Sept. 13, 1960 J. H. ROETHEL 2,952,487

LATCH BOLT AND KEEPER SAFETY INTERLOCK

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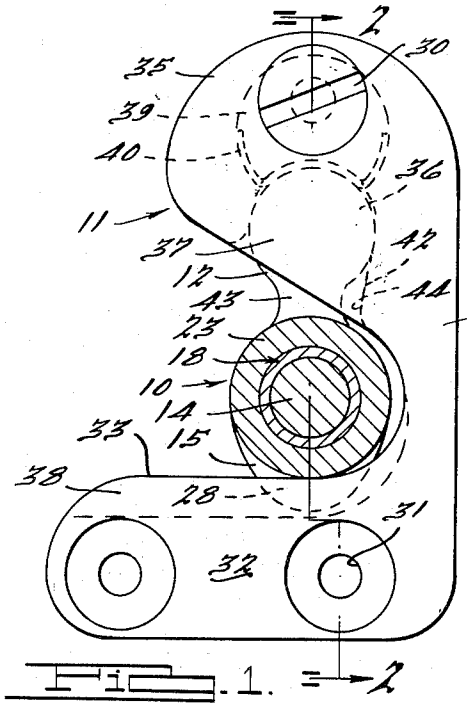


Fig. 1.

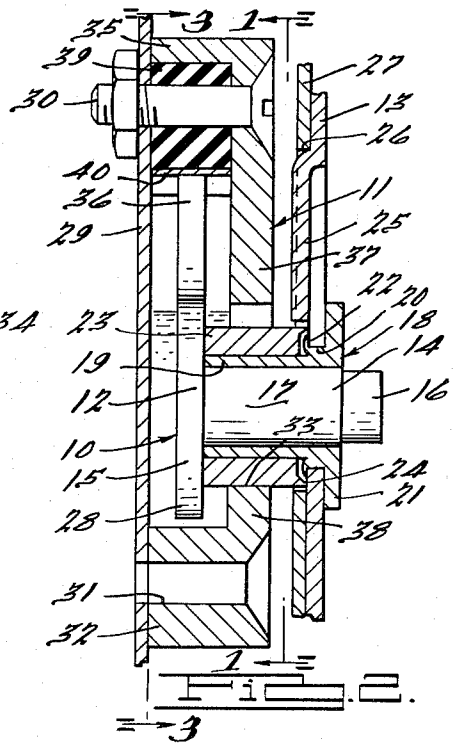
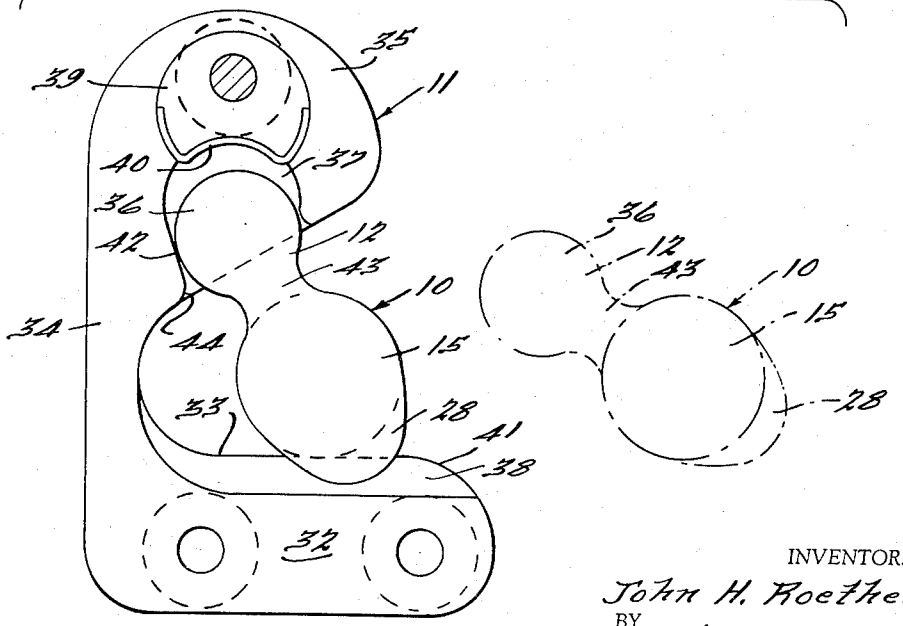


Fig. 2.

