June 18, 1957 J. D. LESLIE 2,796,276

ROTARY BOLT DOOR LATCH

Filed June 23, 1954 2 Sheets-Sheet 1

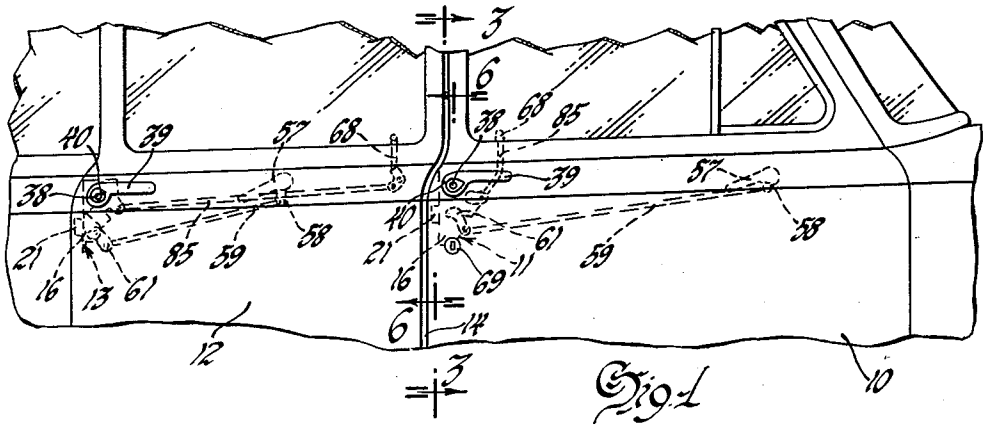


Fig. 1

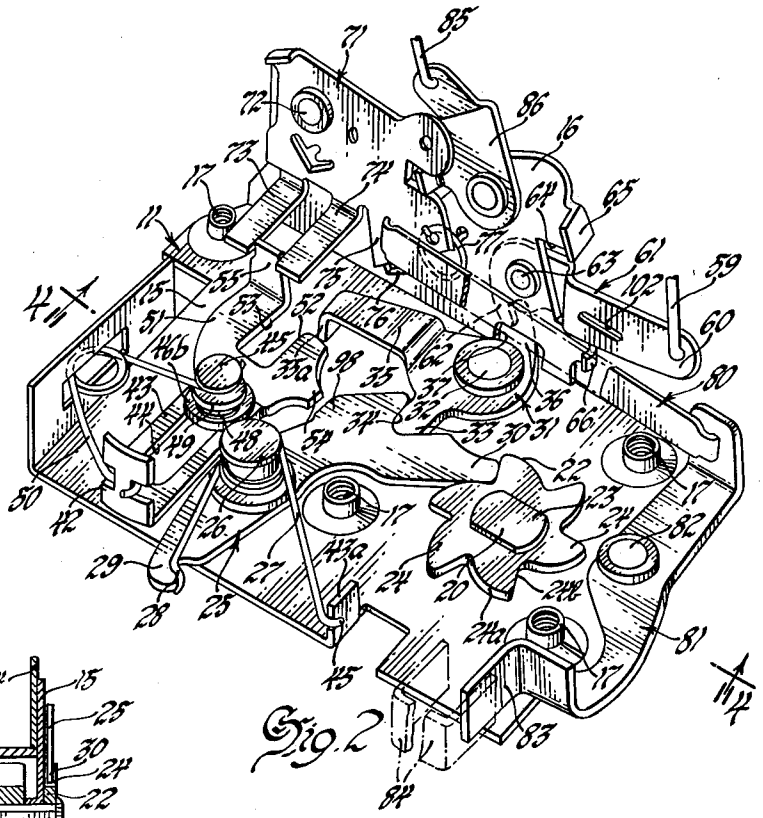


Fig. 2

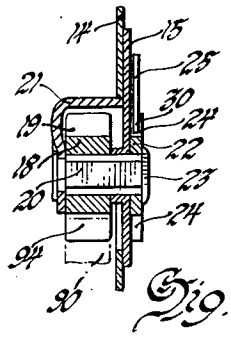


Fig. 5

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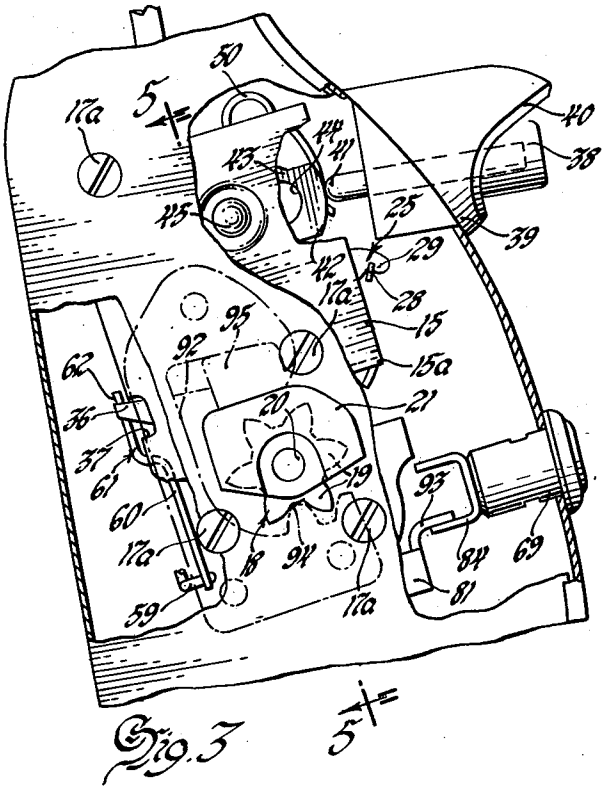


Fig. 3

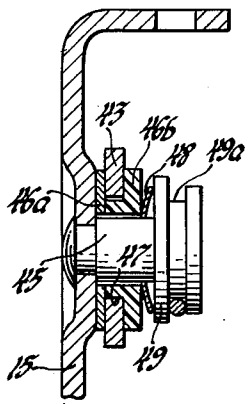


Fig. 4

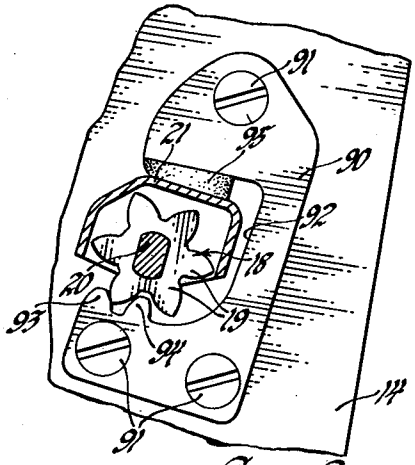


Fig. 6

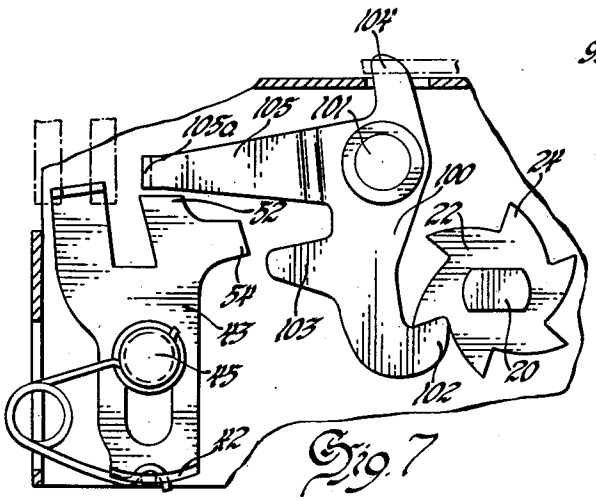


Fig. 7

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ROTARY BOLT DOOR LATCH

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Application June 23, 1954, Serial No. 438,676

5 Claims. (Cl. 292—280)

This invention relates to a door latch, and more particularly to a rotary bolt door latch for an automobile.

In the copending application of James D. Leslie et al., entitled "Rotary Gear Bolt Door Latch," filed November 16, 1953, as Serial No. 392,266, a novel latch mechanism is disclosed and claimed, including latch release mechanism utilizing an intermittent link pivotally mounted on a push button lever which itself is pivoted on the lock frame. The lever and link are swingable upon pivoting the push button lever to operate a detent and release the latch bolt, and the link is shiftable into and out of coupled relation with the detent for locking the door.

