# United States Patent

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## [54] DOOR LATCH ASSEMBLY


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[52] **U.S. Cl.** .....**292/48,** 292/216, 292/DIG. 27, 292/DIG. 65

[51] **Int. Cl.**.....**E05c 3/26**

[58] **Field of Search**.....292/210, 45, 48, 216, 280, 292/DIG. 26, DIG. 27, DIG. 49, DIG.65



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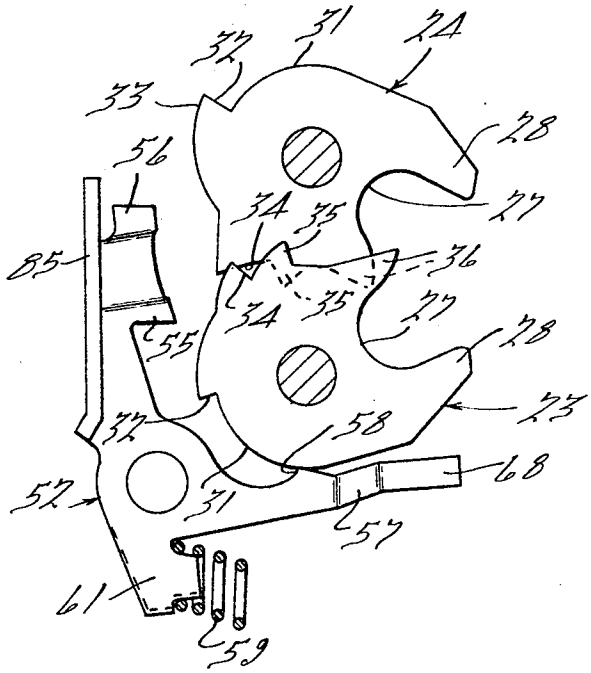
[57] **ABSTRACT**

A latch mechanism for a vehicle door having a pair of pivoted counterswinging latch elements adapted to be held in latched engagement with a striker pin by a detent means. Upon release of the detent means by a latch mechanism operator, the latch elements are free to move to an unlatched position permitting the vehicle door to be opened. The detent means is biased to be restored into engagement with the latch elements after release of the actuating means. Normally, under the biasing force, the detent means maintains an abutting relation to the peripheral surfaces of the respective latch elements and then moves further into latch element holding position as the latch elements encompass the striker. One of the latch elements is provided with an abutment on its peripheral surface positioned to engage a cam surface on a lever arm of the detent means to drive the latter into such latch element holding position in the event the normal biasing means becomes ineffective to do so for any reason.


