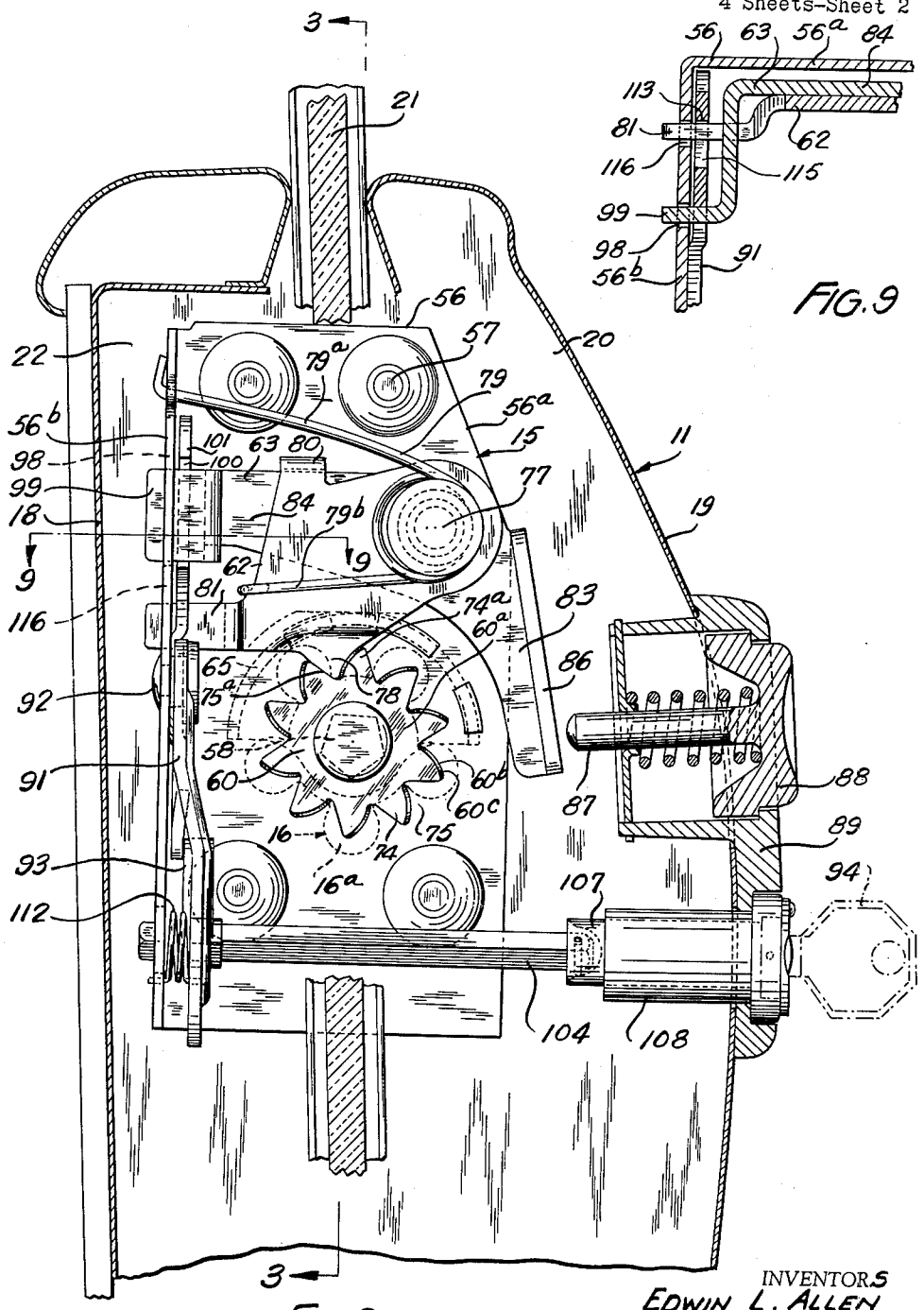


FIG. 2

FIG. 9

INVENTORS
EDWIN L. ALLEN
ANGELO R deVITO
BY Hudson, Boughton, Williams, David & Hoffmann
ATTORNEYS

