March 16, 1965 J. H. ROETHEL 3,173,715

DOOR LOCK

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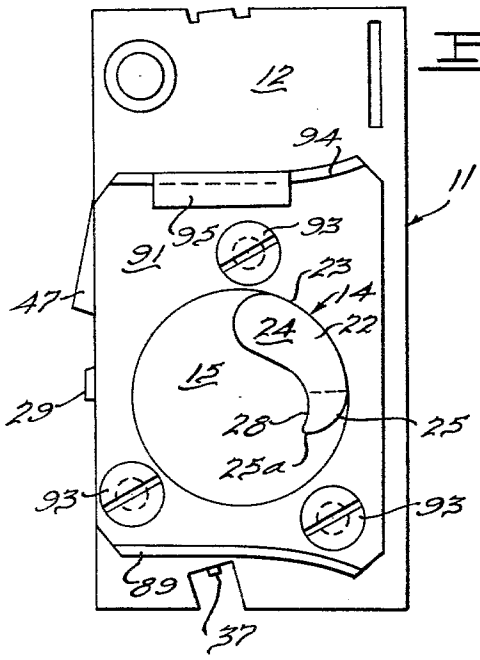
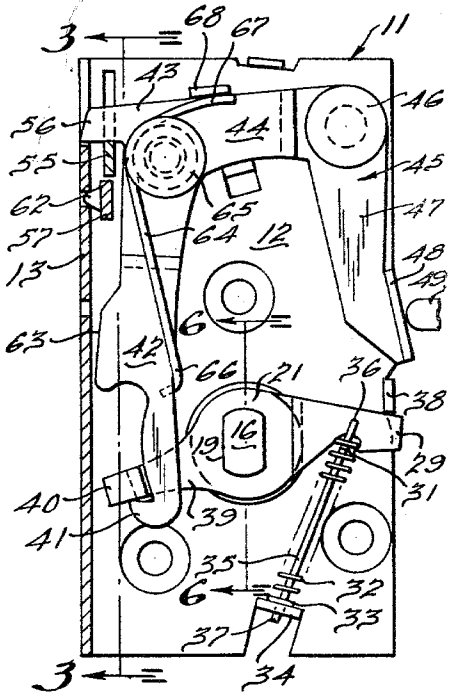


FIG. 1.



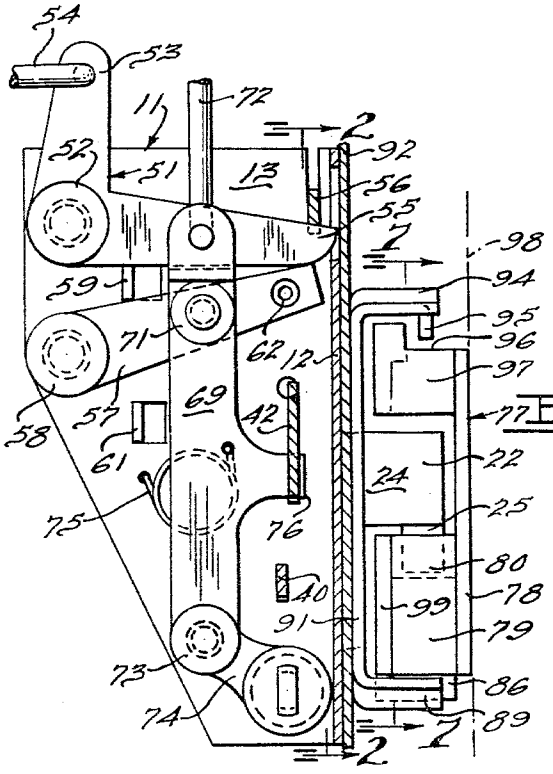


FIG. 2.

FIG. 3.