Fig. 3.



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LATCH BOLT AND KEEPER SAFETY INTERLOCK

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8 Claims. (Cl. 292—198)

This invention relates to a safety latch device particularly adapted for use on vehicle bodies.

The conventional latch bolt coacting with a striker or keeper device is intended only to hold a vehicle door in closed or latched condition against swinging movement about the door hinges. However, such devices frequently fail to keep the vehicle door securely latched under abnormal conditions, such as when the vehicle is involved in a collision or is upset. The modern vehicle body is only a relatively rigid structure. Collision or upset impacts often cause body deformation and relative movement between the vehicle parts and more particularly between the doors and door framing members. Such body deformation and relative movement between the vehicle door and framing member or body pillar may cause the latch bolt to be pulled away from the striker or keeper in a direction longitudinally of the vehicle body permitting the vehicle door to fly open and the vehicle occupants to be thrown from the vehicle even though the latch mechanism itself remains in latched condition.

It is an object of the present invention to provide a simple and inexpensive improvement in a cooperating latch bolt and keeper device which will effectively inhibit lateral movement, that is, movement in a direction longitudinally of a vehicle body, to a degree sufficient to prevent the latch bolt and keeper device from becoming laterally disengaged. It will be understood that some degree of lateral movement must be permitted to occur since certain tolerances and clearances must be allowed in the fitting together of the vehicle body components to compensate for manufacturing inaccuracies. The present invention permits normal manufacturing tolerances and clearances to be maintained while at the same time making provision for limiting the permissible lateral movement of the bolt and keeper device relative to one another so that the two cannot become abnormally disengaged.

Further objects and advantages and the features of construction embodied in the present invention to attain the same will be apparent from the following description and appended claims, reference being had to the accompanying drawing forming a part of this specification wherein like reference numerals designate corresponding parts in the several views.

Fig. 1 is a sectional view taken substantially through the line 1—1 of Fig. 2 looking in the direction of the arrows and illustrating the cooperative relation between the latch bolt and striker device embodying the present invention when the latch bolt is in door latched position.

Fig. 2 is a section taken substantially through line 2—2 of Fig. 1 looking in the direction of the arrows.

Fig. 3 is a view taken substantially through line 3—3 of Fig. 2 looking in the direction of the arrows but illustrating the latch bolt in dot-and-dash outline in its approach position to the striker device and illustrating the latch bolt in solid outline in its safety latched position.

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.

The present application is a continuation-in-part of my co-pending application, Serial No. 561,754, filed January 27, 1956.

In the drawing there is illustrated, by way of example, a particular embodiment of the present invention as applied to the door and frame structure of an automobile body. The embodiment of the invention illustrated comprises a latch bolt device generally designated **10** and a striker or keeper device generally designated **11**.

The latch bolt **10** comprises a lever or finger-like latch element **12** having a substantially figure eight contour. The latch element **12** is pivotally mounted on the latch plate **13** by means of a pivot shaft **14**, the pivot axis being located substantially at the center of the lower or mounting portion **15** of the latch element **12**. The latch element **12** extends in a substantially up-and-down direction when in a door latched position, see Fig. 1, and is swingable in a plane parallel to the front face of the latch plate **13**.

It will be understood that the latch bolt **10** is operatively associated with a conventional latch mechanism mounted on the innerside of the latch plate **13**. For example, in a conventional latch mechanism the end portion **16** of the stud or shaft **14** carries a ratchet member (not shown) adapted to be engaged by a spring-urged pawl (not shown). The latter, when in engagement with the ratchet, is effective to hold the latch bolt device **10** in door latched position, the position shown in Fig. 1. A spring (not shown) is generally provided to urge the latch bolt device into door unlatched position. The pawl may be disengaged from the ratchet to permit the latch bolt to travel to the door unlatched position. The disengaging means generally comprises both outer and inner manually operable lever means. The latch bolt **10** when in door unlatched position assumes the position indicated in dot-and dash outline in Fig. 3. The ratchet is generally provided with an intermediate tooth or step engageable by the pawl to hold the latch bolt **10** in safety latching position. This is necessary in the event that for some reason the door is not completely moved to a latched position whereby, without the safety latching position, it would be in a condition to fly open. The safety latched position of the bolt **10** is illustrated in solid outline with respect to the striker device **11** in Fig. 3. The inner mechanism of the latch mechanism forms no particular part of the present invention and the foregoing brief description is deemed sufficient to establish a background for understanding the present invention.

