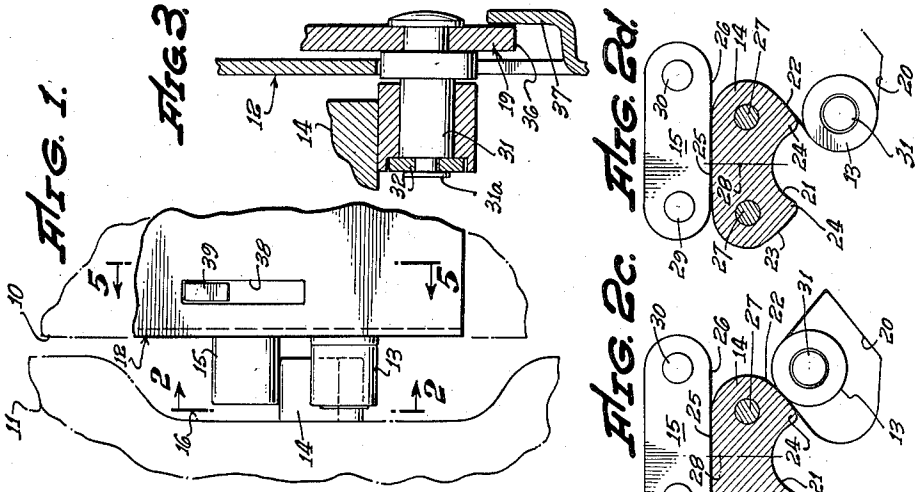
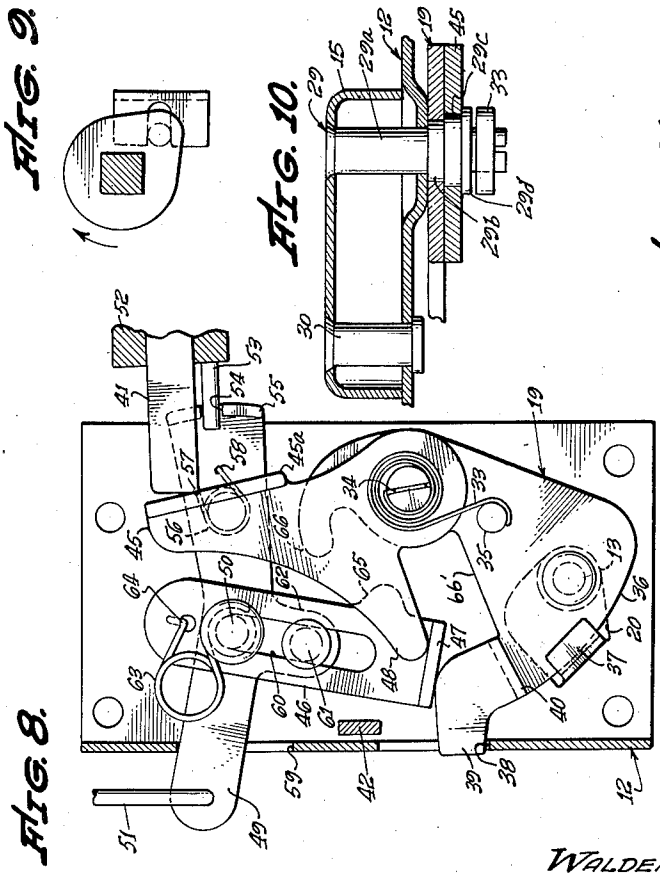
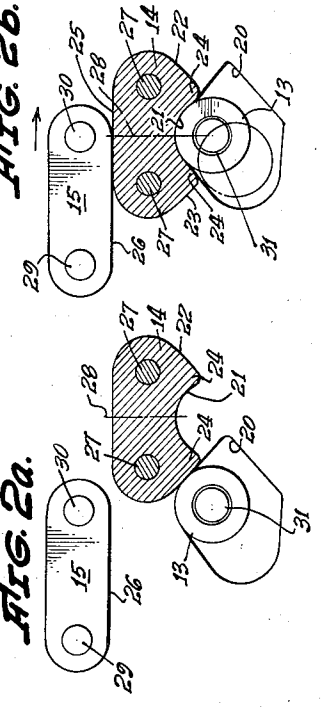
Dec. 9, 1958 W. A. ENDTER 2,863,688