March 27, 1962 E. L. ALLEN ET AL 3,027,185

DOOR CONTROL MECHANISM

Filed Nov. 10, 1958

4 Sheets-Sheet 3

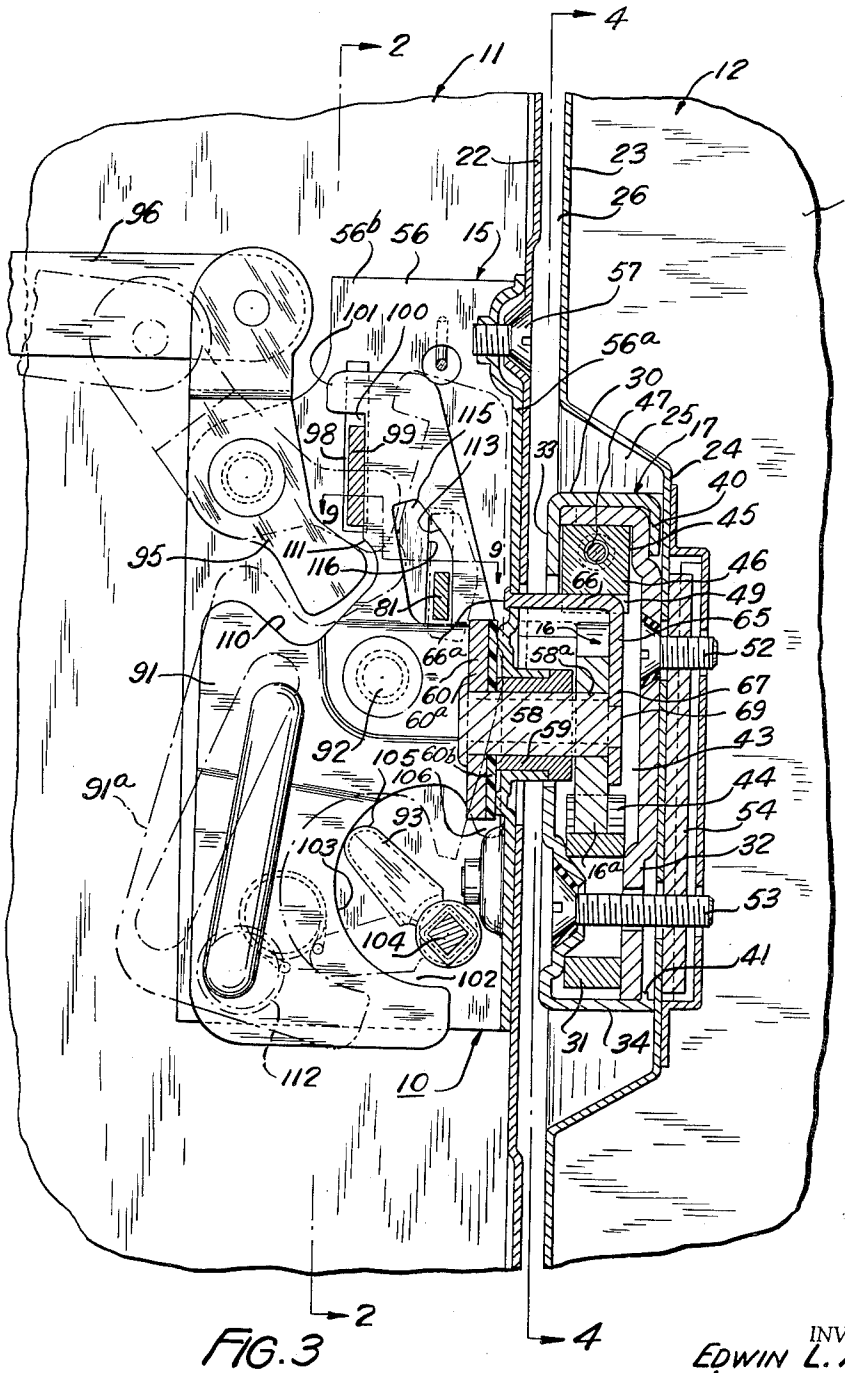


FIG. 3

INVENTORS
EDWIN L. ALLEN
BY ANGELO R deVITO
Hudson, Boughton, Williams, David & Hoffmann
ATTORNEYS

March 27, 1962 E. L. ALLEN ET AL 3,027,185

DOOR CONTROL MECHANISM

Filed Nov. 10, 1958

4 Sheets-Sheet 4

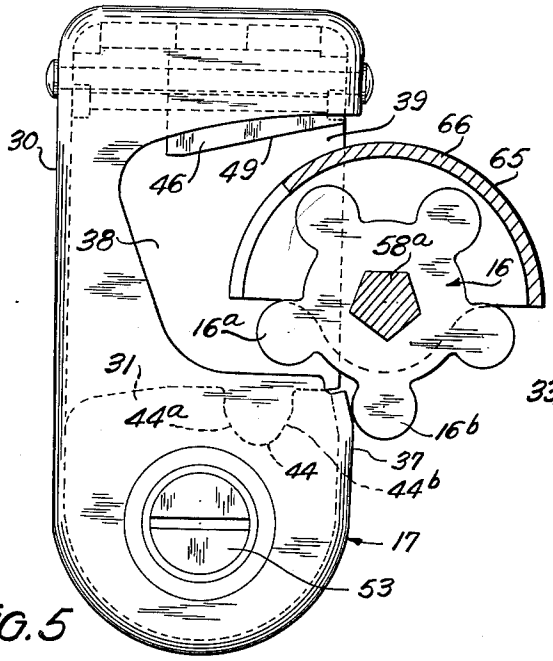


FIG. 5

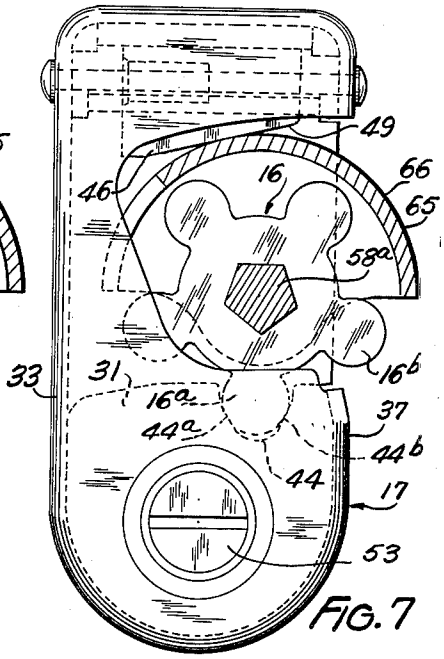


FIG. 7

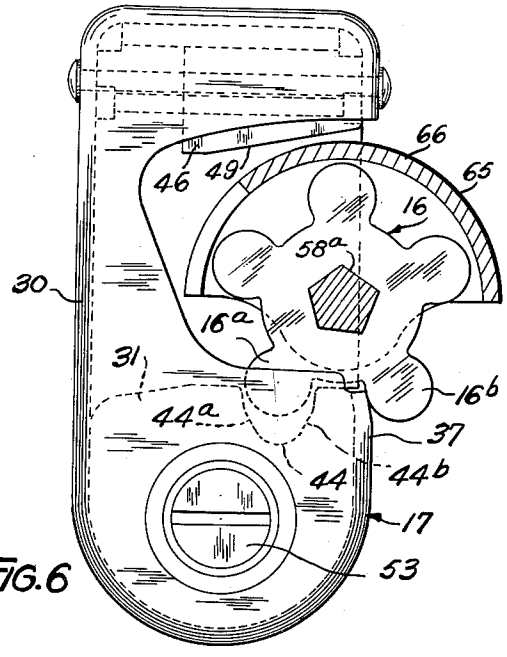


FIG. 6

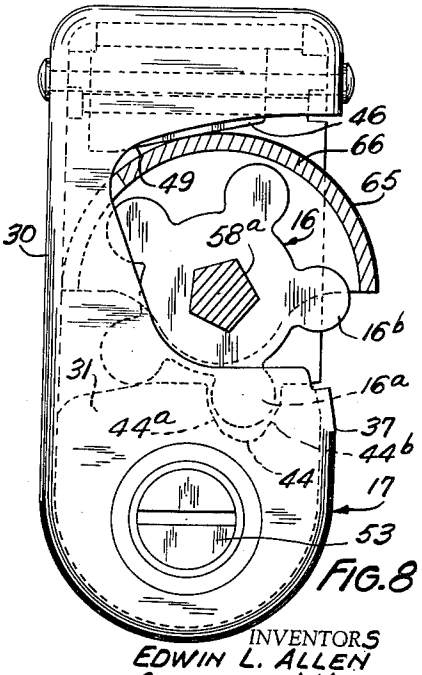


FIG. 8

INVENTORS
EDWIN L. ALLEN
ANGELO R. deVITO
BY Hudson, Boughton, Williams, David & Hoffmann
ATTORNEYS

United States Patent Office 3,027,185
Patented Mar. 27, 1962

3,027,185

DOOR CONTROL MECHANISM

Edwin L. Allen and Angelo R. de Vito, Rockford, Ill., assignors to Lisle W. Menzimer, trustee, Rockford, Ill.

