June 16, 1953 W. A. ENDTER 2,642,301

KEEPER MECHANISM

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Fig. 1.

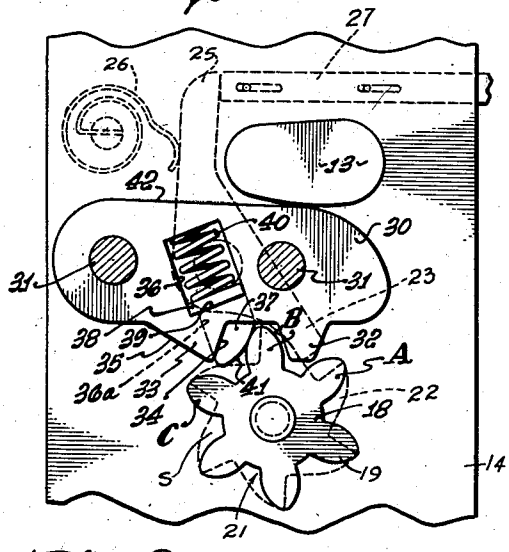


Fig. 2.

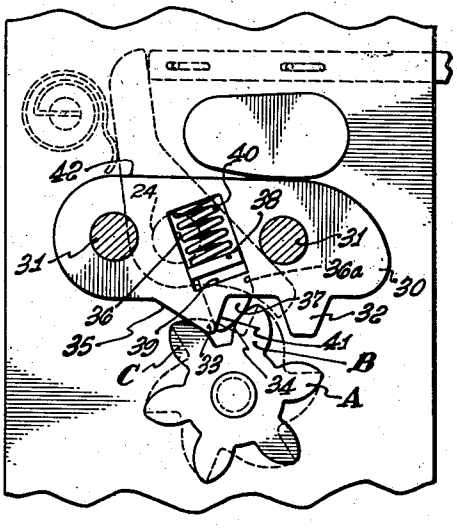
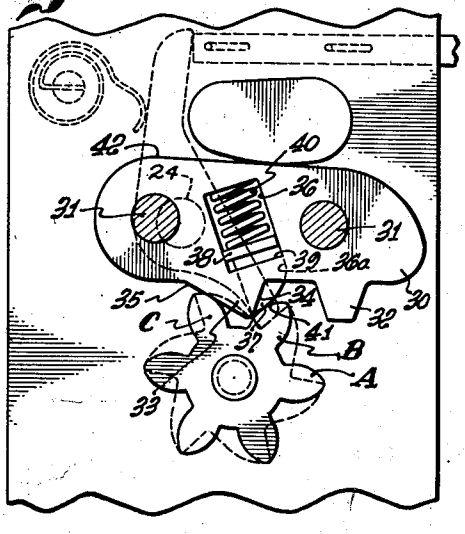


Fig. 3.