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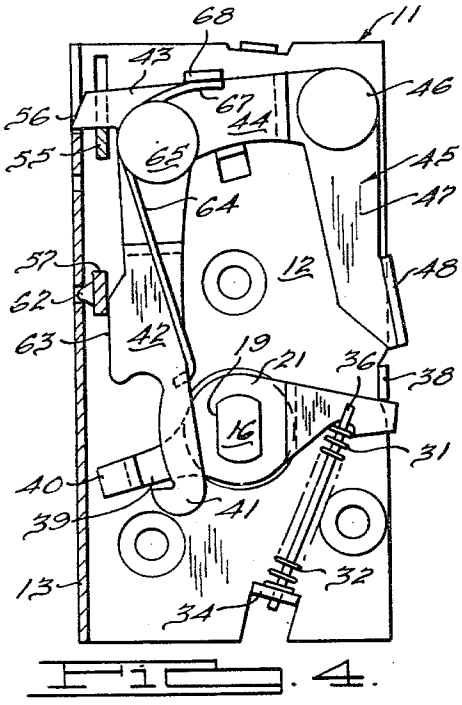

Fig. 4.

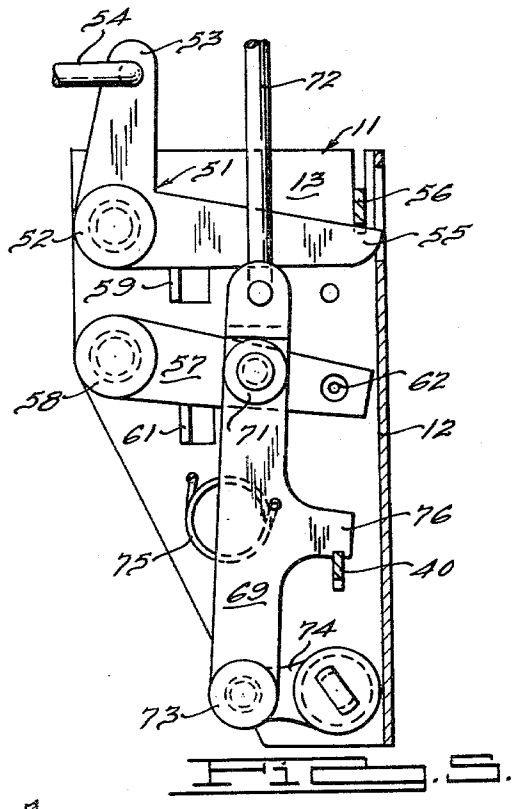

Fig. 5.

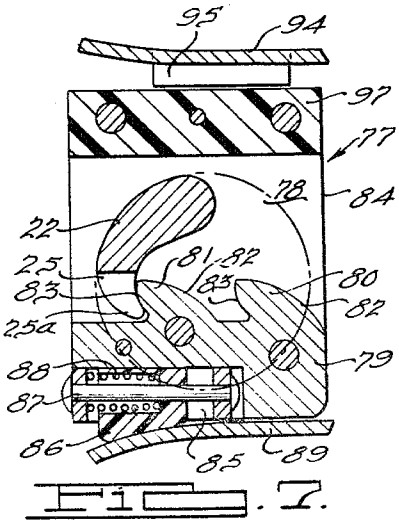

Fig. 7.

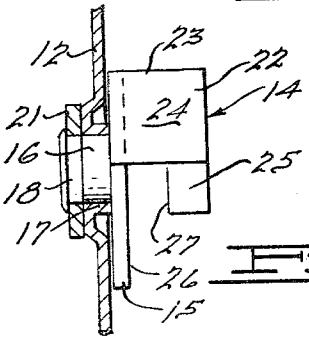

Fig. 6.

