Nov. 15, 1966 J. H. ROETHEL 3,285,645

DOOR LOCK

Filed Aug. 14, 1964

FIG. 1.

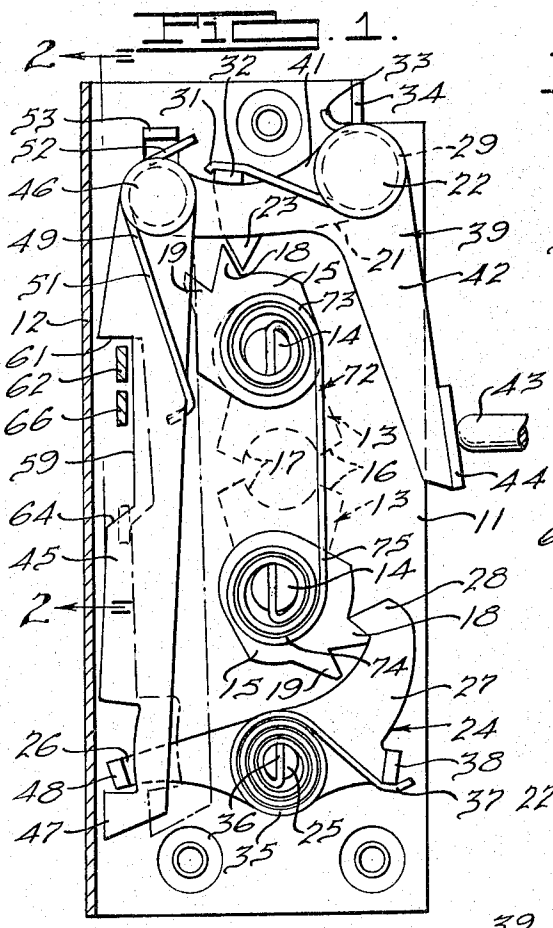


FIG. 2.

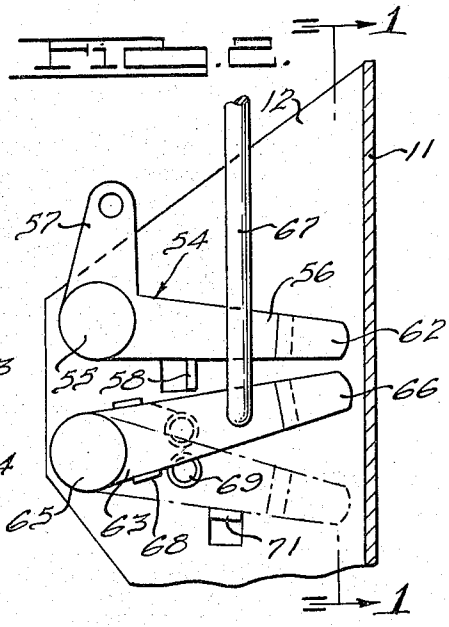
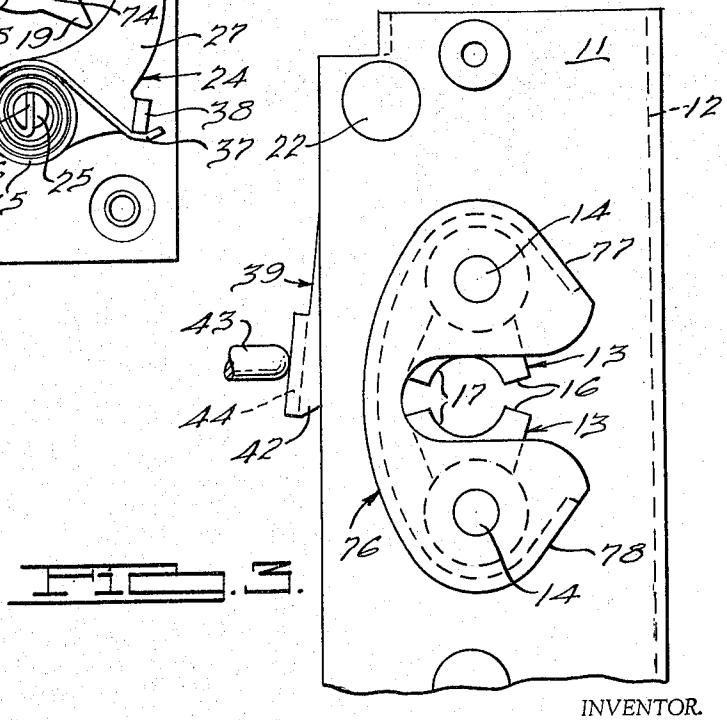


FIG. 3.



