United States Patent [19]

Watermann

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[54] **MOTOR-VEHICLE DOOR LATCH WITH LOCK MECHANISM ONLY ACTUATABLE WITH DOOR CLOSED**

[75] Inventor: **Hans-Dieter Watermann,** Metzkausen, Germany

[73] Assignee: **Arn. Kiekert Sohne,** Heiligenhaus, Germany

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[52] **U.S. Cl.** **292/216**
[51] **Int. Cl.** **E05c 3/26**
[58] **Field of Search** 292/216

[56] **References Cited**

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Primary Examiner—Marvin A. Champion
Assistant Examiner—William F. Pate, III
Attorney—Karl F. Ross

[57] **ABSTRACT**

A door latch has a bifurcate pivotal lock pawl with a pair of arms embracing the lock pin on the doorpost to hold the vehicle door closed. A keeper in the form of a rotatable pin is formed with a notch so that as the door is closed the arms of the pawl in turn cam the keeper around and lodge behind this keeper. The keeper can be rotated both from inside and outside the vehicle to clear the arms of the pawl and enable the door to open. Similarly a lock mechanism can prevent the door-opening mechanism from functioning. The keeper fixedly carries a crank arm having a projection which prevents the lock mechanism from working in all but the closed position of the door to prevent the user from locking his keys in the vehicle. The arms of the pawl serve to arrest the keeper in different angular positions to effect this safety measure.

6 Claims, 14 Drawing Figures

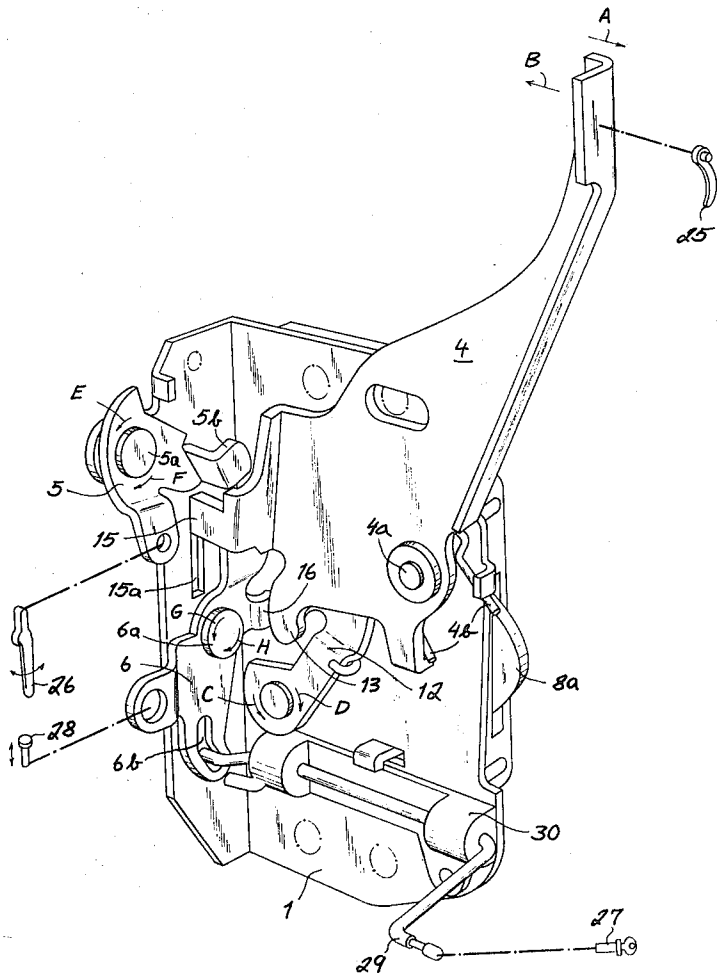
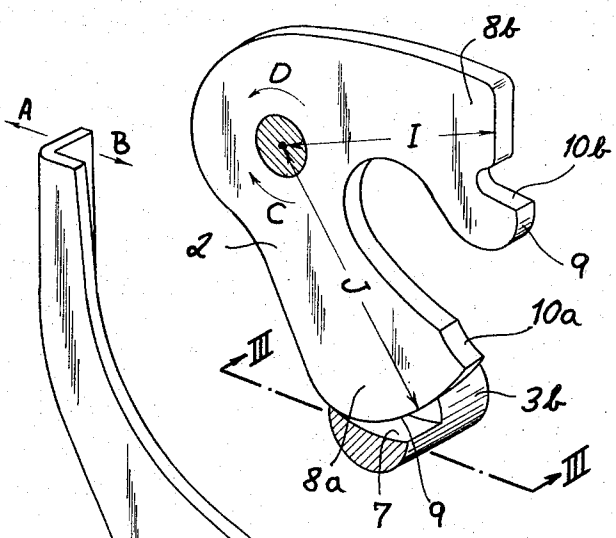