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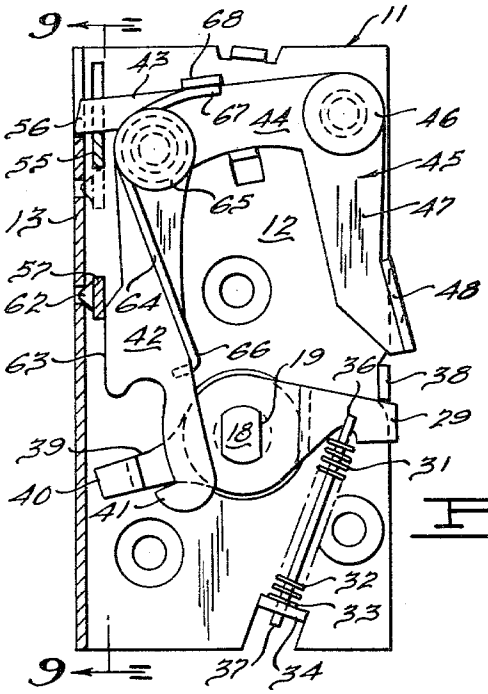

Fig. 8.

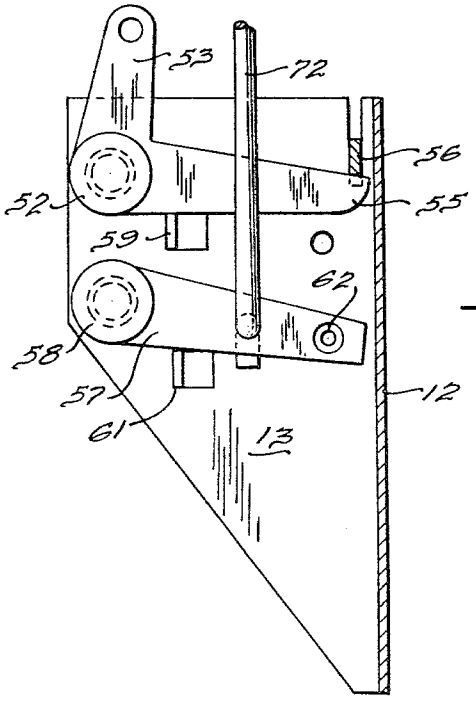

Fig. 9.

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DOOR LOCK

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3 Claims. (Cl. 292—123)

This invention relates to latch mechanism for swinging doors, particularly the doors of automobile or other vehicle bodies.

Although latch mechanisms having rotary or gear-type latch devices have been widely utilized by vehicle manufacturers, it is the opinion of many engineers that such latch mechanisms have inherent deficiencies that cannot be circumvented. These engineers recognize the value of a latch mechanism in which the latch device is always ready for engagement with a keeper device, i.e., a latch device that does not have to be cocked or preset for movement from unlatched to latched condition. This readiness for engagement with a keeper device is a favorable characteristic of rotary or gear-type latch mechanisms. Space limitations, however, have restricted the diametral size of rotary or gear-type latch devices to small diameter gears of modified tooth form having relatively inefficient gear action upon engagement with a rack-type keeper device. The inefficient gear action results in high impact forces being transmitted to the gear shaft and the bearing journalling the shaft. The high impact forces are also transmitted to the keeper device causing the latter eventually to become loosened and misaligned on its vehicle body support structure.

It is an object of the present invention, therefore, to provide a latch mechanism having an improved latch device which is constructed and arranged so as to be always in readiness for latching engagement with a keeper device; which has a highly efficient latching action; and which has minimum shock transmittal characteristics upon engagement with its keeper device as the vehicle door is swung from an open to a closed position.

In its preferred embodiment, the latch mechanism embodying the present invention comprises a support plate for disposition at the free edge wall of a vehicle door. A latch device is mounted on pivoted means carried on said support plate, the latch device being mounted in spaced relation to the pivot axis of said pivot means for bodily shiftable movement from latched to unlatched position. The latch device has a keeper engageable portion adapted to engage a keeper device having secondary latched and fully or primary latched positions thereon. In either position the keeper engaging portion straddles a plane passing through the pivot axis of the latch device pivoted mounting means, the plane being one which is substantially normal to the hinge axis of the door.

