Sept. 25, 1951 W. A. ENDTER 2,569,040

LATCHING MECHANISM

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Fig. 1.

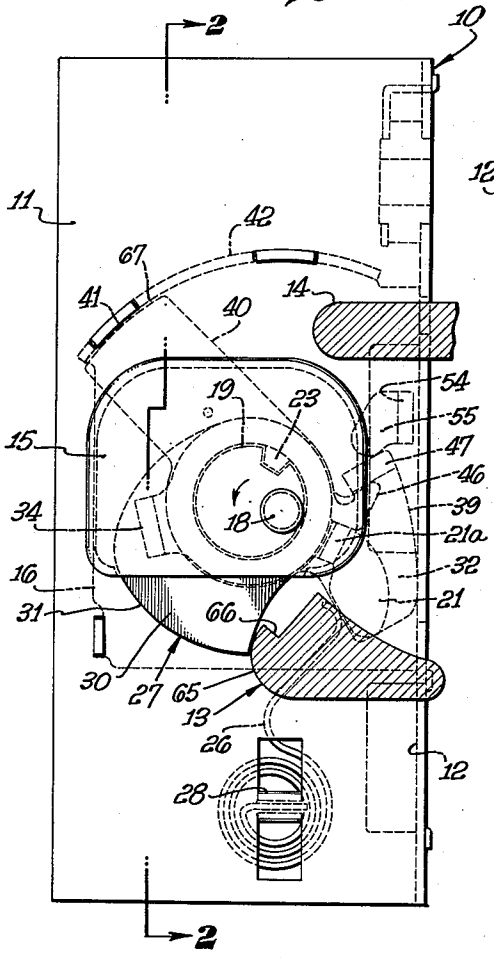


Fig. 2.

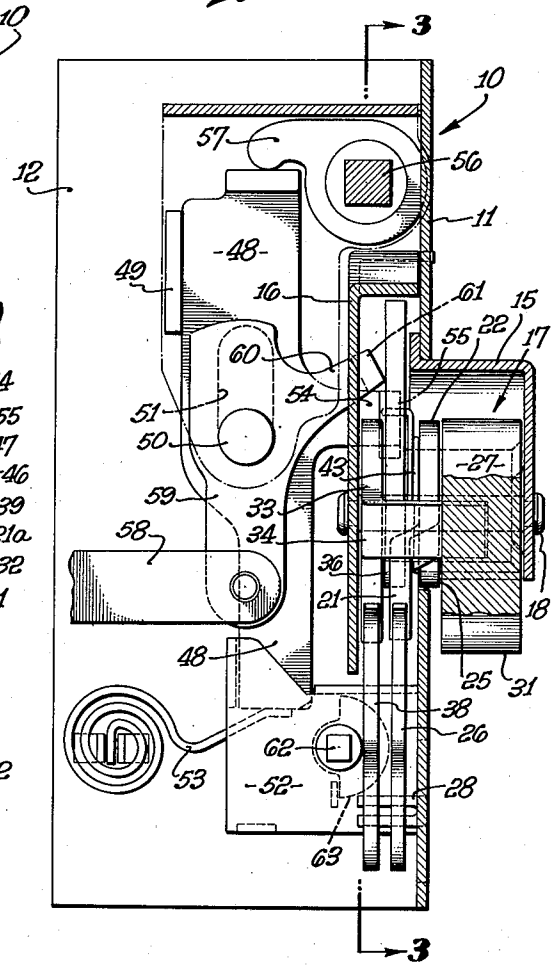


Fig. 7.

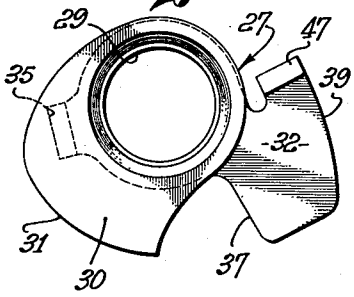


Fig. 8.

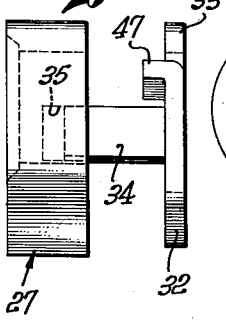


Fig. 9.