This invention provides an improvement over the latch structure shown in S. N. 392,266 by eliminating the push button lever. The improved latch disclosed and claimed herein has fewer parts while performing the same functions in a more efficient manner since friction is reduced by eliminating the lever and its pivotal mounting. Since these latches are made in large quantities, the elimination of the lever results in a substantial cost saving in a year's production of the latch, and the reduction of friction by eliminating one movable part results in easier push button operation of the latch.

In the present invention the intermittent link is slidably mounted directly on the latch frame for sliding and pivotal shifting movement, and preferably an anti-friction bearing, which may be in the form of a nylon roller, is utilized to assure easy sliding operation of the link.

In one form of the invention, the link is coupled through a multiplier lever to a detent member which is under compression when in engagement with the bolt part; and in a modified form of the invention, the link operates directly upon a detent which is under tension when in engagement with the bolt part.

Other features and advantages of the invention will be apparent from the following description and from the drawings, in which:

Fig. 1 is a fragmentary side elevational view of an automobile having the improved door latch therein;

Fig. 2 is an isometric view of the latch;

Fig. 3 is an enlarged section through the body pillar taken along the line 3—3 of Fig. 1;

Fig. 4 is an enlarged section showing the mounting means for the intermittent link on the latch frame;

Fig. 5 is a detail section through the rotary bolt taken along the line 5—5 of Fig. 3;

Fig. 6 is a section taken along the line 6—6 of Fig. 1 and showing the bolt and keeper; and

Fig. 7 is an isometric view of a modified form of the invention.

Referring now more particularly to the drawings, in Fig. 1 an automobile is shown having a front door **10** which is hinged at its front edge and which, adjacent its rear edge, carries a front door latch illustrated generally as **11**. The automobile also has a rear door **12** which is hinged at its front edge and which, adjacent its rear edge, carries a rear door latch **13**. Only the front door latch **11** is illustrated in detail. While the front and rear door latches are

basically the same, the rear door latch may eliminate the means for locking with a key, and may be modified by the addition of a protective "selective free wheeling" feature explained in detail in application S. N. 392,266. The front door latch bolt engages a keeper on a door pillar **14**, and the rear door is hingedly mounted on this pillar. A similar keeper is provided for the rear door latch.

Referring to Figs. 2–6, the latch parts are mounted on a frame having a body or plate portion **15** which, when the latch is mounted on the door, lies in a plane generally parallel to the jamb edge of the door, and a right angle flange portion **16** which lies in a plane generally parallel to the inner door panel. The plate portion **15** has countersunk threaded openings **17** through which screws **17***a* (see Fig. 3) extend for securing the latch frame to the jamb edge of the door.

The latch bolt **18** is in the form of a gear having a plurality of symmetrical and equally spaced teeth **19**, the bolt being mounted on the squared shank of a shaft **20** which is rotatably mounted on the frame plate **15**. A bolt housing **21** is riveted to the outer surface of the plate **15** and rotatably supports the outer end of shaft **20**. The housing **21** and the bolt **18** project out of the door through an opening provided in the edge thereof, and the bolt and housing engage a keeper structure to be hereinafter described to hold the door latched.

On the inner surface of the plate **15** a cam **22** is fixedly mounted on the shaft **20**, the end of the shaft being staked over at 23 to hold the parts in position. The bolt **18** and cam **22** are rigid with shaft **20**, and the shaft is freely rotatable in the latch frame **15** and bolt housing **21**.

Cam **22** has a plurality of equally spaced asymmetrical teeth **24** which are adapted to be engaged by a detent lever **25** to hold the bolt against rotation in one direction (counterclockwise as the parts appear in Fig. 2). The detent lever **25** is pivotally mounted upon a stud **26** which projects from the inner surface of the plate **15**, and a coil spring **27**, which is mounted on the stud **26**, has one end **28** engaging an ear **29** on the free end of the detent. The other end of the spring is anchored on a tab **15***a* bent from the frame **15**, and the spring biases the detent so that a foot **30** at the operating end of the detent is urged into engagement with the cam **22**.