It is a further object of the present invention to incorporate the improved latch device in a latch mechanism of the so-called "free-wheeling" category. In this category of latch mechanisms, the levers, links and connecting members coupling the manually operable devices, such as the door handles, push-buttons or the like, to the latch device for causing movement of the latter from latched to unlatched position, are rendered inoperative to cause unlatching movement. This is done by uncoupling or disconnecting selected links or levers. The manually operable device, such as the handle or push button remains responsive to actuation but no actuating movement is transmitted to the latch device.

Other objects, features and advantages of the present invention will appear in the following description and appended claims, reference being had to the accompanying drawings, in which:

FIG. 1 is an elevation looking at the latch mechanism as it appears from the exterior of the free edge wall of a vehicle door;

FIG. 2 is an elevation, in part sectional, looking at the latch mechanism from the rear side thereof as viewed in FIG. 1;

FIG. 3 is a sectional view taken on the line 3—3 of FIG. 1, the keeper device having been added thereto;

FIG. 4 is a view in part similar to FIG. 2 illustrating parts of the latch mechanism in a different operative position;

FIG. 5 is a view in part similar to FIG. 3 illustrating parts of the latch mechanism in a different operative position;

FIG. 6 is a sectional view taken on the line 6—6 of FIG. 2;

FIG. 7 is a sectional view taken on the line 7—7 of FIG. 3;

FIG. 8 is a view in part similar to FIG. 4 illustrating a second embodiment of the present invention; and

FIG. 9 is a view in part sectional taken on the line 9—9 of FIG. 8.

In the drawings there are illustrated, by way of example, certain embodiments of the present invention as applied to the doors and door frame structures of an automobile body.

The first embodiment of the present invention is shown in FIGS. 1 to 7, inclusive. The latch mechanism therein illustrated, generally designated 11, comprises a case plate 12 having a flange 13. The case plate 12 is adapted to be secured, as by means of screws, to the inner side of the free edge wall of a vehicle door with the flange 13 positioned along the inner panel of the door.

The case plate 12 has mounted thereon a latch or bolt device, generally designated 14. The latch device 14 comprises a circular disk 15 having a short shaft 16 extending rearwardly therefrom. The shaft 16 is rotatably journalled in a bearing, a flanged aperture 17, formed in the case plate 12. The portion 18 of the shaft 16 extending beyond the bearing 17 is provided with flats 19 thereon. The end portion 18 is fitted into a complementarily shaped aperture of a control member 21, to be more fully described. The end portion 18 is of sufficient length to provide sufficient stock to be riveted or staked over to permanently couple the control member 21 through the shaft 16 to the disk 15 for movement therewith. Mounted on the front face of the disk 15 is the latch element 22 of the latch device 14. The latch element comprises a member having its outer contour 23 complementary to the periphery of the disk 15. As best seen in FIG. 1, the latch element 22 extends from the vertical centerline of the disk 15 to a point past the horizontal centerline. The main body portion 24 of the latch element 22 is substantially oval in shape. At a point above the horizontal centerline of the disk, the main body portion terminates in an inwardly curved hook-like portion 25. As best seen in FIG. 3, the hook-like portion is spaced outwardly of the disk 15, i.e., there is a substantial space between the disk surface 26 and the inner face 27 of the hook-like portion. It should also be noted that the horizontal centerline of the disk 15 substantially bisects or straddles the concave surface 28 of the hook-like portion. The surface 28 may hereinafter be referred to as the keeper engaging face of the latch element 22, as will be more fully explained.