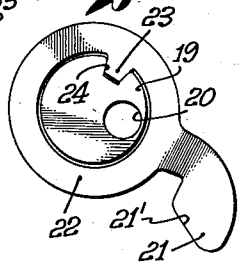
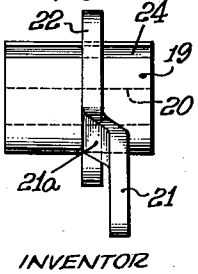


Fig. 10.



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Fig. 3.

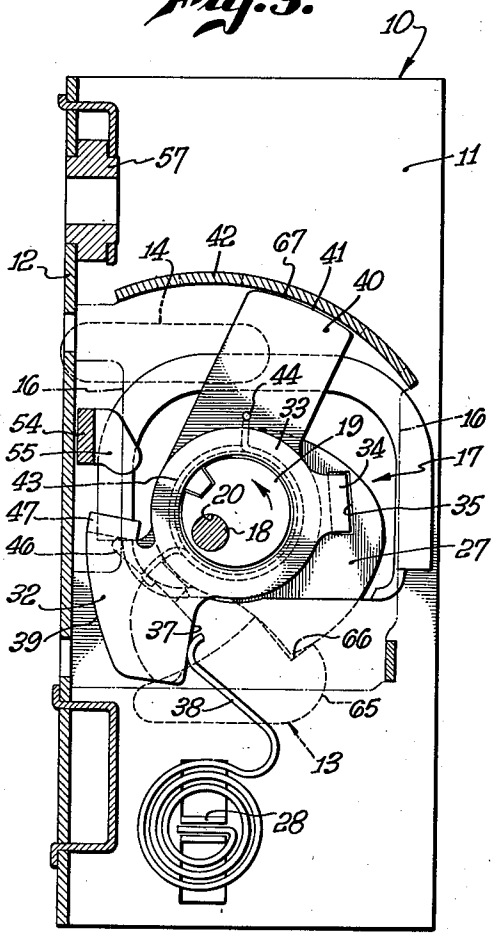


Fig. 4.

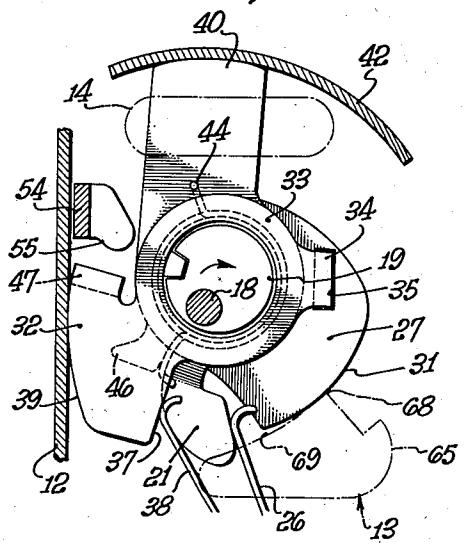


Fig. 5.

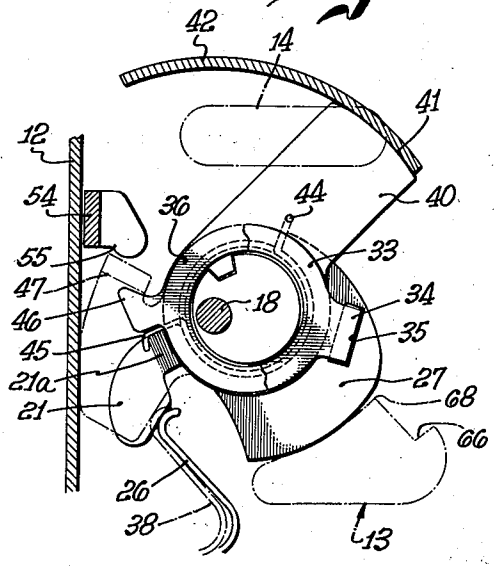
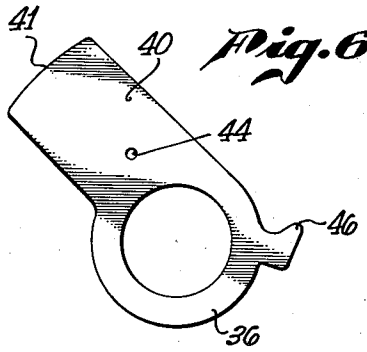


Fig. 6.



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Fig. 11.