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Fig. 4

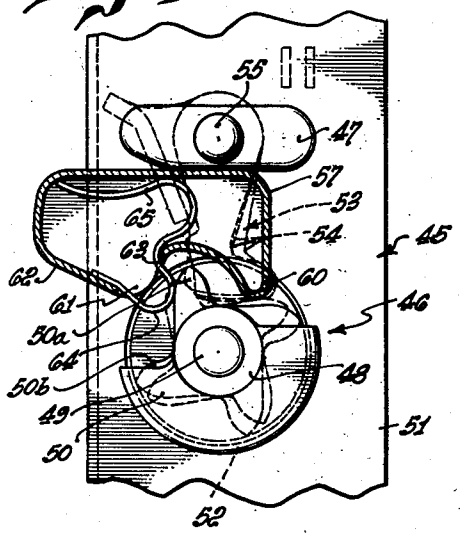


Fig. 5

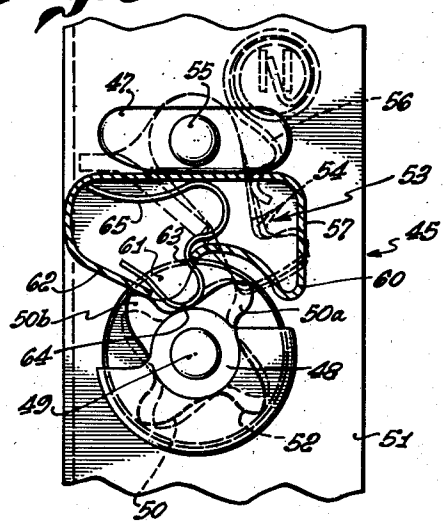


Fig. 6

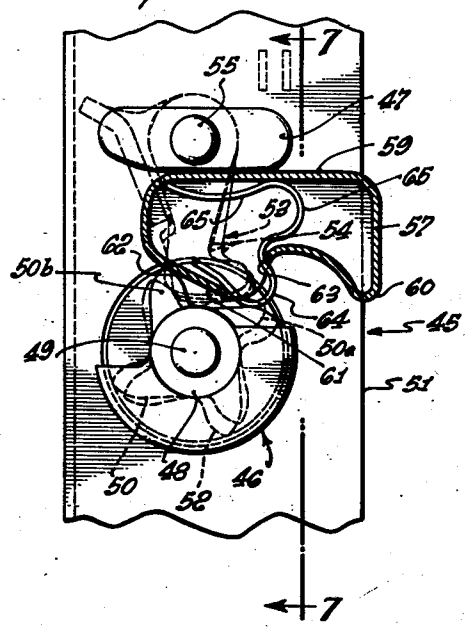
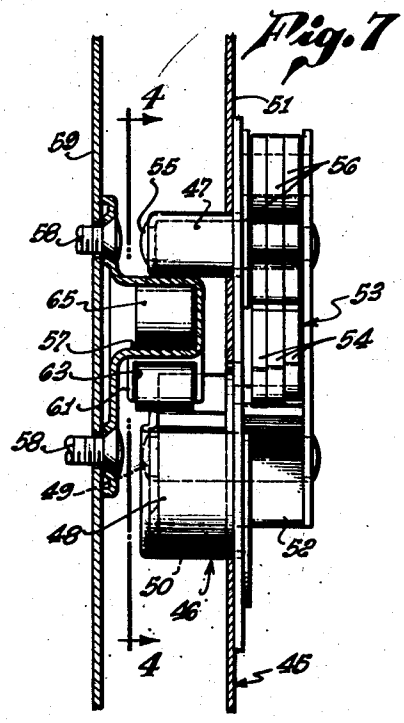


Fig. 7



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KEEPER MECHANISM

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6 Claims. (Cl. 292—341.13)

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This invention has to do with improvements in latching mechanisms particularly applicable to automobile doors, and to the general type employing a rotary bolt having a plurality of circularly spaced heads, and a keeper carrying a tooth-like projection engageable by and receivable between successive bolt heads in the latched condition of the parts.

In conventional latch mechanisms of this type the projection-receiving dimension of the space between the bolt heads is greater than the corresponding dimension of the projection. Accordingly, as the bolt and keeper are brought together toward and into latched association, one of the bolt heads engages against one face of the projection, while a second bolt head is swung into position at the opposite side of the projection and in spaced relation to the corresponding projection face. Due to the existing space, the bolt and keeper are capable of some relative movement, in the absence of a compensatory provision, in a door opening direction after the bolt has rotated to fully latched position. Therefore, in the absence of some means compensating for the bolt and keeper clearance in the respect of maintaining the bolt against the keeper, looseness may develop at the fully latched position of the parts.

Now according to the customary practice, the door is closed against a pillar-carried cushion which is subjected to compression during final closing movement of the door, with the result that the expansive tendency of the compressed cushion tends to keep the bolt head engaged against the projection and thus compensate for the looseness that might otherwise exist. Such looseness will develop, however, if for any reason the necessary compression characteristics of the cushion are lost, as for example due to wear or improper setting relationship of all the parts affected.