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DOOR LOCK

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

Of current interest in automotive design is the use of double-jaw latching mechanisms in which a striker pin is engaged between a pair of opposed jaws to maintain the vehicle body in latched condition. The present invention is embodied in an improved latch mechanism of this general category, and comprises a pair of opposed latching jaws or elements pivotally supported on the main plate portion of the latch mechanism. Both of the latching jaws are fixedly coupled to control or ratchet plates which are engageable by pivoted detent or pawl means for holding the latching jaws in latched position. The latch mechanism includes improved inner and outer manually operable actuating means for simultaneously swinging or pivotally actuating the detent or pawl means to disengage the same from the control or ratchet plates. Also included are improved control means for selectively controlling the effectiveness of the actuating means in the actuation thereby of the detent or pawl means.

An object of the present invention is to provide an improved door latch mechanism which will effectively meet various requirements for vehicle door locks, which is characterized by simplification and compactness in construction, which is easy and economical to manufacture, and which is comparatively quiet, reliable and durable in use.

Further objects and features of the particular embodiment of the invention herein illustrated will appear in the following description, reference being had to the accompanying drawing forming a part of the specification wherein like reference numerals designate corresponding parts in the several views:

FIG. 1 is a sectional elevation taken substantially through lines 1—1 of FIG. 2 illustrating a door latch mechanism constructed in accordance with one embodiment of the invention;

FIG. 2 is a sectional elevation taken substantially through lines 2—2 of FIG. 1; and

FIG. 3 is an elevation of the door latch mechanism taken from the side opposite to that shown in FIG. 1.

Before explaining in detail the present invention, it is to be understood that the invention is not limited in its application to the details of construction and arrangement of parts illustrated in the accompanying drawing, since the invention is capable of other embodiments and of being practiced or carried out in various ways. Also, it is to be understood that the phraseology or terminology employed herein is for the purpose of description and not of limitation.

In the drawing there is illustrated, by way of example, a certain embodiment of the present invention as adapted to be applied to a door and door frame structure of an automobile body. The latch mechanism comprises a case plate **11** which is adapted to be secured, as by means of screws, to the inner side of the jamb portion of a vehicle door (not shown), the case plate **11** having a flange **12** which is adapted to be positioned along an inner panel

of the door. The present latch mechanism has a pair of pivoted latch devices comprising jaw elements **13** (see FIG. 3) positioned at the outer face of case plate **11**. Each jaw element **13** is provided with an integral shaft or pivot portion **14** which extends through a suitable flanged aperture (not visible) in the case plate. Suitable bearing means (not shown) are provided within the flanged aperture for journalling each shaft or pivot portion **14** for pivotal movement and for holding the jaw elements **13** on the case plate. Each jaw element **13** is keyed or otherwise fixedly coupled through its shaft **14** to a control plate **15**, for a purpose to be hereinafter explained.

Each jaw element **13** is a substantially triangular plate member having its pivot axis located near its apex. The base side or the side **16** opposite the apex is provided in the center with a semi-circular recess or enlarged notch **17** adapted to encompass a cylindrical striker or keeper pin (not shown).

Each control plate **15** is provided with two peripherally spaced abutments or ratchet teeth **18** and **19**. Cooperable with the abutment or ratchet toothed edge of the upper control plate **15** is a swinging detent or pawl **21** pivotally mounted on a shoulder rivet **22** secured to the case plate **11**. It will be noted that the detent or pawl **21** extends in a substantially horizontal direction across the case plate **11** from the shoulder rivet **22** toward the flange **12**. The detent or pawl **21** has an abutment portion **23** cooperable with the teeth or abutments **18** and **19** on the upper control plate **15**. It will be further noted that the detent or pawl **21** is located above the upper control plate **15**, that the ratchet teeth or abutments **18** and **19** are located on the upper peripheral surface of the upper control plate **15**, and that the abutment portion **23** of the detent depends from the detent in position to engage either of the ratchet teeth **18** or **19**.

The lower control plate **15** is substantially similar to the upper control plate **15** but is placed on its pivot shaft in inverted relation and out of phase approximately 180° to the upper control plate so that the ratchet teeth **18** and **19** are located at the lower peripheral edge. The reason for this will become apparent as the description proceeds. Cooperable with the abutment or ratchet-toothed edge of the lower control plate **15** is a swinging detent or pawl **24** pivotally mounted on a pivot stud or shoulder rivet **25** secured to the case plate **11**. The detent or pawl **24** is provided with a first arm **26** which extends in the general direction of the flange **12**. It has a second arm **27** which curves upwardly from the pivot stud **25** and terminates in a hook-like portion **28** which functionally is the equivalent of the abutment portion **23** of the detent **21**.