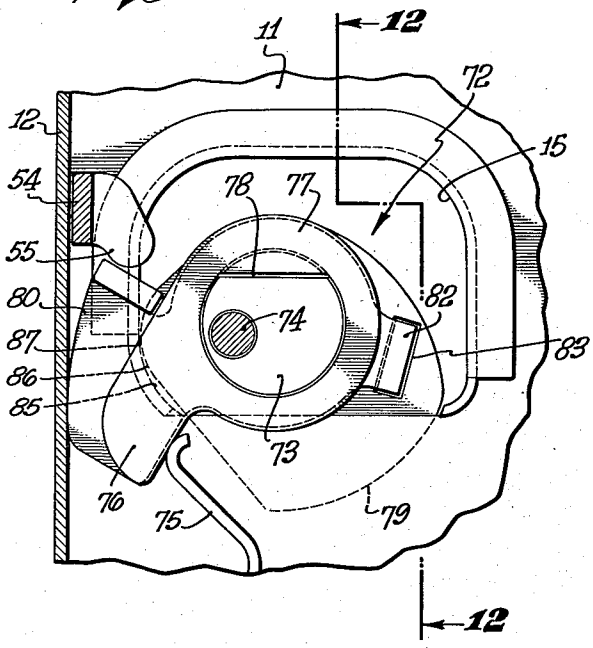
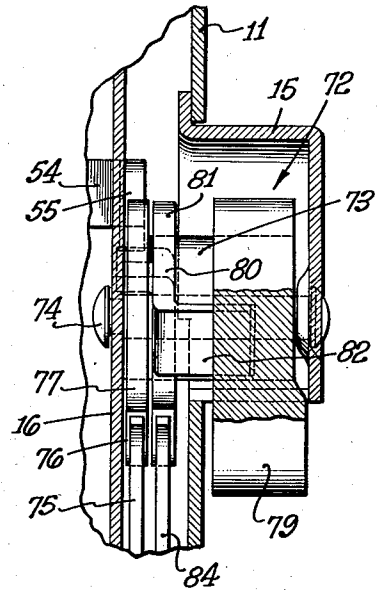


Fig. 12.



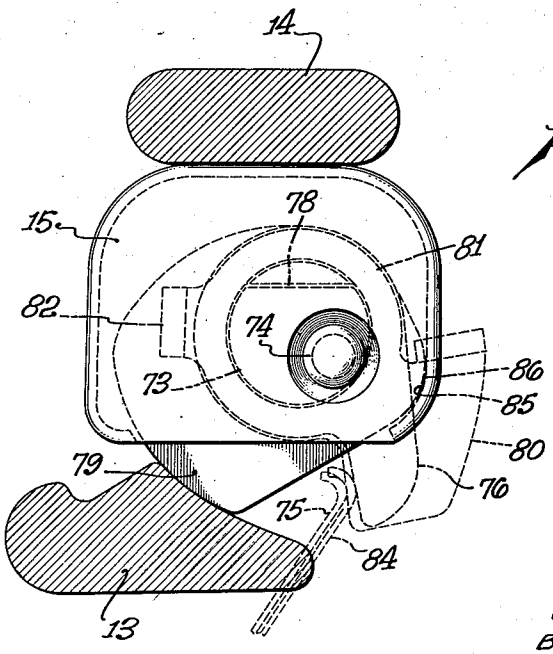


Fig. 13.

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Fig. 14.

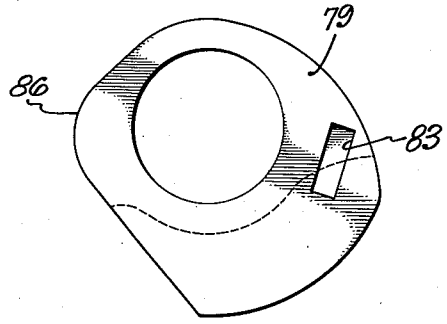


Fig. 15.

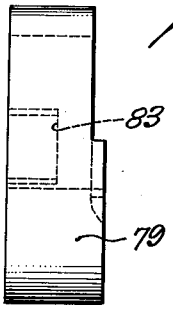


Fig. 16.

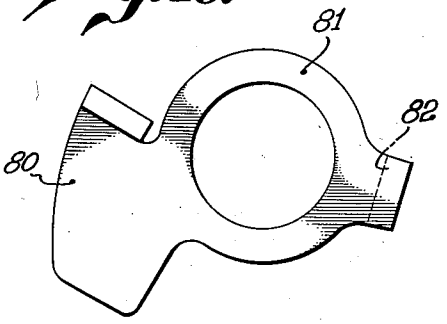


Fig. 17.

