Sept. 21, 1965 F. ERNEST 3,207,546

DOOR LOCK DEVICES

Filed Oct. 7, 1963

FIG. 1.

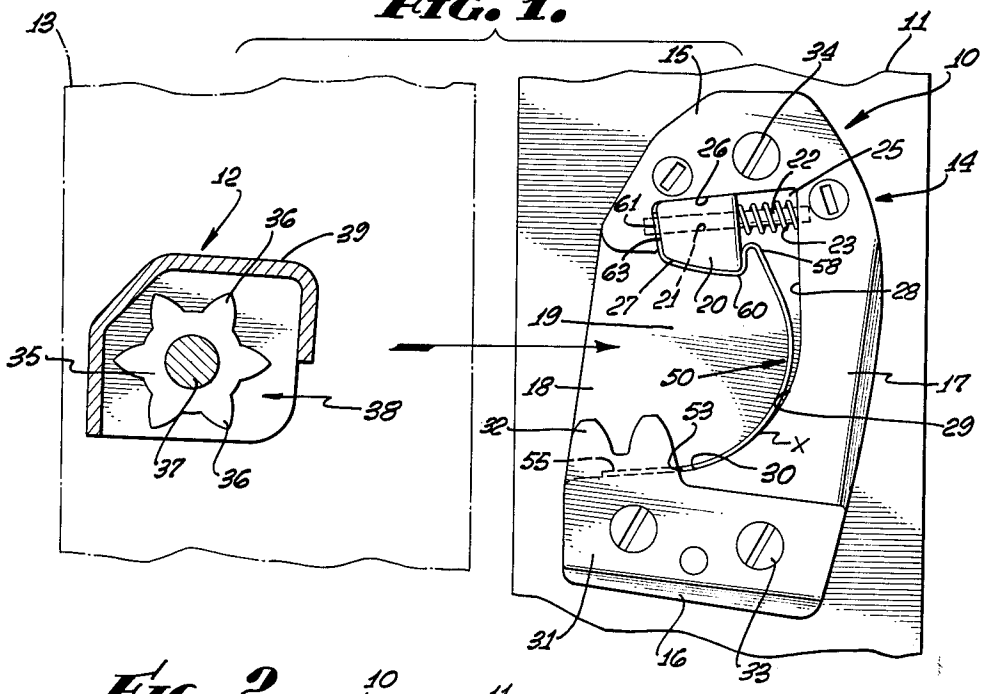


FIG. 2.

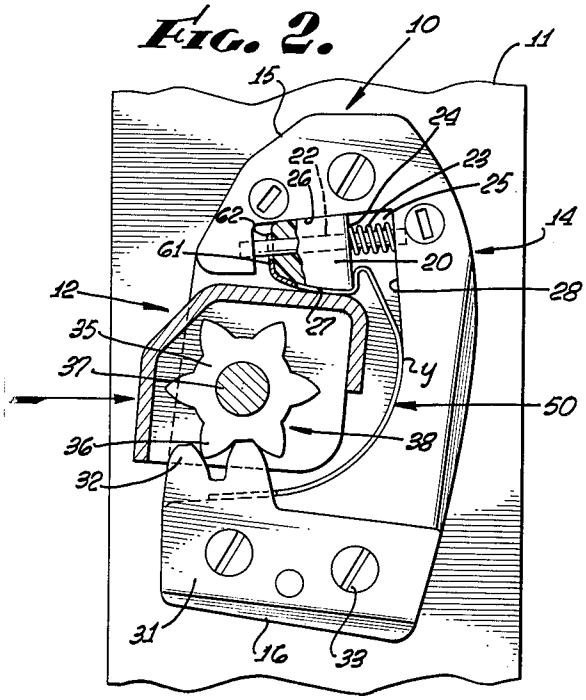
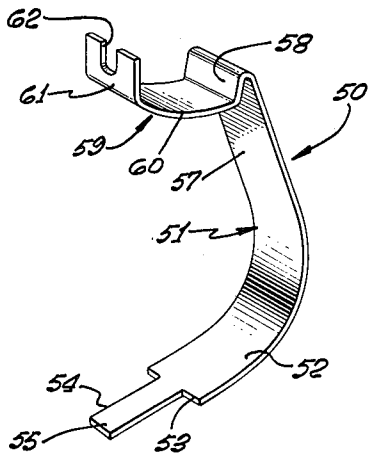


FIG. 3.