When the detent abutment portion **23** and the hook portion **28**, respectively, are in engagement with the control plate abutments **19**, the jaw elements **13** will be held in what is known as a secondary latched position. When in this secondary latched position, the relationship of these jaw elements to a striker or keeper pin creates sufficient interference to prevent opening movement of the vehicle door. The door will not, however, be held against vibratory movement in a vertical direction, and it is expected that the rattling noise that will ensue as the vehicle is driven about will call the occupant's attention to the fact that the door is not fully latched. When the abutment portion **23** and the hook portion **28** are

in engagement with the respective control plate abutments **18**, as seen in FIG. 1, both jaw elements **13** are in final or fully latched position.

The detent or pawl **21** is urged in a counterclockwise direction, as viewed in FIG. 1, or toward the ratchet or upper control plate **15** by a coiled spring **29** having its body portion looped around the pivot stud **22** and one free end portion **31** engaging a lug or projection **32** on the upper edge of the detent or pawl **21**. The other free end **33** of the spring **29** abuts a lug or projection **34** turned out of the case plate **11**.

The detent or pawl **24** is also urged in a counterclockwise direction, as viewed in FIG. 1, or toward the lower ratchet or control plate **15** by a flat spiral spring **35** having its inner end **36** anchored in a slot or kerf in the pivot stud **25** and its free end **37** in abutting relation to a lug **38** appended to the arm **27** of the detent **24**. Thus, both the detent **21** and the detent **24** are spring-urged into engagement with the upper and lower control plates **15**, respectively.

Pivotal actuation of the detent or pawl **21** in a clockwise direction, as viewed in FIG. 1, or in a direction out of the path of the abutments **18** and **19** of the upper control plate **15** is accomplished through an actuating or release lever, generally designated **39**, having a common pivot axis with the detent **21** on the pivot stud **22**. This lever **39** has a horizontally extending arm **41** which extends toward the case plate flange **12** and a vertically depending arm **42**. The horizontally extending arm **41** underlies the lug **32** on the detent or pawl **21** so that when the lever **39** is swung in a clockwise direction, as viewed in FIG. 1, upward movement of its arm **41** will be transmitted through the lug **32** to the detent **21** causing the latter to be lifted out of the path of the abutments **18** and **19** on the upper control plate **15**. The lever **39** is adapted to be operated by an outside operator, such as a push button mounted in a handle mounted on the outer panel of the vehicle door. Only a portion **43** of the stem of the outside operator is shown, the stem portion **43** abutting a flange **44** on the lower end of the lever arm **42**.

Because the present latch mechanism embodies a double detent or pawl system, it is readily apparent that provision also must be made for pivotal actuation of the detent or pawl **24** in a clockwise direction, as viewed in FIG. 1, or in a direction out of the path of the abutments **18** and **19** on the lower control plate **15**. This is accomplished through a link, generally designated **45**, which is pivotally suspended from the free end of the lever arm **41**. The link **45** is connected to the lever arm **41** by means of a pivot stud or rivet **46**. The link **45** has a hook-like portion **47** at its lower end adapted to engage a lug or projection **48** on the free end of the detent arm **26**. When the parts of the latch mechanism are in the relationship shown in FIG. 1, upward movement of the lever arm **41** will cause the link **45** to be raised and the hook-like portion **47** thereon to engage the lug **48** on the detent arm **26**. The detent **24** will then be swung in a clockwise direction or out of engagement with the lower control plate **15**. The link **45** is always urged into its transmitting position shown in FIG. 1 by means of a spring **49** having its body portion encompassing the pivot **46** and an elongated free end portion **51** hooked over the link so as to provide a biasing force urging the lower end of the link **45** toward the flange **12**. The spring **49** has an upper arm portion **52** which engages a lug or projection **53** appended to the lever arm **41**. The lug **53** acts as the fixed member against which the spring **49** reacts.

As with most conventional latch mechanisms, the present latch mechanism is operable from the inside of the vehicle door by means of an inner manually operable bell crank lever, generally designated **54**. The bell crank lever **54** is pivotally mounted on a pivot stud **55** near the upper edge of the case plate flange **12**. It is provided with a substantially horizontally extending arm **56** and a vertically

extending arm **57**. The vertical arm **57** is adapted to be coupled by a draft link (not shown) extending to a remote control mechanism (not shown) mounted on the inner panel of the door. The bell crank lever **54** is adapted to be swung in a counterclockwise direction as viewed in FIG. 2 and is prevented from being swung in a clockwise direction by means of a stop **58** lanced from the case plate flange **12**.