FIG. 1A



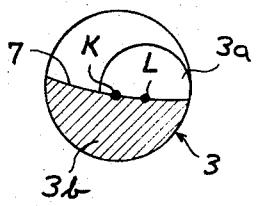


FIG. 3

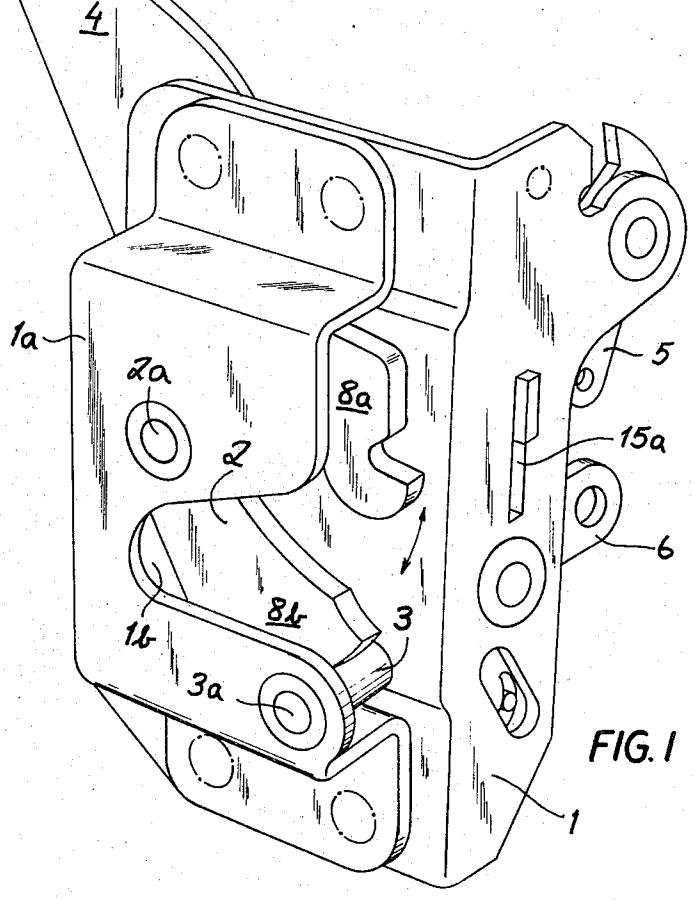


FIG. 1

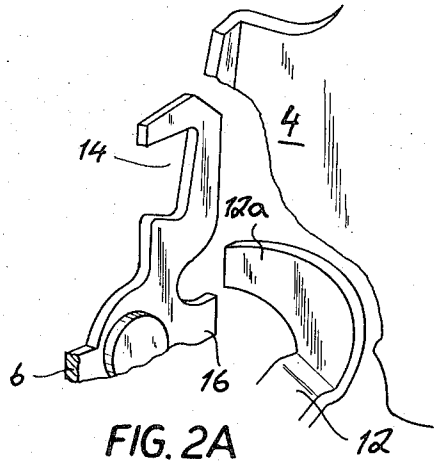

4
14
12a
6
16
12

FIG. 2A

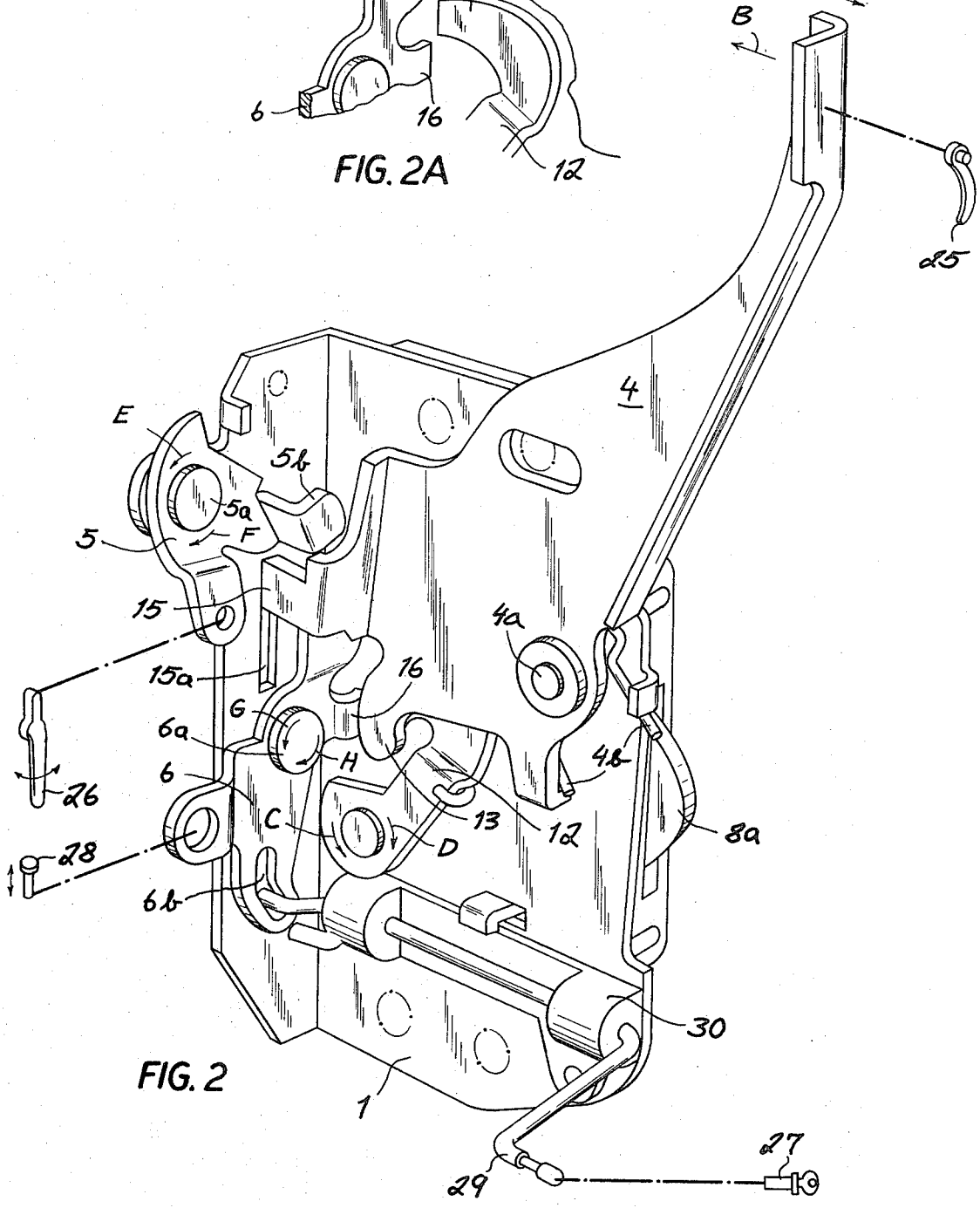

A
B
25
4
E
5b
5a
F
5
15
15a
26
4a
16