When the detent foot **30** is in engagement with the cam **22**, as illustrated in Fig. 2, the door is held in latched position when closed. Of course, if the door is open, it may be closed without releasing the detent since the cam and bolt may rotate in a clockwise direction. Each of the cam teeth **24** is provided with a sloping cam surface **24***a*, and upon rotation of the cam and bolt in a clockwise direction, the detent **25** rides up over the sloping surface **24***a*; however, counterclockwise rotation of the cam and bolt is prevented by the generally radial but arcuate blocking surfaces **24***b* of each cam tooth.

In order to open the door, it is necessary to pivot the detent **25** in a counterclockwise direction (Fig. 2) to free the bolt for counterclockwise rotation. This pivotal movement of the detent is accomplished through a multiplier lever **31** which is pivoted on a stud **32** and which has a detent actuating arm **33** engaged in a recess **34** in the detent lever. The multiplier lever also has a second relatively long arm **35** for operation by means of an outside actuator and a third relatively short arm **36** which extends through an opening **37** in the flange **16** for operation by an inside actuator.

The multiplier lever has several functions. In this latch the detent is placed under compression by engagement with the cam, and therefore the detent pivot **26** is outboard of the cam **22**, so that it is necessary to change the direction of the door opening force. This force is originally exerted on the push button in a direction inboard of the car, and the multiplier lever changes the direction of the

force to move the detent out of engagement with the cam tooth. The multiplier lever arm 36 also transmits and reverses the direction of motion of the inside actuator, and the lever is so arranged that it permits "free wheeling" of an intermittent link which will be hereinafter described.

Operation of the latch from outside the car is accomplished by means of a push button 38 (Figs. 1 and 3) which is slidable in a fixedly mounted handle 39 on the outer door panel. As shown in Fig. 3, the handle has an overhanging or awning portion 40 which extends outwardly beyond the push button and which shields the push button from rain and snow, and also provides a safety feature in that it protects the push button against actuation should an object strike the side of the car or should the car turn over on its side.

The push button acts through a push rod 41 which abuts a flange 42 turned from the outer end of an intermittent link 43. This link is mounted for horizontal sliding movement on the frame 15 and for pivotal shifting movement in vertical directions. Link 43 is formed with an elongated slot 44 through which extends a stud 45. This stud projects through the frame 15, and the head of the stud is staked over the frame as shown in Fig. 4, the shank portion of the stud forming a shoulder so that the frame 15 is clamped between the shoulder and the staked head to mount the stud nonrotatably on the frame. A rolling bearing, which preferably is formed of nylon, is rotatably mounted on the shank of stud 45. The bearing includes a washer 46*a* adjacent the frame body 15 and a roller portion, a head 46*b* and a reduced shank 46*c* engaging the face of the washer 46*a* so that the surface of the shank forms a peripheral groove 47 seating the opposite edges of slot 44. A spring washer 48 is located between the exposed surface of the rolling bearing 46 and the head 49 of the stud 45 to hold the bearing and the link 43 close against the surface of frame plate 15. This anti-friction mounting provides for easy longitudinal sliding movement of the link on the bearing, the nylon bearing permitting movement of the link therealong with a minimum of friction and without jamming. Since the bearing is rotatable on the stud and since the friction imposed by the rotatable mounting and by the spring washer 48 is relatively light, pivotal shifting movement of the link 43 is permitted about the axis of stud 45. A spring 50 urges the link toward the flange 16 of the latch frame, the spring being hooked into a groove 49*a* in the head 49 of stud 45.

The inner end of the link 43 is formed as a fork having spaced arms 51 and 52 separated by a slot 53. On the bottom of the arm 52 is a projection 54 which performs an undogging or unlocking function to be hereinafter described, and on the free end of arm 51 is a bent tab 55 which is part of the locking structure to be hereinafter described.

When the push button 38 is operated to open the door from outside the car, push rod 41, acting against flange 42 on the link 43, causes longitudinal sliding movement of link 43 so that the free end of arm 52 engages a bent tab 35*a* at the end of arm 35 of multiplier lever 31, pivoting the multiplier lever in a clockwise direction and the detent lever 25 in a counterclockwise direction so that detent foot 30 moves out of blocking relation to cam 22 and the bolt 18 is freely rotatable. With the parts in this position, the resilient weatherstrip which seals the door will force the door open slightly.