Filed Nov. 10, 1958, Ser. No. 773,003
8 Claims. (Cl. 292—280)

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

The present invention also provides a co-operating latch and keeper type of door control mechanism in which the latch member has a pivotal movement and is preferably a gear-type latch member, the latch device and the keeper being of novel construction and co-operating in a manner to hold the door more satisfactorily, both as to its latched position and as to the prevention of door rattle or chatter.

This invention further provides novel door latch mechanism employing a gear-type latch member and an associated detent means, and wherein any incorrect positioning of the latch member will be automatically rectified for preventing damage to the mechanism.

Additionally, the invention provides novel door control mechanism which will operate more quietly than previous mechanisms of this type by reason of the use of plastic material in the detent means thereof.

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 partial side elevation of a vehicle body and showing the control mechanism of this invention applied to door and doorframe portions thereof;

FIG. 2 is a vertical section taken through the latch device as indicated by section line 2—2 of FIGS. 1 and 3;

FIG. 3 is a vertical section taken through the latch device and keeper substantially as indicated by section line 3—3 of FIGS. 2 and 4;

FIG. 4 is a vertical section taken on section line 4—4 of FIG. 3 and looking toward the keeper;

FIGS. 5 to 8 inclusive are views similar to FIG. 4 but somewhat diagrammatic in form and representing different operating positions of the latch member in relation to the keeper; and

FIG. 9 is a fragmentary horizontal section taken on section line 9—9 of FIGS. 2 and 3 to further illustrate the automatic unlocking means.

The door control mechanism 10 of the present invention is shown, by way of example, as being applied to co-operating door and doorframe members 11 and 12 of a vehicle body 13. The mechanism comprises, in general, a latch device 15 having a pivoted latch member preferably in the form of a gear 16, and a keeper 17 which is engageable by the latch member for holding the door in a closed and door-latched condition.

The door 11 is here shown as being the left front door of an automobile, and the doorframe 12 is here represented as being a frame member or body pillar with which the free or upright rear edge portion 14 of the door co-operates when the door is in its closed position. The door 11 is swingable about a substantially vertical hinge axis provided by hinge means (not shown) located adjacent the front edge of the door.

As shown in FIG. 2, the door 11 comprises inner and outer wall panels 18 and 19 defining an inner space or chamber 20 therebetween into which a window glass 21 is movable. The door 11 also comprises an upright edge

wall 22 at the rear or free edge portion 14 of the door and on which the latch device 15 is mounted, as explained hereinafter.

The doorframe or body pillar 12 is of a conventional construction and includes an upright edge wall 23 facing the door opening and which edge wall includes a rearwardly offset wall portion 24 providing a keeper-receiving recess 25. When the door 11 is in its closed and door-latched position, the edge walls 22 and 23 lie in a substantially opposed fore-and-aft relation with a cleavage crevice 26 therebetween as shown in FIG. 3, and also lie on opposite sides of a parting or cleavage plane extending transversely of the vehicle.

The latch device 15 is shown and described herein as being mounted on the door 11 and the keeper 17 as being mounted on the doorframe 12, but it will be understood, of course, that this relative arrangement can be reversed, if desired, by having the latch device mounted on the doorframe and the keeper mounted on the door.

The keeper 17 will now be described in detail and is in the form of a generally flat hollow structure comprising a body or shell 30 and insert members 31 and 32 retained in such body. The body 30 is provided with a flat front wall 33 having a marginal or peripheral flange 34 extending rearwardly from such front wall and which flange forms edge walls at the sides of the keeper including an edge wall 35 facing inwardly of the vehicle and upper and lower edge wall portions 36 and 37 facing outwardly of the vehicle. The body 30 has a cut out 38 formed in the front wall 33 thereof and which also extends into the outer edge wall to form an access opening 39 between the upper and lower edge wall portions 36 and 37.

The insert member 32 is a plate-like member which forms the rear wall of the keeper 17 and is secured in the body 30 as by a rear retaining flange 40 and retaining lugs 41 provided on the body adjacent the upper and lower ends thereof. The insert member 32 co-operates with the body 30 in defining a chamber 43 in the keeper into which the latch member or gear 16 is movable, as will be explained hereinafter.

The insert member 31 is located in the lower portion of the chamber 43 and has a recess therein forming a locking pocket 44 which faces upwardly toward the access opening 39 and is in an offset relation to the latter. The locking pocket 44 receives one of the teeth of the gear 16 when the door is moved to its door-latched position, as will be explained hereinafter. A portion of the front wall 33 overlies the locking pocket 44 and forms a retaining means which is engageable by such one tooth for preventing spreading apart between the door 11 and doorframe 12 in the fore-and-aft direction in the event of a collision.

The upper portion of the body 30 co-operates with the upper portion of the insert member 32 to form a guideway 45 in the keeper which extends in a direction transversely of the vehicle and is located above the access opening 39 in an offset relation to the latter. A thrust member 46 in the form of a wedge block is located in the guideway 45 and is shiftable in the latter. The wedge block 46 is retained in the guideway 45 by a pin 47 mounted in the body 30 and extending through an opening 48 of such block.

The wedge block 46 is provided with a tapered thrust surface 49 on the lower side thereof and which faces toward the locking pocket 44 for a purpose to be explained hereinafter. A compression spring 51 disposed in surrounding relation to the pin 47 is effective against the wedge block 46 to yieldingly resist shifting of the block along the guideway 45 in a direction toward the inner edge wall 35 of the keeper.