DOOR LATCHING MECHANISM

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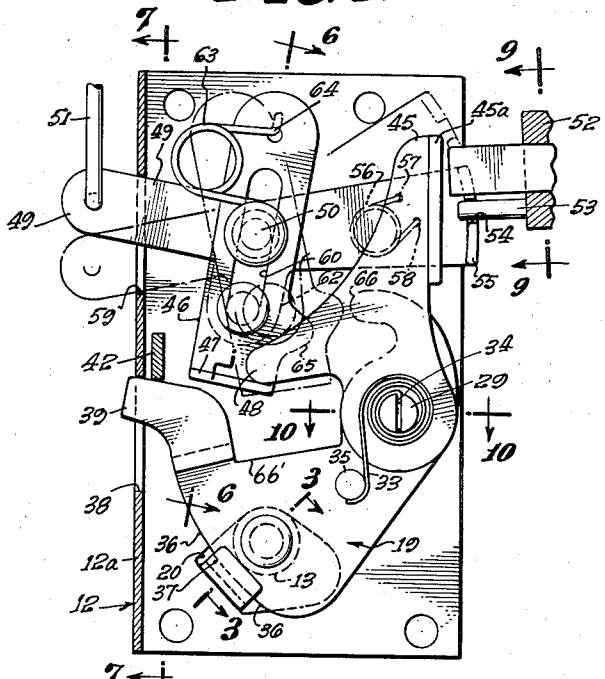
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DOOR LATCHING MECHANISM

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FIG. 5.



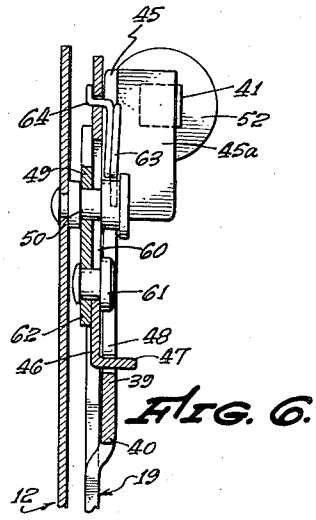


FIG. 6.

FIG. 4.

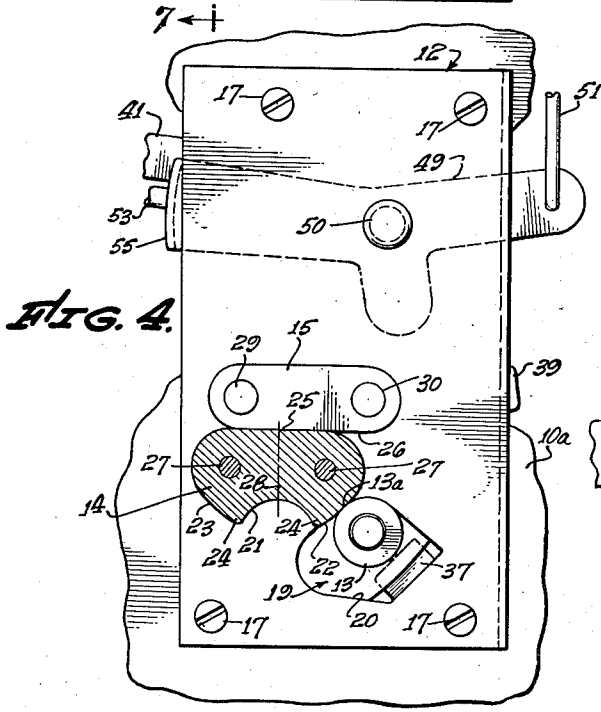
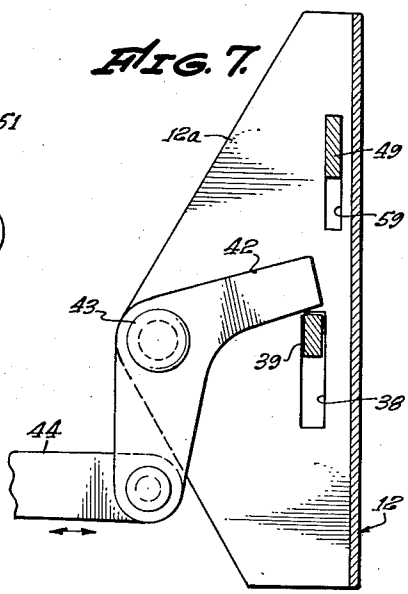