**7 Claims, 7 Drawing Figures**



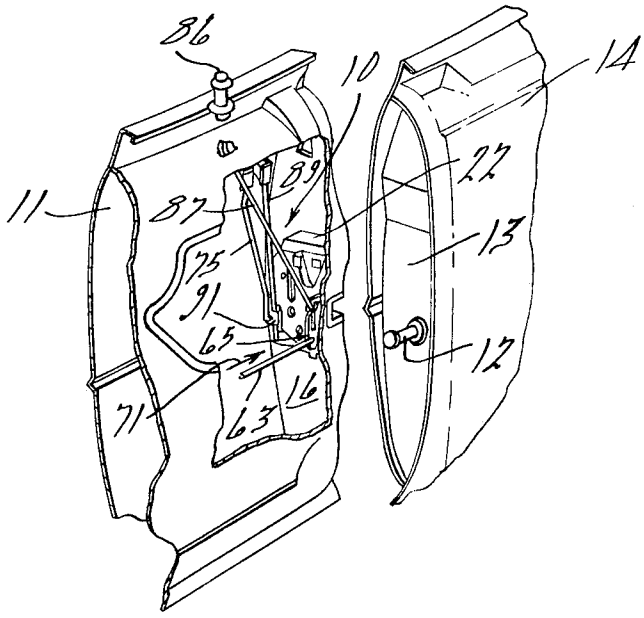



FIG. 1

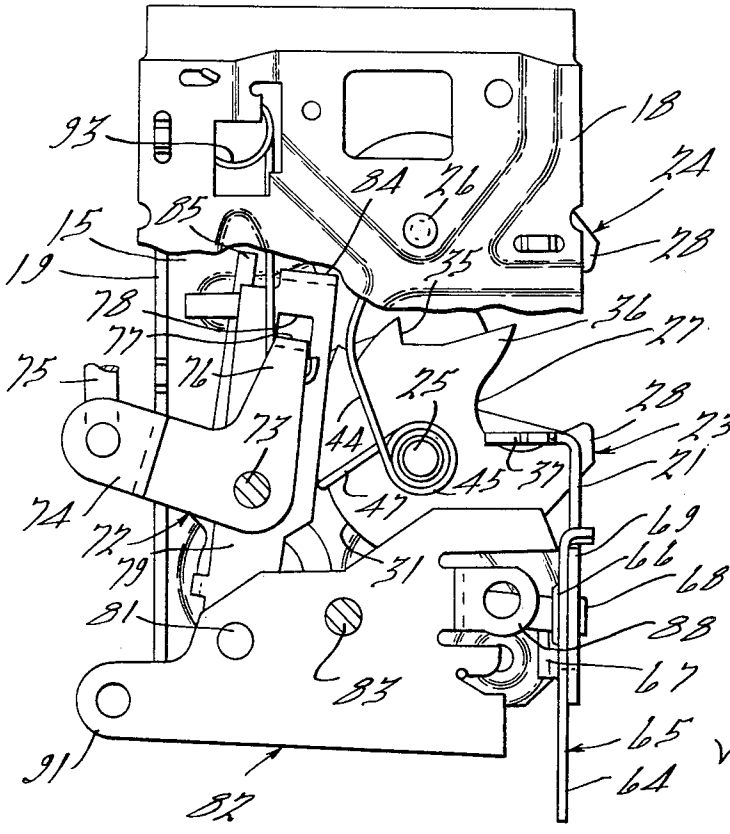



FIG. 2

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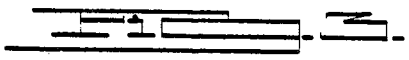