The keeper 17 is located in the cleavage crevice 26, preferably in the offset pocket portion 25 thereof as shown in FIG. 3, and is secured to the wall portion 24 of the doorframe 12 as by means of upper and lower connecting screws 52 and 53 which engage in threaded openings of a retainer plate 54. When thus mounted on the doorframe 12, the keeper 17 is in an edgewise outward facing relation with the access opening 39 in an exposed position for receiving the gear 16.

The latch device 15 is provided with a support or mounting plate 56 having angularly disposed plate portions 56a and 56b of which the plate portion 56a is adapted to be secured to the edge wall 22 of the door 11 as by means of suitable attaching screws 57. The latch device 15 also comprises a pivot shaft 58 which is rotatable in a suitable bushing 59 carried by the plate portion 56a. The bushing and shaft extend through the edge wall 22 of the door and the shaft has the gear 16 secured thereon.

A control member for controlling the gear 16 is provided and is here shown as being in the form of a ratchet wheel 60 secured on the pivot shaft 58. The latch device 15 also includes detent means co-operating with the ratchet wheel 60 and comprising a detent member or lever 62 and a detent actuating lever 63.

The latch member 16, as mentioned above, is in the form of a gear member and, for the purposes of the present invention, has an odd number of teeth 16a, in this case five such teeth. The gear is secured on the pivot shaft 58 by providing the latter with a noncircular shaft portion 58a which engages in an opening of corresponding shape in the gear, such shaft portion and opening being of a polygonal shape having the same number of corners or apices as the gear has teeth.

Since the gear 16 has five teeth, the polygonal shaft portion 58a and gear opening have the shape of a pentagon, and the opening of the gear is formed therein so that the teeth of the gear are centered on radial lines passing through the apices of the pentagon. When the shaft portion 58a and the gear opening are of such a polygonal shape and the teeth of the gear are centered on the apices of the polygonal opening, the assembly of the gear on the shaft is facilitated because the only position in which the gear can be assembled on the noncircular shaft portion 58a is a position which will be correct for the desired functional co-operation of the gear with the keeper 17.

The latch device 15 also comprises a combined thrust member and gear cover 65 which is movable into the keeper 17 through the access opening 39 and co-operates with the wedge block 46 when the door is swung to its closed position. The cover 65 is here shown as being a crescent-shaped member having curved and flat walls 66 and 67 of which the curved wall 66 has a convex external curvature for co-operation with the thrust face 49 of the wedge block 46. The cover 65 is also shown as being secured to the plate portion 56a by means of riveted portions 66a provided on the curved wall 66 and which extend through such plate portion.

The gear cover 65 is mounted on the plate portion 56a so as to project through the edge wall 22 of the door with the flat wall 67 spaced from the plate portion 56a to form with the latter a crescent-shaped chamber 68 in which the gear 16 is located. The pivot shaft 58 extends through and beyond the gear 16 and has a projecting end portion 69 journaled in the flat wall 67. This relation between the shaft portion 69 and the flat wall 67 is effective to provide additional support for the pivot shaft 58.

The teeth of the gear 16 are of a suitable shape or contour to be readily movable into and out of the locking pocket 44 through the access opening 39 of the keeper during the closing and opening movements of the door 11. When the door 11 is in its fully closed and latched condition the gear tooth then engaged in the locking pocket 44, here designated as the tooth 16a, will lie substantially on a vertical axis 71 which extends through the rotation axis 72 of the pivot shaft 58 and which is also the central vertical axis of the locking pocket.

The shapes or contours and the sides of the teeth 16 and of the locking pocket 44 are such that when the tooth 16a is in the door-latched position shown in FIG. 4, it will bear or seat against the inner wall of the locking pocket, preferably at two spaced points 44a and 44b on opposite sides of the vertical axis 71, and will be in a loaded condition both with respect to an in-and-out movement of the door 11 relative to the doorframe 12 as well as in regard to a downward movement of the door relative to the doorframe. This loaded condition of engagement of the tooth 16a in the locking pocket 44 holds the door in a firm manner when the door is in its fully closed position, such that rattle or chatter between the door and doorframe will be substantially eliminated. The sides of the pocket 44 are preferably shaped so as to have flat areas in a downwardly converging relation and with which the arcs of the curved sides of the tooth 16a are tangent when this tooth is seated in the pocket.

The co-operation of the gear cover 65 with the thrust block 46 also produces a door-supporting and door-holding action which assists in producing the condition of loaded engagement of the tooth 16a in the locking pocket 44 and also eliminates rattle or chatter of the door 11 by preventing upward movement of the door relative to the doorframe 12.

To explain further the co-operation of the gear cover 65 with the thrust block 46 of the keeper, it is pointed out that when the door swings to its closed position, the cover moves into the cut out 38 of the keeper 17 and into the chamber 43 through the access opening 39. This movement of the cover into the keeper brings the convex surface of the curved wall 66 into engagement with the tapered thrust surface 49 of the wedge block 46 causing the latter to be shifted in the guideway 45 and along the pin 47 in opposition to the compression spring 51. When the door reaches its fully-closed position, the cover 65 will occupy a location in the keeper 17 substantially as shown in FIG. 4, and the wedge block 46 will have been displaced along the guideway 45 to the position shown in FIG. 4 so that the thrust engagement between the cover and wedge block is in a substantially vertically opposed relation to the thrust engagement of the gear tooth 16a in the locking pocket 44.

The ratchet wheel 60 is a toothed or star-shaped wheel having peripheral teeth 74 of a suitable shape and notches or tooth recesses 75 between the pairs of adjacent teeth. In accordance with the present invention, the number of teeth 74 provided on the ratchet wheel 60 is an even number and is at least equal to the number of teeth provided on the gear 16. Preferably, and as shown in the latch device 15 here illustrated, the number of ratchet teeth 74 is a multiple of the number of teeth on the gear. The gear 16 is provided with an odd number of teeth, in this instance five teeth, and since the ratchet wheel has an even number of teeth which is a multiple of the number of teeth on the gear, the ratchet teeth in this instance will comprise ten teeth.

The ratchet wheel 60 is mounted on the pivot shaft 58 so as to lie inwardly of the plate portion 56a and has alternate teeth thereof located substantially on the same radial axes as the teeth of the gear 16.