A particular importance of the present invention is the manner in which the latch bolt **10** is mounted on the latch plate **13**. It will be noted that the main body portion **17** of the pivot shaft **14** is journalled in a mounting means comprising a bushing **18**. The bushing **18** has a main cylindrical body portion **19** provided with a shoulder **20** of slightly greater diameter than the main body portion and a flange **21** of somewhat larger diameter. The shoulder **20** is undercut to provide a lip portion **22**. The bushing **18** is assembled to the plate **13** by being inserted in a suitable aperture of a diameter complementary to the diameter of the bushing shoulder **20**. The lip portion **22** is then staked or riveted over to securedly and fixedly retain the bushing **18** in place.

The peripheral surface of the bushing main body portion **19** provides a bearing surface for a bearing means

in the form of a roller 23. The roller 23 may be made of a suitable plastic material such as nylon or any suitable metal having good anti-friction qualities. The roller 23 end face 24 is undercut so as not to frictionally engage the staked or riveted-over lip portion 22.

After the roller 23 is placed on the bushing 18, the pivot shaft 14, which may be integral with or riveted to the latch element 12, is inserted in the bushing. When the ratchet plate (not shown) is positioned on the end portion 16 of the latch bolt shaft 14 and the end portion is staked or riveted over, the roller 23 will be trapped between the lower or mounting portion 15 of the latch element 12 and the latch bolt plate portion 13.

As will be noted, Fig. 2, the latch plate 13 is provided with an embossed portion 25 which is adapted to fit into or substantially close up the hole or aperture 26 in the free edge wall or jamb 27 of the vehicle door through which the latch bolt is inserted to project beyond the plane of the leading edge of the door.

It will be noted that the latch element 12 is provided with a flange portion 28 which extends below the lower edge of the roller 23, for a reason to be explained.

The striker or keeper device 11 adapted to cooperate with the latch bolt device 10 embodied in the present invention is adapted to be secured to the vehicle body pillar 29 by suitable bolts 30 projecting through the bolt holes 31. The striker or keeper device, as best seen in Figs. 1 and 3, has in general the form of the letter C open to the outside. It is preferably made of a unitary piece of material and comprises a bottom or foot part 32 having a substantially flat upper surface 33, an ascendant or erect rib portion 34 and a head portion 35 of essentially hook form. The head portion 35 serves to engage the upper or latching portion 36 of the latch element 12 in a manner so as to retain the vehicle door in a closed position. The bottom part or foot portion 32 of the keeper device, or, more particularly, the upper surface 33 thereof, presents a support or bearing means engaging member for the bearing means or roller 23 of the latch bolt device 10. Thus, when the latch bolt device 10 is engaged with the striker or keeper 11 in a manner as shown in Fig. 1, the latter serves to simultaneously hold the door in latched position and to secure the door against vertical movement while the vehicle is in motion.

However, it will be noted that provision is made to prevent the latch bolt device 10 from becoming disengaged from the striker or keeper in a direction of movement axially of the pivot shaft 14 thereof. The axial movement referred to would be in a direction to the right with reference to Fig. 2. The upper or latching portion 36 of the latch element 12 is received in a pocket undercut behind the front wall 37 of the striker or keeper. The bottom or foot part 32 of the striker or keeper device 11 is undercut behind the wall portion 38, on the upper surface 33 of which the roller rides. The lower flange 28 of the latch element 12 projects into this lower undercut portion. Thus, any attempted axial movement to the right as viewed in Fig. 2 of the latch element relative to the striker is inhibited by the wall portions 37 and 38 of the keeper device, except for that movement permitted by the clearance between the latch element 12 and said wall portions. When the latch bolt device 10 is in engagement with the striker or keeper device 11 either in fully latched position as shown in Fig. 1 or in safety latched position as shown in solid outline in Fig. 3, the latch element cannot become disengaged from the striker or keeper device in the normal direction of swinging movement of the door about its hinges or in the event of such distortion of the vehicle body as would cause the door to be moved relatively to the framing member or body pillar in a direction longitudinally of the vehicle body.