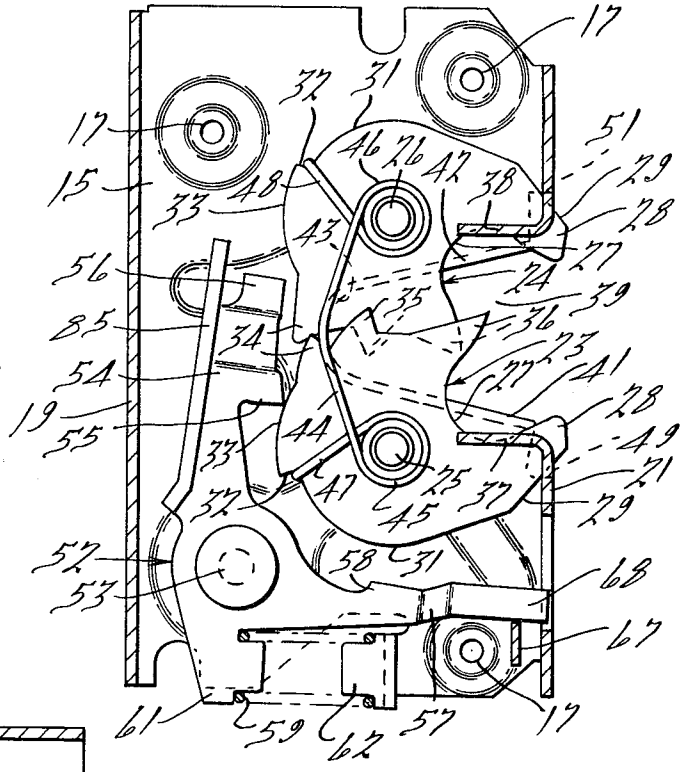


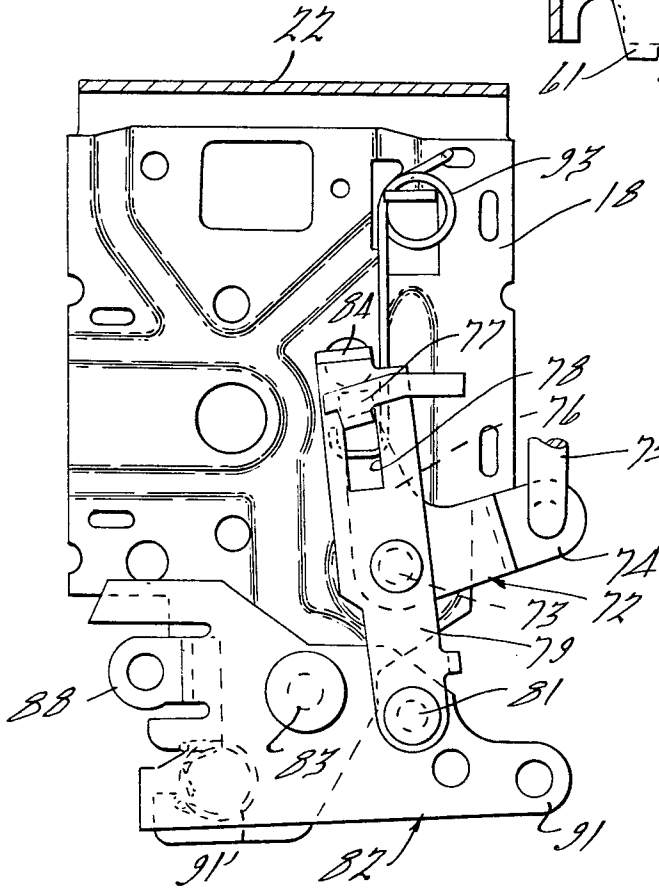


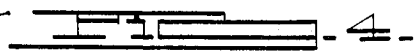

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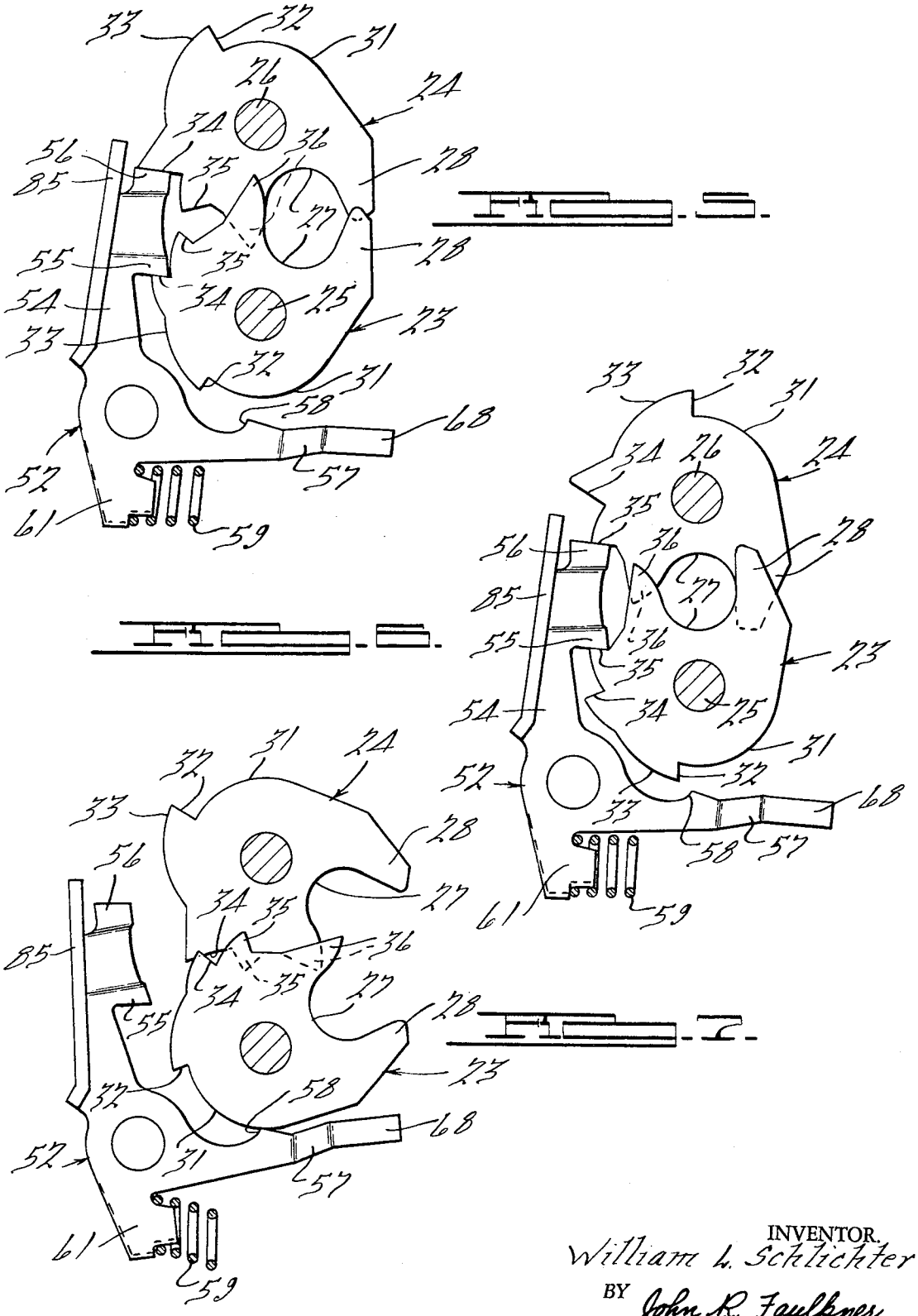