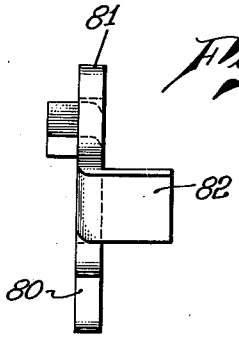


Fig. 18.

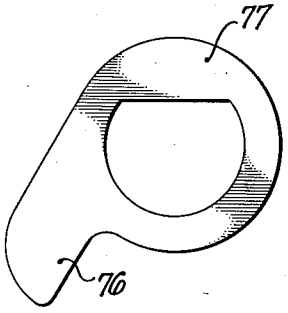
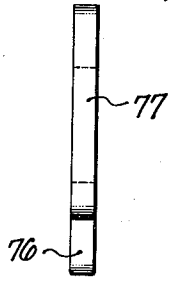


Fig. 19.



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Patented Sept. 25, 1951

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UNITED STATES PATENT OFFICE

2,569,040

LATCHING MECHANISM

Waldemar A. Endter, Long Beach, Calif.

Application June 1, 1945, Serial No. 597,097

8 Claims. (Cl. 292—220)

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This invention pertains to improvements in latch mechanisms adaptable generally for latched association of relatively movable members, or closures with relatively stationary structures. Particularly the invention contemplates important advances and improvements in automobile door latches and locks, and will be described typically as embodied in that form of latching mechanism.

One of my major objects is to provide improvements intended to simplify the construction and operation of the type of mechanisms disclosed in my application Serial Number 524,163, filed February 28, 1944, on Latch Devices, now Patent No. 2,376,992. Reference may be had to that patent for a more complete explanation of the fundamental principles and novelty of this general type of latch mechanism. For present purposes it will suffice to observe that its essential characteristics are predicated upon (1) absolute assurance that after the bolt enters the keeper, it will not accidentally disengage and can only be released by manual operation, and (2) the provision of a take-up mechanism operable when the bolt is securely within the keeper, to crowd the door against the pillar by movement independent of the bolt and keeper, or to exert opposing thrusts against the closure and bolt independently of any requirement for bolt movement along the keeper.

As indicated, the present mechanism employs the fundamental principles of the latches disclosed in said patent, but presents important advantages, particularly with respect to the self-acting take-up means, in simplicity and economy of construction and the assured ease and security of its operation. One major improvement is the provision of eccentric means primarily for accomplishing the take-up action, and also as an operative mounting for certain associated parts of the mechanism that permits their reduction to a few simple parts in compact and easily assembled arrangement.

Another feature is the employment of the eccentric to actuate and control a means for dogging or holding the bolt against anti-latching movement with relation to the keeper. Particularly the invention contemplates utilizing the eccentric means as a mounting for a dogging element, all in a manner such that in the bolt latching position of the eccentric means the dogging element is maintained in holding position, whereas when the parts are operated to disengage the latch, the dogging element is retracted in predetermined relation with the movement of the eccentric means.

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In its preferred form, the invention embodies an eccentric center or shaft upon which the bolt is mounted for relative rotation and also for bodily movement within the effective or operative range of the shaft eccentricity. The capacity of the bolt for relative rotation permits its independent movement when first engaging and entering the keeper. By spring-urging the eccentric shaft, the bolt, upon entering the keeper, is thrust against it while the eccentric simultaneously reacts against the door to crowd it in a closing direction.

By mounting the dogging element on the eccentric shaft, and by providing suitable stop means determinative of the position of the eccentric means in the open or released condition of the latch, the dogging element at the time is maintained in released position. However, as the bolt is closed into the keeper, the accompanying effect on the eccentric is to cause it to exert, as explained, a latching thrust against the bolt and simultaneously to urge the dogging element in a holding direction so that the bolt is held against anti-latching movement from any position reached as it progressively advances in the keeper. Thus the bolt not only is retained against inadvertent release out of the keeper, but it is held against retrograde movement as it advances in the keeper in response to the take-up action of the mechanism.