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United States Patent Office 3,207,546 Patented Sept. 21, 1965

3,207,546

DOOR LOCK DEVICES

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Filed Oct. 7, 1963, Ser. No. 314,245
12 Claims. (Cl. 292—341.13)

The present invention relates to lock devices, and more particularly to devices of the rotary bolt type used for automobile doors.

Door lock devices of the type disclosed in United States Patents Nos. 2,629,620 and 2,860,905 embody a rotary bolt and housing carried by the door which coact with the teeth of a striker or keeper and a spring pressed wedge or shoe carried by the vehicle body or door pillar to maintain the bolt in engagement with the striker teeth and hold the door against vertical movement. It is found that the spring exerts insufficient force on the wedge to prevent vertical and other movement of the door, resulting in its rattling. This undesirable result is emphasized by wear of the engaging surfaces of the housing and wedge, particularly where the wedge is made of relatively soft material, such as nylon or other synthetic resin.

Accordingly, an object of the present invention is to provide a door lock device of the type above indicated, in which the spring force acting on the wedge is increased substantially, thereby eliminating door movement when the door is in closed position.

Another object of the invention is to provide a door lock device of the type above indicated, in which resistance to wear of the wedge is increased considerably, thereby eliminating door rattling that would otherwise result.

A further object of the invention is to provide a device that can be mounted on existing door locks of the rotary bolt type to supplement the spring force acting on the striker assembly wedge and to increase the wear resistance of such wedge. In fact, wear on the wedge by the door housing member is eliminated since the device acts as a shim on the wedge engaged by the door housing.

An additional object of the invention is to provide a leaf spring capable of being mounted on existing door locks of the rotary bolt type to function as an intervening wear take-up and wear resisting shim between the wedge and door housing members, and to supplement the force of the spring acting on the wedge, the leaf spring coacting with the striker or keeper frame in such manner that its spring force is substantially greater than a direct proportion to its extent of deflection.

This invention possesses may other advantages, and has other objects which may be made more clearly apparent from a consideration of a form in which it may be embodied. This form is shown in the drawings accompanying and forming part of the present specification. It will now be described in detail, for the purpose of illustrating the general principles of the invention; but it is to be understood that such detailed description is not to be taken in a limiting sense, since the scope of the invention is best defined by the appended claims.

Referring to the drawings:

FIGURE 1 is an exploded view of a striker or keeper assembly and rotary bolt device cooperable therewith, with the door in open position;

FIG. 2 is a view of the parts disclosed in FIG. 1 following movement of the door to fully closed position;

FIG. 3 is an isometric projection of a leaf spring forming part of the door lock apparatus illustrated in FIGS. 1 and 2.

A typical automobile door lock construction of the rotary bolt type is illustrated in the drawings, including a keeper assembly **10** secured to the vehicle body or door pillar **11** and a cooperating rotary latch mechanism **12**

suitably mounted on the end wall of an automobile door **13**.

The keeper or striker assembly **10** includes a frame **14** of generally C-shape having spaced upper and lower arms **15**, **16** connected by an intermediate portion or strut **17**. The intermediate portion and upper and lower arms may be reinforced by a strengthening web or base **18** integral therewith and forming the inner vertical wall of a cavity **19** provided by the C-shape of the frame. In the specific device illustrated in the drawings, the upper arm **15** of the striker or keeper frame carries a slidable shoe or wedge **20**, made of a suitable material, such as nylon, which has a bore **21** therethrough to receive a pin or guide rod **22** mounted in the frame, the wedge being urged in an outward direction by a helical compression spring **23** encompassing the guide rod and bearing against the inner end **24** of the wedge and the inner wall **25** of the frame. The pin **22**, spring **23** and major portion of the wedge **20** are disposed within an upper recess **25** in the frame, the upper surface of the wedge being slidable along a companion upper bearing surface **26** of the frame and the lower surface **27** of the wedge being tapered, inclining in an upward direction outwardly of the frame.