FIG. 7.



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DOOR LATCHING MECHANISM

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Application June 14, 1954, Serial No. 436,459

1 Claim. (Cl. 292—221)

This invention relates to improved latch mechanisms for use on automobile doors and the like. Certain features of the mechanism as disclosed herein are being claimed in my copending application Serial No. 436,460, filed June 14, 1954, now Patent No. 2,786,348; and certain other features which are claimed herein are disclosed in that copending application and in my copending application and in my copending application Serial No. 384,096, filed October 5, 1953, now Patent No. 2,758,860.

Latch devices embodying the invention are of the general type including a keeper unit, and a spring pressed bolt which overrides the keeper unit upon closing movement of the door, and then moves into a latching position of engagement with a holding surface on the keeper. Preferably, the keeper unit in latched condition is engaged also by a dovetail lug or shoulder, with the bolt and lug bearing against the keeper unit in essentially opposite vertical directions, to confine the keeper against relative vertical movement. A major object of the invention is to provide a latch device of this general type which is structurally extremely simple, and yet is very positive in latching action, being constructed to positively assure against accidental unlatching of the device as a result of vibrations in use, and to virtually eliminate all backlash upon closing of the door.

Some of the advantages of the invention are attained by virtue of a unique interrelationship between the positioning of the dovetail lug or shoulder, and the manner in which the bolt is mounted as a swinging bolt for pivotal latching and antilatching movement. Specifically, the bolt is preferably so mounted that its keeper engaging portion or surface is offset from the pivotal axis of the bolt in the same vertical direction as that in which the dovetail lug bears vertically against the keeper unit. It has been found that this particular relationship of the parts eliminates the possibility of the bolt riding along the keeper surface in an antilatching direction as a result of vibrations of the car and door in use, whereas in prior latch devices where the lug and bolt have been differently positioned, such vibration has been capable of completely unlatching the mechanism. For best operation, the lug bears downwardly against the keeper, and the bolt is correspondingly offset downwardly with respect to the pivotal axis about which it swings.

Structurally, the apparatus may include a generally vertically extending plate, which may be mounted to an edge of a car door, and has a bolt carrying part at its inner side mounted for pivotal movement about an axis extending generally perpendicularly to the plate. The bolt may project from this swinging part and through an aperture in the plate to its outer side, for engagement with the coacting keeper. An additional part, for actuating the bolt carrying part, may be mounted at the inner side of the plate for pivotal movement about the same axis as the bolt. Preferably a single pin or element serves both to attach the dovetail lug to the plate at its

outer side, and to mount the bolt carrying part for its desired pivotal movement at the inner side of the plate. This element may also serve the added function of pivotally mounting the actuating part.

Certain additional features of novelty reside in the manner of construction of the keeper itself. In particular, the keeper may have a first surface for engaging the dovetail lug and facing in one vertical direction (usually upwardly) and a second bolt engaging surface facing essentially in the opposite vertical direction. As the bolt moves relative to the keeper toward latched position, the bolt may engage three successive portions of the coacting keeper surface. A first of these portions of the keeper surface is inclined, to deflect the bolt in antilatching or keeper overriding direction, while the second portion forms a notch for receiving the bolt in a safety catch position. The third portion is inclined oppositely to the first inclined portion, and is engaged by the bolt in the ultimate latched position.