My primary object is to provide an improved keeper and keeper-bolt combination which will assure continued interengagement of the bolt and keeper projection in all latched positions of the parts independently of the door cushion, and in fact independently of any parts extraneous to the latch mechanism itself. In accordance with the invention, provision is made whereby during its rotation to latched position, the bolt is subjected to yielding resistance interposed between the bolt and keeper in a manner assuring engagement and constant contact between the bolt and keeper surfaces requiring interengagement for retention of the parts in latched condition.

While the invention contemplates broadly the

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interposition between the bolt and keeper of a yielding resistance in the manner indicated, I preferably incorporate in the keeper structure a bolt-engaged bearing element, displacement of which is spring resisted, with the element being located in such proximate relation to the keeper projection as to accelerate rotation of the bolt in relation to the projection and in advance of the bolt rotation that would otherwise occur in the absence of the bearing element. By virtue of its yieldable displaceability, the bearing element is capable of responding to progressive movements of the bolt toward final latched position so as to permit reception of the keeper projection between successive bolt heads, while at the same time imposing such resistance to the bolt rotation as to assure the maintenance of constant contact between the latching head and the keeper projection. As will appear, the spring-urged bearing member may serve a further function in imparting to the bolt a take-up thrust tending constantly to crowd the bolt to fully latched position and against the pillar cushion.

It is preferred to use in conjunction with the rotary bolt a spaced bearing member engageable with the keeper body at a side opposite its latching projection. By directing the spring thrust against the bearing element in proper relation to the latching projection and the bearing surface of the keeper engaged against the aforesaid bearing member, the spring is utilized to serve the further function of exerting opposing thrusts tending to secure the keeper tightly in a dove-tail relation between the bolt and the bearing member.

All the various features and objects of the invention, as well as the details of a typical and illustrative embodiment, will be understood more fully from the following detailed description of the accompanying drawings, in which:

Fig. 1 is a view illustrating one form of bolt and keeper combination embodying the invention, and in which the bolt has rotated to the safety catch position;

Figs. 2 and 3 are similar views showing progressively advanced positions of the bolt;

Figs. 4, 5 and 6 are views similar to Figs. 1 to 3, illustrating a variational form of the invention, and taken in the plane of line 4—4 of Fig. 7; and

Fig. 7 is a section and elevation of the bolt parts taken on line 7—7 of Fig. 6.

Referring first to Figs. 1 to 3, the latch mechanism construction is shown to comprise a keeper 30 attached as by studs 31 to a stationary automobile door pillar, and a rotary bolt 18 and

bearing projection or lug 13, both of which are carried by the door 14 to project in spaced relation from its edge face so that as the door closes, the keeper then is receivable between the bolt 12 and bearing projection 13.

The keeper is shown to have at its lower edge a first or safety catch tooth-like projection 32 and spaced therefrom, a second similar latching projection 33. The upper surface 42 of the keeper presents a bearing face engageable against the under side of the bearing projection 13 as the latter moves from right to left, as viewed in the drawings, when the door swings to closed position.

The bolt comprises a rotor 18 carrying a plurality of uniformly and circularly spaced heads 19, the rotor being fixed to a shaft 20 which also carries inside the end face of the door a ratchet gear indicated by the dotted lines at 21, and which has a circular arrangement of teeth 22 corresponding in number and spacing to the bolt heads. Antilatching rotation of the bolt between intervals corresponding to the spacings of teeth 22, is prevented by engagement with a pawl 23 pivoted at 24 and having an upper arm 25 against which spring 26 bears to engage the pawl against the bolt ratchet. The pawl is releasable from blocking or holding relation to the bolt as by a push button rod diagrammatically indicated at 27 and operable from the outside of the door.