The inside unlatching mechanism includes a remotely located inner turn handle 57 (Fig. 1) connected by a link 58 to a remote actuating rod 59. The rear end of this rod is connected to an arm 60 of a remote lever 61 which is formed as a bell crank and is pivoted intermediate its ends by a stud 63 on the flange 16 of the latch frame. The other arm 62 of the remote lever extends adjacent arm 36 of multiplier lever 31. When the remote handle 57 is turned, lever 61 is pivoted in a counterclockwise direction (Fig. 2) to operate the multiplier lever 31 and the detent 25 and to free bolt 18. The remote lever operates in a recess 64 in the flange 16, and tabs 65 and 66 which are bent from the flange at opposite sides of the recess 64 provide stop means to limit the movement of the remote lever.

The latch may be locked from inside the car by means of a conventional garnish molding push button 68, or from outside the car by means of a key actuated lock cylinder 69 (Fig. 1).

The locking means includes a trip lever 71 which is pivoted on the flange 16 on a rivet 72. The trip lever has spaced prongs 73 and 74 which are bent at right angles to lie in a plane parallel to the plate 15 and which straddle the tab 55 which is bent from intermittent link arm 51. The trip lever is movable about the axis of rivet 72 between an unlocked position (Fig. 2) and a locked position defined by a stop tab 75 which is bent from lever 71 and extends through a slot 76 in the flange 16. The opposite ends of the slot cooperate with the tab to stop movement of the trip lever, and an overcenter spring 77 holds the lever in either its locked or unlocked position. In Fig. 2 trip lever 71 is in unlocked position, holding the longitudinally and pivotally movable intermittent link 43 in a position wherein arm 52 thereof is aligned with the tab 35*a* on the multiplier lever arm 35. With the parts in this position, operation of the outside push button will move the detent 25 out of engagement with the cam 22. If the trip lever 71 is pivoted in a counterclockwise direction to its locked position, carrying with it intermittent link 43 so that arm 52 is out of alignment with tab 35*a*, and upon operation of the outside push button, the intermittent link merely "free wheels," the tab 35*a* entering the slot 53 in the intermittent link.

In order to lock the door by means of a key from the outside, a connecting link 80 (Fig. 2) extends downwardly from the trip lever and is connected at its lower end to one end of a rockable locking lever 81 which is pivoted intermediate its ends on the plate 15 by means of a stud 82. The outer end of the locking lever has a flange 83 which is straddled by an actuator 84 connected to the locking cylinder 69. When the door is locked by means of a key, the actuator 84 is turned to rock the locking lever 81 in a clockwise direction, pulling down on the connecting link 80 and moving the trip lever 71 and link 43 to locked position.

In order to lock the door from inside the car, the garnish molding push button 68 is pushed down. The button 68 is connected to the trip lever 71 through an actuating rod 85 and a bell crank 86, so that the trip lever is moved between locked and unlocked positions by means of the garnish molding button.

Figs. 3 and 6 show the interengagement between the bolt 18 and the keeper to hold the door latched. As shown in these figures, the keeper comprises a generally C-shaped casting 90 which is secured to the body pillar 14 by means of screws 91. The casting 90 is provided with a recess 92, and two integral teeth 93 and 94 project into the recess 92 along the lower side thereof. On the upper side of the recess 92, there is mounted a conventional spring-pressed sliding shoe which preferably is formed from a block of nylon. When the door is closed, the upper surface of the bolt housing 21 engages the lower surface of the sliding shoe 95 and the gear teeth 19 of the bolt 18 engage the keeper tooth 94. The tooth 93 provides a safety latch, and when the door is in fully latched position, a latch tooth 19 rides over inside the keeper tooth 94 as shown in Figs. 4 and 6.

In this latch, when the door is opened from the outside by actuation of the push button 38, only a relatively light opening push button pressure is necessary despite the fact that the door may be sealed with a pressure of the order of 100 pounds. This easy opening is due in part to the provision of the multiplier lever 31 between the intermittent link 43 and the detent lever 25, the multiplier

lever providing a force multiplication factor of about two. Further, in order to move the detent foot **30** out of blocking relation to the cam **22**, the detent is swung through an arc in a direction substantially at right angles to the direction of the force which the cam tooth exerts against the detent foot, and the only force which it is necessary to overcome is the frictional component between the end of the detent foot **30** and the abutting surface of the cam tooth. If it were necessary to operate the detent foot in a direction opposed to the direction of force which the cam tooth exerts, much more door opening pressure would be necessary.