The above and other features and objects of the present invention will be better understood from the following detailed description of the typical embodiment illustrated in the accompanying drawings, in which:

Fig. 1 is a view showing fragmentarily portions of an automobile door and adjacent stationary pillar, and their carried interengageable bolt and keeper parts;

Figs. 2*a*, 2*b*, 2*c* and 2*d* are enlarged vertical sections taken on line **2**—**2** of Fig. 1, and showing the keeper and bolt in four different relative positions;

Fig. 3 is an enlarged fragmentary section through the keeper engaging bolt, and taken on line **3**—**3** of Fig. 5;

Fig. 4 is a view taken on line **2**—**2** of Fig. 1, and showing more of the door carried mechanism than is visible in Figs. 2*a*, 2*b*, 2*c* and 2*d*;

Fig. 5 is a vertical section taken on line **5**—**5** of Fig. 1, and showing the various parts which are hidden within the door, the parts being illustrated in their unlocked condition;

Fig. 6 is a section taken on line **6**—**6** of Fig. 5;

Fig. 7 is a vertical section taken on line **7**—**7** of Fig. 5;

Fig. 8 is a view corresponding to Fig. 5, but showing the parts as they appear when actuated to release the bolt and permit opening movement of the door;

Fig. 9 is a section taken on line **9**—**9** of Fig. 5, and showing the key controlled lock element in unlocked position; and

Fig. 10 is a section taken on line **10**—**10** of Fig. 5.

Referring first to Fig. 1, I have shown fragmentarily a portion of a conventional automobile swinging door **10**, and a portion of an adjacent vertical stationary pillar or supporting structure **11**. To the edge of the door is mounted a carrier plate or body **12**, which carries a movable bolt **13** for engaging in latched relation with a keeper **14** stationarily carried by pillar **11**. Bolt **13** engages the underside of keeper **14**, with the upper side of the keeper being engageable by a dovetail lug or bearing member **15** carried by plate **12**. The pillar **11** may be recessed at **16** to receive keeper **14** and the associated door carried parts. As seen in Fig. 4, plate **12** may be rectangular, and is connected into a correspondingly shaped opening in the body surface **10***a* of the door. A number of screws **17** may be employed for thus attaching the plate **12** to the door. Bolt element **13** may comprise an externally cylindrical roller, which is attached to a carrying part **19** mounted at the inner side of plate **12**. The bolt projects from part **19** through opening **20** formed in plate **12**, this opening being shaped as shown to allow for limited downward movement of bolt **13** between the latching position of Fig. 2*c* and the released position of Fig. 2*d*.

The vertical sectional configuration of keeper **14** is

ilustrated in Figs. 2*a*–2*d* and 4. As seen in those figures, the keeper has a cylindrical downwardly facing recess **21** at the center of its underside, this recess being curved in correspondence with the outer surface of bolt **13**, and adapted to receive the bolt in the safety catch position of Fig. 2*b*. Horizontally beyond recess **21** in a latching direction, keeper **14** has an inclined surface **22**, which is engaged by bolt **13** in the latched position shown in Figs. 2*c* and 4. At the opposite side of recess **21**, the keeper has an oppositely inclined surface **23**, which acts to engage the bolt, and cam it or deflect it downwardly (see Fig. 2*a*), as the bolt and keeper move into interengagement. The recess **21** and surfaces **22** and **23** are desirably joined smoothly by curved surface portions **24** of relatively small radii of curvature. At its upper side, keeper **14** has an upper horizontal surface **25**, which slidably engages a horizontal undersurface **26** of door carried dovetail lug **15**, as the door closes, to support the door on the keeper. The keeper may be rigidly attached to the pillar by a pair of screws **27**, and is preferably symmetrical at opposite sides of a vertically extending central plane **28**, so that a single design of keeper may be employed for both right and left hand swinging doors. As seen in Figs. 2*a*–2*d*, 4 and 10, lug **15** may be hollow and horizontally elongated, and is rigidly secured to the outer side of plate **12** by a pair of horizontally spaced pins **29** and **30**, which extend through the lugs and have their outer ends peened or enlarged to retain the lug.