It will be noted that the head portion 35 of the striker or keeper device 11 is provided with a rubber insert 39 shielded at the lower portion thereof by a metal shield 40, the latch element contacting portion of which is contoured complementarily to the upper curved contour of the upper or latching portion 36 of the latch element 12. The rubber insert 39 is inserted from the rear face of the striker or keeper device 11 and is automatically retained therein when the striker or keeper device is bolted to the vehicle frame member or body pillar 29. The rubber insert 39 is provided with a suitable hole permitting it to receive the bolt 30 holding the striker or keeper device to the body pillar.

In operation, when the vehicle door is in unlatched condition the latch element 12 has the position shown in dot-and-dash outline in Fig. 3. As the door is swung to a closed position, the roller 23 engages the rounded toe portion 41 of the bottom or foot part 32 of the striker or keeper device and suitably rolls along the upper surface 33 thereof. Thus, if the vehicle door has sagged about its hinges slightly, the roller 23 will cause the door to be picked up so as to properly align the latch bolt element 12 relative to the striker before the door is slammed shut. As the closing movement of the door continues, the rounded portion of the upper or latching portion 36 of the latch element 12 will abut the upper surface of the angularly inclined end wall 42 on the ascendant or rib portion 34 of the striker or keeper device and the latch element 12 will be rotated or swung in a clockwise direction as viewed in Fig. 3. It will be noted that the upper or latching portion and lower or mounting portion of the latch element are connected by a suitably reduced neck portion 43 which, when the latch element 12 is in fully latched position, provides a clearance space between the apex 44 of the inclined end wall 42 of the ascendant rib 32 and the latch element 12. Actually, as the door is moved to fully closed position, the rubber seal around the edges of the door is somewhat compressed and the latch element 12 will overtravel a slight degree. The clearance between the apex 44 of the angular end wall 42 and the neck portion 43 of the latch element permits such overtravel without damage to the bolt device or the striker. Should the closing movement of the door be interrupted when the latch bolt has reached only the position shown in Fig. 3, the vehicle door will be held in safety latched position. It will be obvious that the latch bolt device cannot be moved out of the striker or keeper unless the latch mechanism is released to permit the bolt to rotate back to the position shown in dot-and-dash outline in Fig. 3. Upon normal closing of the door, the latch bolt will travel all the way to the position shown in Fig. 1. The rubber insert 39 will be compressed slightly. It will be understood that the rubber will be sufficiently resistant to compression so that the latch bolt will be substantially held against movement in an up-and-down direction thereby holding the vehicle door against vibration in a vertical direction. Inasmuch as the bushing 18 which supports the latch bolt element 12 and its pivot shaft 14 is rigidly and firmly secured to the latch plate 13, it is not necessary to provide any additional structure, such as a dovetail cooperating with a wedge, to hold the vehicle door against movement in an up-and-down direction. The hard rubber insert acts as a means for taking up any vertical clearances which might exist between the latch element and the striker or keeper device.

Although in its preferred form, as illustrated and hereinabove described, the structure embodying the present invention utilizes the roller 23, it will be readily apparent that the roller 23 may be eliminated and a non-rollable bearing means substituted therefor. Compensation would have to be made for the removal of roller 23 so as to maintain the latch element 12 in proper relation to the striker 11. This could be done by increasing the outside diameter of the main cylindrical portion 19 of the bushing 18 to a dimension equal to the outside diameter

of the roller **23**. In the alternative, the height of the wall portion **38** of the striker **11** could be increased so that the upper surface **33** thereof would underlie the outer surface of the cylindrical portion **19** should it be desired to maintain the diameter of the latter as shown. Further, both the outside diameter of the bushing portion **19** and the height of the wall portion **38** could be increased to suitable complementary dimensions to maintain the latch element **12** in its desired door latched relationship to the striker **11**.

Obviously, a fixed bearing means instead of the roller **23** engaging the upper surface **33** of the striker bottom or foot portion **32** would be less desirable from the standpoint of the increased frictional wear on the supporting surface **33** resulting from sliding friction as compared to that resulting from rolling friction. However, the elimination of the roller **23** reduces the cost of the mechanism without too seriously decreasing the useful life thereof. The rollerless construction would be noisier in operation but here again the cost differential might outweigh this advantage of the construction embodying a roller **23**.