G
6a
H
6
4b
C
13
12
8a
D
28
6b
30
1
27
29

FIG. 2

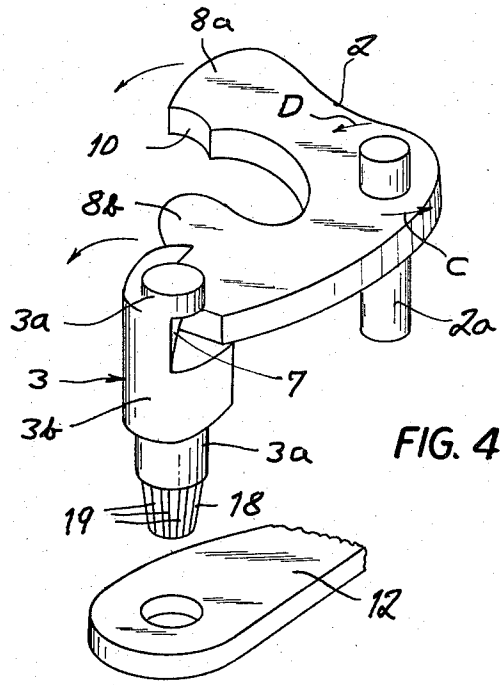


FIG. 4

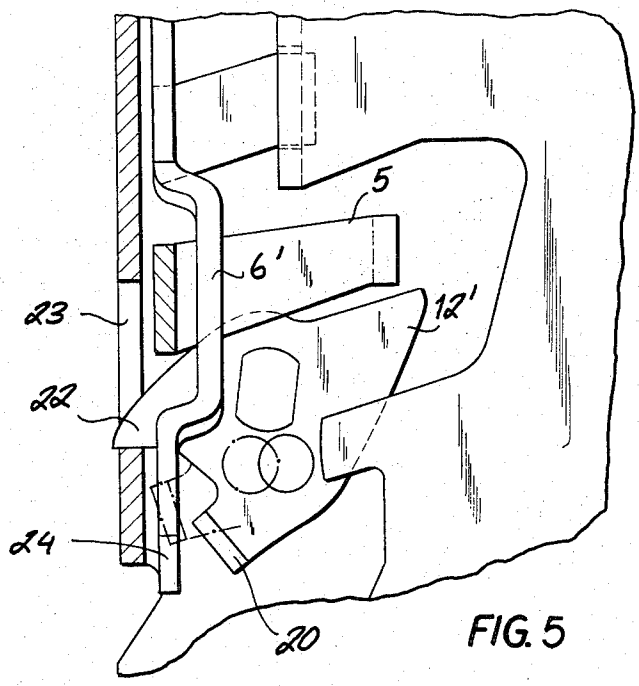


FIG. 5

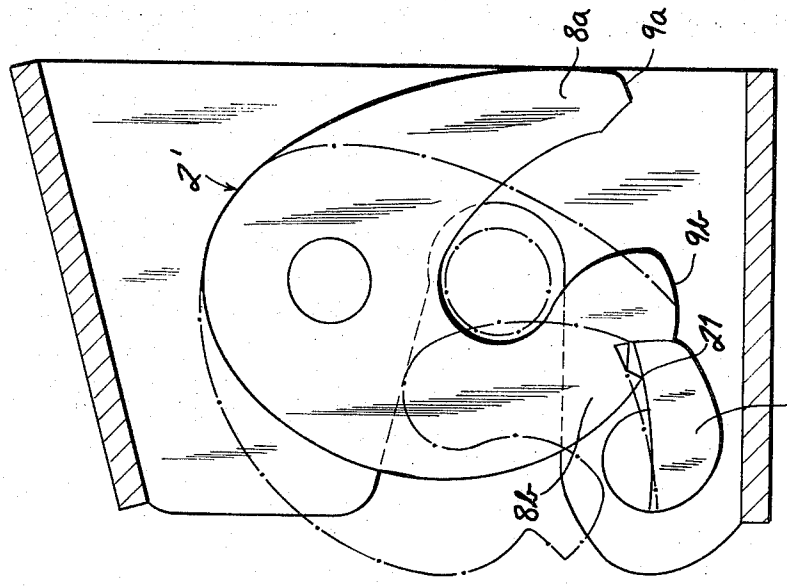


FIG. 8

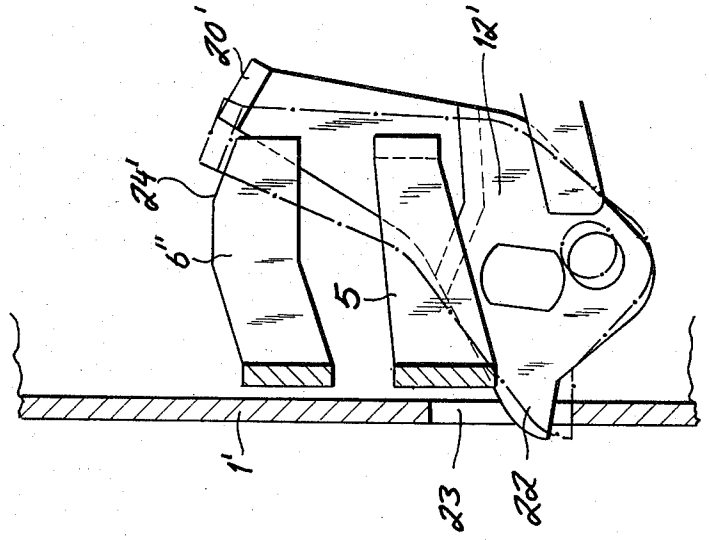


FIG. 7

