March 26, 1940. R. MARPLE 2,195,179

LOCKING DEVICE

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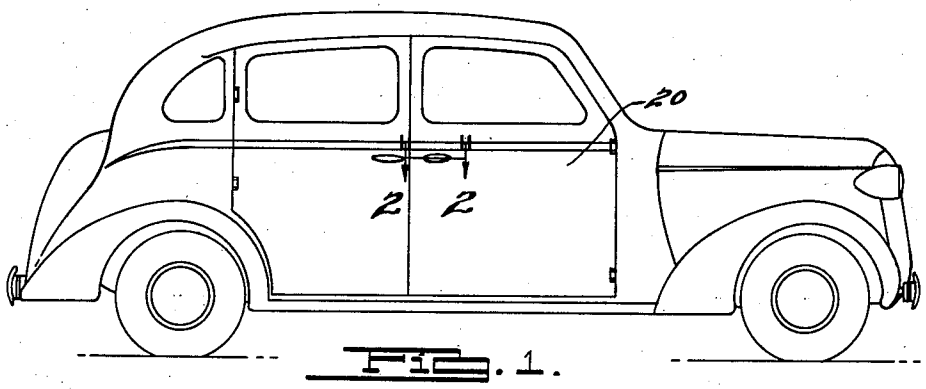


Fig. 1.

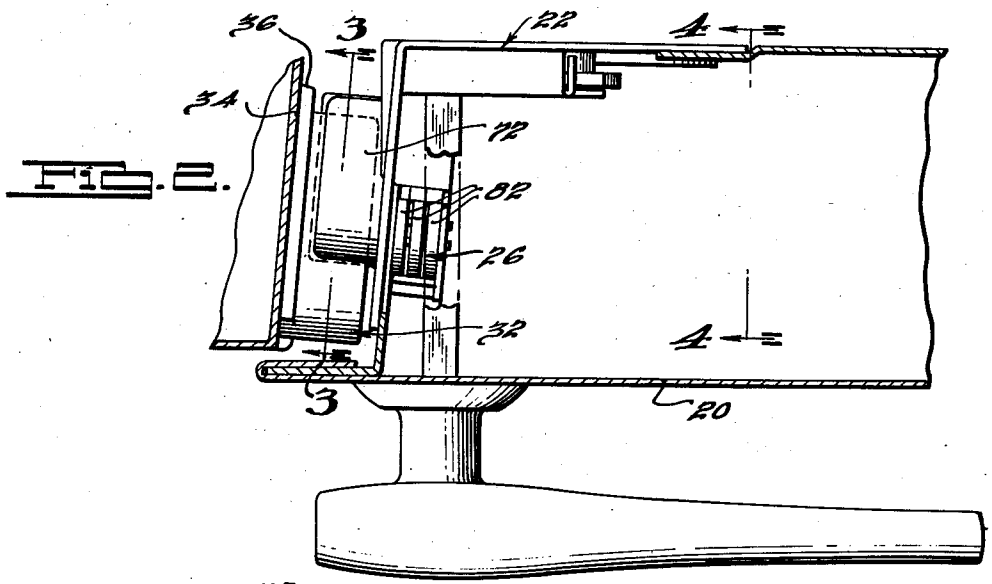


Fig. 2.

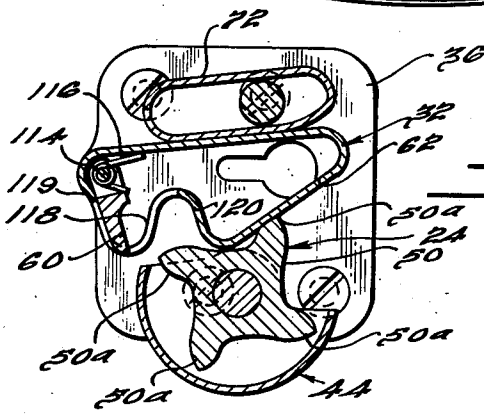


Fig. 3.

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LOCKING DEVICE

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Fig. 4.

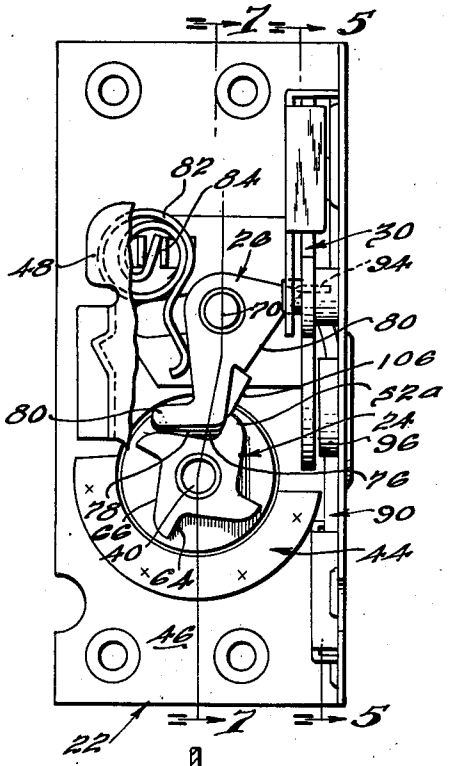
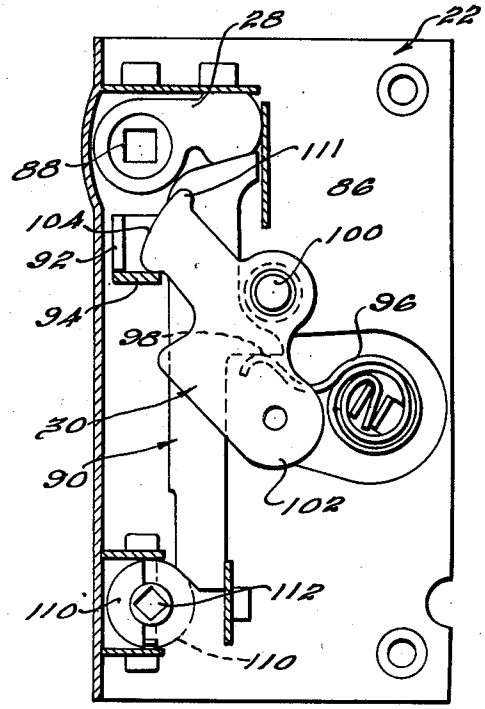