The construction embodying the present invention as hereinabove described derives an important advantage from the relationship of the upper or latching portion **36** of the latch element **12** to the upper or head portion **36** of the keeper or striker device **11** when the latch element is in door latched condition (see Fig. 1). In effect the upper portion **36** of the latch element and the retaining pocket of the striker head portion **35** form a ball and socket connection, at least in a plan normal to the pivot axis of the latch element **12**. As the vehicle is driven about a certain amount of lateral twisting of the vehicle body occurs. This is reflected in the vehicle door and the adjacent body pillar to which the door is latched being twisted laterally relative to one another. This is turn causes relative movement between the peripheral surface of the upper or latching portion **36** of the latch element **12** and the adjacent wall surface of the retaining pocket in the striker head portion **35**. But because of the partial ball and socket relationship between the latch element and the striker, the latching action remains fully effective as the latch element upper or latching portion **36** rolls from side to side relative to the striker head portion pocket. And, because of the relatively large contact areas involved this is very little frictional wear resulting from such relative movement.

A further advantage of the ball and socket relationship of the latch element **12** and striker or keeper **11** is that the installation of the striker on the body pillar is made much easier. Normally, much care must be taken to insure that the vertical axis of the striker is perfectly aligned with the door latched position vertical axis of the latch element. This is particularly true when the latch bolt and keeper or striker are of the type exemplified in my U.S. Patent 2,499,165. As illustrated therein, positive latching of the door depends on line contact between a relatively small gear tooth on the rotor and a small rack tooth on the striker. Improper vertical alignment of the striker results in either non-latching or unsafe latching of the vehicle door. With the construction embodied in the present invention, the vertical mis-alignment of the striker may be several degrees from the optimum position without rendering the latching action impossible or unsafe.

The large contact areas between the latch element **12** and striker **11** also effectively diminish the effect of wear between the contact surfaces resulting from relative vertical movement between the latch element and striker caused by vehicular vibrations in a vertical plane, as will be readily apparent.

The foregoing construction and arrangement which has been described is believed to be a relatively inexpensive, easily fabricated and highly efficient means of providing a safety interlock for vehicle doors.

I claim:

1. In a door latching mechanism, a latch device having a latching portion and a mounting portion spaced from said latching portion, mounting means fixedly mounted on the door journalling said latch device at its mounting portion for pivotal movement, bearing means on said mounting means adjacent said latch device mounting portion, a keeper device having latch holding means cooperable with said latching portion of said latch device upon closing the door to hold the door in latched position, said keeper device having a bearing means engaging member traversed by said bearing means upon closing the door, said latching portion leading said bearing means toward engagement with said keeper device, said keeper device having an end wall engageable by said leading latching portion and against which the latter travels to cause said latch device to be pivoted into door latched position, said member having a part disposed to be in blocking position with respect to a portion of said latch device mounting portion in the closed position of the door and effective to block such relative displacement of the latching portion from the latch holding means longitudinally of the door as would cause separation thereof.

2. In a door latching mechanism, a latch device having a latching portion and a mounting portion spaced from said latching portion, bushing means fixedly mounted on the door, a pivot stud for said latch device journalled by said bushing means and to the outer end of which said latch device is secured at its mounting portion, bearing means on said bushing means adjacent said latch device mounting portion, a keeper device having latch holding means cooperable with said latching portion of said latch device upon closing the door to hold the door in latched position, said keeper device having a member engageable by said bearing means and against which the latter travels upon closing the door, said latching portion preceding said bearing means into engagement with said keeper device, said keeper device having an end wall engageable by said preceding latching portion and against which the latter travels to cause said latch device to be pivoted into door latched position, said member having a part overlapping a projecting portion of said latch device in the closed position of the door and effective to block such relative displacement of the latching portion from the latch holding means longitudinally of the door as would cause separation thereof.

3. In a door latching mechanism, a latch device, means for pivotally mounting said latch device to turn on the door, said means comprising a bushing means fixedly secured to the door and a pivot stud journalled within said bushing means, said latch device having a latching portion projecting radially from the pivotal mounting thereof, a roller carried by said bushing means adjacent said latch device, a keeper device having a recessed portion cooperable with said latching portion of said latch device upon closing the door for holding the door in latched position, said keeper device having a member engageable by said roller and against which said roller travels upon closing the door, said latching portion preceding said roller into engagement with said keeper device, said keeper device having an end wall engageable by said preceding latching portion and against which the latter travels to cause said latch device to be pivoted into door latched position, said member overlapping said latch device in position to block such relative displacement of the latching portion from said recessed portion longitudinally of the door as would cause separation thereof.