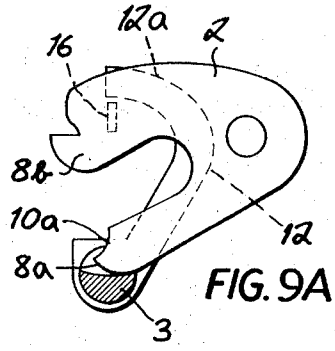


FIG. 9A

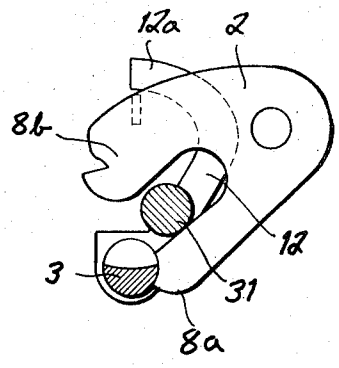


FIG. 9B

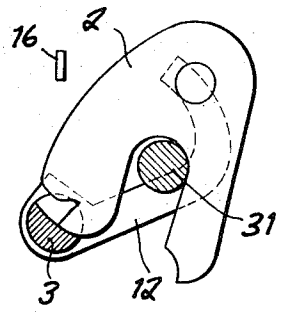


FIG. 9C

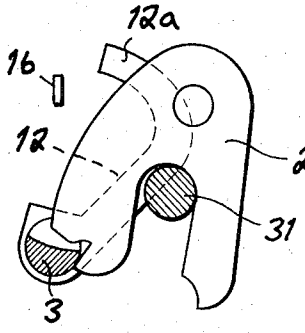


FIG. 9D

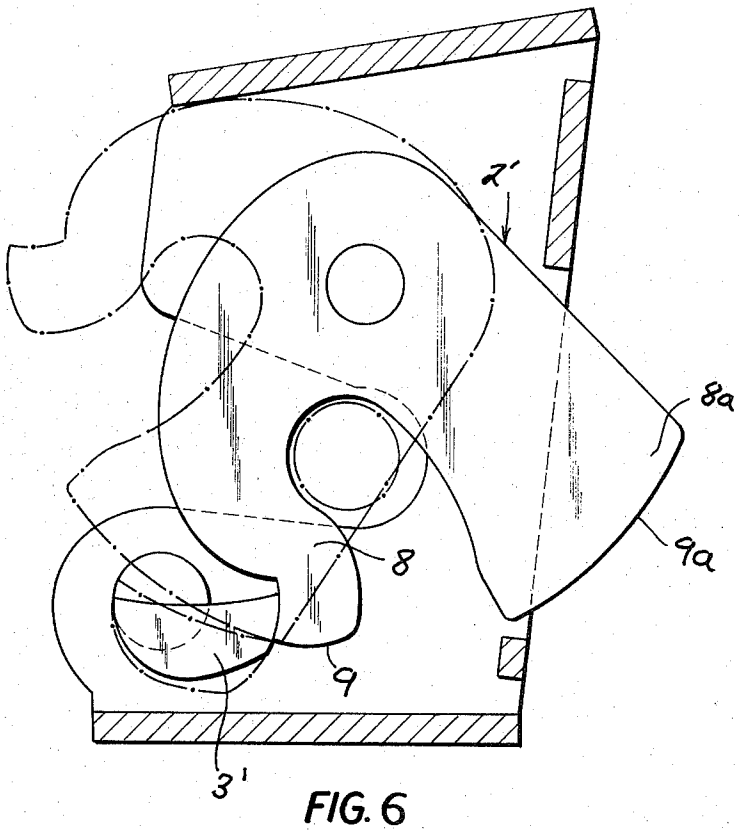


FIG. 6

MOTOR-VEHICLE DOOR LATCH WITH LOCK MECHANISM ONLY ACTUATABLE WITH DOOR CLOSED

FIELD OF THE INVENTION

The present invention relates to a motor-vehicle door latch, and, more particularly to a latch of this type which may be locked from inside or outside the vehicle.