The detent lever 62 and the actuating or detent release lever 63 are swingably supported by a pivot 77 projecting from the plate portion 56a, and the detent lever is provided with a detent 78 which is engageable in one of the notches 75 of the ratchet wheel 60. A spring 79 mounted on the pivot 77 has an arm 79a anchored on the plate portion 56b and also has a second arm 79b effective against the detent lever 62 for urging the detent

78 toward an engaged position in one of the notches of the ratchet wheel 60.

The detent lever 62 is also provided with a yoke portion comprising a lug 80 and a projecting finger 81. The actuating lever 63 is provided with arms 83 and 84 located on opposite sides of the pivot pin 77, and of which the arm 84 lies in the yoke recess formed by the space between the lug 80 and the finger 81. The yoke recess is of greater width than the arm 84 so that a lost-motion operating connection is formed between this arm and the detent lever 62. This lost-motion operating connection permits swinging of the detent member 62 on the pivot pin 77, either by means of the actuating member 63 or independently of the actuating member.

The arm 83 of the actuating member 63 includes a flange or plate portion 86 facing outwardly of the door 11 and which is engageable by the stem 87 of a push button 88. The push button 88 is of a conventional form and may be a part of a door handle unit 89 mounted on the outer panel 19 of the door.

When the door is in its closed and latched condition, represented by the engagement of the tooth 16^a in the locking pocket 44 of the keeper 17 as shown in FIG. 4 for the full-line position of the gear, the detent 78 will be engaged in the notch 75^a of the ratchet wheel 60 as shown in FIG. 2 to thereby retain the tooth 16^a in its engaged position in the locking pocket. By manually depressing the push button 88, the actuating lever 63 will be swung in a clockwise direction on the pivot pin 77 causing the arm 84 to act against the lug 80 and swing the detent member 62 in a clockwise direction and in opposition to the force of the spring 79. This clockwise swinging of the detent member 62 shifts the detent 78 away from a holding position for the ratchet wheel 60 and to a releasing position which will permit rotation of the ratchet wheel and gear 16 in a clockwise direction to allow opening movement of the door and disengagement of the tooth 16^a from the locking pocket 44.

The lost-motion operating connection between the arm 84 and the detent lever 62 permits the above-mentioned independent swinging of the detent lever in opposition to the spring 79 so that a forced rotation of the ratchet wheel 60 in a counterclockwise direction as seen in FIG. 2, such as would be produced by the co-operation of the gear 16 with the keeper 17 during the final closing movement of the door, will result in a camming action of the tooth 74^a against the detent 78. This camming action automatically swings the detent lever 62 to its release position, that is to a position with the detent 78 disengaged from the notch 75^a, to permit the ratchet wheel and the gear 16 to rotate in the counterclockwise direction necessary for the movement of the door to its closed and latched position, without actuation of the push button 88.

The movements of the gear 16 and the different positions assumed thereby during the closing movement of the door can be more fully explained by referring to the views shown in FIGS. 5 to 8 inclusive of the drawings. FIG. 5 represents the condition in which the door is approaching its closed position and the tooth 16^b of the gear has just come into engagement with the wall portion 37 of the keeper 17.

The wall portion 37 serves as a striker for the tooth 16^b by providing a substantially vertically disposed striker surface, and continued closing movement of the door after the engagement of the tooth 16^b with the striker causes the gear to advance farther into the keeper to the position shown in FIG. 6 in which the tooth 16^a has moved part-way into the locking pocket 44. This partial engagement of the tooth 16^a in the locking pocket 44 represents the safety-latched condition of the door and, at this time, the detent 78 will be fully engaged in one of the notches 75 of the ratchet wheel 60 to hold the gear in this partially engaged position for retaining the door in its safety-latched condition.

The final closing movement of the door causes the gear 16 to move more fully into the keeper 17 to thereby bring the tooth 16^a to a fully engaged condition in the locking pocket 44, as shown in FIG. 7, and which corresponds with a fully-closed and door-latched or door-locked condition of the control mechanism 10. At this time, the gear cover 65 of the latch device 15 has come into engagement with the wedge block 46 in the manner and for the purpose already explained above and has shifted the latter along its guideway 45 to the position shown in FIG. 7.

If the closing movement of the door is carried out with a strong force or slamming action, the movement of the gear 16 into the keeper 17 will continue beyond the door-latched position shown in FIG. 7 and to an over-travel position shown in FIG. 8. This over-travel position is only a temporary position of the gear 16 and the rebound tendency of the door will cause the gear to immediately return to the door-latched position shown in FIG. 7. This return of the gear to the door-latched position is assisted by the expansive force of the spring 51 reacting against the gear cover 65 through the wedge block 46.

As has been stated above, the ratchet member 60 has twice the number of teeth as the gear 16 and this relationship of the detent provides an important advantage in the control mechanism 10. To explain this advantage it is pointed out that if the gear 16 is manually rotated or otherwise shifted while the door 11 is in an open position, so that the gear stands in an incorrect position when the door is moved to its closed position, the tooth 16^b will engage the striker of the keeper 17 in the position relationship shown in phantom lines in FIG. 4 instead of the position relationship shown in FIG. 5.

It will accordingly be seen that when the tooth 16^b engages the keeper 17 in the incorrect or abnormal position relationship shown in FIG. 4, the gear will need to be rotated through a greater angular distance in order to bring the tooth 16^a into its fully engaged position in the locking pocket 44. This greater angular distance will, in this instance, be one-third greater than the angular distance which the gear would ordinarily need to be rotated for the full engagement shown in FIG. 7 for the tooth 16^a in the locking pocket 44.

It will therefore be seen that whenever the abnormal position relationship of FIG. 4 occurs, the further closing movement of the door necessary to bring the door to its fully latched position will merely result in a rotation of the gear a distance equal to three of the toothed spaces 75 of the ratchet wheel 60 instead of two such spaces. Therefore, by reason of the provision of an even number of teeth on the ratchet wheel 60 which is a multiple of the odd number of teeth on the gear 16, the closing movement of the door will result in a self-correcting co-operative action of the gear with the keeper by which the ratchet member 60 is rotated sufficiently to move three of the ratchet teeth 74 past the detent 78.