Referring now to Figs. 5 and 8, the part **19** for carrying bolt **13** may be formed of rigid sheet metal, and lies in a vertical plane extending parallel to and at the inner side of plate **12**. Part **19** is mounted by and about a cylindrical portion **29***b* of lug mounting pin **29** for swinging movement in a vertical plane and about a horizontal axis extending perpendicularly with respect to plate **12**. This pivotal mounting allows part **19** and the carried bolt **13** to swing about pin **29** between their Fig. 5 and Fig. 8 positions. Bolt **13** is mounted to part **19** by a shaft **31** (see Fig. 3), about which the roller bolt is freely rotatable, and on which the bolt is retained by an outer retaining washer **32**, and peening of shaft **31** at **31***a*. Shaft **31** extends parallel to pin **29**, so that the bolt is rotatable about an axis which extends parallel to the pivotal axis of bolt carrying part **19**.

The bolt and part **19** are yieldingly urged to their latching positions of Fig. 2*c* and Fig. 5 by a spiral spring **33**, one of whose ends is received within a transverse slot **34** formed in the non-rotatable pin **29**, and the other of whose ends is received about a lug or projection **35** formed on part **19**. Spring **33** thus acts to urge part **19** and the bolt in a clockwise direction as seen in Fig. 5. Beyond bolt **13**, part **19** may have an arcuate edge **36**, which is centered about the axis of pin **29**. Adjacent this edge, mounting plate **12** may have a rigid portion **37**, which is turned first inwardly and then upwardly (see Fig. 3), to form a guide element for retaining part **19** against movement inwardly away from plate **12**. To supplement this guiding effect, plate **12** may have a vertical flange portion **12***a* turned inwardly at right angles to the main rectangular portion of plate **12**, and containing a vertical slot **38** for movably receiving and guiding a projection **39** formed at the outer end of part **19** (see Figs. 5 and 7). The end portion **39** of part **19** may be offset somewhat inwardly with respect to the main portion of that part, by turning the part first inwardly and then upwardly at **40**.

The bolt **13** is preferably adapted to be released by either an inside operator, usually a swinging handle (not shown), or an outside operator, typically a push button **41**. The inside operator or handle may actuate part **19** and its carried bolt **13** by means of a bell crank **42** pivotally attached at **43** to flange **12***a* of plate **12**. The bell crank may be connected by a strap **44** with the inside operator, so that the crank is swung in a clockwise direction (as seen in Fig. 7) upon actuation of the inside operator. Crank **42** has an arm which engages projection **39** of part **19**, to actuate that part and the bolt downwardly in a bolt releasing direction upon the defined clockwise swinging movement of crank **42**.

Push button **41** acts to release the bolt through an actuating part **45**, and a connecting member **46**, which serves as a releasable connection between parts **45** and **19**. Connector **46** is actuable between active (unlocked) and inactive (locked) positions by a pivotal locking member **49**. Element **45** is pivotally mounted by pin **29** for swinging movement about the same axis as bolt carrying part **19**. The upper portion of element **45** may have an inturned flange **45***a*, which is engageable by push button **41** so that leftward sliding movement of the push button (as seen in Fig. 5) acts to swing element **45** in a counter clockwise direction about pin **29**. This swinging movement is transmitted to parts **19** through an inturned ear or lug **47** of connector part **46**, which lug is engaged at its upper side by a projection **48** of element **45**, and at its underside is engageable with projection **39** of part **19**.

To now describe the construction of pin **29** more specifically (see Fig. 10), this pin may have four portions **29***a*, **29***b*, **29***c*, and **29***d* all of which are cylindrical and centered about a common axis. The first portion **29***a* extends through plate **12** and the hollow lug **15**, and is peened at its outer end to retain the lug to the plate. The second portion **29***b* is of a somewhat greater diameter, and acts as a head for retaining the pin against outward movement relative to the plate. This second portion also serves to pivotally mount part **19**. The third and still larger portion **29***c* pivotally mounts element **45**, while the fourth portion **29***d* retains element **45** on the pin. A fifth reduced dimension portion contains the previously mentioned slot **34** for receiving the turned end of spring **33**.