BACKGROUND OF THE INVENTION

A motor-vehicle door latch that can be locked from the inside and from the outside usually has a simple button or lever on the inside to actuate the lock mechanism and a lock cylinder operated from the exterior by the ignition key.

A common problem with such latches is that the user may leave his key in the ignition switch, and push down the lock buttons after leaving, thereby locking himself out of his car. One system for preventing this has been to design the lock such that it is necessary to depress the door-opening button when closing the vehicle door in order to keep it locked. If the inside door-locking button is depressed and the door is simply closed, the locking mechanism will automatically open itself, thereby making it unlikely that the forgetful user will lock himself.

Nontheless, such a solution has proven far from satisfaction in all respects. Many owners customarily open the car dorr, depress the lock button, hold the door-opening button in, and shut the door automatically, whether or not they have their keys.

In addition it has been found to be advantageous to make it impossible to open the doors from the inside while they are locked, i.e., the locking member is in its "secure" position. In this manner accidental actuation of the inside door-opening member will be precluded. Similarly theft becomes much more difficult since operation of the inside door-opening member by inserting a wire or the like through the window is ineffective.

OBJECTS OF THE INVENTION

It is therefore an object of the present invention to provide an improved latch for use in a motor vehicle.

Another object is to provide such a latch that greatly decreases the possibility that the user will lock his keys in his car or be locked out.

Yet another object is to provide such a latch wherein the door may be locked from the inside and from the outside in a manner that disables the inside door-opening member.

SUMMARY OF THE INVENTION

The above and other objects are attained according to the present invention in a latch which cannot be locked or secured when the door is open, thereby precluding depressing of the latching button of the open door and closing of the door to lock the keys in the car. The last door to be shut on the vehicle must be shut from outside with a key.

According to an important feature of this invention the latch has a pivotal bifurcated locking pawl or fork mounted on the vehicle door which engages over a bolt fixed to the doorpost. A rotatable keeper engages the fork in the locked position of the door to hold the bolt in the fork. This keeper is a rotatable pin formed with a step or notch-like portion which is eccentric with respect to the pin axis and has a curvature conforming to

that of the bifurcate pawl that is engaged by the rounded ends of the arms of the fork as the door is closed, these ends coming the keeper around from its rest position. Normally the keeper lies in a predetermined angular position, it is rotated in one sense as the ends of the fork arms engage in the step on closing the door, and returns under spring tnesion in the opposite sense to another predetermined position which is intermediate the first-mentioned position which corresponds to an open position of the door and the fully deflected position in which the fork arms pass by it. The lock mechanism according to the present invention can only be actuated in this intermediate position.

According to another feature of the present invention the keeper may assume this intermediate position in both the so-called "safety" or ajar position of the door in which only one arm of the fork is behind the keeper, or only when both arms of the fork are past the keeper, in the fully locked or secured position of the door.

Thus the keeper is provided with an actuating member that extends orthogonally to the keepr rotation axis. This member is linked to the inside and outside door-opening handles for rotation of the keeper to free the latching fork. The latch is also provided with a locking element which must be displaced, pivoted for example, in order either to disable the inner and outer door handles or to disconnect them from the keeper's actuating member for locking of the door. The actuating member, according to the present invention, has a projection which is engageable with the locking element to prevent its displacement in all but the angular position of the keeper corresponding to the locked position of the door.

With such an arrangement it is impossible to lock up a car without using the car keys to lock the last door. Similarly it is impossible to lock any door that it is not fully closed so that the dangerous condition of a partially closed door is called to the attention of the person trying to lock it.

DESCRIPTION OF THE DRAWING

The above and other objects, features, and advantages of the invention will become more readily apparent from the following description, reference being made to the accompanying drawing in which:

FIG. 1 is a perspective view of the latch according to the present invention;

FIG. 1A is a detail of FIG. 1;

FIG. 2 is a perspective view of the latch of FIGS. 1 and 1A, seen from the opposite direction;

FIG. 2A is a detail of FIG. 2;

FIG. 3 is a section taken along line III—III of FIG. 1A;

FIG. 4 is an exploded perspective view of several elements of the latch of FIGS. 1–3;

FIGS. 5 and 6 are sections taken in the same direction but at different depths in another embodiment of the latch according to the present invention;

FIGS. 7 and 8 are views similar to FIGS. 5 and 6 showing yet another latch according to this invention; and

FIGS. 9A – 9D are diagrammatic views illustrating the various positions of the latch of FIGS. 1–4.