As shown in the drawings the teeth of the gear 16 comprise a full circumferential complement of teeth equally spaced therearound at seventy-two degree intervals. The ratchet member 60 has a full circumferential complement of equally spaced ratchet teeth and, since the ratch teeth are twice as numerous as the gear teeth, they are spaced apart at thirty-six degree intervals.

The angular relationship between the teeth of the gear 16 and the teeth of the ratchet member 60 is therefore such that when the detent 78 is fully engaged with the ratchet member, the contacting position of the striker-engaging tooth relative to the substantially vertical striker surface provided by the keeper edge wall portion 37 will never be substantially less than an inclined angular position of fifty-four degrees from the horizontal. This condition is highly advantageous because the striker-engaging tooth, such as the tooth 16^b of FIG. 4, will thus always engage the substantially vertical striker surface with an angle of incidence which is favorable to sliding of the

striker-engaging tooth to cause pivotal movement of the gear 16 for movement of one tooth thereof into a door-latching position in the pocket 44 of the keeper. Since this contact angle is always one favorable to such a sliding engagement of the striker-engaging tooth, there will be minimum likelihood of a malfunctioning of the latch mechanism or damage thereto resulting from a more direct or endwise bumping engagement of the tooth against the striker surface.

In accordance with the present invention the ratchet member 60 is constructed, at least in part, of a nonmetallic material, preferably a plastic material such as nylon or other suitable plastic material, and which plastic portion is engageable by the detent 78 during the functioning of the detent mechanism. One advantage resulting from such a composite construction for the ratchet member 60 is a sound-deadening effect by which objectionable noise, such as a clacking or banging of the detent 78 against the teeth 74 of the ratchet member, is prevented. When the plastic material is nylon, it is somewhat yieldable and is wear-resistant so that damage or breakage is less likely to occur for the ratchet teeth or the detent 78.

The composite construction for the ratchet member 60 is here obtained by making this member of a layered construction comprising a toothed metal wheel member 60^a and a plastic wheel member 60^b disposed in face-to-face relation with the teeth of these members in a substantially registered relation. The wheel members 60^a and 60^b are held against relative rotation by the noncircular portion of the pivot shaft 58 on which they are mounted. The size and shape of the teeth of the plastic wheel member 60^b are such that portions 60^c of the latter will project into the tooth spaces 75 on the counterclockwise side of the tooth edges of the teeth 74, as shown in FIG. 2. The plastic portions 60^c thus projecting into the tooth spaces 75 will be engageable by the detent 78 when the latter drops into one of the tooth spaces, and such contact with the plastic portion will deaden the sound of the engagement of the detent in a tooth space.

The latch device 15 also comprises locking means which is effective on the gear 16 through the detent means for establishing a locked condition of the control mechanism and of the door 11. For this purpose, the latch device 15 is provided with a locking lever 91 lying adjacent the plate portion 56^b and swingably mounted on the latter by a pivot pin 92. A locking arm 93 is provided and is manually actuatable by a conventional key 94 for causing swinging of the locking lever 91 to locking and releasing positions. The locking lever 91 is also swingable to its locking and releasing positions by an inside control means located on the inner side of the door 11 and here represented by a control lever 95 and a control link 96.

The plate portion 56^b is provided with a vertical slot 98 (see FIG. 3) at a point above the pivot pin 92. The actuating lever 63 carries an offset end portion 99 which is swingable in the slot 98 and with which the upper portion of the locking lever 91 cooperates. For this cooperation, the upper portion of the locking lever 91 is provided with a notch 100 for receiving the offset lever portion 99 and a lug 101 overhanging the notch and forming an abutment which is engageable by the offset lever portion.

The lower portion of the locking lever 91 is provided with a crescent-shaped recess 102 and a cam edge 103 extending along the edge of the recess and facing toward the plate portion 56^a. The locking lever also carries a horn-like portion 106 which projects into the recess 102 at one end of the cam edge 103. The locking arm 93 is swingably actuatable by a spindle 104 of a non-circular cross-sectional shape, in response to manual rotation of the key 94, and has a rounded free end 105 which cooperates with the horn projection 106 for swinging the locking lever 91 to its locking position and cooperates with the cam edge 103 for swinging the locking lever to its releasing position. The spindle 104 has its outer end connected with a lock cylinder 107 (see FIG. 2) which is rotatable in a lock barrel or sleeve 108 supported by the handle unit 89 of the door 11.

The locking lever 91 is shown in full lines in FIG. 3 in its locking position in which the notch 100 has been brought into a straddling or confining relation to the offset lever portion 99 and in which the lug 101 extends transversely across the upper edge of this offset lever portion. When the locking lever is in this position the actuating lever 63 is retained against clockwise swinging movement by means of the lug 101 and, at this time, the detent 78 will not be disengageable from the ratchet wheel 60 by manual actuation of the push button 88 and the latch mechanism 15 and door 11 will be in a locked condition.

The broken line position 91^a of the locking lever, as shown in FIG. 3, represents the unlocking position of this lever in which the notch 100 and the lug 101 have been swung toward the right and away from the offset lever portion 99 to thereby release the actuating lever 63 for manual swinging in a clockwise direction by actuation of the push button 88 to permit unlatching of the gear 16 from the keeper 17.

The locking lever 91 is also swingable to its locking and releasing positions by the engagement of the inside control lever 95 with one or the other of a pair of shoulders 110 and 111 provided on the upper portion of the locking lever. The locking lever 91 is releasably retained in its locking and releasing positions by a ring-shaped wire spring 112 of the over-center type which is disposed between, and connected with, the lower portion of the locking lever and the plate portion 56^b.

The latch device 15 also comprises an automatic unlocking means for causing unlocking of the latch device 15 in the event that this device happens to be in a locked condition when the door 11 is swung to its closed position. Such an automatic unlocking means is desirable so as to prevent an operator of the vehicle from unintentially locking himself out of the vehicle in the event that the latch device is in a locked condition when the door is swung shut.

This automatic unlocking means comprises cooperating elements on the detent lever 62 and the locking lever 91, as shown in FIGS. 3 and 9, and which elements preferably comprise a cam or cam edge 113 and a thrust element effective thereagainst. In this instance the cam edge 113 is carried by the locking lever 91 and is located thereon at a point above the pivot pin 92 and the thrust element is carried by the detent lever 62 and is formed by the finger projection 81 thereof. The cam edge 113 is preferably formed on the locking lever 91 as an edge of a slot-like opening 115 punched in the latter. The thrust finger 81 is here shown as being of a length to also extend through the plate portion 56^b and is accommodated by a suitable clearance slot 116 provided in the latter.