The upper inner portion **28** of the rear wall of the intermediate strut **17** of the frame extends substantially vertically, its lower portion merging into a tapered or curved wall surface **29**, which, in turn, merges into a lower wall surface **30** of the lower arm **16** of the frame and defining the lower portion of the recess or cavity **19**.

Mounted upon the lower arm **16** of the striker or keeper frame is a toothed insert **31** having a pair of upwardly extending bolt engaging teeth **32**. Screws **33** extend through the toothed insert member **31** and through the lower arm **16** into the end pillar wall of the vehicle body **11** to secure the insert member to the frame and the lower portion of the latter to the body. Similarly, one or more upper screws **34** secure the upper portion of the frame **14** to the pillar wall of the automobile. If desired, the insert **31** can be integral with the frame **14**.

A rotatable bolt **35** having external teeth **36** is rotatably mounted on a shaft **37** secured in a bolt housing member **38**, which is suitably secured to and projects from the jam face or end wall **13** of the automobile door. When the door is swung to a closed position, the teeth **36** of the rotatable bolt ride over the striker teeth **32**, the upper surface **39** of the bolt housing or casing **38** engaging the tapered surface **27** of the sliding shoe or wedge **20** to retain the door against vertical movement. Shifting of the door to its fully closed position will result in the housing **38** moving the wedge **20** inwardly against the force of its spring **23**, the spring pressed wedge tending to urge the housing **38** and its rotatable bolt **35** toward the companion bolt engaging teeth **32** to maintain them firmly coengaged. The bolt **35** is retained against reverse rotation to prevent the door from being opened in a known manner by the usual detent mechanism employed in door locks of the type disclosed. Since such detent mechanism forms no part of the present invention, it has not been illustrated in the drawings.

As a result of use of the door lock mechanism, wear occurs on the shoe or wedge **20**, which is made of much softer material than the bolt housing **38**. As a result, the spring force acting on the wedge and forcing the rotary bolt **35** downwardly into engagement with the stationary teeth **32** is diminished. At that, the spring force is relatively low, even when the device is new. The production of wear of the wedge **20** and even on the coengaging top surface **39** of the bolt housing permits vertical movement of the door when in its closed position, and its consequent rattling.

The present invention overcomes the aforenoted difficulties and actually increases the available spring force. A generally U-shaped spring member **50** is mounted within the recess or cavity **19** of the striker or keeper frame **14**. This leaf spring extends around the inner portion of the recess or cavity to permit entry of the housing **38** and rotary bolt **35** thereinto. In the specific keeper assembly disclosed in the drawings, the slidable shoe or wedge **20** is at the upper portion of the cavity **19** and the insert **31** at its lower portion. When used in this environment, the spring assembly includes a spring arm **51**, the lower portion **52** of which is of arch shape, being adapted to bear against the lower curved wall **29** of the intermediate frame portion **17** and also extending against the lower arm **16** of the frame, to which the lower portion of the spring arm may be suitably anchored, as by abutting a shoulder or anchor portion **53** of the spring arm against the toothed insert member **31**. The lower portion of the spring arm is disclosed as having notches **54** on opposite sides of a projecting arm portion **55**, so that the same spring can be used with both right and left hand keeper assemblies. In lieu of relying upon the shoulder or anchor portion **53** to engage the toothed insert **31**, and thereby prevent movement of the lower portion **52** of the U-shaped leaf spring **50** with respect to the frame **14**, a suitable fastening means, such as a screw (not shown), may extend through the lower portion of the spring into the frame arm **16** at the bottom of the cavity **19**.

The arch portion **52** of the spring merges into an upper relatively straight portion **57** disposed along the inner wall **28** of the cavity, which, in turn, merges into the inner finger **58** of a U-shaped saddle portion **59** of the spring, the inner finger folding downwardly over the upper end of the arm portion **57**. This inner finger **58** merges into an intermediate web **60** curved to conform to the tapered surface **27** of the wedge **20**, the web merging into an outer finger **61** extending outwardly and in the same direction as the inner finger **58** and having a central notch **62** therein to permit the bifurcations of the finger to straddle or extend on opposite sides of the pin **22**, the outer finger extending against the outer surface **63** of the slidable shoe or wedge, with the inner finger engaging the inner surface **24** of the wedge.