SPECIFIC DESCRIPTION

As seen in FIGS. 1–3 a latch adapted to be mounted

on the edge of a motor-vehicle door has a mounting plate 1 which is generally L-shaped and which carries a channel-shaped plate 1*a* formed with a cutout 1*b* adapted to receive a locking pin or bolt 31 mounted on the vehicle doorpost. This channel 1*a* defines a rectangular passage with the mounting plate 1.

Mounted on a pin 2*a* pivoted both in the plate 1 and in the channel 1*a* is a locking fork 2 having a pair of arms 8*a* and 8*b*. A keeper 3 has small diameter ends 3*a* journaled in the plate 1 and the channel 1*a*. In this manner the latch need only be slightly wider than the fork 2 for a very compact size. This keeper 3 has a large diameter central section 3*b* which is substantially semicylindrical and has a somewhat concave surface 7. The center K of curvature of the semicylindrical central portion is offset from the central axis L of the pin ends 3*a*, which latter axis is the rotation axis for the keeper 3. Both arms 8*a* and 8*b* are formed with a rounded edge 9 so that on rotation of the fork 3 in direction C (FIGS. 1A, 2, and 4) the edge 9*a* of the arm 8*a* first commingly rotates the keeper 3 in direction C against the force of a spring 12*a*. The arm 8*a* rests against the surface 7 in the open position of the latch shown in FIG. 9A so that no sharp blow is given to this surface 7 as the door is shut. Once the arm 8*a* is past the keeper 3 this element may rotate back in direction D opposed to direction C and a rounded notch 10*a* formed on the back of leg 8*a* may come snugly to rest on the cylindrical surface of the portion 3*b* as shown in FIG. 9B. Both the notch 10*a* and the portion 3*b* have the same radius of curvature. On continued closing of the door the locking pin will further rotate the pawl 2 in direction C so that the round surface 9*b* of arm 8*b* will rotate the keeper 3 again, but this time a full return of the keeper 3 will be impossible since the arm 8*b* is formed with a cutout 10*b* that will prevent the full return as seen in FIG. 9C. Thus the arm 8*a* has an effective length J that is greater than the length I of the arm 8*b* at its cuout 10*b*. FIG. 1 shows best how the corner of the edge 7 will fit snugly into the cutout or notch 10*b*. The utility of this two-position blocking of the keeper 3 will be described below.

Inside the motor-vehicle door the latch is provided with a latch-actuating lever 4 which is displaceable in a direction B to open the door. This lever 4 is pivoted at 4*a* and is provided with a torque spring 4*b* which urges it in direction A opposite to direction B. The external door handle or button 25 is attached to this lever 4. A projecting tab 15 extends through a slot 15*a* in the plate 1 and thereby limits the extent of pivoting of the lever 4 about axis 4*a*.

The end 3*a* of the keeper 3 that is journaled in the plate 1 is formed with a frustoconical extension having ribs 19. An actuating lever or crank 12 for the keeper is press-fitted over this extension 18 which is thereafter hammered over like a rivet for a very tight fit to make the keeper 3 and the crank 12 virtually one integral piece.

The spring 12*a* acts to bias the element 12 in direction C to return the keeper 3 to its normal position (FIG. 9A). The lever 4 is formed with a lug 13 engageable against the element 12 to rotate the keeper in direction D when the lever 4 is actuated in direction B to open the door.

The vehicle door is opened from the inside by actuation of an inside door handle 26 which is connected to an inside actuator 5 pivoted on the plate 1 at 5*a* and formed with a projecting lug 5*b* engageable with the tab 15 of the lever 4 so that on rotation of the actuator 5 in direction F the lever 4 is displaced in direction B to open the door. Spring return of the lever 4 in the direction A returns the actuator 5 in direction E.

The door is locked by means of a locking element 6 which immobilizes the lever 4 and, since the pivotal actuating element 5 is effective through this lever 4, therefore makes it impossible to open the door by means of the exterior handle 25 or interior handle 26. The locking element 6 pivots about an axis 6*a* and is formed with a notch 14 broader at its base than at its mouth which can be engaged over the projection or tongue 15 when the lever 4 is deflected fully in direction A. Thus actuation of an internal door-locking button 28 will rotate the element 6 in a sense G to engage this element over the tongue 15 and lock the door. Rotation in the opposite sense H will free the tongue. An external lock cylinder 27 connected through a crank 29 carried in a pivot block 30 fits into an arcuate slot 6*b* formed in the locking element 6 so that a key may lock or unlock the door.