A feature of operation of the latch is the provision of "automatic undogging" and "remote undogging" combined with keyless locking. Because of the automatic undogging feature, it is impossible for the operator to lock himself out of the car inadvertently because whenever the door is closed, the latch is automatically shifted to unlocked condition unless the operator consciously acts to obtain keyless locking. The tab **54** which projects from the bottom of the arm **52** of intermittent link **43** is adapted to abut a small projection **98** on the detent lever **25**. Therefore, if the door is closed with the latch locked, counterclockwise pivotal movement of the detent as the bolt **18** rides over the keeper teeth **93** and **94** will cause interengagement of the tab **54** and projection **98** to shift the intermittent link **43** and trip lever **71** to unlocked condition.

Similarly, by means of the remote undogging feature, the door may be opened through the inside handle regardless of whether the latch is in locked or unlocked condition. Operation of the remote handle moves the detent **25** through the multiplier lever **31** and the remote lever **61**, so that the undogging projection **98** engages the tab **54** and shifts the parts to unlocked condition.

Despite the fact that normal closing of the door will automatically undog the latch or shift the parts to unlocked condition, the construction provides for keyless locking whenever the operator consciously desires to lock the door without using a key. In order to lock the door without a key, it is merely necessary to depress the garnish molding button **68** when the door is open, thus shifting the trip lever **71** and intermittent link **43** to locked condition and then to push in on the outside push button while the door is being closed. Operation of the outside push button shifts the intermittent lever **50** longitudinally so that its undogging tab **54** is out of the path of movement of the projection **98** on the detent **25**, and the parts are not shifted to unlocked condition upon counterclockwise pivotal movement of the detent lever.

Fig. 7 shows, in fragmentary form, a modified form of the invention wherein the detent is under tension instead of being under compression as in the form illustrated in Figs. 2–6, and wherein the multiplier lever has been omitted.

In Fig. 7, the detent **100** is pivoted inboard of the bolt at **101**, and the detent is formed with a foot comprising hook **102** at its outer end adapted to engage the teeth **24** of latch **22**. The detent has an undogging projection **103** which, when the detent swings upwardly, engages the undogging projection **54** on the intermittent link **43**. At its inner end, the detent has an integral arm **104** which is similar in function to the arm **36** of the multiplier lever **31** of Fig. 2.

Instead of a multiplier lever, the detent is formed with an integral upwardly extending arm **105** which terminates in a flange **105***a* lying in the normal path of movement of arm **52** of the intermittent link. When the intermittent link slides inwardly, it picks up detent arm **105** to pivot the detent and release the latch. The intermittent link may be shifted into a locked position in the same manner as described in connection with Figs. 2–6, and the balance of the lock structure is identical with Figs. 2–6 and is not shown in detail.

While I have shown and described two embodiments of my invention, it is capable of many modifications. Changes, therefore, in the construction and arrangement may be made without departing from the spirit and scope of the invention as set forth in the appended claims.

I claim:

1. An automobile door latch of the character described, including: a latch frame having a body lying in a plane generally parallel to the jamb face of the door; latching means pivotally mounted on said frame body; a detent movably mounted on said frame body and having a foot adapted to engage said latching means to block pivotal movement thereof in one direction; an operating link having a planar body portion and a flange extending at an angle out of the plane of the body portion; means providing a stud and slot connection between the body portion of said link and said frame body for mounting the link on the frame body for slidable movement and for pivotal movement between operative and inoperative positions, said link being coupled to and adapted to operate the detent upon sliding movement when in operative position and being uncoupled from the detent when in inoperative position; a bearing in said stud and slot connection comprising a sleeve rotatably mounted on the stud and having an annular flange, the link being rotatably supported on the sleeve for sliding movement between the annular flange and the frame body; means for pivoting said link on said bearing; and an operating push rod adapted to engage said flange to slide the link, said rod being movable in a plane spaced from but parallel with the frame body whereby force exerted on the flange tends to jam the link against the frame body.