As described above and shown in FIG. 1, the latch element 22 is in the position it occupies when in latched engagement with a keeper or when in keeper disengaged position when the vehicle door is open. It is normally maintained in this position through the control member 21, see FIG. 2. It will be noted that the control member 21 has a horizontally extending arm 29 which is engaged by the upper end 31 of a compression spring 32. The lower end 33 of the compression spring 32 reacts against a shelf 34 turned inwardly from the case plate 12. A guide

member 35 prevents lateral displacement of the spring 32 when placed under compression. The guide member 35 is an elongated bar which is bifurcated at its upper end 36 to straddle the arm 29 of the control member 21. The lower end 37 of the guide member slidably projects through an aperture in the shelf 34.

The compression spring 32 normally urges the control member 21 in a counterclockwise direction as viewed in FIG. 2 so that the arm 29 abuts a stop 38 on the edge of the case plate 12. This results in the latch element 22 normally being held in the position shown in FIG. 1. For the latch element 22 to be shifted to an unlatched position, it must be bodily shifted in a counterclockwise direction, as viewed in FIG. 1, about the center of rotation of the disk 15. This is accomplished through a system of levers and links.

It will be noted, see FIG. 2, that the control member 21 has an arm 39 extending oppositely to the arm 29. This arm 39 has an offset end portion 40 adapted to be engaged by the hook-like end proportion 41 of a substantially vertically extending link 42. The link 42 is pivotally suspended from the end 43 of an arm 44 of a bell crank lever 45. The bell crank lever 45 is pivotally mounted on the case plate 12 by a pivot stud 46.

The bell crank 45 has a depending arm 47 having a flange 48 thereon engageable by the stem 49 of a push-button or the like operable from the outside of the vehicle door.

With the latch mechanism parts positioned as shown in FIG. 2, it will be apparent that if the bell crank 45 is swung in a clockwise direction the link 42 will be raised. The link 42 hook-like end portion 41 will engage the end 40 of the control member arm 39 causing the control member 21 to be swung in a clockwise direction against the resistance of spring 32. The movement of the control member 21 is transmitted through shaft 16 to disk 15 causing the latch element 22 to be bodily raised in a counterclockwise direction as viewed in FIG. 1.

The latch mechanism is adapted to be actuated from the inside of the vehicle door through a bell crank lever 51 pivotally mounted on the case plate flange 13 near the upper end of the latter on a pivot stud 52. The bell crank lever 51 has an upstanding arm 53 adapted to be coupled by a draft link 54 to a conventional remote control mechanism (not shown) mounted on the inner door panel. The bell crank lever 51 has a substantially horizontally extending arm 55 extending toward the case plate 12 and underlying an extension 56 of the arm 44 of the bell crank lever 45. Thus, if the bell crank 51 is swung in a counterclockwise direction, as viewed in FIG. 3, its arm 55 will lift the arm 44 of the bell crank lever 45 and thereby the link 42. This upward movement of the link 42 normally will result in the movement of the control member 21 and thereby the latch device 14 in unlatching direction.

Provision is made for rendering the link 42 inoperative to transmit movement of either bell crank lever 45 or 51 to the control member 21. Referring now to FIG. 4, it will be noted that the link 42 is shown displaced to the right of its FIG. 2 position. When so displaced, its hook-like end portion 41 will bypass the end portion 40 of the control member 21 upon the link 42 being raised. Thus, no unlatching movement can be induced from either the inside or the outside of the door.

Displacement of the link 42 from its FIG. 2 to its FIG. 4 position is accomplished through selective positioning of a lever or swinging arm 57 pivotally mounted at 58 on the case plate flange 13. The arm 57 is swingable in an arc between spaced stops 59 and 61 on the flange 13. The arm 57 is provided at its free end with a protuberance 62 extending toward the flange 13 thereby maintaining the arm spaced outwardly therefrom. As shown in FIGS. 2 and 3, the arm 57 is in an inoperative position. But when swung downwardly in a clockwise direction from its FIG. 2 to its FIG 4 position, the free end of the arm 57 cams

itself between the flange 13 and a shoulder or step 63 on the link 42. This forces and holds the link 42 in a position in which its hook 41 is ineffective to engage the end portion 40 of the control member 21.