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# DOOR LATCH ASSEMBLY

## BACKGROUND OF THE INVENTION

The conventional vehicle door latch mechanism comprises an assembly of pivoted latch elements, pivoted detent means for holding the latch elements in latched condition, pivoted levers for actuating the detent means to disengage the latter from the latch elements to permit unlatching movement and various springs to bias the various pivoted members in the relative directions of movement required to achieve the desired functions. The detent means in particular is spring-urged in latch element engaging direction.

For any one of a number of reasons, the spring acting on the detent means may fail to bias the latter back into holding position relative to the latch elements after disengagement therefrom. For example, the spring itself may fail, a corrosion buildup between the detent means and support plate may create excessive friction which the spring is unable to overcome or an ice coating between the detent means and support plate could interfere with proper operation.

Accordingly, it is an object of the present invention to provide a latch mechanism incorporating a latch element movement responsive means for positively driving the detent means into latch element holding position upon movement of the latch elements to latched position.

## SUMMARY OF THE INVENTION

The present invention relates to a latch mechanism comprising a primary support plate for disposition on the inner surface free edge wall of a vehicle door. The latch mechanism has a secondary support plate in spaced parallel relation to the primary support plate. Mounted on the side of the primary support plate facing the secondary support plate is a latch device means comprising a pair of latch elements each mounted on a respective pivot shaft for counterswinging movement into and out of latched position. A detent means comprising a lever member having a plurality of lever arms is pivotally mounted on a primary support plate on the same side of the latter as the latch device means. The detent means has an arm having spaced detent portions adapted to simultaneously engage spaced abutments on the latch device elements to hold the latter against counterswinging movement from latched to unlatched position. A spring means engaged with the detent means normally urges the latter toward latch element holding position. The latch mechanism includes a cam means responsive to movement of the latch device means toward latched position, as occurs upon engagement of the latch elements with a striker as the door is moved to closed position. This cam means positively biases the detent means into latched element holding position if the spring means fails to do so.

In particular, the cam means comprises a cam surface on a second lever arm of the detent means. The cam surface underlies the peripheral surface on one of the latch elements. The one latch element has an abutment positioned to engage the cam surface to drive the detent means into latch element holding position.