Fig. 5.



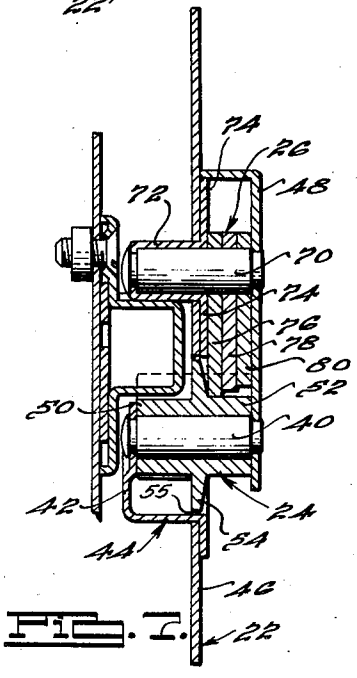


Fig. 7.

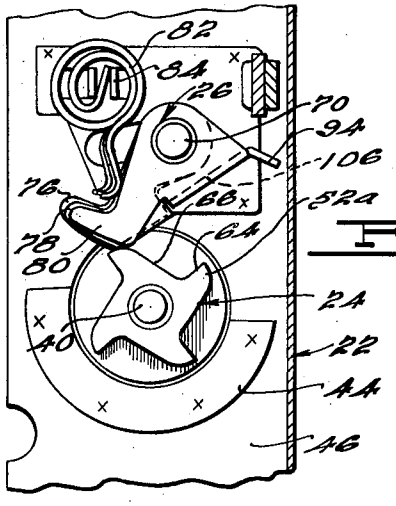


Fig. 6.

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LOCKING DEVICE

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Fig. 8.

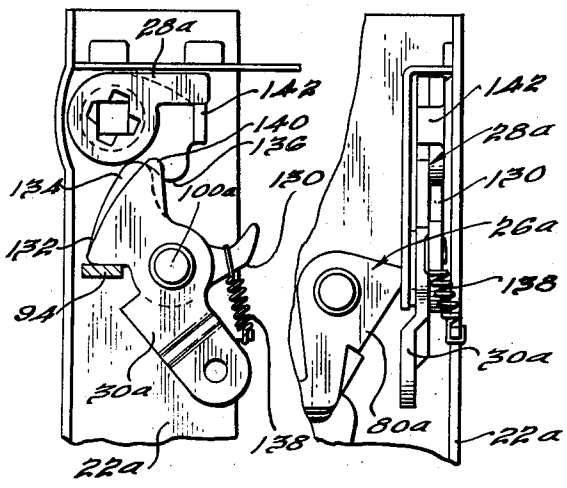
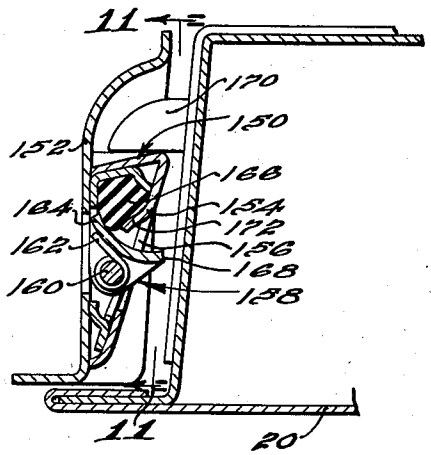


Fig. 9.

Fig. 10.



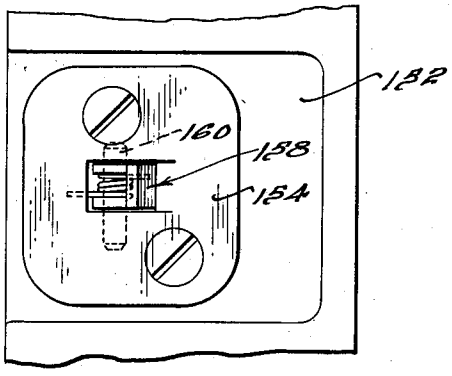


Fig. 11.