2. An automobile door latch of the character described, including: a latch frame having a body lying in a plane generally parallel to the jamb face of the door; latching means pivotally mounted on said body; a detent movably mounted on said body and having a foot adapted to engage said latching means to block pivotal movement thereof in one direction; an operating link having a planar body portion with a longitudinally extending slot therein, said link having a flange extending at an angle out of the plane of the body portion; a stud mounted on said frame and projecting through said slot to provide a stud and slot connection between the body portion of said link and said frame body for mounting the link on the frame body for slidable movement and for pivotal movement between operative and inoperative positions, said link being coupled to and adapted to operate the detent upon sliding movement when in operative position and being uncoupled from the detent when in inoperative position; a bearing formed of material having a low coefficient of friction in said stud and slot connection, said bearing comprising a sleeve rotatably mounted on the stud and having an annular flange, the link being rotatably supported on the sleeve for sliding movement between the annular flange and the frame body; means for pivoting said link on said bearing; and an operating push rod adapted to engage said flange to slide the link, said rod being movable in a plane spaced from but parallel with the frame body whereby force exerted on the flange tends to jam the link against the frame body.

3. An automobile door latch of the character described, including: a latch frame having a body lying in a plane generally parallel to the jamb face of the door; latching means pivotally mounted on said frame body; a detent pivotally mounted on said frame body and having a foot adapted to engage said latching means to block pivotal movement thereof in one direction; an operating link having a planar body portion with a longitudinally extendinng slot therein, said link having a flange extending at a right angle from one end of the link out of the plane of the body portion; a stud mounted on the frame and projecting through said slot to provide a stud and slot connection between the body portion of said link and said frame body

for mounting the link on the frame body for slidable movement and for pivotal movement between operative and inoperative positions, said link being coupled to and adapted to operate the detent upon sliding movement when in operative position and being uncoupled from the detent when in inoperative position; a bearing in said stud and slot connection comprising a sleeve rotatably mounted on the stud and having an annular flange, the link being rotatably supported on the sleeve for sliding movement between the annular flange and the frame body; means for pivoting said link on said bearing; and an operating push rod adapted to engage said flange to slide the link, said rod being movable in a plane spaced from but parallel with the frame body whereby force exerted on the flange tends to jam the link against the frame body.

4. An automobile door latch of the character described, including: a latch frame having a body lying in a plane generally parallel to the jamb face of the door; latching means pivotally mounted on said frame body; a detent pivotally mounted on said frame body and having a foot adapted to engage said latching means to block pivotal movement thereof in one direction; a multiplier lever pivotally mounted on said frame body and having a first arm connected to said detent and a second arm; an operating link having a planar body portion and a flange extending at an angle out of the plane of the body portion; means providing a stud and slot connection between the body portion of said link and said frame body for mounting the link on the frame body adjacent the second arm of said multiplier lever for slidable movement and for pivotal movement between operative and inoperative positions, said second arm lying in the path of sliding movement of the link when the link is in operative position and lying outside the path of sliding movement of said link when the link is in inoperative position; a bearing in said stud and slot connection comprising a sleeve rotatably mounted on the stud and having an annular flange, the link being rotatably supported on the sleeve for sliding movement between the annular flange and the frame body; means for pivoting said link on said bearing; and an operating push rod adapted to engage said flange to slide the link, said rod being movable in a plane spaced from but parallel

with the frame body whereby force exerted on the flange tends to jam the link against the frame body.

5. An automobile door latch of the character described, including: a latch frame having a body lying in a plane generally parallel to the jamb face of the door; latching means pivotally mounted on said frame body; a detent movably mounted on said frame body and having a foot adapted to engage said latching means to block pivotal movement thereof in one direction, said detent having an integral operating arm extending therefrom; an operating link having a planar body portion and a flange extending at an angle out of the plane of the body portion; means providing a stud and slot connection between the body portion of said link and said frame body for mounting the link on the frame body adjacent said operating arm for slidable movement on the frame body and for pivotal movement between operative and inoperative positions, said operating arm lying in the path of sliding movement of said link when the link is in operative position and lying outside the path of sliding movement of said link when the link is in inoperative position; a bearing in said stud and slot connection comprising a sleeve rotatably mounted on the stud and having an annular flange, the link being rotatably supported on the sleeve for sliding movement between the annular flange and the frame body; means for pivoting said link on said bearing; and an operating push rod adapted to engage said flange to slide the link, said rod being movable in a plane spaced from but parallel with the frame body whereby force exerted on the flange tends to jam the link against the frame body.

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