The link 42 is normally urged toward the flange 13 by a hinge spring 64 carried on the pivot stud 65 coupling the link to the arm 44 of the bell crank lever 45. One end 66 of the hinge spring 64 is hooked over the link 42 and the other end 67 abuts a lug 68 on the arm 44. The spring 64 is placed under increased tension by the interposition of the arm 57 between the link 42 and the flange 13.

In the present embodiment, the locking arm 57, the arm for rendering the link 42 inoperative to engage the control member 21, is shiftable from the inside or the outside of the vehicle door through a vertically extending link 69. The link 69 is pivotally coupled to the arm 57 by a pivot stud 71, the pivotal coupling being contiguous to the upper end of the link 69. Above the pivot stud 71 the link 69 is connected by a rod 72 to a push-pull button (not shown) accessible at the garnish molding of the vehicle door, as is known to the art. At its lower end the link 69 is pivotally coupled at 73 to a crank arm 74 having an aperture therein to receive the shaft (not shown) of a conventional key cylinder mechanism (not shown). This is also well known in the prior art and further discussion is deemed unnecessary. The key cylinder mechanism is, of course, accessible from the outside of the vehicle door.

The link 69 is held in its upper and lower positions of movement by a toggle spring 75.

It should be noted that the link 69 has a laterally extending arm 76, which, as best seen in FIG. 5, overlies the end 40 of the control member arm 39. Should the parts of the latch mechanism be placed in the FIGS. 4 and 5 position with the vehicle door open and the door is then slammed shut, the latch element 22 will merely ride over the keeper causing the control member arm 39 to be kicked up. The end 40 of the arm 39 will abut the link arm 76 causing the link 69 to be kicked up and restored to its FIG. 3 position.

For purposes of definition, the latch mechanism parts, when in the position shown in FIGS. 2 and 3, are considered in latch mechanism unlocked condition. That is, movement of either the inside or outside operator results in unlatching movement of the latch device 14. When the parts are in the FIGS. 4 and 5 position, the latch mechanism parts are considered in latch locked condition. Although the inside and outside operators are fully responsive to actuating movement and the link 42 is also fully responsive to actuation movement, the link 47 merely bypasses the control member 21 without moving the latch device to unlatched position. This latched mechanism locked condition may also be referred to as the "free wheeling" condition of the mechanism.

The latch mechanism of the embodiment of FIGS. 8 and 9 differs from that of the previously described embodiment primarily in the elimination of the link 69. In this embodiment the rod 72 leading to the push-pull button at the garnish molding is directly coupled to the lever arm 57. No provision is made for locking the door from the outside and no provision is made for restoration of the latch mechanism to unlocked condition should it be placed in locked condition with the door open. That is, the link 69 and the key cylinder mechanism crank 74 are eliminated.

Brief reference has been made to the latch device 14 and its latch element 22 and the keeper engaging surface 28 of the latter. With reference now to FIGS. 1, 3 and 7, the coaction between the latch element 22 and the keeper device, herein generally designated 77, will now be described.

The keeper device 77 comprises a substantially square plate 78 having secured to its lower portion a rack 79. The rack 79 has two upwardly projecting teeth 80 and 81. As best seen in FIG. 7, the teeth 80 and 81 are not true gear teeth but have a special form. They appear to

be tilted toward the left, as viewed in FIG. 7, and are provided with a curved surface 82 and an overhanging latch bolt engaging portion 83, for reasons to be more fully explained. When mounted on a body pillar, the side 84 of the keeper is the outer side or the side first approached by the latch element 22.

The rack 79 is undercut at its inner lower corner to provide a recess 85 to receive a slidable wedge block 86. The wedge block 86 is guided on a guide rod 87 and is urged by spring 88 in an outward direction. The wedge block 86 is adapted to engage the flange 89 of a channel-shaped member 91 which is indirectly carried on the outer face of the case plate 12, see FIG. 1.