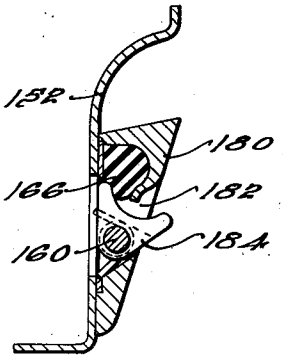


Fig. 12.

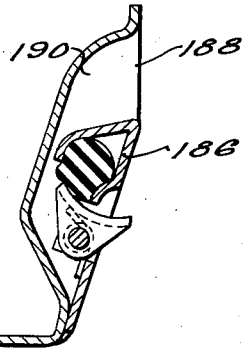


Fig. 13.

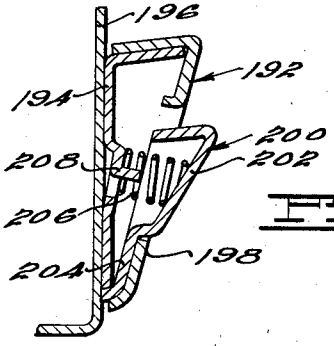


Fig. 14.

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Patented Mar. 26, 1940 2,195,179

UNITED STATES PATENT OFFICE

2,195,179

LOCKING DEVICE

Rollo Marple, Jackson, Mich., assignor to Hancock Manufacturing Company, Jackson, Mich., a corporation of Michigan

Application August 18, 1937, Serial No. 159,746

11 Claims. (Cl. 292—214)

This invention relates to locking devices for vehicle doors or the like, and in particular provides improved constructions of locks of the rotary bolt type, as well as improved constructions of lock-keepers.

Features of the herein disclosed construction which are not claimed herein, are claimed in applicant's copending applications Serial No. 308,511, filed December 11, 1939, and Serial No. 315,122, filed January 22, 1940, both whereof are divisions of this application, and in applicant's copending application Serial No. 235,982, filed October 20, 1938.

Objects of the invention are to provide an improved door lock and keeper particularly adapted for use on vehicle doors or the like, characterized as being simple in construction, economical of manufacture, and extremely durable and efficient in operation; to provide a lock of the rotary bolt type, embodying an improved construction of rotary bolt, adapted to co-operate in an improved manner with one or a plurality of actuating dogs therefor; to provide a lock of the rotary bolt type embodying an improved construction and arrangement of the several parts thereof, to accommodate the lock to limited space requirements; to provide an improved lock keeper, embodying a main bolt holding portion, and also embodying a retractable safety catch portion, which may be utilized with locks having either rotary bolts or bolts of other types; and to generally improve the construction and operation of vehicle door locks and keepers therefor.

With the above, as well as other objects in view, which appear in the following description and in the appended claims, preferred but illustrative embodiments of the present invention, are shown in the accompanying drawings, throughout the several views of which corresponding reference characters are used to designate corresponding parts, and in which:

Figure 1 is a view in elevation, illustrating the application of the invention to automobile doors;

Fig. 2 is a view in transverse section, taken along the line 2—2 of Fig. 1;

Fig. 3 is a view in vertical section, taken along the line 3—3 of Fig. 2;

Fig. 4 is a view taken along the line 4—4 of Fig. 2;

Fig. 5 is a view taken along the line 5—5 of Fig. 4;

Fig. 6 is a view corresponding generally to Fig. 4, but showing the parts in a different stage of a door closing movement;

Fig. 7 is a view in vertical section, taken along the line 7—7 of Fig. 4;

Figs. 8 and 9 are views in rear and side elevation, respectively, of a modified bolt retracting means which may be used in the practice of the invention;

Figs. 10 and 11 are views in vertical section and in plan, respectively, of a modified construction of lock-keeper embodying the invention; and,

Figs. 12, 13 and 14 are views in vertical section of further modified keeper constructions embodying the invention.

The improved lock, which is secured within the door 20 of the associated vehicle, comprises generally a casing member 22; a rotary bolt 24; a plurality of dogs designated collectively as 26, for holding the bolt against rotation in a door opening direction; an outside operated roll-back 28, for releasing the dogs 26 from the bolt 24 in response to movement of the conventional outside handle; and an inside retracting member 30, which may be operated in response to the conventional inside door handle, or the like, to release the dogs 26 from operative engagement with the bolt. The keeper 32, which is described in more detail below, is suitably secured to the door pillar 24, as by means of a bracket 36.

The bolt 24, is rotatably journaled in the lock casing upon a trunnion or pin 40. One end of the pin 40 is supported in the flange 42 of a bracket 44, which is suitably secured as by welding to the flange 46 of the previously identified lock casing 22. The other end of the pin 40 is supported in a supplemental casing member 48, which is suitably secured to the inner face of the flange 46.

The bolt 24 is formed to provide a keeper engaging portion 50 which projects externally of the lock casing 22 for cooperation with the keeper 32; an inner or dog engaging portion 52; and a separating fin or vane 54 which is somewhat larger in diameter than the portions 50 and 52, and serves to substantially close the opening 55, which is provided in the flange 46 of the casing 22 to accommodate the bolt. The lower half of the outwardly projecting portion 50 of the bolt 24 is substantially enclosed by the previously mentioned bracket 44, which is given a substantially semi-cylindrical form for this purpose.