As will be understood, as the door closes from open position, one (A) of the bolt heads 19 engages against the keeper projection 32, with resultant rotation of the bolt to the safety catch position of Fig. 1, in which the bolt head B is rotated behind and in vertical overlapping relation with projection 32. Upon continued movement of the door to fully closed position, the bolt is rotated by engagement of its head B against the later described element 36, to swing the adjacent head C opposite and in vertically overlapping relation with the projection 33, in which position the bolt is held against antilatching rotation by the pawl 23 and the bolt therefore remains blocked by the keeper until release of the pawl by operation of the push rod 27.

Now as illustrated, the space at S between adjacent bolt heads may be greater than the dimension of that portion of the projection 33 received between the heads in a latched condition of the parts, and consequently a clearance may exist to permit looseness in the bolt and projection interengagement. As previously discussed, the pillar is usually equipped with a cushion (not shown) which is engaged and compressed by the door toward the limit of its closing movement. Accordingly when the bolt reaches the full home position of Fig. 3, the resiliency and expansibility of the cushion tends to move the door to the point of engaging the bolt head C against projection 33, and therefore relieve the clearance existing. It will be appreciated, however, that in the absence of the pillar cushion or at such time as the cushion loses its compressibility, a looseness exists in the closed condition of the latched parts, because of the previously described bolt and projection shape and dimensional relationships.

As shown in Figs. 1 to 3, the safety catch projection 32 is typically of symmetrical tooth shape. The second latching projection 33 has a face 34 of relatively steep angularity and a lower angle face 35 at an angle of say 30 degrees with the horizontal. The keeper contains a recess 36 open at one side to the extent illustrated, the lower

extent 36a of the recess continuing on through the bottom of the keeper and being closed at its sides. The recess contains a movable bearing element 37 having a head 38 engageable against shoulder 39 to limit the downward displacement of the element by a coil spring 40 confined between the upper end of the recess and the head of the element. As illustrated, the latter has a curved face 41 received in the open condition of the latch within the space between the projections 32 and 33, and in the path of the bolt heads.

Assuming that the door is being swung closed, the bolt head A first engages projection 32 to rotate the adjacent head B into a safety catch position somewhat in advance of the relative positions of the parts shown in Fig. 1. Continued closing movement of the door engages head B against the bearing element 37 as in the Fig. 1 position. Then as the door is further closed to bring the bolt head C opposite the face 35 of projection 33, the bearing element 37 is displaceable against the resistance of spring 40 to the extent required to permit the head C to swing directly into engagement with the lower extent of surface 35 as in Fig. 2. Then during continued and final closing movement of the door, the bolt is rotated further to the Fig. 3 position while the head C continues to be engaged against surface 35 while moving upwardly along it. Thus the effect of the spring urged bearing element is to obviate the possibility of clearance between the bolt and keeper, and to insure against any looseness in the engaged condition of the bolt and keeper between the positions of Figs. 2 and 3, independently of the existence or effect of any cushion against which the door may close.

Upon closing movement of the door to and beyond the Fig. 1 position, the bearing projection 13 is engaged against the upper face 42 of the keeper so that the latter is held between the bolt and bearing projection in a dove-tail relation. The tightness of the dove-tail interfit is advantageously increased by virtue of the described keeper assembly, and specifically by the interposition and opposing thrust of spring 40 between the body of the keeper and the bearing element 37. With the latter engaged and supported against the bolt, the upward spring thrust tends to crowd the keeper face 42 against the bearing projection 13, to the complete elimination of any looseness in the dove-tail interfit, as well as the avoidance of looseness in the bolt and keeper interengagement.

Referring now to the variational form of the invention illustrated in Figs. 4 to 7, here as before, the door 45 may be assumed to carry the rotary bolt assembly generally indicated at 46 and positioned below and in spaced relation to the door-carried bearing projection 47. The bolt 48, mounted for rotation on shaft 49, has a plurality of circularly and equally spaced heads 50 at the outside of the latch mechanism case plate 51, the bolt carrying at the inside of the pillar an integral circular series of heads 52 corresponding in number to the heads 50 and offset relative thereto. Antilatching rotation of the entire bolt, including the heads 50 and 52 is resisted by the known arrangement of cams, generally indicated at 53, which also serve to exert take-up thrust against the bolt in its latched positions. The cam assembly 53 may comprise a plurality, typically three, of individual cams 54 rotatable on pin 55 and urged against the bolt heads 52 by coil spring 56. The illustrated bolt

and cam structure is well known and requires no further detailed description.