Locking part **49** is mounted for pivotal movement between its full line and broken line positions of Fig. 5. This mounting is effected by a pin **50**, which is attached to the inner side of plate **12**, and extends through an opening in element **49**. Pin **50** extends parallel to pin **29**, to mount element **49** for swinging movement about a horizontal axis parallel to the axis of pivotal movement of the other parts.

Locking part **49** is actuable between its two Fig. 5 positions either by vertical movement of an inner control element **51**, or swinging movement of an outer key controlled element **52**. The inner element **51** is connected at its upper end to the usual depressable garnish mold button. The outer key controlled element **52** extends about push button **41**, and guides that push button for its essentially horizontal sliding movement. Element **52** and push button **41** are adapted to swing about the axis of the push button in a counter clockwise direction from the Fig 10 unlocked position to a locked position, in which the parts **46** and **49** take the broken line positions of Fig. 5. This swinging movement of element **52** is effected by turning of a proper key inserted in a key controlled lock structure accessible from the outer side of the door.

Element **52** carries a pin **53**, which is receivable within a recess **54** formed in a turned end portion **55** of element **49**, so that the defined swinging rotary movement of element **52** acts to move locking element **49** between its two Fig. 5 positions. An overcenter spring **56** may have its opposite ends **57** and **58** connected into openings in element **49** and plate **12** respectively, so that this spring will act to yieldingly hold element **49** in either of its two positions. The left end portion of element **49**, as seen in Fig. 5, may extend through a vertically elongated guide slot **59** in the inturned portion **12***a* of plate **12**, to assist pin **50** in guiding element **49** for only the desired limited swinging movement.

Connecting member **46** may be formed of sheet metal extending parallel to plate **12**, and may be vertically

elongated, as shown. This connecting member 46 contains a vertically elongated straight slot 60, through which the previously mentioned pin 50 extends. The portion of pin 50 which is received within slot 60 is cylindrical and of an external diameter corresponding substantially to the width of the slot, to guide the connecting member 46 for transverse movement relative to element 49. An additional pin 61, also of a diameter corresponding to the width of slot 60, is carried by a downwardly extending portion 62 of element 49, and projects from that element through the slot and in parallel relation to pin 50, to coact with that pin in guiding connecting member 46. As will be understood, this pin and slot connection mounts connector member 46 for swinging movement about pin 50 with element 49, and also for essentially vertical sliding movement relative to element 49. A spring 63 is connected at one end 64 to member 46, and at its other end bears downwardly against pin 50, to yieldingly retract member 46 upwardly relative to element 49. Such upward retraction of member 46 is of course limited at the Fig. 5 position, member 46 being movable downwardly to the Fig. 8 position.

When the door is closed, the engagement of keeper 14 with bolt 13 acts to deflect the bolt downwardly and swing bolt carrying part 19 in a counter clockwise direction as seen in Figs. 5 and 8. I utilize this keeper induced swinging movement of parts 13 and 19 to automatically unlock the latch mechanism by virtue of closing movement of the door, to thus prevent accidental locking of the mechanism. For this purpose, part 19 has an upper portion 66, which extends upwardly and then laterally toward connecting part 46, and which is engageable with a projection 65 on part 46 to deflect the latter from its broken line position in Fig. 5 to its full line position as a result of the swinging movement of part 19 caused by engagement of bolt 13 with the keeper as the door is closed. Projection 66 is so dimensioned as to be movable out of the path of keeper induced swinging movement of part 19 when connecting element 46 is actuated downwardly while in its broken line position of Fig. 5. That is, when element 46 is in its broken line position, and is then actuated downwardly by counter clockwise movement of element 45, this so positions element 46 that the movement of part 19 effected by engagement of the bolt with the keeper during closing of the door no longer can serve to deflect element 46 and the associated element 49 to their full line positions of Fig. 5.