The latch mechanism also has various members for actuating the detent means to disengage the latter from the latch elements and also to render at least the outside operator inoperative to release the detent means.

## DESCRIPTION OF THE DRAWINGS

Further features and advantages of the present invention will be explained in greater detail making reference to the description which now follows, reference being had to the drawings in which:

FIG. 1 is a fragmentary perspective view of a vehicle body and a vehicle door, parts of the door being cut away to expose the latch mechanism;

FIG. 2 is a plan view of the latch mechanism with a major portion of the cover plate or secondary support plate cut away to expose the latch mechanism components;



FIG. 3 is a plan view in part sectional of the primary support plate of the latch mechanism with the latch mechanism components mounted thereon shown in unlatched condition;

FIG. 4 is a plan view of the inner side of the cover plate or secondary support plate with the components of the latch mechanism mounted thereon;

FIG. 5 is a diagrammatic view of the latch elements and the detent means as they appear when the latch mechanism is in a secondary latched condition;

FIG. 6 is a view in part similar to FIG. 5 illustrating the latch elements and the detent means in fully latched condition; and

FIG. 7 is a view in part similar to FIG. 5 illustrating the latch elements in unlatched condition and the detent means as it appears after being actuated for disengagement from the latch elements but before it is biased toward and restored in latch element engaged position by the spring means acting thereon.

## DETAILED DESCRIPTION OF THE INVENTION

Referring now to the drawings, the latch mechanism, generally designated **10**, is adapted to be mounted within a vehicle door **11** of a vehicle body. The latch mechanism is adapted to engage a striker pin **12** carried on the jamb face **13** of a vehicle body panel **14**.

The latch mechanism **10** has a primary support plate **15** which is adapted to be secured by bolts (not shown) to the inner surface of the free edge wall **16** of the door **11**. Threaded bolt receiving holes **17** are visible in the FIG. **3** view of the primary support plate **15**. The latch mechanism has a secondary support plate **18** which is in spaced parallel relation to the primary support plate **15**. The two plates **15** and **18** are held in spaced parallel relationship to each other by side flanges **19** and **21** on the plate **15** and a top flange **22** on the plate **18**.

The operating components of the latch mechanism are located between the primary and secondary support plates **15** and **18**. Some of these components may be considered as primarily mounted on the inner side of the primary support plate **15**. These include the latch device means which comprises a pair of latch elements **23** and **24**. The latch elements **23** and **24** are irregularly shaped plates which are pivotally mounted on respective pivot shafts **25** and **26**, the axes of which project in a direction normal to the support plate **15**. Each pivot shaft **25** and **26** is riveted at one of its ends to the plate **15** and in final assembly at its other end to the plate **18** thereby functioning to hold the support plates in assembled relationship as well as providing for pivotal support of the latch elements.

The latch elements are swingable in counterswinging directions and are vertically displaced relative to one another with overlapping portions.

Each latch element **23–24** has a semi-circular pin receiving notch **27** adapted in door latched condition to encompass the striker pin **12** carried in the body pillar jamb face **13**. Each latch element has an extension or finger **28** at one side of the notch **27** which, as will be explained with reference to FIG. **6** and **7**, are adapted to overlie each other to provide a barrier against relative unlatching movement between the latch elements and the striker pin in door latched condition. Rearwardly of the extension or finger **28**, each latch element has a straight peripheral surface **29** extending tangentially from a curved surface **31** which is interrupted by an abutment **32**. The abutment **32** is a step to a further curved surface **33** of greater radius than the curved surface **31**. The curved surface **33** is interrupted by a pair of spaced steps or abutments **34** and **35**. From the abutments **34** and **35** back to the notch **27**, each latch element has a substantially outwardly radially extending apex portion **36**.

The side flange **21** of the primary support plate **15** is provided with an enlarged opening bounded by inwardly turned flanges **37** and **38**. These flanges lead into a substantially V-shaped notch **39** in the primary support plate having flanged guide edges **41** and **42** for guiding the striker pin **12** into proper alignment between the latch element notches **25**. The V-shaped notch **39** terminates in a rounded bight **43**.