The keeper 57 may be of hollow formation and attached by screws 58 to be carried by the stationary pillar 59, see Fig. 7. The keeper has a top bearing surface 59 egngageable against the underside of the door-carried bearing projection 47, and at its lower side the keeper has a safety catch projection 60 which may be of any of the usual forms, either movable or stationary. The keeper is shaped to provide a second projection 61 engageable by the bolt in its fully latched position along an inclined surface 62 corresponding in angularity to the previously described keeper surface 35. Between projections 60 and 61, the underside of the keeper shell has an opening 63 through which projects the turned portion 64 of a leaf spring 65 contained within the keeper and bearing against its walls as shown in Figs. 4 to 6.

In considering the operation of the mechanism, assume first the bolt to have been moved to the safety catch position of Fig. 4 in which opening of the door, is loosely blocked by the engageability of head 50*a* with projection 60, and the resistance to bolt antilatching rotation presented by the blocking positions of the cams 54. Upon further closing movement of the door, the bolt bears against and displaces portion 64 of the spring to a degree permitting, as in Fig. 5, initial direct engagement between bolt head 50*b* and the inclined keeper surface 62. At this position the shortest of the cams 54 has reached substantially its tripping position, i. e. the point at which the cam overrides one of the bolt heads 52 to cam and rotatably urge the bolt in a clockwise or latching direction. As will be understood, continued advancement of the bolts brings the additional cams successively into bolt rotating action, in sequence corresponding to the increasing lengths or radii of the cams.

Beyond the Fig. 5 position, the continued effects of the cams are to rotate the bolt in a latching direction, and to progressively move the bolt head 50*b* along the inclined keeper surface 62 to the fully latched or home position shown in Fig. 6. As therein illustrated the projection of the turned portion 64 of spring 65 out of the keeper opening 63, is sufficient to permit continued engagement of the spring by the bolt head 50*a*, so that throughout its range of latching and take-up movement beyond the Fig. 5 position, the bolt engages and tends constantly to displace the spring. Consequently as in the first described embodiment of the invention, the bolt head 50*b* initially assumes a position of engagement with the keeper surface 62, and retains that engagement throughout further take-up rotation of the bolt.

I claim:

1. A keeper having a stationary projection adapted to be engaged by a rotary bolt and received between successive circularly-spaced heads carried by the bolt, and yielding means carried by the keeper adjacent one side of said projection in position to be engaged by a first of said bolt heads and to yieldingly urge said first bolt head in a direction tending to rotate said bolt and thereby effect engagement of a second of said bolt heads against the opposite side of said projection while the first bolt head remains engaged against said yielding means.

2. A keeper as recited in claim 1 in which said yielding means is contained within a recess in said keeper.

3. A keeper as recited in claim 1 in which said yielding means comprises a bearing element slidably mounted in said keeper and engageable with said first head of the bolt, and a spring yieldingly urging said element against said first bolt head.

4. A keeper as recited in claim 1 in which said yielding means comprises a leaf spring contained within a recess in said keeper and projecting therefrom at said one side of the keeper for engagement with said first bolt head.

5. A keeper as recited in claim 1 in which said keeper has a second stationary projection at said one side of said first-mentioned projection engageable by the bolt in advance of said first projection upon movement of the keeper and bolt into latched engagement.

6. A keeper as recited in claim 1 in which said yielding means is constructed and positioned to exert force against said first head of the bolt in a direction having a component toward the axis of the rotary bolt when said first and second bolt heads are received at opposite sides of said projection.

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