All the various features and objects of the invention, as well as the details of a typical and preferred embodiment, will be understood to better advantage from the following description of the accompanying drawings, in which:

Fig. 1 is an outside elevation of the latch mechanism, the keeper parts appearing in section;

Fig. 2 is a cross-section on line 2—2 of Fig. 1;

Fig. 3 is a section on line 3—3 of Fig. 2;

Figs. 4 and 5 are views illustrating progressive and relative positions of the bolt, keeper and holding dog as the bolt advances into the keeper;

Fig. 6 shows the holding dog;

Fig. 7 is an end view showing the bolt and the bolt control element in the enterengaging relationship which they occupy in the mechanism;

Fig. 8 is a side view of Fig. 7;

Fig. 9 is an end view of the eccentric center or shaft and its control lever;

Fig. 10 is a side view of Fig. 9;

Fig. 11 is a fragmentary inside view showing the bolt and eccentric parts in a variational form of the invention;

Fig. 12 is a section on line 12—12 of Fig. 11;

Fig. 13 is a fragmentary outside view showing the parts of Fig. 11 in an initial latched position;

Fig. 14 is a view showing one end of the bolt;

Fig. 15 is an edge view of the bolt as viewed from the right of Fig. 14;

Figs. 16 and 17 are face and edge views, respectively, of the bolt control lever; and

Figs. 18 and 19 are face and edge views, respectively, of the eccentric control lever.

Referring first to Figs. 1 and 2, the latch mechanism and associated controls are shown to be contained within the usual angular case **10** comprising flange **11** which supports the latching mechanism proper, and flange **12** inside which is mounted the hereinafter described inside and outside operators. As will be understood, the case **10** is adapted to be secured in the customary manner to one of two relatively movable members to be latched, for example to the door frame. On the other member, for example the stationary door pillar, are mounted the keeper parts consisting of the bolt-engaged keeper **13** and the horizontally projecting lug **14** engageable by the bolt housing **15** and against which the housing is pressed by virtue of the bolt thrust against the keeper **13** in the positions of the parts represented by Figs. 3, 4 and 5.

The bolt housing **15** is shown to be attached in the usual manner to the flange **11** and to be open at its lower end directly above the keeper **13**. Attached to the inside of flange **11** is a supporting plate or deck **16**, the outline of which is illustrated by the dot-dash lines in Fig. 3. As best illustrated in Fig. 2, the eccentric means, bolt, holding dog and the control levers, generally indicated at **17**, are mounted on pin **18** extending through and supported by the housing **15** and deck **16**. An eccentric center or shaft **19**, see Figs. 9 and 10, is rotatable on the pin **18**, the latter passing through hole **20** extending longitudinally through the shaft in offset relation to its axial center.

The rotative position of the shaft **19** about pin **18** is controlled by lever **21** carried by ring or sleeve **22** held against rotation relative to the shaft by the reception of lug **23** within the longitudinal groove or way **24** in the shaft. By reference to Fig. 2 it will be seen that the lever arm **21** projects inwardly in offset relation to the sleeve **22**, thus permitting it to be positioned within the case opening **25** and the lever **21** to extend inside the case. Face **21'** of the lever arm is engaged by spring **26** suitably supported at **28**, the tendency of the spring constantly being to rotate the shaft **19** about the pin **18** in the direction of the arrow in Fig. 1, and as will appear, to exert opposing thrusts against the closure member and bolt when the latter is engaged against the keeper **13**.

The bolt **27** is rotatably carried on the shaft **19** at the outside of sleeve **22** within the housing **15**. As best illustrated in Fig. 7, the bolt has a shaft receiving opening **29** and a downwardly projecting head **30** with an arcuate keeper engaging face **31**.

The bolt is controllable by a lever arm **32** integral with sleeve **33** which is rotatable on the shaft **19** adjacent the deck **16**, see Fig. 2. The bolt and sleeve are interlocked for rotation together, but in a manner permitting their manufacture and assembly as separate units, by a sleeve-carried arm **34** received within recess **35** in the bolt, the arm **34** extending outside and bridging across sleeve **22** and the holding dog sleeve **36**, again is clearly shown in Fig. 2. The face **37** of arm **32** is engaged by a second spring **38** supported by the mounting at **28**, the effect of the spring constantly being to resist rotation of the bolt **27** on the eccentric shaft in an anti-latching direction. In the open position of the latch shown in Fig. 1, the curved edge **39** of arm **32** engages the case flange **12**, the latter thus serving as a stop to arrest rotation of the bolt in an advancing or latching direction.