As most clearly appears in Figs. 3 and 7, the outer portion 50 of the bolt 24 is formed to provide a plurality of radially extending, equi-angularly spaced keeper engaging teeth or projections

of teeth 50a, any one of which is effective as described hereinafter to cooperate with either the safety catch 60 associated with the keeper, or the keeper portion 62 associated therewith, to hold the door in either the partially closed or safety position, or the fully closed position, respectively. It will be appreciated that the angular spacing between the projections and teeth 50a, relative to the spacing between the safety catch 60 and the keeper portion 62, is such that the bolt 24 can roll over or across the keeper in a manner similar to the cooperation between a gear and a rack.

As most clearly appears in Figs. 4, 6 and 7, the inner portion 52 of the bolt 24 is formed to provide a number of dog engaging teeth or projections 52a, the number and angular spacing between which corresponds to the number and angular spacing of the keeper engaging teeth 50a. The teeth 52a, however, are angularly displaced from the teeth 50a. This relation results in reducing the space requirements of the lock, since the positions of the dogs can thus be determined independently of the rotative positions of the teeth 50a. Each tooth 52a is formed to provide a generally radially extending dog releasing portion 64, and a locking portion 66.

The dogs 26 are provided to cooperate with the locking portion 66 of the bolt 24 to hold the bolt 24 against rotation in a clockwise or door opening direction, as viewed in Figs. 3, 4 and 6. It is preferred to utilize a plurality of such dogs of progressively increasing length, to provide a take-up action for the lock, as hereinafter described. In the present instance, three dogs are illustrated, although a smaller or a larger number may be utilized if desired.

The three dogs, designated as a whole as 26, are rotatably supported in the lock casing upon a pin or trunnion 70, which extends parallel to but spaced from the previously mentioned bolt supporting pin 40. The outer end of the pin 70 is supported in a member 72, the inner flanges 74 of which are secured to the inner face of the casing flange 46, and the outwardly extending body portion of which serves, as most clearly appears in Figs. 3 and 7, as a dovetail member. The inner end of the pin 70 is supported in the previously mentioned supplemental casing member 48. Each of three dogs, which are individually designated as 76, 78 and 80, includes a downwardly extending body, which terminates in a laterally offset foot. The dog 76 is slightly longer than the dog 78, and the dog 78, in turn, is slightly longer than the dog 80. Each of the dogs 76, 78 and 80 is provided with a biasing spring 82 individual thereto. One end of each spring is secured between a pair of lugs 84, which are inwardly struck from the casing flange 46, and the free end of each spring 82 bears against the edge of the associated dog and so continuously urges it in a counter-clockwise or locking direction, as viewed in Figs. 4 and 6.

The outside roll-back 28 is illustrated as being conventionally pivotally supported in the base 86 of the casing 22, for rotation by the conventional door spindle 88. The outer end of the roll-back member 28 normally bears against a retracting link 90, which is slidably supported adjacent the casing base 86, and also serves, as hereinafter described, to cooperate with the locking mechanism to lock the outside roll-back 28 against actuation. The link 90 is provided with a laterally offset foot 92, which normally bears against a rearwardly extending shoulder 94 formed on the dog 80. A spring 96, suitably secured to the casing base 86, continuously bears against a second shoulder 98, formed on the link 90, and so urges it, as well as the roll-back 28, to the illustrated normal or locked position.

The inside retracting link 30 is pivotally supported upon the base 86 of the casing 22, as by means of a pin 100. One end 102 of the link 30 is adapted for connection to the conventional link mechanism (not shown) which may extend to an inside door operating handle. The other end 104 of the inside actuating link is formed as a foot, for cooperation with the previously mentioned dog shoulders 94.

In order to render the dogs 76 and 78 responsive to the movement of the dog 80, as influenced by the shoulder 94 provided thereon, the dog 80 is provided with a laterally turned portion 106, which extends around and behind the rear edges of the dogs 76 and 78. With the just described arrangement, it will be appreciated that clockwise rotation of the outside roll-back 28, as viewed in Fig. 5, causes the link 90 to move downwardly. The engagement between the foot 92 of the link 90 and the shoulder 94 associated with the dog 80, causes the downward movement of the link 90 to be accompanied by a clockwise rotation of the three dogs 76, 78 and 80, as viewed in Figs. 4 to 6, thereby releasing the dogs from the bolt 24, and permitting the latter to be rotated in a clockwise or door opening direction. The same action also results from a counter-clockwise rotation of the inside link 30, the end 104 whereof bears against the shoulder 94 associated with the dog 80. Upon releasing either the outside roll-back 28 or the inside contracting ring 30, however, as the case may be, the springs 82 associated with the several dogs are effective to urge the dogs to the locking position shown in Fig. 4.

In order to lock the link 90 against downward movement, and so render the outside roll-back 28 ineffective to actuate the dog, the segmentally formed locking device 110 is provided. It will be appreciated that the member 110 is pivotally supported in the base 86 of casing 22, for rotation in response to a key-actuated spindle 112. In the unlocked position, shown in full lines in Fig. 5, the segmental member 110 is out of the path of the lower end of the link 90, so that it is ineffective to prevent or control such movement of the link 90. If the member 110 is rotated to the position shown in dotted lines in Fig. 5, however, the body thereof is disposed in the path of movement of the lower end of the link 90, and prevents downward movement thereof. In addition to the foregoing locking arrangement for the outside roll-back 28, it will be noted that the inside retracting link 30 is provided with a projection 111. Upon rotation of the links 30 in a clockwise direction, as viewed in Fig. 5, the projection 111 is moved into the path of and in blocking relation to the outside roll-back 28, thereby preventing rotation thereof in an unlocking direction. To release the roll-back 28 from the just mentioned locking action, the link 30 may be returned to the position shown in Fig. 5.