Movement of the bell crank lever **54** is transmitted to the detents **21** and **24** through the link **45**. As shown in FIG. 1, the side of the link **45** adjacent to the case plate flange **12** is provided with an elongated notch **59**. The upper edge **61** of the notch **59** extends in a substantially horizontal direction and overlies the free end **62** of the bell crank lever arm **56** with only a slight amount of clearance therebetween. Thus, with the parts as shown, upward movement of the arm **56** of the bell crank lever **54** causes the link **45** to be raised, thereby raising the lever arm **41** which in turn causes upward movement of the detent **21** so that its abutment portion will be out of the path of the ratchet teeth **18** and **19** on the upper control plate **15**, and which simultaneously causes swinging movement of the detent **24** so that its abutment portion **28** will be out of the path of the ratchet teeth **18** and **19** on the lower control plate **15**.

As on a conventional vehicle door latch mechanism, provision is made for "locking" the latch mechanism to prevent disengagement of the detents from the control plates holding the latch jaws in latched position. In the present latch mechanism, this is accomplished by means of a locking lever, generally designated **63**. It will be noted that the lower edge of the notch **59** is inclined at **64** to provide a cam surface. When the locking lever **63** is moved to its FIG. 2 position about its pivot stud **65** to the dot-dash outline position shown, the end **66** of the lever **63** engages the cam surface **64** and drives the link **45** away from the case plate flange **12** against the resistance of the spring **49**. The link **45** is moved to the dot-dash outline position shown in FIG. 1, and in this position the hook portion **46** on the end thereof is out of abutting relation to the lug **48** on the detent arm **26**. Therefore, the link **45** although actuated by either the inner or outer manually operable means, is rendered ineffective to cause clockwise swinging movement of the detent **24** in a direction to move the projection **28** out of the path of the abutments **18** or **19** on the lower control plate **15**. It will be understood that the upper detent **21** does move so that its projection **23** is out of the path of the abutments **18** and **19** on the upper control plate **15**. The relationship of the jaw elements with a striker pin trapped therebetween is, however, such that unless both jaw elements are freely movable to an unlatched position, the door cannot be moved to an open position.

The locking lever **63** may be moved from locking to non-locking position by means of a rod **67** which projects through the garnish molding on the inner side of the vehicle door for manual engagement so that it may be moved up and down with corresponding movement of the locking lever **63**. A suitable spring **68** may be provided to positively hold the locking lever **63** in either of its positions. As shown, the spring **68** is a flat spring having a dimple at its free end which nests in either one of a pair of depressions **69** indented on the flange **12**. A stop **71** is lanced from the flange **12** to limit the movement of the locking lever **63** in its downward direction.

To complete the description of the present latch mechanism, attention is called to the compound spring generally designated **72**. This compound spring **72** comprises an upper spiral spring **73** and a lower spiral spring **74**, the inner ends which are fixedly coupled to the upper and lower pivot shafts **14** of the upper and lower jaw elements **13**, respectively. Since the upper and lower jaw elements must swing in opposite directions upon engagement with a striker pin, the springs are counterwound and both urge their respective jaw elements in

unlatched direction, the link **75** therebetween acting as the reaction member against which each spring acts in its attempt to unwind. Since the springs are mounted on the pivot shaft portions, this tendency to unwind urges the latch elements in unlatched direction.

The latch elements are mounted in an appropriate housing **76** (see FIG. 3). The wall surfaces **77** and **78** of the housing on each side of the opening through which the striker or keeper pin is admitted acts as a stop to limit the movement of the latch elements in opening direction and to insure that the latch elements are positioned so that they will be ready to engage the striker pin as the door is moved from an open to a closed position. As the door is moved to a closed position, the striker pin will seat in one or the other of the recesses **17**. This causes the striker pin to be guided into engagement with the recess **17** in the other jaw element so that both jaw elements fully engage the striker pin on opposite sides as they are swung against the resistance of their respective springs toward the fully latched position shown in FIG. 3. The detent abutment portion **23** and the detent abutment portion **28** will then engage the control plate ratchet teeth **18** or **19** so that the jaw elements are restrained against movement in an unlatching direction.

In fully latched position, the center of the striker pin will be located substantially at the center of the circular notches or recesses **17**. In fully latched position this center lies over-center from a line drawn between the pivot axes of the two jaw elements. This relationship is such that any forces tending to separate the two jaw elements will not be in the direction of opening movement of the door but will be rather in the direction of closing movement, and thus the tendency would be to urge the door more fully in a closed direction.