The channel-shaped member 91 is said to be indirectly carried on the case plate 12 of the latch mechanism because in installed position the free edge wall or jamb 92 of the door is interposed between the two (see FIG. 3). The latch mechanism is mounted on the inner face of the wall 92 with its latch element projecting through a suitable aperture in the latter. The channel-shaped member 91 is then placed against the outer face of the wall 91 and is then bolted by the bolts 93 to the case plate 12.

The upper flange 94 of the channel-shaped member 91 is provided with a depending lip or flange 95 adapted to project into a stepped down corner 96 of a block 97 carried on the upper portion of the plate 77. This functions to prevent lateral separation of the door wall 92 from the adjacent face of the body pillar indicated at 98 in FIG. 3. The front face of the rack is covered by a plate 99 which similarly is effective to prevent lateral disengagement of the striker engaging portion 25 from either rack tooth 80 or 81 with which it might be engaged.

The coaction between the latch mechanism 11, particularly the latch element 22 and channel-shaped member 91 with the keeper 77 is as follows:

As the vehicle door is swung from an open to a closed position the leading edge 25*a* of the keeper engaging portion 25 of the latch element 22 engages the curved surface 82 of the outer tooth 80 of the rack 79. The latch element is forced upwardly, i.e., in a counterclockwise direction as viewed in FIG. 1 or a clockwise direction as viewed in FIG. 7. It swings bodily about the spaced pivot axis defined by the center of rotation of the disk 15. As it passes the tooth 80, it drops into the recess between the rack teeth 80 and 81, being urged in this direction by the spring 32 acting against the control member 21. Normally, the drop-in movement would be barely perceptible since the momentum of the swinging door would carry the latch element 22 beyond the recess between the teeth 80 and 81. But should this not happen, the door would be latched—not fully, but in what is known as a secondary latched position.

If the swinging momentum is great enough, the latch element 22 will be carried over the tooth 81, reaching the FIG. 7 position. This is the fully or primary latched position.

It will be noted that the center of the disk 15, the pivot axis about which the latch element 22 bodily shifts, lies substantially on a line or in a plane tangential to the upper surfaces of the teeth 80 and 81. The keeper engaging portion 25 of the latch element 22 straddles the line or plane. Because of the overhanging contour of the teeth 80 and 81 and the concave surface 28 of the keeper engaging surface, any force exerted on the door forcing it outwardly would tend to pull the latch element 22 more securely in latching direction. Yet, because of the leverage available in the latch mechanism, the latch element 22 is readily releasable from the keeper device to permit unlatching movement of the door.

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.

I claim:

1. In combination; a latch mechanism mounted on the vertical free edge wall of a swinging door, said latch mechanism comprising a latch member, pivot means pivotally mounting said latch member for bodily shiftable movement form a door latched to a door unlatched position about a fixed pivot axis spaced from said latch member, said latch member being immovable relative to said pivot means, said latch member having a keeper engaging portion having a latching face and a camming face angularly inclined to said latching face, and means acting through said pivot means yieldably urging said latch member toward latched position, said last-mentioned means comprising a control member fixedly coupled to said latch member through said pivot means, and resilient means coupled to said control member; and a keeper device mounted on a vertical face of a body pillar to which said free edge wall is latchable, said keeper device comprising a member having aligned tooth-like projections thereon defining secondary latched and primary latched positions; said latch member camming face being adapted to engage said keeper member to bodily shift said latch member toward unlatched position against the resistance of said yieldable means to permit said keeper engaging portion to override said tooth-like projections as said door is moved to a closed position, said latching face being adapted in door closed position to engage either a secondary or a primary tooth-like projection to maintain said door latched, said pivot axis in door latched position lying substantially in a plane passing through the apexes of said tooth-like projections, said keeper engaging portion lying substantially on the tooth-like projection side of said plane when in engagement with a tooth-like projection, each tooth-like projection having an inclined latching face adapted when in engagement therewith to oppose the latching face on said keeper engaging portion, the engagement of the opposed latching faces being such that any force tending to open said door when in latched condition will urge said keeper engaging portion into deeper engagement with the coacting tooth-like projection.