In order to prevent the door from being locked when the fork 2 is in any position other than engaged in the notch 10*b* the element 12 is formed with a tooth 12*a* engageable over a tooth 16 formed on the locking element 6. FIGS. 2A and 9C, show the relative position of these two teeth 12*a* and 16 in the closed position of the door. In the open position of FIG. 9A or the position of FIG. 9B wherein the keeper 3 is engaged against the rounded notch 10*a*, the arm 12 will be rotated further in sense C and the tooth 12*a* will engage over the tooth 16 and completely prevent rotation of the locking element 16. Thus the locking devices 27 and 28 can only serve to lock the latch when the door is closed. Even if the door has only been pulled to enough for the arm 8*a* to catch over the keeper 3 as in FIG. 9D it will be impossible to lock the door without further closing it. As noted, the curve of the stepped portion of the pin (keeper) 3 has its radius at the center of rotation of the pawl so that the curved arm of the latter remains continuously in contact with the pin.

In the embodiments shown in FIGS. 5–8 references numerals of FIGS. 1–4 are used whereever applicable. In FIGS. 5 and 6 in particular a control lever or locking element 12′ is provided with a projecting tab 20 which in an open position (dot-dash lines) of the vehicle door extends into a slot 24 cut in an actuating member 6′ to prevent the latch mechanism from being locked by lifting of this member 6′. In the semilatched or fully latched positions the keeper 3′ is free to return fully counterclockwise to a rest position wherein a nose 22 formed on the pawl 12′ engages one edge of a slot 23. In this fully returned position the member 6′ is cleared and the door may be locked, so that in this embodiment locking can take place in both the fully and semilatched positions of the door. The open door position is shown in FIGS. 5 and 6 in dot-dash lines and the fully closed position in solid lines.

In FIGS. 7 and 8 substantially the same arrangement is employed except that the pawl 12′ has an extension 20′ which reaches in the solid-line open position of the door over a lock element 6″ to prevent this latters actuation. In this embodiment however the semilatched (dot-dash) position has the keeper 3′ rotated further counterclockwise than in the open position, a projection 21 being provided so on the fork 2′ to hold the

keeper 3' down that only in the fully closed position may the door be locked.

I claim:

1. A latch comprising:

a support;

a pawl pivotal on said support and lockingly engageable with a bolt;

a keeper on said support operatively engageable with said pawl and displaceable between a first position blocking pivoting of said pawl and a second position allowing pivoting of said pawl, said pawl having a curved camming surface engaging said keeper for rotating same upon entrainment of said pawl by said bolt;

actuating means engageable with said keeper for displacing said keeper from said first to said second position to open said latch;

locking means operatively engageable with said actuating means and operable for preventing displacement of said keeper from said second to said first position by said actuating means and thereby locking said latch; and

means operatively connected between said locking means and said keeper for preventing operation of said locking means to lock said latch only with said keeper in said first position, said keeper carrying a crank constituting part of said actuating means, of said locking means, and of the third-mentioned means, said crank being angularly fixed to said keeper and rotatable therewith, said crank being formed with a projection displaceable on displacement of said keeper between said first and second positions, said locking means including a displaceable locking element adjacent said projection, said projection in said second position of said keeper engaging said element and preventing movement of same, said crank being formed with a nose engaging said support in said open condition of said latch to prevent the latch from being locked in an open-door position.

2. The latch defined in claim 1 wherein said keeper is a rotatable pin formed with a step having a surface engageable by said camming surface of said pawl.

3. The latch defined in claim 2 wherein said pin is formed with a substantially frustoconical ridged surface at one end, said crank being force-fitted over said frustoconical surface.

4. The latch defined in claim 2 wherein said pawl has a pair of arms engageable with said keeper, said bolt being engageable between said arms.

5. The latch defined in claim 4 wherein in an open condition of said latch one of said arms lies against said keeper and in a closed condition corresponding to said first position the other arm engages said keeper.

6. The latch defined in claim 5 wherein said keeper is engageable in said one position behind said other arm in said locked condition of said latch, said other arm being formed with a notch receiving part of said keeper.

* * * * *