The ring or sleeve **36**, see Fig. 6, rotatable on the shaft **19** between sleeves **22** and **33**, carries the holding or dogging lever **40** having a curved end surface **41** engageable against the arcuate stationary abutment **42** which may be formed as an end wall of the deck **16** and which has its center of curvature at the axial center of the pin **18**. The holding dog **40** is constantly urged to rotate about the eccentric shaft clockwise as viewed in Fig. 3 by suitable means, as for example the coil spring **43** placed about the shaft between sleeves **22** and **36**, one end of the spring being received within opening **44** in the holding dog, and the opposite end of the spring bearing at **45** against the "bent" or angular portion **21***a* of arm **21**. Sleeve **36** carries a projection **46** which lies directly beneath and is engageable by lug **47** on the bolt control lever **32**. Projection **46** in turn is engageable with the angular portion **21***a* of the offset eccentric shaft control lever **21**, as clearly illustrated in Fig. 1.

The invention broadly contemplates the provision of any suitable mechanism controllable from the inside and outside of the door, to actuate the described latch parts, and directly or indirectly to lock the bolt against retraction from the keeper. Merely as illustrative, the control mechanisms appearing in Fig. 2 are shown to comprise a virtually reciprocable link **48** guided in its sliding movement against lug **49** and by pin **50** extending through slot **51** in the link. The lower end of the link extends within the lock mechanism housing **52** and is engaged by spring **53** which normally maintains the link in the illustrated normal or retracted position. The link carries a lever arm **54**, the turned end **55** overlies and is engageable with lug **47** on the bolt control lever arm **32**.

The bolt is releasable from latched association with the keeper by an outside operator or door handle, the spindle **56** of which carries arm **57** engageable with the upper turned end of link **48** to thrust the link downwardly against the resistance of spring **53** and cause arm **55**, by its engagement with the bolt control lever **32**, to rotate the bolt in an anti-latching direction. Simultaneously with the bolt rotation, the holding dog **40** and eccentric shaft **19** are rotated in a corresponding direction, by virtue of the engagement of lug **47** with projection **46**, and engagement of the latter against portion **21***a* of the lever arm **21**.

The inside operator, controlled by the usual link **58**, comprises a lever **59** pivoted on the pin **50** and having an arm **60**, the turned end portion **61** of which is engageable against the end portion **55** of the arm **54**. Upon retractive movement of the link **58**, arm **60** is swung down to rotate the bolt and associated latch parts in a releasing direction as just explained above.

Effective locking of the bolt against retraction from the keeper may be accomplished by locking the link **48** against downward or bolt releasing movement. Suitable locking mechanism typically may comprise a key-controlled spindle **62** carrying a flange segment **63** which, when turned in a counterclockwise direction as viewed in Fig. 2, is

brought beneath the link 48 to prevent its downward movement. The view shows the flange segment in its normal or unlocking position.

In considering the operation of the latch mechanism, and with particular reference to the actions and effects resulting from movement of the bolt into latched association with the keeper, assume first the parts to be in the positions of Fig. 1 wherein the door member is open and the bolt disengaged from the keeper. As the door is closed, the bolt first engages the end face 65 of the keeper and is cammed upwardly against the resistance of spring 38 to the position of Fig. 3, in which the bolt is received within a safety catch recess on notch 66 in the keeper. From the foregoing description, it will be understood that by virtue of their interengagement through the lugs 47, 46 and angular portion 21a, the bolt, holding dog and the eccentric control sleeve 22 (and therefore the eccentric shaft itself) rotate with the bolt as it is thus displaced by engagement with the keeper. At this point it may be observed that in both the open position of Fig. 1, and the safety catch position of Fig. 3, the bearing end 41 of the holding dog is withheld from engagement with the abutment 42, as illustrated by the clearance space at 67.

Upon further closing movement into the keeper, the bolt rides over the high point 68 and, under the influence of spring 38, snaps down into the keeper, first to the position of Fig. 4, at substantially which point surface 39 of the bolt control arm 32 will be brought into engagement with the case flange 12. Upon reaching the initial latched position of Fig. 4, however, the bolt and its control lever are permitted to rotate ahead of the holding dog and eccentric shaft due to the fact that corresponding rotation of the latter parts is arrested by bolt engagement with the keeper. The resultant disengagement of lugs 46 and 47 frees the holding dog for turning on the eccentric shaft and to be brought into holding engagement with the abutment 42. Likewise, the eccentric shaft is freed for bodily movement under the influence of spring 26, the effect of which is to rotate and bodily displace the eccentric, and in so doing to exert opposing thrusts, one through the bolt against the keeper, and the other through the pin 18 against the door member, to force it in a closing direction. As will be understood, by reason of the mechanical characteristics and advantages of the eccentric, it is possible in this manner to exert against the door a constant and strong closing force.