The latch elements are spring-urged in counter or opposite directions toward unlatched position by a compound spring **44** having counterwound coiled end portions **45** and **46** encompassing the respective pivot shafts **25** and **26**. The coiled portions **45** and **46** have free end portions **47** and **48** hooked over the edge of the latch elements in engagement with the respective abutments **32**. The spring coiled end portions bias the latch elements toward unlatched position to the extent permitted by stops **49** and **51** in the side flange **21**.

Cooperable with the abutments **34–35** on the latch elements **23–24** is a swinging detent means **52** pivotally mounted on a shoulder rivet **53** secured to the primary support plate **15**.

The detent means **52** is a plural armed lever member. A first one of the lever arms, the arm **54**, extends from the pivot **53** generally longitudinally of the primary support plate so as to lie to one side of the latch elements **23–24**. The lever arm **54** has spaced abutments **55–56** on its latch element contiguous side which are adapted to coact with the abutments **34–35** on the latch elements, as will be further explained.

The second arm **57** of the detent means **52** extends generally transversely of the primary support plate and lies in contiguous relationship to the latch element **23**. Intermediate its ends the arm **57** has a cam surface or abutment **58** which under certain conditions abuts the latch element **23** peripheral surface **31**, see FIG. **7**.

The detent means **52** is spring-loaded in latch element engaging direction by a compression spring **59** which extends between a downwardly projecting arm **61** on the detent means and a tab **62** formed on the lower portion of the primary support plate **15**.

The present latch mechanism is preferably operated from the inside of the vehicle door through the medium of a remote control mechanism (not shown) connected to a longitudinally shiftable draft link or rod **63** which is pivotally connected to the lower end of a vertically depending arm **64** of a bell crank **65**. The bell crank **65** is pivoted on the shank of a shoulder rivet **66** (See FIG. **2**) secured to the primary support plate **15**. The bell crank **65** has a substantially horizontally extending arm **67** adapted to underlie an extension **68** on the end of the detent means arm **57**. The shoulder rivet **66** on which the bell crank **65** is mounted is secured to a flange **69** which extends in a direction normal to the surface of the primary support plate **15**. Movement of the draft link **63** in a direction toward the latch mechanism, i.e., in the direction of the arrow **71** in FIG. **1**, causes the bell crank **65** to be swung to raise its arm **67**. This causes a lifting movement to be applied to the arm **57** of the detent means **52** causing the arm **54** of the latter to be swung away from the latch elements.

Release of the detent means **52** from the latch elements **23–24** through the remote control mechanism on the inside of the vehicle door is independent of the actuation of the detent means from the outside of the vehicle door.

The latch mechanism components for releasing the detent means from the latch elements from the outside of the vehicle door are supported on the secondary support or cover plate **18** and reference is now made to FIG. **4** for the orientation of these components. As was noted above, disengagement of the detent means **52** from the latch elements **23–24** is accomplished by swinging the detent means in a direction to cause the arm **54** to move away from the latch elements. This is accomplished from the outside of the vehicle door by a system of levers and links which comprise a bell crank lever **72** pivotally mounted on a shoulder rivet **73** fastened to the secondary support plate **18**. The bell crank lever **72** has a generally horizontally extending arm **74** adapted to be connected by a link **75** to an outside operator (not shown). The bell crank lever **72** also has a generally vertically extending arm **76** which at its upper end has a tab portion **77** which fits through a slot **78** in an elongated link **79**.

The link **79** is pivotally supported at its upper end on a pivot stud **81** carried on a generally horizontally extending member **82** which is pivoted intermediate its ends by a pivot stud **83** secured to the secondary support plate **18**.

At its end opposite the pivoted end, the link **79** has a tab **84** which in unlocked condition of the latch mechanism **10** lies in abutting relationship to a flange **85** on the edge of the detent lever arm **54**. Thus, when the bell crank lever **72** is swung in a counterclockwise direction, as viewed in FIG. **2**, the interconnection between the bell crank lever **72** and the link **79** results in the latter also being swung in a counterclockwise direction. The tab **84** will then abut the flange **85** and cause the detent means **52** also to be swung in a counterclockwise direction away from and out of engagement with the latch elements **23–24**. This permits the latch elements, if in a latched condition, to move to an unlatched condition so that the vehicle door may be opened relative to the body panel.

