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DOOR HINGE WITH BUILT-IN PRELOADED TORSION BAR HOLD-OPEN MEANS

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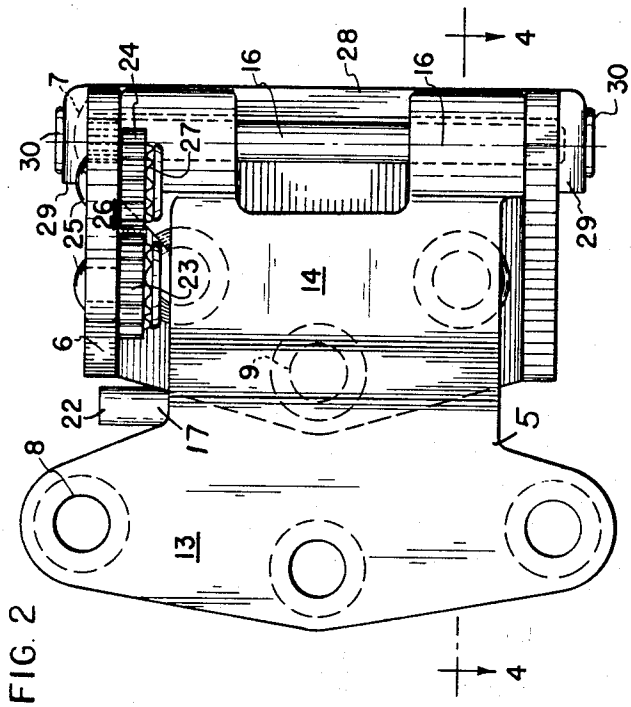


FIG. 2

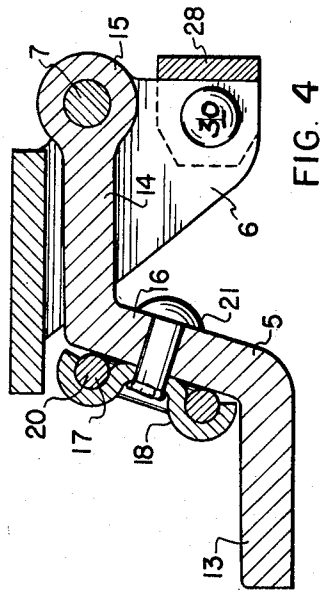


FIG. 4

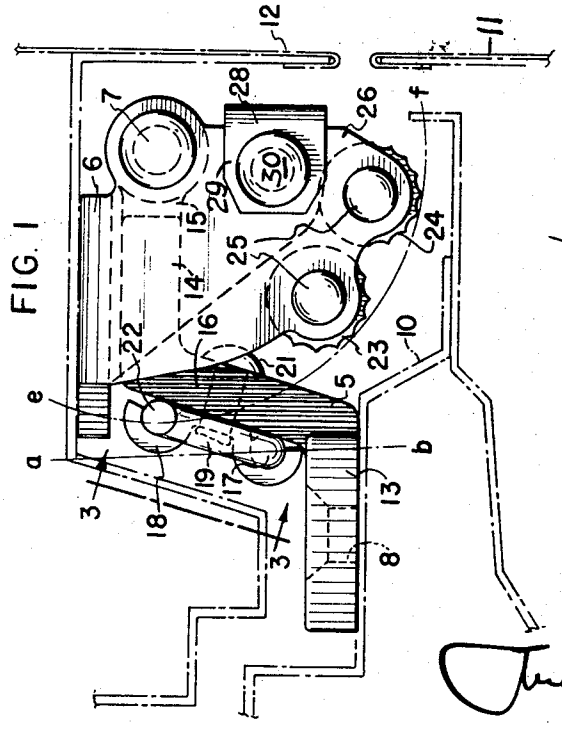


FIG. 1

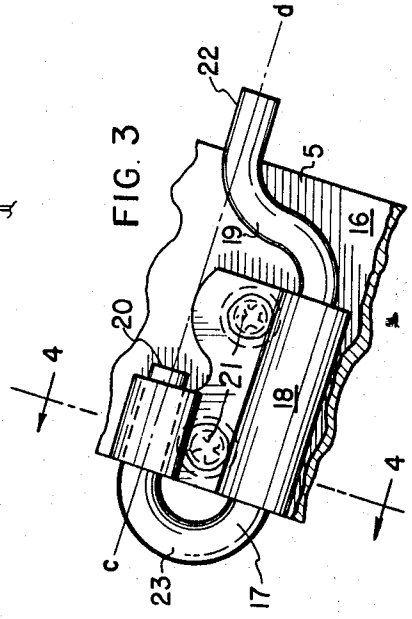


FIG. 3

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DOOR HINGE WITH BUILT-IN PRELOADED TORSION BAR HOLD-OPEN MEANS

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10 Claims. (Cl. 16—145)