The configuration of latching surface 22 of the keeper can be defined most readily by describing its relation to the door carried parts when the keeper and bolt are in their latched relative positions of Figs. 2*c* and 4. More specifically, when the parts are in that relation, latching surface 22 of the keeper preferably extends substantially arcuately about the axis of pin 29, that is about the pivotal axis of bolt 13 and bolt carrying member 19. For best results, the surface 22 may be cylindrical and very precisely centered about the defined axis, though it is possible to employ a straight rather than a curved surface, with that straight surface being tangential to an arc centered about the axis of pin 29. The surface 23 at the opposite side of the keeper may be curved at the same radius as surface 22, these two surfaces desirably being symmetrical with respect to the previously mentioned vertical central plane 28. The cylindrical safety notch surface 21 is parallel to the axis of pin 29, and has a radius equal to that of the engageable outer surface of bolt 13.

To now describe the operation of the illustrated latch mechanism, first assume that the door 10 is in open condition, and that the latch parts are in the unlocked full line positions of Fig. 5. As the door is then closed, bolt 13 first engages surface 23 of keeper 14, see Fig. 2*a*, and is deflected downwardly by the keeper to override its first projection, and then move upwardly into recess 21 to the safety catch position of Fig. 2*b*. Further closing movement of the door advances the bolt past the second keeper projection, so that the bolt may move upwardly under the influence of spring 33 to the Fig. 2*c* latched position. By virtue of the described configuration of latching surface 22, there is virtually no backlash in the mechanism as bolt 13 moves upwardly along surface 22 toward latched position.

The interengagement of bolt 13 and the keeper in their Fig. 2*c* positions acts to retain the door in closed condition, until the bolt is released by either the inside operator or the outside operator. As previously described, the actuation of the inside operator serves through strap 44 and crank 42 to swing part 19 and the bolt downwardly to the Fig. 2*d* position, and thus permit opening of the door. For releasing the bolt from the outside of the door, push button 41 is pressed inwardly from its Fig. 5 position to its Fig. 8 position, to swing element 45 in a counter-clockwise direction to its Fig. 8 position, with that swinging movement being transmitted through ear 47 of connector member 46 to projection 39 of part 19. The part 19 is thus swung downwardly as seen in Fig. 9, to release the bolt and permit opening movement of the door. When the push button is released, spring 33 returns part 19 upwardly, and spring 63 returns connector member 46 upwardly relative to element 49.

If it is now desired to lock the door, locking member 49 is swung to its Fig. 5 broken line position by actuation of either the inner control member 51 or the outer key operated control member 52. This swinging movement of locking member 49 correspondingly swings the carried connector member 46 to its Fig. 5 broken line position, in which its lower turned ear 47 is moved to the right of projection 39 of part 19. When connector member 46 is in this position, counter-clockwise swinging movement of element 45 upon inward movement of push button 41 still serves to actuate connector 46 downwardly, but such downward movement of the connector member does not correspondingly actuate part 19 and the bolt. This is true because, in locked position member 46 is located above a recessed portion 66′ of part 19, rather than above projection 39, so that ear 47 of connector 46 does not engage and actuate downwardly the projection 39 upon downward movement of connector 46. Inward movement of push button 41 then serves merely to move connector 46 downwardly into recess 66′, without releasing the bolt.

If the door is closed while the lock mechanism is in its Fig. 5 broken line (locked) position, the keeper overriding deflection of the bolt during closing movement of the door serves to automatically actuate parts 46 and 49 to their Fig. 5 full line (unlocked) position. Specifically, as bolt 13 engages and overrides the keeper, the bolt is deflected downwardly, to correspondingly swing the bolt carrying part 19 in a counter-clockwise direction (as seen in Fig. 8), so that upper projection 66 of part 19 engages projection 65 of element 46, to swing element 46 and the associated locking element 49 in a clockwise direction (as seen in Figs. 5 and 8) to the Fig. 5 full line position.