Referring particularly to Fig. 3, the keeper 32 comprises a body, which may be and preferably is formed as a relatively heavy metal stamping, and which is formed to define the previously mentioned bolt engaging surface 62. The previously mentioned safety catch 60 is and may be formed as a die casting, or the like, and is piv-

otally supported upon a pin 114, which extends between and is supported in the opposite side wall of the keeper 32. A spring 116 is connected between the catch 60 and the keeper body, and continuously urges the safety catch 60 to the active position shown in Fig. 3. It will be noted that the otherwise continuous body of the keeper 32 is cut away, as indicated at 118, to afford a slot or opening through which the safety catch may move from the active position shown in Fig. 3 to a retired position. It will be noted that the back of the safety catch 60 abuts the portion 119 of the body of the striker plate 32, so that such portion 119 forms a limit stop to the rotation thereof under the influence of the spring 116.

Also as clearly appears in Fig. 3 when the door is in a closed position, the keeper 32 is in a position between the rotary bolt 24 and the previously mentioned dovetail member 72. The upper surface of the keeper 32, as well as the under surface of the dovetail member 72, are downwardly inclined in the direction of a door closing movement. With this relation, the dovetail member 72 tends to serve as a stop to movement of the keeper 32 in the leftward or door closing direction as influenced by the bolt 24. The members 24, 32 and 72, accordingly, function in accordance with the functioning of the usual separately formed door dovetails associated with locks of the conventional slidable bolt type, and permit such separate dovetail structures to be entirely dispensed with in the practice of the invention.

Considering the operation as a whole of the embodiment shown in Figs. 1 through 7, the parts are shown in Figs. 2, 3, 4, 5 and 7 in position occupied thereby when the door is in a fully or tightly closed position. Under these circumstances, the upper tooth 50*a* of the outer portion of the rotary bolt 20 bears solidly against the cooperating surface 62 of the keeper 32, forcibly wedging the latter between the bolt 24 and the dovetail member 72. At the same time, the foot of the longest dog 76 bears solidly against the upper substantially horizontally disposed locking surface 66 associated with the inner portion of the bolt 24. Dog 76 is thus effective to entirely prevent any clockwise rotation of the bolt 24, so that the door is positively held in the just mentioned fully or tightly closed position.

To open the door, either the outside roll-back 28, or the inside operating link 30 may be actuated, to force the shoulder 94 associated with the dog 80 downwardly, thereby rotating all three of the dogs 76, 78 and 80 in a clockwise direction as viewed in Figs. 4 and 6. This rotation of the dogs, which takes place in opposition to the forces of their associated biasing springs 82, moves the feet thereof out of range of the teeth 52*a* of the inner portion of the rotary bolt 24, thereby permitting the latter to be freely rotated in a clockwise or door opening direction, in response to the movement thereover of the keeper surface 62 and the safety catch 60.

Upon release of the inside retracting link 30 or the outside roll-back 28, which may be expected to occur shortly after the keeper safety catch 60 passes beyond the bolt 24, the springs 82 again become effective to return the dogs to the position shown in Fig. 4, in which they are effective to hold the bolt in the corresponding illustrated position.

The return movement of the dogs, also causes the outside roll-back 28 and the inside link 30 to resume the position shown in Fig. 5. The movement of the roll-back 28 is also influenced by the spring 96, and the movement of the link 30 may also be influenced by the conventional return spring mechanism (not shown) associated therewith.

During a door closing movement the bolt 24 moves to the right relative to the keeper 32 as viewed in Fig. 3. As the vehicle door approaches a partially closed position, corresponding to the conventional safety position, the safety catch 60 engages the right-hand face of the upper tooth 50*a* associated with the rotary bolt 24. Continued door closing movement causes the catch 60 to apply a rotative force to the bolt 24. The springs 82, however, associated with the locking dogs, are stronger than the spring 116 associated with the safety catch 60, so that no rotative movement of the bolt 24 occurs. Instead, the safety catch 60 rotates in a clockwise direction relative to the keeper 60 to a retired position, in which the keeper 32 may be moved past the upper tooth 50*a*. As soon as the end of the safety catch 60 passes beyond the upper bolt tooth, the spring 116 associated therewith is rendered effective to cause the safety catch to return to the active position shown in Fig. 3, in which position it is effective to cooperate with the left-hand face of the upper bolt tooth 50*a* and positively prevents the door from again being fully opened, without again actuating the dogs designated collectively as 26 to release the bolt 24.