If the member **82** is shifted about its pivot axis **83** in a clockwise direction, the tab **84** on the end of the link **79** will bypass the flange **85** on the detent means arm **54**. This effectively renders the outside operator ineffective to disengage the detent means **52** from the latch elements **23–24**. The latch mechanism then is considered in a "locked" condition. The member **82** thus may be considered a locking control member.

The locking control member is shiftable about the pivot axis **83** from a latch mechanism locking position to a latch mechanism unlocking position from either the inside or the outside of the vehicle door. As best seen in FIG. **1**, the vehicle door is provided with a push button **86**. Such a button conventionally is accessible at the upper edge of the door inside of the window glass. The push button **86** is connected by a link **87** to an apertured appendage **88** on the locking control member **82**. With the push button **86** in a raised position as shown in FIG. **1**, the locking control member **82** is in the normal latch mechanism operative position shown in FIGS. **2** and **4**. In this position, as has been explained, the link **79** is swingable to cause the detent means to be disengaged from the latch elements.

The second locking link **89** is connected to the apertured end **91** of the locking control member. The link **89** at its upper end is coupled to a conventional key cylinder mechanism through which the link may be shifted up and down to swing the locking control member about its pivot axis **83**.

The locking control member **82** is held in either latch mechanism locked or latch mechanism unlocked position by a toggle spring **92** extending between the control member **82** and the secondary support plate **18**. One other spring of importance is a spring **93** which is mounted on the secondary support plate **18** and urges the link **79** in a counterclockwise direction as viewed in FIG. **4** out of abutting relation with the flange **85** on the detent means arm **54**. Every time the link **79** is actuated by actuation of the bell crank **72** it is restored to its inoperative position by the spring **93**.

Referring now to FIGS. **4**, **6** and **7**, several different operative relationships of the detent means to the latch elements are shown. In FIG. **5**, for example, detent abutments **55** and **56** on the detent means arm **54** are shown interposed between the abutments **34** on the latch elements **23** and **24**. In this condition the latch elements **23** and **24** are not in their fully latched position. This occurs when insufficient force is exerted on the door during closing movement to cause the striker pin, as it enters between the fingers **28** into abutting relation with the apex portions **36**, to drive the latch elements toward a fully latched condition. In the FIG. **5** condition, the door is latched but is not held fully against rattling or vibratory motion.

FIG. **6** illustrates the normal fully latched condition of the latch elements in which the abutments **55** and **56** on the detent means arm **54** are interposed between the abutment surfaces **35** on the latch elements **23** and **24**. In this condition the striker pin **12** is tightly gripped by the latch elements so as to hold the door against movement in any direction.

In FIG. **7**, the relationship of the detent means to the latch elements may be considered as that which occurs after the detent means **52** is moved to a fully disengaged position relative to the latch elements by either the inside or outside operator. The latch elements **23** and **24** are held in their fully unlatched position by the compound spring **44**. The detent means under

the influence of spring **59** now should be restored to an abutting relationship to the latch elements, such as shown in FIG. 3. It will be noted in FIG. 3 that the corner edge of the abutment **55** on the detent means arm **54** is in abutting relation to the curved edge **33** of the latch element **23**. Under the influence of the spring **59**, upon the latch elements being moved toward latched condition the detent abutments **55** and **56** should first move into the FIG. **5** relationship, and then, if sufficient force is exerted on the door, into the final latched position shown in FIG. **6**.

For any of a number of reasons, such as the failure of spring **59** or the accumulation of road dust, dirty grease or even an ice coating between the detent means and the primary support latch plate **15**, conditions could arise in which the spring **59** is unable to urge the detent means **52** in a clockwise direction as viewed in FIG. **7**. With the detent means inhibited from movement from this position the door would rebound to an open position since the detent means abutments **55** and **56** would not achieve either the FIG. **5** or the FIG. **6** relationship to the abutments on the latch elements.