If, however, push button 41 is pressed inwardly during such closing movement of the door (with the mechanism locked), the keeper induced bolt deflection is then ineffective to unlock the mechanism, so that the mechanism remains in locked condition. This is true because the inward movement of push button 41 acts to move connector member 46 downwardly within recess 66′, so that projection 65 is out of the path of swinging movement of projection 66, and the keeper induced deflection of bolt 13 and part 19 therefore has no effect on connector member 46. As a result, the door may be locked without the use of a key, merely by depressing inner element 51 to swing locking element 49 to its Fig. 5 dotted position, and then pressing push button 41 inwardly while the door is being closed.

In the latched condition of the apparatus, as shown in

Fig. 2c, the dovetail lug **15** bears downwardly against keeper **14**, while bolt **13** bears against the keeper in a direction having an upward component (i. e. a component in the reverse vertical direction). As previously mentioned, it is rather important for assuring a most effective latching action that the pivotal bolt **13** be mounted in a particular relation to lug **15**. Specifically, the bolt is so mounted that its keeper engaging portion **13***a* is offset vertically with respect to the axis of the bolt in the same vertical direction (downwardly as shown), as the direction in which lug **15** bears against the keeper. By virtue of this arrangement, any vibration of the parts in use can not have the effect of causing the bolt to ride downwardly along keeper surface **22** toward unlatched position, as often occurs where the lug and bolt are not positioned in this unique relation.

I claim:

A dovetail latch mechanism comprising a keeper adapted to be mounted to a support member, and a bolt structure to be mounted to a door which is mounted for horizontal swinging movement relative to said member in opening and closing directions; said keeper having a generally upwardly facing first bearing surface at its upper side having a portion disposed essentially parallel to the direction of essentially horizontal closing movement of the door; said keeper having a second surface facing generally downwardly at its underside, said bolt structure including an essentially vertically extending mounting plate adapted to be mounted on the free edge of the door and containing a slot, means forming a projected downwardly facing bearing surface on said plate at the outer side thereof and engageable downwardly against said first keeper surface, a swinging plate-like arm pivotally attached to the inner side of said mounting plate for swinging movement parallel to the mounting plate about an essentially horizontal axis which remains continuously fixed relative to the mounting plate, a bolt projecting horizontally from said arm and through said slot at a level spaced substantially below the level of said axis and substantially below the level of said downwardly facing projected bearing surface and carried by the arm for swinging movement therewith in latching and antilatching directions about said fixed axis, said keeper being adapted to pass vertically between said projected bearing surface and said bolt upon door closing movement with said first and second bearing surfaces on the keeper engaging said projected bearing surface and said bolt respectively, said second keeper surface having one portion inclined in a first direction and adapted upon door closing movement to initially engage the bolt and deflect it in antilatching direction and away from said projected bearing surface, said second keeper surface having a second portion inclined in the opposite direction and along which the bolt will then advance in latching direction into holding engagement with said second inclined portion to retain the door closed, said bolt having a surface facing at an upward inclination substantially directly toward said fixed axis and which bears toward said axis against said second inclined portion of said second keeper surface in latched position of the bolt, said second inclined portion of said second keeper surface being curved essentially arcuately in correspondence with the path of pivotal movement of the engaged bolt surface about said fixed axis, and a spring continuously urging said arm and bolt in latching direction to yieldingly resist said deflection thereof in antilatching direction and then latch the bolt in holding engagement with said second inclined portion of said second keeper surface, said bolt in its fully latched position creating a direct pull at an upward inclination toward said axis and against said second inclined portion of the second keeper surface to resist opening movement of the door and at the same time hold said projected bearing surface of the mounting plate tightly against said first keeper surface in a tight dovetail relation, said fixed pivotal axis of the bolt, in all conditions of the mechanism, being spaced above the level of said projected bearing surface and said first keeper surface, and said projected bearing surface and the engaging first keeper surface, in latched condition of the mechanism, having engaging portions intersecting a line extending directly between said axis and the keeper engaging portion of the bolt so that the bolt pulls the keeper at an upward inclination directly toward and into tight engagement with said projected bearing surface.

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