It is believed that the operation of the present latch mechanism is evident from the foregoing description, but that a brief restatement may be helpful. When the jaw elements are in unlatched position, a position in which they would be facing toward the opening in the housing on the front face of the latch mechanism, the detent projection **23** on the detent **21** and the detent projection **28** on the detent **24** will lie behind the ratchet teeth **19** on the control plates. Upon closing movement of the door, the jaw elements will engage a striker pin which will force them toward the rear of the housing. Swinging movement of the jaw elements will be transmitted through the pivot shafts **14** to the control plates **15**, the upper control plate rotating in a counterclockwise direction and the lower control plate rotating in a clockwise direction. The detent projections **23** and **28** will merely override the ratchet teeth **19** and **18**.

The detent projections will drop into engagement with the ratchet tooth **19** on each control plate if insufficient force is applied in closing the door, but if sufficient force is applied both projections will drop into engagement with the ratchet teeth **18** thereby maintaining the jaw elements in fully latched position. If it is now desired to lock the doors so that they cannot be opened, it is only necessary to depress the rod **67** so that the locking lever **63** will be moved downwardly swinging the link **45** away from the flange **12**. As described above, this disturbs the abutting relationship between the end **47** of the link and the projection **48** on the detent **26**. If the outside manually operable means is actuated to depress the stem **43** to swing the lever **39** in a clockwise direction, or if the remote control bell crank lever **54** is swung to raise the lever arm **56** into abutting relation with the link edge **61** which will also cause the lever **39** to be swung in clockwise direction, only the upper detent **21** will be disengaged from the upper control plate. The lower detent **24** will remain in ratchet plate restraining condition and the door cannot be unlatched.

Should the parts of the latch mechanism be placed in "locked" condition when the vehicle door is open and the door is then moved to a closed position, no damage to the latch mechanism can occur. The detents **21** and **24** will merely override the projections on the control plates **15**. The detent arm **26** of the lower detent **24** will merely move up and down in the clearance provided at the end of the link **45**, and the upper detent **21** will merely move independently of the release lever **39** since it is pivoted independently of the lever on the pivot stud **22**. If the door is closed and in locked condition, it is only necessary to raise the rod **67** to lift the locking lever **66** to permit the spring **49** to urge the link **45** back into operative relationship to the detent arm **26**. The door may then be opened by actuation of either the inner manually operable bell crank lever **54** or the outer manually lever **39**.

I claim:

1. In a latch mechanism for a swinging door,
a support having a plate portion for disposition at a free edge wall of the door,
a pair of jaw elements pivotally mounted on one side of said plate portion for counter-swinging movement from an unlatched position toward each other to a latched position in which said jaw elements are adapted to engage a striker pin therebetween,
a pair of control plates mounted on the opposite side of said plate portion each of which is fixedly coupled to one of said jaw elements for pivotal movement therewith,
a pair of detent means each pivotally mounted on said plate portion and engageable with detent engageable portions on the respective control plates to restrain said jaw elements in door latched position,
spring means biasing said jaw elements toward unlatched position,
said spring means comprising a pair of counterwound spiral springs,
each of said springs being coupled to one of said control plates, respectively, to urge the same in counterclockwise direction of rotation,
said spring means being coupled to each other through a common link portion,
said link portion providing a reaction means against which said springs react to urge said control plates and thereby said jaw elements in unlatched direction,
and manually operable means engageable with said pair of detent means to simultaneously disengage the latter from the respective control plates to permit movement of said detent means restrained jaw elements to unlatched position.

2. In a latch mechanism according to claim **1**,
said manually operable means comprising a release lever pivotally mounted on said plate portion having direct engagement with one of said detent means for disengaging the same from the control plate engaged thereby,
and link means coupled to said release lever extending into engagement with the other of said detent means for transmitting release lever movement to the latter from the control plate engaged thereby.

3. In a latch mechanism according to claim **2**,
said release lever and said one detent means having a common pivot axis and being mounted for pivotal movement independently of each other,
said one detent means having a part thereof in abutting relation to said release lever so that upon swinging movement of the latter in one direction said one detent means will be swung in the same direction but swinging movement of said one detent means in said one direction independently of said release lever will not result in corresponding swinging movement of the latter.

4. In a latch mechanism according to claim **3**,
said link means when in release lever movement transmitting position having a part thereof abutting a part

of said detent means with both of said parts being movable in the same direction upon operation of said release lever,

said detent means part being movable in said same direction independently of said link means part upon movement of the detent means independently of said link means, such as occurs when the jaw elements are moved from unlatched to latched position on closing of the door.

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