The spring **50** is so proportioned that when its saddle portion **59** is slipped over the shoe or wedge **20**, its anchor portion **53** engages the toothed insert **31** with the intermediate arch portion **52** of the spring engaging the wall **29** of the recess or cavity **19**, the leaf spring **50** being under tension and tending to urge the wedge **20** in an outward direction when the door **13** is open, supplementing the force of the helical spring **23**. The web **60** of the spring extends over the tapered surface **27** of the wedge **20** and functions as a shim to be engaged by the bolt housing or casing **38**, instead of the latter directly engaging the wedge itself.

When the door **13** is moved to closed position, the teeth **36** of the rotatable bolt **35** engage the teeth **32** of the keeper assembly, the bolt housing **38** bearing against the web **60** of the spring and urging the wedge **20** inwardly against its helical spring **23** and also inwardly against the spring force of the leaf spring arm **51**. As the housing **38** moves to its fully closed position, the arch portion **52** of the arm, in effect, fulcrums against the inner wall **29**, **28** of the housing recess, the arm deflecting in the nature of a cantilever beam with increasing spring force in resisting inward movement of the wedge **20**, constantly urging the wedge **20** and the shim **60** covering its tapered surface in an outward direction against the housing **38** to force the latter downwardly and retain the bolt teeth **36** in firm engagement with the keeper teeth **32**, thereby insuring against movement of the door and its rattling. Thus, the spring force of the helical spring **23** is supplemented to a considerable degree by the spring force of the cantilever beam arm **51**. This latter spring force

increases greater than in proportion to the extent of deflection of the spring arm **51** as the wedge **20** moves inwardly along the guide pin **22** and upper bearing surface **26**, since the arch portion **52** of the arm is, in effect, flattened against the inner wall **29**, **28** of the housing, decreasing the effective length of the spring arm and thereby greatly increasing its resisting spring force. Thus, as disclosed in FIG. 1, the effective length of the spring arm **51**, with the door in open position, extends from the bearing point of the arm against the inner wall at x to the wedge **20**; whereas, with the door in closed position, such as disclosed in FIG. 2, the effective length of the spring arm extends from its uppermost bearing point against the wall at the point y to the wedge, this latter arm being of considerably shorter extent than the effective length of the arm disclosed in FIG. 1. During the inward deflection of the arm, as the rotary bolt **35** and housing **38** are moved inwardly of the cavity **19**, the lower portion of the arm **51** remains fixed, being anchored or shouldered against the lower wall **30** of the cavity and the toothed insert member **31**.

In addition to greatly enhancing the spring force, the leaf spring **50**, being made of a suitable metal, such as spring steel, has its web **60** contacting the metallic bolt housing or casing **38**, rather than the relatively soft wedge **20** engaging the bolt housing or casing. The result is a substantial decrease in wear on the parts since the co-engaging parts are much more wear resistant than the nylon wedge. Accordingly, the tight engagement of the rotary bolt teeth **36** with the keeper teeth **32** will be maintained over a much longer life of the automobile body and its door, door movement being eliminated when the door is in closed position.

The leaf spring device is usable in connection with existing door locks of the rotary bolt type, requiring no changes in the structure of the latter. It is shaped and designed in such fashion as to supplement the force of the helical spring **23** on the wedge to positively prevent rattling of the door when in closed position, to minimize wear on the parts, and to compensate for wear that does occur through a greater spring force tending to urge the wedge outwardly and retain the rotary bolt teeth against the keeper teeth.

I claim:

1. In a keeper structure having a generally C-shaped frame adapted to be mounted on a supporting body and including spaced upper and lower generally horizontal arms providing an opening closed at one side by a generally vertical portion rigidly interconnecting said arms, a wedge projecting into said opening and movable along one of said arms, and teeth on said other arm projecting into said opening toward said wedge, the combination therewith of a generally C-shaped leaf spring in said opening having a first portion adjacent and substantially fixed with respect to said other arm, a second portion engaging said wedge, and a third portion interconnecting said first and second portions and engaging said vertical frame portion to provide a spring force on said wedge resisting its inward movement along said one of said arms.