This invention relates to improvements in hold-open devices for doors, more particularly automobile doors, and is concerned with the provision of novel torsion bar hold-open means designed to give a thoroughly reliable hold-open action in the fully as well as partially opened positions of the door, the hold-open means functioning smoothly and quietly in the two predetermined positions of the door but being out of engagement otherwise so as to allow freedom of movement of the door in the rest of the opening and closing movements, which is especially important in doors designed to have an upward swing as they are opened, it being quite important in such cases to keep the opening effort at a minimum.

In accordance with my invention, a torsion bar mounted in preloaded condition on one of two relatively hinged members has a laterally extending crank arm on the outer end of which is provided the detent arranged to be engaged in succession by two strikers mounted on the second of the two members and adapted to cooperate with the detent in the partially opened and fully opened positions of the door, the strikers otherwise remaining out of contact with the detent throughout the rest of the door opening and closing movement, the crank arm being deflected against the torsional resistance of the torsion bar as the detent rides over the strikers, thereby providing the hold-open action in the two positions of the door. Preferably, the arrangement of the parts is such that the torsion bar provides a greater resistance to deflection of the detent by the strikers in the door closing movement than the door opening movement, so that there is less likelihood of accidental movement of the door in a closing direction from either the intermediate or fully opened positions.

The strikers are preferably scalloped or star rollers rotatably mounted so as to turn on their pivots when they come into mesh with and deflect the detent in rolling past the same in either direction of door movement, wavy spring washers compressed under the rollers providing sufficient friction drag to hold the rollers against turning except when engaged with the detent in deflecting the same in moving to and from the hold-open positions, thereby insuring repeated engagement of the detent with the individual rollers in the same way upon each operation so as to obtain the same smooth quiet operation every time.

The invention is illustrated in the accompanying drawing, in which:

FIG. 1 is a top view of an automobile door hinge with built-in preloaded torsion bar hold-open means provided in accordance with my invention;

FIG. 2 is a side view of FIG. 1;

FIG. 3 is another side view of a portion of FIG. 1 to better illustrate the torsion bar and its mounting on the body half of the door hinge, and

FIG. 4 is a horizontal section on the line 4—4 of FIGS. 2 and 3.

The same reference numerals are applied to corresponding parts throughout the views.

Referring to the drawing, the reference numeral 5 designates the inner or body half of a cage hinge to

which the outer or door half 6 is pivotally connected by means of a pintle 7. Parts 5 has bolt holes 8 for reception of bolts for fastening it to the body, and part 6 also has bolt holes 9 for reception of bolts to fasten it to the door. A portion of the door pillar on the body is indicated in dot and dash lines at 10 in FIG. 1, and the adjacent outside portion of the body at 11, while at 12 is indicated a portion of the outside of the door to which the door half 6 of the hinge is fastened. This is deemed sufficient to show the relationship of the hinge to the door and body and enable a clearer understanding of the invention. As seen in FIG. 1, the body half 5 of the hinge is generally Z-shaped in horizontal section, the attaching end portion 13 being parallel to the outer end portion 14, on which the pintle bearing 15 is provided, while the transverse intermediate or connecting angular portion 16 provides a mounting on the outer side thereof for the generally J-shaped torsion bar 17, as indicated at 18, the torsion bar being so disposed with its crank end 19 in abutment with the outer side of the intermediate portion 16 so that the torsion bar can be fastened in preloaded condition on the inner hinge member 5. In other words, the tail-end portion 20 of the torsion bar 17, which would normally not be in coplanar relationship to the crank portion 19, is forced into coplanar relationship to the crank portion when the fastening plate 18 is riveted, as at 21, to the intermediate portion 16 of the inner hinge member 5, thereby preloading the torsion bar so that an appreciably greater force must be efflerted on the detent end 22 that projects above the intermediate portion 16 of the inner hinge member for engagement by the strikers 23 and 24 carried on the outer hinge member 6. The torsion bar 17 is bent from high carbon steel round bar stock with the lower radius arm 19′ normally in a vertical plane at an angle relative to the vertical plant of the crank arm 19, as indicated by the dot and dash line *a–b* in FIG. 1, which is merely illustrative of the angle and not intended to represent the specific angle required, as that might be larger or smaller than the one shown, depending upon the requirements of the hinge, so far as preload spring tension in the torsion bar is concerned. The torsion bar is heat-treated before assembly on the inner hinge member 5 and is held in a fixture with the plate 18 while the rivets 21 are being applied. The vertical detent end 22 of the torsion bar, as seen in FIG. 3, is aligned with the tail-end portion 20 as shown by the line *c–d*. The radius of the crank 19 may, however, be larger or smaller than the radius of the other end 19′ of the torsion bar, a larger radius crank arm 19 giving greater leverage so that less force is required to deflect the detent 22 than with a crank arm of the length shown, and vice versa, with a shorter length crank arm.