Assuming that the locking lever is in its full-line locking position shown in FIG. 3 when the door is swung to its closed position, it will be seen that the forced rotation of the ratchet member 60 in a counterclockwise direction resulting from the cooperation of the gear 16 with the keeper 17 will cause upward swinging of the detent lever 62. This upward swinging of the detent lever will cause the thrust finger 81 thereof to engage the cam edge 113 and apply an actuating force thereto which will swing the locking lever 91 to its unlocking position.

From the accompanying drawings and foregoing detailed description it will now be readily understood that this invention has provided door control mechanism well suited for use on a vehicle door and which will be very effective for holding the door in a supported antirattle condition when the door is in its closed and fully latched position. It will also be understood that this door con-

trol mechanism is of a simple and practical form and comprises only a small number of parts which can be readily produced and easily assembled. Additionally, it will be seen that the mechanism is automatically self-correcting with respect to an inaccurate positioning of the latch member and that, by reason of the plastic material embodied in the detent mechanism, will be relatively quiet and wear resistant in operation. It will be recognized further that the automatic unlocking means of the mechanism will be reliably effective in preventing an undesired locking of the door when the latter is swung to its closed position with the latch device in a locked condition.

Although this door control mechanism has 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 thus described our invention, we claim:

1. In a door latch device; a support adapted for connection with a door and having angularly disposed flange portions; a pivot shaft mounted on one of said flange portions; a gear-shaped latch member supported by said shaft for pivotal movement for latching engagement of teeth on the lower side of said latch member with a keeper during movement of said latch member to a door-latched position; a ratchet wheel connected with said latch member and also having pivotal movement about the axis of said shaft; detent means comprising a detent member movable between a release position and a holding position in engagement with teeth on the upper side of said ratchet wheel, and an actuating member manually movable for shifting said detent member in an upward direction from said holding position to said release position; said detent member being effective in said holding position for releasably holding said latch member in said door-latched position by preventing pivotal movement of said ratchet member in one direction; spring means for urging said detent member toward said holding position; said detent member being movable in said upward direction in opposition to said spring means and independently of said actuating member by a ratcheting pivotal movement of said ratchet member in response to a forced pivotal movement of said latch member in the opposite direction; a locking member having a locking portion and being supported on said other flange portion for movement of said locking portion to locking and unlocking positions relative to said actuating member; and means effective between said detent member and said locking member for causing movement of said locking portion to said unlocking position in response to the upward independent movement of said detent member; the last-mentioned means comprising a cam portion on one of the two last-mentioned members, and a thrust means on the other of said two members and having a combined sliding and wedging engagement with said cam portion.

2. A door latch device as defined in claim 1 and wherein said detent member and said locking member are lever members; and wherein the last-mentioned means comprises a cam slot in one of said lever members and a thrust finger carried by the other of said lever members and projecting into said cam slot for a combined sliding and wedging action therein.

3. A door latch device as defined in claim 1 and wherein said locking member comprises a lever having a cam slot and said detent member comprises a lever having yoke arms in straddling relation to said actuating member; and wherein one of said yoke arms is normally in a spaced relation to said actuating member and projects into said cam slot for a combined sliding and wedging action therein.

4. In door control mechanism for use between a doorframe and a vehicle door swingably connected therewith; a keeper adapted for mounting on said doorframe and comprising a body having a latch-receiving recess and an outer edge wall comprising a substantially vertically disposed striker surface and provided with an access opening in communication with said recess; said keeper also having a single locking pocket therein in communication with said recess; said striker surface and the pocket being located in a substantially vertically offset relation to said opening; latch means adapted for mounting on said door and comprising a toothed latch member in the form of a rotatable gear movable to a door-latched position in said keeper; said latch member having a full circumferential complement of gear teeth consisting of five equally spaced teeth; a ratchet wheel connected with said latch member and having a full circumferential complement of ratchet teeth consisting of ten equally spaced teeth; detent means co-operable with said ratchet wheel for retaining said latch member in said door-latched position; and spring means effective on said detent means for urging the same to a normally fully-engaged position relative to said ratchet wheel; said pocket being of a shape to substantially mate with and receive any one tooth of said latch member in a seated engagement therein when said latch member is in said door-latched position; said pocket being located so that a substantially vertical center line thereof passes substantially through the rotation axis of said latch member when the latter is in said door-latched position; said one tooth being movable into said pocket in response to rotation of said latch member produced by engagement of the next adjacent tooth of the latch member with said striker surface during closing movement of the door; said seated engagement of said one tooth comprising a two-point antirattle door-holding engagement with the wall of said pocket at points located on opposite sides of said center line; the angular spacing of the teeth of said latch member in relation to the angular spacing of the teeth of said ratchet wheel being such that when said detent means is in said fully-engaged position the contacting position of the striker-engaging tooth relative to said striker surface will never be substantially less than an inclined angular position of fifty-four degrees from the horizontal.

5. Door control mechanism as defined in claim 4 wherein the door-latching engagement with said keeper is by latch member teeth located on the lower side of said latch member, and the holding engagement of said detent means is with ratchet teeth located on the upper side of said ratchet wheel.