2. In a latch mechanism for a door mounted for swinging movement about a hinge axis, a support having a main plate portion for disposition at the free edge wall of the door, a latch member, pivoted means mounting said latch member on said plate portion adjacent one face thereof for bodily shiftable movement from latched to unlatched position, said latch member being mounted on said pivot means in spaced relation to the pivot axis thereof, said pivot axis being fixed relative to said main plate portion, said latch member having a keeper engaging portion which in latched position straddles a plane passing through said pivot axis, said plane being substantially normal to said hinge axis, a control member positioned adjacent the other face of said plate portion and coupled to said pivoted means in coincident relationship thereto and for movement therewith about said pivot axis, outer manually operable means mounted on said plate portion for pivotally actuating said control member to turn said pivoted means and thereby bodily shift said latch member about said pivot axis from latched to unlatched position, said outer manually operable means comprising a swingable lever and link means pivotally mounted on said lever, said link means having a part thereof engageable with said control member to swing the latter in unlatching direction upon said lever being swung, locking means on said support positionable in a locking position to force said link means part to bypass said control member thereby rendering said lever inoperative to move said control member in unlatching direction, and means coupled to said locking means engageable by said control member upon movement of said latch member by engagement with a keeper device to restore said locking means to nonlocking position.

3. In a latch mechanism for a door mounted for swinging movement about a hinge axis, a support having a main plate portion for disposition at the free edge wall of the door, a latch member, pivoted means mounting said latch member on said plate portion adjacent one face thereof for bodily shiftable movement from latched to unlatched position, said latch member being mounted on said pivot means in spaced relation to the pivot axis thereof, said pivot axis being fixed relative to said main plate portion, said latch member having a keeper engaging portion which in latched position straddles a plane passing through said pivot axis, said plane being substantially normal to said hinge axis, a control member positioned adjacent the other face of said plate portion and coupled to said pivoted means in coincident relationship thereto for movement therewith about said pivot axis, spring means urging said control member and thereby through said pivot means said latch device in latched direction, outer manually operable means mounted on said plate portion for pivotally actuating said control member to turn said pivoted means and thereby bodily shift said latch member about said pivot axis from latched to unlatched position against the resistance of said spring means, said outer manually operable means comprising a swingable lever and link means pivotally mounted on said lever, said link means having a part thereof engageable with said control member to swing the latter in unlatching direction upon said lever being swung, inner manually operable means engageable with said lever for swinging the latter, locking means on said support comprising a swingable member shiftable into and out of abutting relation to said link means and when in abutting relation to the latter forcing the same to be displaced to a position in which its said part bypasses said control member thereby rendering said lever inoperative to move said control member in unlatching direction, and link means coupled to said swingable member for shifting the same into and out of abutting relation to said first mentioned link means, said last mentioned link means having a part thereof adapted to abut said control member when said swingable member part is in abutting relation to said first mentioned link means whereby said control member upon movement of said latch device by engagement with a keeper device is operative to shift said locking means to nonlocking position.

References Cited in the file of this patent

UNITED STATES PATENTS

2,143,965	Van Voorhees	Jan. 17, 1939
2,904,365	Cockburn et al.	Sept. 15, 1959
2,940,789	Priestman	June 14, 1960
3,002,778	Chanaryn et al.	Oct. 3, 1961

FOREIGN PATENTS

1,245,157	France	Sept. 26, 1960

OTHER REFERENCES

Waggonfabrik, German application 1,038,438, printed Sept. 4, 1958 (K1.68b1), 2 pages spec., 1 sheet drwg.