According to the present invention, the detent means arm **57** with its cam surface **58** lies in abutting relation to the peripheral surface **31** on the latch element **23** so that as the latch element is swung in a counterclockwise direction upon engagement with the striker pin **12**, the abutment **32** will engage and kick the cam surface **58** downwardly thus driving the detent means **52** in a clockwise direction. The relationship of the latch element abutment **32** to the cam surface **58** on the detent means arm **57** is such that this action occurs just as the latch element abutments **35** are in a position of slight overtravel relative to one another so that the abutments **55** and **56** on the detent means arm **54** are able to position themselves between the latch element abutments **35**. Thus, even if for any reason spring **59** is ineffective to accomplish its function of restoring the detent means to normal latch element holding position, the interaction between the latch element **23**, abutment **32** and the cam surface means on the detent means arm **57** insures that the latching relationship will be achieved.

It will be understood that the invention is not to be limited to the exact construction shown and described, but that various changes and modifications may be made without departing from the spirit and scope of the invention as defined in the appended claims.

I claim:

**1**. A latch mechanism comprising:

a primary support plate for disposition adjacent an inner surface of a free edge wall of a vehicle door and a secondary support plate in spaced parallel relation to the primary support plate,

latch device means mounted on the side of the primary support plate facing the secondary support plate comprising a pair of latch elements each mounted on a respective pivot shaft for counterswinging movement into and out of latched position,

detent means comprising a lever member having a plurality of lever arms and pivotally mounted on the primary support plate on the same side of the latter as the latch device means,

a first one of the lever arms having spaced detent portions thereon adapted to simultaneously engage spaced abutments on the latch device elements to hold the latter against counterswinging movement from latched to unlatched position,

spring means engaged with and normally urging the detent means toward latch device means holding position,

cam means responsive to movement of the latch device means to latched position for positively driving the detent means into latch element holding position on failure of the spring means,

and detent actuating means on the surface of the secondary support plate facing the primary support plate operable to disengage the detent means from the latch device means to permit latch element movement to unlatched position.

**2**. A latch device mechanism according to claim **1**, in which:

the cam means for driving the detent means into latch element holding position comprises:

a second one of the lever arms having a cam surface thereon adapted in unlatched position of the detent means to underlie a peripheral surface of one of the latch elements,

and an abutment on the one latch element positioned to engage the lever arm cam surface to drive the detent means into latch element holding position.

**3**. A latch mechanism according to claim **2**, in which:

the detent actuating means comprises an elongated detent engaging member having a detent lever arm engaging abutment on one end,

a control lever pivotally mounted on the secondary support plate,

the detent engaging member being pivotally connected at its other end to the control lever,

and an operating lever pivotally mounted on the secondary support plate and coupled to the detent engaging member for swinging the latter to cause the abutment thereon to engage the detent means and swing the same out of latch device means engagement.

**4**. A latch mechanism according to claim **3**, in which:

the control member is shiftable to move the detent engaging member longitudinally to displace its end abutment out of the path of the detent actuating means thereby to render the latter inoperative to disengage the detent means from the latch elements.

**5**. A latch mechanism according to claim **4**, in which:

a compound spring means has respective coiled end portions encompassing each of the latch element pivot shafts,

each coiled end portion terminating in a free end engaging an abutment on a respective latch element and exerting a torque thereon for urging the latch elements in unlatching direction,

and the free end of one coiled end portion is engaged with the abutment on the one latch element positioned to engage the second lever arm cam surface.

**6**. A latch mechanism according to claim **2**, in which:

a compound spring means has respective coiled end portions encompassing each of the latch element pivot shafts,

and each coiled end portion terminates in a free end engaging an abutment on each latch element and exerting a torque thereon for urging the latch elements in unlatching direction.

**7**. A latch element according to claim **6**, in which:

the free end of one coiled end portion is engaged with the abutment on the one latch element positioned to engage the second lever arm cam surface.

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