If the door closing movement is continued beyond the safety position just described, the sloping face 120 of the keeper 32 is brought into engagement with the right-hand face of the upper bolt tooth 50*a*, and applies a positive rotative force to the bolt 24. Due to the fact that the bolt holding effect of the dogs, designated collectively as 26, results from the cooperation between the feet thereof and the bolt faces, and not from the strength of the biasing springs 82, it is possible to utilize springs 82 which are relatively weak. Accordingly, a minimum of door closing force is required to render the keeper face 120 effective to rotate the bolt 24 in a clockwise direction, as viewed in Figs. 3, 4 and 6. During such movement, a leading face 64 of an inner bolt tooth 52*a* bears against the rear edges of the dogs, and turns these dogs from the positions shown in Fig. 4 to positions corresponding to those shown in Fig. 6.

When the door reaches a substantially closed position the just mentioned inner bolt tooth face 64 passes beyond the heel of the shorter dog 80, permitting the latter to ride up over the rounded end of the dog engaging bolt face 66. As soon as this action takes place, the spring 82, associated with the dog 80, becomes effective to rotate the latter in a counter-clockwise direction, as viewed in Fig. 6, and forcibly continue the rotation of the bolt 24 in the counter-clockwise or door closing direction. At slightly spaced stages in the continued door closing movement, the bolt face 64 successively passes beyond the heels of the dogs 78 and 76, rendering the springs 82 associated with these dogs successively effective to continue the counter-clockwise or door closing rotation of the bolt 24.

It will be appreciated that at any stage of the door closing movement at which the inner bolt face 64 passes beyond the heel of a selected dog, rendering such dog effective to assume the position shown in Fig. 4, such dog becomes effective to prevent a clockwise or door opening movement

of the bolt 24. In such instance, any tendency of the bolt to rotate in a clockwise direction applies a substantially radial force to the particular dog. The parts are preferably so adjusted that the shorter dog 80 reaches the just mentioned blocking position as an incident to each door closing movement. Accordingly, even though the vehicle door is only very lightly closed, a positive lock is applied to the door.

With the dog 80 in the blocking position, the two longer dogs 78 and 76 occupy positions in which the springs 82, associated therewith, are still effective to continuously urge the bolt 24 in a counter-clockwise or door closing direction. In addition to being positively held against an opening movement, accordingly, the door is continuously urged to a further closed position.

In certain instances it may be found that the forces of the springs 82 acting upon the associated longer dogs 76 and 78 will be effective to cause the door closing movement to continue to a point at which the intermediate dog 78 is in the blocking position. In other instances, as where the resistance to further door closing movement is sufficient to prevent such continued movement, it is found that road shocks or the like cause the door to momentarily move inwardly a slight amount relative to the vehicle body. Any such inward movement immediately relieves the otherwise existing resistance to continued counter-clockwise movement of the bolt 24, and is immediately taken up by a movement of the intermediate dog 78, or the final dog 76 to the blocking position. It will be seen, accordingly, that the several dogs being of slightly different length, assume the blocking positions thereof at different substantially closed positions of the door, and that a minimum expected closing force of the door is sufficient to render at least the shortest dog 80 effective to reach the blocking position, leaving the remaining dogs effective to take up any additional closing movement.

In the modified embodiment of the invention shown in Figs. 8 and 9, the outside roll-back 28*a* is arranged to actuate the locking dogs through an intermediary of a pivoted lever 130, which is rotatably supported upon the pin 100*a*, which also pivotally supports the inside retracting link 30*a*. The portion 132 of the lever 130 bears directly upon the shoulder 94, which may be associated with the locking dogs in the manner described with reference to the first embodiment, and the portion 134 thereof abuts the nose 136 of the outside roll back 28*a*. A spring such as 138 may be, and preferably is, connected between the other end of the lever 130 and the lock casing 22*a*, and continuously urges the lever 130 and consequently the roll-back 28*a* to the position shown in Figs. 8 and 9. As in the previously described embodiment, rotation of the inside operating lever 30*a* in a clockwise direction from the position shown brings the nose 140 thereof into blocking engagement with a projection 142 provided on the outside roll back 28*a*, and so prevents actuation of the latter.

In all other respects except those noted above, the construction and arrangement as well as the opertion of the embodiment of Figs. 8 and 9 preferably duplicates that of the embodiment of Figs. 1 through 7.

It will be appreciated from the foregoing description of the improved keeper 32, that it is broadly immaterial whether the retractable safety catch be embodied in keepers particularly designed for use with locking devices of the rotary bolt type, or of the more conventional slidable bolt type. The remaining figures, Nos. 10 through 14, illustrate modified embodiments of the improved keeper of the present invention, which are particularly adapted for use with locks of the slidable bolt type, but which may also be used with locks of the rotary bolt type as above described.

Referring particularly to Figs. 10 and 11, a modified embodiment of keeper is illustrated, in which the body 150 of the keeper is of generally triangular form, the base whereof is secured to the door pillar 152, and the opposite and generally uniformly sloping face 154 of which is presented to the bolt of the associated lock. The base 154 of the striker is provided with an opening 156, through which the safety catch 158 projects. The safety catch 158 is carried upon a pin 160, which is journalled in a respectively opposite side wall of the striker body. A spring 162 is connected between the safety catch and the striker body, and continuously urges the safety catch to the position shown in Fig. 10. A limit stop to such movement is afforded by the engagement between the end 164 of the safety catch and a buffer 166 which may be formed of, for example, rubber or other resilient material. The buffer 166 is received within the body of the striker. In the position of the parts shown in Fig. 10, the end 168 of the safety catch 158 extends sufficiently beyond the plane of the sloping surface 154 to cooperate with the bolt 170 of the associated lock to hold the door in the partially closed position. During a closing movement of the door the bolt 170 slides upwardly along the surface 154, as viewed in Fig. 10, and upon encountering the safety catch 158, depresses the latter into the striker body, and so passes over it without substantial obstruction. A limit to the depressing movement of the safety catch 158 is afforded by the engagement between the end 168 thereof and a portion 172 which forms a part of the surface 154.