While spring 26, acting through the eccentric, thus tends to move the door in a closing direction and with relation to the bolt engaged against the keeper, spring 38 continuously tends to rotate the bolt further into the keeper, with the result that as the door looseness is progressively taken up by crowding it against the pillar, the bolt progressively advances into the keeper, and ultimately to the full home position shown in Fig. 5. The dogging element 40 simultaneously is advanced along and maintained by spring 43 in end engagement with the abutment 42 to effectively resist and positively hold the eccentric against bodily movement in a direction permitting retrograde or anti-latching movement of the bolt from each most advanced position which it reaches in the keeper. It is important to observe that the resistance to anti-latching movement of the parts afforded by the holding dog 40, is a radial reactive force having no component of sufficient magnitude that any combination of pressure and vibration tending to open the door, will displace the dog from its holding thrust against the abutment. Thus when the bolt has entered the keeper, it can only be released by intentional manual manipulation of the inside or outside of the described inside or outside operators.

Referring now to Figs. 11 to 19 illustrating the variational form of the invention, the assembly 72 is shown, as in the first described form, to comprise the eccentric center or shaft 73 rotatable on pin 74 terminating in the housing 15 and deck 16. The eccentric is urged in a bolt-latching direction by spring 75 acting against lever arm 76 on sleeve 77 engaged at 78 against the flattened surface of the eccentric shaft so that the lever and shaft rotate together. The bolt 79, rotatably carried on the shaft 73 within the housing 15, is controllable by lever 80 integral with the eccentric mounted sleeve 81 at the inside of the case flange 11, the sleeve arm 82 being received within the bolt opening 83 so that the control lever 80 and bolt rotate together. Spring 84, engaging the control lever 80, constantly resists anti-latching rotation of the bolt on the eccentric. Functionally the control lever 80, sleeve 81 and bolt 79 constitute a unitary assembly, the parts of which in the broad contemplation of the invention, may be made as a single piece. For manufacturing purposes, and to facilitate assembly, it may be desirable to form the parts separately, substantially as illustrated.

From the description of the first described form of the invention, it will be understood that the function of the spring 75, acting through the lever 76 and sleeve 77, is to urge the eccentric and bodily displace the bolt in a latching direction, and that spring 84, acting through the lever 80, sleeve 81 and arm 82, resists any tendency for the bolt to rotate out of the keeper. As before, the parts are releasable from latched association with the keeper by manual actuation of lever arm 54 on the sliding link.

The principal features of distinction and importance in this variational form are the provision of dogging means carried directly by the bolt itself, or formed integrally with the bolt, and the location of the dogging action at the side of the bolt and eccentric assembly generally opposite the position of the first described dogging element. In this latter connection it may be mentioned that the dogging means may have any desired location about the bolt and eccentric assembly, as illustrated by the variances in this respect between the two illustrated embodiments.

Referring to Figs. 11 and 13, the inner surface of the housing 15 is shown to be arcuately curved at 85 about the center of pin 74 and to be engageable by a curved surface shoulder 86 on the bolt, see Fig. 15, the curvature of the shoulder being somewhat less than the curvature of surface 85. The relationship between these surfaces and the centers of the shaft 73 and pin 74 may be substantially as laid out in Fig. 11.

It will be observed that in the open or unlatched positions of the parts as shown in Fig. 11, a clearance exists at 87 between surface 85 and the bolt shoulder 86, thus permitting unopposed rotation of the bolt as it is displaced by movement against the keeper, and then reversely projected into the keeper to the initial latched position of Fig. 13. In the latched condition of the parts, the bolt shoulder 86 is brought to bear against surface 85 to resist bodily displacement

of the bolt and eccentric in an anti-latching direction. To illustrate, the position and working relation of the eccentric to surface **85** is such that any tendency for the bolt to be displaced away from the keeper **13** as a result of the keeper pressure against the bolt, is blocked by the thrust of the bolt shoulder **86** against the surface. Simultaneously with any tendency for looseness to occur in bolt engagement against the keeper, the thrust of spring **84** tends at all times to rotate the bolt further into the keeper. Thus the bolt is held securely latched against retraction under the influence of any pressure or vibration tending to open the latched closure.