6. In door control mechanism for use between a doorframe and a vehicle door swingably connected therewith; a keeper adapted for mounting on said doorframe and comprising a body having a latch-receiving recess and an outer edge wall comprising a substantially vertically disposed striker surface and provided with an access opening in communication with said recess; said keeper also having a single locking pocket therein in communication with said recess; said striker surface and pocket being located in a substantially vertically offset relation to said opening; latch means adapted for mounting on said door and comprising a latch member in the form of a rotatable gear movable to safety-latched and door-latched positions in said keeper; said latch member having a full circumferential complement of gear teeth consisting of five equally spaced teeth; a ratchet wheel connected with said latch member and having a full circumferential complement of ratchet teeth consisting of ten equally spaced teeth; detent means co-operable with said ratchet wheel for retaining said latch member in said safety-latched and door-latched positions; and spring means effective on said detent means for urging the same to a normally fully-engaged position relative to said ratchet wheel; said pocket being of a shape to substantially mate with and receive any one tooth of said latch member as a load tooth in a final seating position therein when said latch member is in said door-latched position; said pocket being located so that a substantially vertical center line thereof passes substantially through the rota-

tion axis of said latch member when the latter is in said door-latched position; said one tooth also having a partially engaged first position in said pocket when said latch member is in said safety-latched position; said one tooth being movable to said partially-engaged first position and said final seating position in succession and the movement thereof to said partially-engaged first position being in response to rotation of said latch member produced by engagement of the next adjacent tooth of the latch member with said striker surface during closing movement of the door; said final seating position of said one tooth comprising a two-point antirattle door-holding engagement with the wall of said pocket at points located on opposite sides of said center line; the engagement of said detent means with one tooth of said ratchet wheel being effective to retain said latch member in said door-latched position and the engagement of said detent means with a next adjacent tooth of said ratchet wheel being effective to retain said latch member in said safety-latched position; the angular spacing of the teeth of said latch member in relation to the angular spacing of the teeth of said ratchet wheel being such that when said detent means is in said fully-engaged position the contacting position of the striker-engaging tooth relative to said striker surface will never be substantially less than an inclined angular position of fifty-four degrees from the horizontal.

7. In door control mechanism for use with a swingable vehicle door having an upright free edge which, in the closed position of the door, is in a substantially opposed and fore-and-aft aligned relation to an adjacent upright fixed edge of an associated doorframe so that the opposed edges define an intervening cleavage crevice and lie on opposite sides of an upright transverse cleavage plane; a keeper adapted for mounting on said fixed edge so as to lie in said cleavage crevice and having a latch-receiving recess; said keeper comprising a front wall and an edge wall connected with said front wall and including a substantially vertically disposed striker surface facing laterally outwardly of the vehicle; said keeper also having a single locking pocket therein in communication with said recess, and an access opening in said edge wall and leading into said recess; said striker surface and pocket being located in a substantially vertically offset relation to said opening; latch means adapted for mounting on said door and comprising a latch member in the form of a rotatable gear movable to a door-latched position in said keeper; said latch member having a full circumferential complement of gear teeth consisting of five equally spaced teeth; a ratchet wheel connected with said latch member and having a full circumferential complement of ratchet teeth consisting of ten equally spaced teeth; detent means cooperable with said ratchet wheel for retaining said latch member in said door-latched position; and spring means effective on said detent means for urging the same to a normally fully-engaged position relative to said ratchet wheel; said pocket being of a shape to substantially mate with and receive any one tooth of said latch member in a seated engagement therein when said latch member is in said door-latched position; said pocket being located so that a substantially vertical center line thereof passes substantially through the rotation axis of said latch member when the latter is in said door-latched position; said one tooth being movable into said pocket in response to rotation of said latch member produced by engagement of the next adjacent tooth of the latch member with said striker surface during closing movement of the door; said seated engagement of said one tooth comprising a two-point antirattle door-holding engagement with the wall of said pocket at points located on opposite sides of said center line; the angular spacing of the teeth of said latch member in relation to the angular spacing of the teeth of said ratchet wheel being such that when said detent means is in said fully-engaged position the contacting position of the striker-engaging tooth relative to said striker surface will never be substantially less than an inclined angular position of fifty-four degrees from the horizontal; said front wall having a portion thereof overlying said pocket and engageable by said one tooth for preventing a fore-and-aft spreading apart of said door and doorframe.

8. In door control mechanism for use between a doorframe and a vehicle door swingably connected therewith; a keeper adapted for mounting on said doorframe and comprising a body having a latch-receiving recess and an outer edge wall comprising a substantially vertically disposed striker surface and provided with an access opening in communication with said recess; said keeper also having a single locking pocket therein in communication with said recess; said striker surface and pocket being located in a substantially vertically offset relation to said opening so as to both lie on one side thereof; means providing a guideway in said keeper in communication with said recess and located on the opposite side of said opening; support means adapted for mounting on said door; a latch member pivoted on said support means and comprising a rotatable gear movable to a door-latched position in said keeper; said latch member having a full circumferential complement of gear teeth consisting of five equally spaced teeth; a ratchet wheel connected with said latch member and having a full circumferential complement of ratchet teeth consisting of ten equally spaced teeth; detent means co-operable with said ratchet wheel for retaining said latch member in said door-latched position; said pocket being of a shape to substantially mate with and receive any one tooth of said latch member in a seated engagement therein when said latch member is in said door-latched position; said pocket being located so that a substantially vertical center line thereof passes substantially through the rotation axis of said latch member when the latter is in said door-latched position; said one tooth being movable into said pocket in response to rotation of said latch member produced by engagement of the next adjacent tooth of the latch member with said striker surface during closing movement of the door; said seated engagement of said one tooth comprising a two-point antirattle door-holding engagement with the wall of said pocket at points located on opposite sides of said center line; wedge means in said guideway and shiftable therealong in an inward direction away from said opening; a first spring means engaging said wedge means and urging the same in the opposite direction along said guideway; a thrust projection on said support means and movable into said recess to a door-holding position against said wedge means so as to be subject to a wedging action by the latter for forcing said one tooth toward said seated engagement in said pocket; and a second spring means effective on said detent means for urging the same to a normally fully-engaged position relative to said ratchet wheel; the angular spacing of the teeth of said latch member in relation to the angular spacing of the teeth of said ratchet wheel being such that when said detent means is in said fully-engaged position the contacting position of the striker-engaging tooth relative to said striker surface will never be substantially less than an inclined angular position of fifty-four degrees from the horizontal.

References Cited in the file of this patent

UNITED STATES PATENTS

1,219,698	Brackett	Mar. 20, 1917
2,242,993	Domecki	May 20, 1941
2,270,559	Rolph et al.	Jan. 20, 1942
2,374,840	Schonitzer	May 1, 1945
2,629,621	Roethel	Feb. 24, 1953
2,646,300	Roethel	July 21, 1953
2,683,617	Roethel	July 13, 1954
2,731,822	Bargman	Jan. 24, 1956
2,796,276	Leslie	June 18, 1957
2,811,381	Allen	Oct. 29, 1957
2,931,677	De Vito et al.	Apr. 5, 1960