The embodiment of Fig. 12 distinguishes primarily from the embodiment of Figs. 10 and 11 in that the body 180 of the keeper is formed as a metal casting as distinguished from the pressed metal body 150 described above. The body 180 is recessed at 182 to receive the pivotally mounted safety catch 184, which may correspond in operation and function to the pivotally mounted safety catch 158. In other respects, the arrangement of the embodiment of Fig. 12 corresponds with that described with reference to Figs. 10 and 11.

Fig. 13 illustrates a construction in which the outer face 186 of the keeper lies flush with and forms an uninterrupted continuation of the correspondingly angled surface of the door pillar 188. The keeper is positioned within a recess 190 formed in the face of the pillar. Fig. 14 illustrates a construction in which the keeper is formed entirely of metal stampings. In Fig. 14, the body 192 of the keeper is formed of an inner stamping 194, which may be secured directly to the outer face of the door pillar 196, and an outer stamping 198, which is suitably fitted over and secured to the stamping 194. The safety catch 200, also formed of a metal stamping, is provided with a surface portion 202, which normally extends beyond the normal level of the surface of the stamping 198, and is also provided with an extended portion 204, which fits between the two stampings 194 and 198, to provide a pivotal supporting connection for the safety catch. A compression spring 206 is seated between the safety catch 202

and a lug 208 struck inwardly from the base of the stamping 194, and acts to continuously urge the safety catch 200 to the position shown. The lug 208 also acts as a limit stop to an inward movement of the safety catch 200, caused for example by the passage thereover of the bolt (not shown) of the associated lock.

From the foregoing, it will be appreciated that the present invention provides extremely and effective door lock and keeper constructions, which are simple and economical of manufacture, and which are exceptionally efficient and satisfactory in operation. It will also be appreciated that the specifically described embodiments are illustrative, and that various modifications in the form, number and arrangement of the described parts may be made within the spirit and scope of the invention.

What is claimed is:

1. In a lock keeper for cooperation with a toothed pivoted bolt, the combination of means defining a tooth-like projection over which said bolt may rotate in a closing direction, and a safety catch retractably mounted on said lock keeper in advance of said projection for movement between retracted and projected positions and spaced therefrom an amount large enough to enable said safety catch to move from the retracted to the projected position while a tooth of said bolt is in said space.

2. In a lock keeper for cooperation with a toothed pivoted bolt, the combination of means defining a tooth-like projection over which said bolt may rotate in a closing direction, and a safety catch retractably mounted on said lock keeper in advance of said projection for movement between retracted and projected positions and spaced therefrom an amount large enough to enable said safety catch to move from the retracted to the projected position while a tooth of said bolt is in said space, said safety catch being retractable by said bolt during movement of said bolt in a locking direction.

3. In a keeper for cooperation with an associated toothed pivoted bolt, the combination of a member formed to define a tooth-like projection having one flank against which a tooth of the bolt bears when in locking position, and having a second tooth-like projection spaced in advance of said first tooth-like projection, said second tooth-like projection being pivotally mounted for movement between retracted and projected positions and being retractable by said bolt during movement of the bolt in a locking direction, the spacing between said first and second tooth-like projections being large enough to enable said second tooth-like projection to move from the retracted to the projected position while said tooth is in said space.

4. In a lock, the combination of a pivoted bolt having first and second teeth spaced peripherally thereof, and a keeper for said bolt, said keeper having first and second tooth-like projections spaced apart from each other and having an interdental recess therebetween, the flank of said first projection adjacent said recess being engaged by said first tooth during a relative movement in one direction between said bolt and keeper and acting to rock said bolt about its pivot and bring said second tooth into locking engagement with the opposite flank of said first projection, said second projection being retractable from a blocking position by said first tooth during said relative movement and being disposed to resume said blocking position after the passage thereover by said first tooth, the said interdental recess being proportioned relative to said first and second teeth so that said first tooth passes beyond second projection and enables the latter to move from its retracted position to its projected position in blocking relation to said bolt while said first tooth is in said interdental space.

5. In a lock, the combination of a bolt of pivotal type having first and second teeth spaced peripherally thereof, and a keeper for said bolt comprising means defining a tooth-like projection one flank whereof is disposed to be engaged by said first tooth during a relative movement between said bolt and keeper and act as a fulcrum to pivot said bolt and bring said second tooth into locking engagement with the other flank thereof, said pivoting acting to swing said first tooth out of engagement with said one flank, a safety catch retractably mounted on said keeper in advance of said tooth-like projection and adapted to be retracted from a blocking position to a retracted position by said first tooth during said relative movement and to resume said blocking position after said first tooth has passed therebeyond, the spacing between said safety catch and said projection being proportioned so that said safty catch when projected does not interfere with said swinging movement of said first tooth.