I claim:

1. A latching mechanism applicable to a relatively stationary member and a movable closure member, comprising a rotatable bolt to be carried by one of said members and engageable with a keeper carried by the other of said members, eccentric means mounting said bolt and exerting opposing thrusts against the bolt and said one member to hold the bolt against the keeper and at the same time to bodily move the closure member toward said stationary member, an abutment on said one member stationary relative to the bolt, and dogging means rotatable with the bolt and engageable with said abutment to restrain reverse movement of said eccentric means.

2. A latching mechanism comprising an eccentrically rotatable bearing, a bodily movable bolt actuated by said bearing and engageable with a keeper, yielding means rotatably urging said bearing to thrust the bolt against the keeper, and eccentrically operable dogging means actuated by said bearing to hold the bolt against anti-latching movement.

3. A latching mechanism comprising eccentric means including an eccentrically rotatable shaft and a sleeve, a bodily and rotatably movable bolt carried by said sleeve and engageable with a keeper, yielding means rotatably urging said shaft to thrust the bolt against the keeper, means forming a stationary abutment, and a dogging element carried by said shaft and engageable with said abutment to hold the bolt against anti-latching rotation.

4. A latching mechanism comprising eccentric means including an eccentrically rotatable shaft and a sleeve, a bodily and rotatably movable bolt carried by said sleeve and engageable with a keeper, yielding means rotatably urging said shaft to thrust the bolt against the keeper, means resisting but permitting anti-latching rotation of the bolt and sleeve relative to said shaft, means forming a stationary abutment, a dogging element carried by said shaft and engageable with said abutment to hold the bolt against anti-latching movement, said dogging element being yieldably urged against the abutment, and manually controlled means for retracting the bolt from the keeper and disengaging the dogging element from said abutment.

5. A latching mechanism comprising eccentric means including a shaft and a sleeve, a bodily and rotatably movable bolt carried by said sleeve and engageable with a keeper, yielding means tending to rotate said sleeve and bolt in a latching direction relative to the shaft, a second sleeve carried by the shaft, means maintaining said second sleeve against rotation relative to the shaft, and yielding means urging said second sleeve and shaft rotatably in a bolt latching direction.

6. A latching mechanism comprising eccentric means including a shaft and a sleeve, a bodily and rotatably movable bolt carried by said sleeve and engageable with a keeper, yielding means tending to rotate said sleeve and bolt in a latching direction relative to the shaft, a second sleeve carried by the shaft, means maintaining said second sleeve against rotation relative to the shaft, yielding means urging said second sleeve and shaft rotatably in a bolt latching direction, and interengaging means carried by said sleeves whereby anti-latching rotation of the bolt produces rotation in a corresponding direction of said second sleeve and the shaft.

7. A latching mechanism comprising eccentric means including a shaft and a sleeve, a bodily and rotatably movable bolt carried by said sleeve and engageable with a keeper, yielding means tending to rotate said sleeve and bolt in a latching direction relative to the shaft, a second sleeve carried by the shaft, means maintaining said second sleeve against rotation relative to the shaft, a third sleeve rotatable on said shaft, means forming a stationary abutment, a dogging element carried by said third sleeve and engageable with said abutment to hold the bolt against anti-latching movement, yielding means urging the dogging element against said abutment, and interengaging means carried by said sleeves whereby anti-latching rotation of the bolt produces rotation in a corresponding direction of said second sleeve and the shaft and also said third sleeve and the dogging element.

8. A latching mechanism comprising an eccentrically rotatable shaft, a bolt rotatable on said shaft and operable upon rotation of the shaft to releasably engage a keeper, means forming a stationary arcuate abutment, a dogging projection integral with said bolt and engageable with said abutment to hold the bolt against anti-latching movement, yielding means rotatably urging said bolt in a latching direction, and yielding means rotatably urging said shaft to thrust the bolt against the keeper.

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Number	Name	Date
119,374	Lee	Sept. 26, 1871
369,885	Shaw	Sept. 13, 1887
685,578	Deggim	Oct. 29, 1901
1,244,443	Hurd	Oct. 23, 1917
1,403,638	Roath	Jan. 17, 1922
2,029,197	Roedding	Jan. 28, 1936
2,376,992	Endter	May 29, 1945

FOREIGN PATENTS

Number	Country	Date
14,776	Great Britain	Oct. 31, 1887
810,192	France	Mar. 17, 1937