4. In a door latching mechanism, a latch device having a latching portion and a mounting portion spaced from said latching portion, means for pivotally mounting said latch device to turn on the door, said means comprising a bushing means fixedly secured to the door and a pivot stud journalled within said bushing means, said latch device being secured at its mounting portion to the outer end of said pivot stud, a roller mounted on said bushing

means adjacent said latch device mounting portion, a keeper device having latch holding means cooperable with a portion of said latch device upon closing the door to hold the door in latched position, said keeper device having a roller engaging member traversed by said roller upon closing the door, said latching portion preceding said roller into engagement with said keeper device, said keeper device having an end wall engageable by said preceding latching portion and against which the latter travels to cause said latch device to be pivoted into door latched position, said keeper device also having a member disposed in blocking position with respect to said latching portion of said latch device in the closed position of the door and effective to block such relative displacement of the latching portion from said latch holding means longitudinally of the door as would cause separation thereof.

5. In a door latching mechanism, a latch device having a latching portion and a mounting portion spaced from said latching portion, means for pivotally mounting said latch device to turn on the door, said means comprising a bushing means fixedly secured to the door and a pivot stud journalled within said bushing means, said latch device being secured at its mounting portion to the outer end of said pivot stud, a roller mounted on said bushing means adjacent said latch device mounting portion, a keeper device having a latch holding means cooperable with a portion of said latch device upon closing the door to hold the door in latched position, said keeper device having a roller engaging member traversed by said roller and above which said roller travels upon closing the door, said latching portion preceding said roller toward engagement with said keeper device, said keeper device having an end wall engageable by said preceding latching portion and against which the latter travels to cause said latch device to be pivoted into door latching position, said member being disposed in blocking position with respect to said latching portion of said latch device in the closed position of the door and effective to block such relative displacement of the latching portion from said latch holding means as would cause separation thereof longitudinally of the door.

6. In a door latching mechanism, a latch device, means for pivotally mounting said latch device to turn on the door, said means comprising a bushing means fixedly secured to the door and a pivot stud journalled within said bushing means, a roller carried by said bushing means adjacent said latch device, a keeper device, said latch device and keeper device having one a latching portion and the other a recessed portion inter-engageable upon closing the door for holding the door in latched position, said keeper device having a member engageable by said roller and against which said roller travels upon closing the door, said latching portion preceding said roller into engagement with said keeper device, said keeper device having an end wall engageable by said preceding latching portion and against which the latter travels to cause said latch device to be pivoted into door latched position, said member overlapping said latch device in position to block such relative displacement of the latching portion from said recessed portion longitudinally of the door as would cause separation thereof.

7. In a door latching mechanism, a latch device having a latching portion and a mounting portion spaced from said latching portion, mounting means fixedly mounted on the free edge wall of the door and journalling said latch device at its mounting portion for pivotal movement, bearing means interposed between said latch device and said free edge wall, a keeper device having latch holding means cooperable with said latching portion of said latch device upon closing the door to hold the door in latched position, said keeper device having a bearing means engaging member traversed by said bearing means upon closing the door, said latching portion preceding said bearing means into engagement with said keeper device, said keeper device having an end wall engageable by said preceding latching portion and against which the latter travels to cause said latch device to be pivoted into door latching position, said keeper device having a portion disposed in blocking position with respect to a portion of said latch device in the closed position of the door and effective to block such relative displacement of the latching portion from the latch holding means longitudinally of the door as would cause separation thereof.

8. In a door latching mechanism, a latch device, mounting means pivotally supporting said latch device on the free edge wall of the door in spaced relation thereto, bearing means interposed between said latch device and said free edge wall, a keeper device, said latch device and said keeper device having one a latching portion and the other a recessed portion receiving said latching portion upon closing the door for holding the door in latched position, said keeper device having a portion engageable by said bearing means against which the latter bears upon closing the door, said latching portion preceding said bearing means into engagement with said keeper device, said keeper device having an end wall engageable by said preceding latching portion and against which the latter travels to pivot said latch device into door latching position, and said latch device and keeper device having in door closed position overlapping sections effective to block such relative displacement of the latching portion from said recessed portion longitudinally of the door as would cause separation thereof.

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