6. In a lock, the combination of a bolt of pivotal type having first and second teeth spaced peripherally thereof, and a keeper for said bolt comprising means defining a tooth-like projection one flank whereof is disposed to be engaged by said first tooth during a relative movement between said bolt and keeper and act as a fulcrum to pivot said bolt and bring said second tooth into locking engagement with the other flank thereof, said pivoting acting to swing said first tooth out of engagement with said one flank, a safety catch retractably mounted on said keeper in advance of said tooth-like projection and adapted to be retracted from a blocking position to a retracted position by said first tooth during said relative movement and to resume said blocking position after said first tooth has passed therebeyond, the spacing between said safety catch and said projection being proportioned to freely receive said first tooth after said safety catch has resumed its projected position.

7. In a lock, the combination of a bolt of pivotal type having teeth spaced peripherally thereof, and a keeper for said bolt comprising means defining a pair of interdentally spaced tooth-like projections whereover the teeth of said bolt are adapted to have rolling engagement during relative movement of the bolt and keeper in an unlocking direction, one of said tooth-like projections being retractably mounted so that during movement between the bolt and the keeper in a locking direction, the bolt engages such one tooth-like projection and retracts the same without causing pivotal movement of the bolt, said other tooth-like projection being effective upon engagement by a tooth of said bolt during such locking movement to pivot said bolt and bring an adjacent tooth into locking engagement with the flank of said second tooth-like projection which is opposite from said interdental space, said interdental space being large enough to permit movement of said first tooth-like projection from the retracted to the projected position thereof while a tooth of said bolt is in said interdental space.

8. In a lock, for association with first and

second relatively movable members, the combination of a bolt of pivotal type having teeth spaced peripherally thereof carried by said first member, an abutment stationarily mounted on said first member in spaced relation to said bolt in a direction parallel to the plane of pivotal movement of said bolt, a keeper carried by said second member disposed when said lock is in locking position to be received in wedging relation between said abutment and said bolt, said keeper having a back disposed to abut the surface of said abutment, and having in oppositely disposed relation to said back a tooth-like projection one flank whereof is disposed to be engaged by one tooth of said bolt during a relative movement between said bolt and keeper in a locking direction and act as a fulcrum to pivot said bolt and bring an adjacent tooth into locking engagement with the other flank thereof, said adjacent tooth acting to wedge said keeper between the bolt and the abutment, said pivoting of said bolt acting to swing said one tooth out of engagement with said one flank, and a safety catch retractably mounted on said second member in advance of said tooth-like projection and adapted to be retracted from a blocking position to a retracted position by said one tooth during said locking movement and to resume said blocking position after said one tooth has passed therebeyond, the spacing between said safety catch and said projection being proportioned so that said safety catch may move from its retracted position to its projected position while said one tooth is in the space between said projection and said safety catch.

9. In a latch mechanism for association with relatively movable members, the combination of a bolt having a plurality of angularly spaced heads any one of which is adapted to engage a keeper, said bolt being rotatably mounted on one of the members, a keeper mounted on the other member and operative to cause the bolt to rotate in one direction during a closing movement of the members and to rotate in the other direction during an opening movement of the members, said keeper having a first part against which a head of the bolt bears when the members are in closed position and having a second part disposed for engagement by a head of the bolt before the members reach the closed positions, said second part including means so related to said first part that when said second part is passed by said bolt while the members are uninterruptedly moved in one direction between open and closed positions said second part is operative to cause the bolt to rotate a different amount than when said second part is passed by the bolt while the members are uninterruptedly moved between said positions in the other direction, whereby in successive closing actions successive ones of said heads are presented to said first part.

10. In a latch mechanism for association with relatively movable members, the combination of a bolt having a plurality of angularly spaced heads any one of which is adapted to engage a keeper, said bolt being rotatably mounted on one of the members, a keeper mounted on the other member and operative to cause the bolt to rotate in one direction during a closing movement of the members and to rotate in the other direction during an opening movement of the members, said keeper having a first part against which a head of the bolt bears when the members are in closed position and having a second part disposed for engagement by a head of the bolt before the members reach the closed positions, said second part including means so related to said first part that when said second part is passed by said bolt while the members are uninterruptedly moved from the open to the closed position said second part is ineffective to cause the bolt to rotate and while the members are uninterruptedly moved from the closed to the open position said second part is effective to cause a rotation of the bolt, whereby in successive closing actions successive ones of said heads are presented to said first part.

11. In a latch mechanism for association with relatively movable members, the combination of a multi-headed bolt having a plurality of angularly spaced heads, said bolt being rotatably mounted on one of the members, a keeper mounted on the other member and operative to cause the bolt to rotate in one direction during a closing movement of the members and to rotate in the other direction during an opening movement between the members, said keeper having a first part against which a head of the bolt bears when the members are in fully closed position and a second part against which a head of the bolt bears when the members are in partially closed position, said second part being retractable by the bolt during a closing movement so that the bolt is caused to rotate a different amount during a closing movement than during an opening movement whereby in successive closing actions said keeper part engages successive ones of said heads.

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