2. In a keeper structure having a generally C-shaped frame adapted to be mounted on a supporting body and spaced upper and lower generally horizontal arms providing an opening closed at one side by a generally vertical portion rigidly interconnecting said arms, a wedge projecting into said opening and movable along one of said arms, and teeth on said other arm projecting into said opening toward said wedge, said wedge having a tapered surface facing said other arm, the combination therewith of a generally C-shaped leaf spring in said opening having a first portion engaging and substantially fixed with respect to said other arm, a second portion engaging said wedge and disposed over said tapered surface, and a third portion interconnecting said first and second portions and engaging said vertical frame portion to provide a spring

force on said wedge resisting its inward movement along said one of said arms.

3. In a keeper structure having a generally C-shaped frame adapted to be mounted on a supporting body and spaced upper and lower generally horizontal arms providing an opening closed at one side by a generally vertical portion rigidly interconnecting said arms, a wedge projecting into said opening and movable along one of said arms, and teeth on said other arm projecting into said opening toward said wedge, said wedge having a tapered surface facing said other arm, the combination therewith of a generally C-shaped leaf spring in said opening having a first portion engaging and substantially fixed with respect to said other arm, a second portion including inner and outer fingers engaging inner and outer ends, respectively, of said wedge, and a web interconnecting said fingers and disposed over said tapered surface, and a third portion interconnecting said first portion and inner finger and engaging said vertical frame portion to provide a spring force on said wedge resisting its inward movement along said one of said arms.

4. In a keeper structure having a generally C-shaped frame adapted to be mounted on a supporting body and including spaced upper and lower generally horizontal arms providing an opening closed at one side by a generally vertical portion rigidly interconnecting said arms, a wedge projecting into said opening and movable along one of said arms, and teeth on said other arm projecting into said opening toward said wedge, the combination therewith of a generally C-shaped leaf spring in said opening having a first portion adjacent and substantially fixed with respect to said other arm, a second portion engaging said wedge, and a third portion interconnecting said first and second portions and engaging said vertical frame portion to provide a spring force on said wedge resisting its inward movement along said one of said arms, said third portion and vertical frame portion being so shaped that said third portion progressively engages said vertical frame portion closer to said one of said arms as said wedge moves inwardly of said opening to decrease the effective length of said third portion.

5. In a keeper structure having a generally C-shaped frame adapted to be mounted on a supporting body and including spaced upper and lower generally horizontal arms providing an opening closed at one side by a generally vertical portion rigidly interconnecting said arms, a wedge projecting into said opening and movable along one of said arms and along a guide rod mounted in said frame and extending through said wedge, and teeth on said other arm projecting into said opening toward said wedge, said wedge having a tapered surface facing said other arm, the combination therewith of a generally C-shaped leaf spring in said opening having a first portion adjacent and substantially fixed with respect to said other arm, a second portion including inner and outer fingers engaging inner and outer ends, respectively, of said wedge, and a web interconnecting said fingers and disposed over said tapered surface, said outer finger having a notch receiving said guide rod, and a third portion interconnecting said first portion and inner finger and engaging said vertical frame portion to provide a spring force on said wedge resisting its inward movement along said one of said arms.

6. In a keeper structure having a generally C-shaped frame adapted to be mounted on a supporting body and spaced upper and lower generally horizontal arms providing an opening closed at one side by a generally vertical portion rigidly interconnecting said arms, a wedge projecting into said opening and movable along one of said arms, and teeth on said other arm projecting into said opening toward said wedge, said wedge having a tapered surface facing said other arm, the combination therewith of a generally C-shaped leaf spring in said opening having a first portion engaging and substantially fixed with

respect to said other arm, a second portion including inner and outer fingers engaging inner and outer ends, respectively, of said wedge, and a web interconnecting said fingers and disposed over said tapered surface, and a third portion interconnecting said first portion and inner finger and engaging said vertical frame portion to provide a spring force on said wedge resisting its inward movement along said one of said arms, said third portion and vertical frame portion being so shaped that said third portion progressively engages said vertical frame portion closer to said one of said arms as said wedge moves inwardly of said opening to decrease the effective length of said third portion.

7. In a keeper structure having a general C-shaped frame adapted to be mounted on a supporting body and including spaced upper and lower generally horizontal arms providing an opening closed at one side by a generally vertical portion rigidly interconnecting said arms, a wedge projecting into said opening and movable along one of said arms, and teeth on said other arm projecting into said opening toward said wedge, the combination therewith of a leaf spring in said opening having a first portion substantially fixed with respect to said frame and a spring arm engaging said wedge to resist inward movement of said wedge along said one of said arms.

8. In a keeper structure having a generally C-shaped frame adapted to be mounted on a supporting body and spaced upper and lower generally horizontal arms providing an opening closed at one side by a generally vertical portion rigidly interconnecting said arms, a wedge projecting into said opening and movable along one of said arms, and teeth on said other arm projecting into said opening toward said wedge, said wedge having a tapered surface facing said other arm, the combination therewith of a leaf spring in said opening having a first portion substantially fixed with respect to said frame, a second portion engaging said wedge and disposed over its tapered surface, and a spring arm interconnecting said first and second portions to resist inward movement of said wedge along said one of said arms.

9. A leaf spring adapted to be mounted in a keeper structure having a generally C-shaped frame that includes spaced upper and lower generally horizontal arms providing an opening closed at one side by a generally vertical portion rigidly interconnecting said arms, the keeper structure also including a wedge projecting into the opening and movable along one of the arms, and teeth on the other arm projecting into the opening, the leaf spring being of generally C-shape and adapted to be disposed in the opening and having a first portion adapted to be fixed with respect to the other arm, a second portion adapted to engage the wedge, and a third portion interconnecting the first and second portions and adapted to engage the vertical frame portion to provide a spring force on the wedge resisting its inward movement along the one frame arm.

10. A leaf spring adapted to be mounted in a keeper structure having a generally C-shaped frame that includes spaced upper and lower generally horizontal arms providing an opening closed at one side by a generally vertical portion rigidly interconnecting the arms, the keeper structure also including a wedge projecting into the opening and movable along one of the arms, and teeth on the other arm projecting into the opening, the wedge having a tapered surface, the leaf spring being of generally C-shape and adapted to be disposed in the opening and having a first portion adapted to be fixed with respect to the other arm, a second portion adapted to engage the wedge and to be disposed over its tapered surface, and a third portion interconnecting said first and second portions and adapted to engage the vertical frame portion to provide a spring force on the wedge resisting its inward movement along the one arm.

11. A leaf spring adapted to be mounted in a keeper structure having a generally C-shaped frame that includes

spaced upper and lower generally horizontal arms providing an opening closed at one side by a generally vertical portion rigidly interconnecting the arms, the keeper structure also including a wedge projecting into the opening and movable along one of the arms, and teeth on the other arm projecting into the opening, the wedge having a tapered surface, the leaf spring being of generally C-shape and adapted to be disposed in the opening and having a first portion adapted to be fixed with respect to the other arm, a second portion including inner and outer fingers adapted to be disposed in engagement with inner and outer ends, respectively, of the wedge, and a web interconnecting said fingers and adapted to be disposed over the tapered surface of the wedge, and a third portion interconnecting said first portion and inner finger and adapted to engage the vertical frame portion to provide a spring force on the wedge resisting its inward movement along the one arm.

12. A leaf spring adapted to be mounted in a keeper structure having a generally C-shaped frame that includes spaced upper and lower generally horizontal arms providing an opening closed at one side by a generally vertical portion rigidly interconnecting the arms, the keeper structure also including a wedge projecting into the opening

and movable along one of the arms and also along a rod fixed to the frame and extending through the wedge, and teeth on the other arm projecting into the opening, the leaf spring being of generally C-shape and adapted to be disposed in the opening and having a first portion adapted to be fixed with respect to the other arm, a second portion including inner and outer fingers adapted to engage inner and outer ends, respectively, of the wedge, and a web interconnecting said fingers and adapted to be disposed over the tapered surface of the wedge, said outer finger having a notch adapted to receive the rod, and a third portion interconnecting said first portion and inner finger and adapted to engage the vertical frame portion to provide a spring force on the wedge resisting its inward movement along the one arm.

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