The strikers 23 and 24 are in the form of scalloped or fluted rollers mounted on rivets 25 on the underside of the upper wall 26 of the outer hinge member 6, these rivets being of a shouldered type and providing a mounting behind the head of each for a wavy spring washer 27, which, by frictional engagement with the face of the rollers, serve to hold the same against turning freely. The rollers project from the edge of the upper wall 26, as seen in FIG. 1, and, in the opening of the door, as these rollers move in a clockwise direction, as seen in FIG. 1, along the arc *e–f*, they engage and deflect the detent end 22 of the torsion bar in succession, roller 23 deflecting the detent when the door has reached a mid-position, open wide enough for a person to get in or out without any difficulty. Some additional movement in an opening direction is permitted in this position by the spacing of the rollers 23 and

24, so that the operator is not cramped for space if additional space is needed. The door is held in fully opened position only when the second roller 24 has deflected the detent 22 and moved past it. A positive stop is afforded by a strap 28 which extends the full height of the outer hinge member 6 and has right angle bent end portions 29 riveted to the top and bottom walls of the outer hinge member 6, as indictaed at 30, this strap 28 being arranged to come into abutment with the outer end portion of the inner hinge member 5 after the second roller 24 has deflected and moved past the detent 22, this positive stop allowing for a predetermined small angularity of free movement of the door. Less angular movement beyond the hold-open position with roller 24 in action is usually provided for a rear door than for a front door. The extent of deflection of the detent 22 necessary to pass each of the rollers 23 and 24 is evident from the arc *e–f* in FIG. 1.

In operation, the scalloped or star rollers 23 and 24 will be turned through whatever small angularity may be necessary by engagement of one of the scallops with the detent 22 of the torsion bar 17 upon engagement of the rollers with the bar in the first opening of the door, and, of course, the rollers are turned through a certain angularity as the detent end 22 rolls on them while being deflected thereby as the door reaches first the intermediate position and later the fully opened position. The wavy spring 27 exerts sufficient frictional drag on each of the rollers to hold the same against any further turning the moment the detent 22 gets out of mesh with the roller. Consequently, the two parts mesh perfectly the same way upon each and every engagement thereafter, the rollers being turned each time only through a small angle, one way in opening the door, the reverse in closing. Thus, there is no likelihood of the hold-open means ever failing to operate properly, due to ice, rust, grit, or any other cause. The operation is always smooth and quiet and requires very little effort. Due to the difference in mechanical advantage by virtue of a more favorable angularity of the parts 22 and 23 or 24 in relation to one another in the opening of the door, it requires less effort on the part of the operator to engage the hold-open means in the opening of the door than is required to release the hold-open means in the closing operation. This is considered advantageous because it gives better assurance of the door not being closed accidentally, as by a sudden wind pressure or by someone accidentally brushing against the open door when it is not intended to close it. The fact that the door swings freely throughout all but the portions of the door opening movement involved in hold-open action is also considered a big advantage especially in those installations where the door has an upward swing in opening and it is desirable on that account not to add to the effort required. After the door has been opened to its full extent, the strap 28 limits further opening movement by coming into engagement with the outer end portion 14 of the inner hinge member 5. There is no likelihood of the torsion bar 17 ever being overstressed and taking a set in a direction away from the rollers 23 and 24 to any appreciable extent, which might result in malfunctioning of the hold-open means or unreliable hold-open action. The torsion bar 17 should easily last the life of the car or longer, and there should never be any necessity for replacing this part because of breakage or wear, and the same is also true in regard to the rollers 23 and 24 and their spring washers 27. If either of the rollers 23 or 24 ever shows any wear on the scallop used, it can be turned enough to make use of another scallop. The necessity for that, however, is not considered likely.

It is believed the fregoing description conveys a good understanding of the objects and advantages of my invention. The appended claims have been drawn to cover all legitimate modifications and adaptations.

I claim:

1. In a hinge comprising a generally channel-shaped outer hinge member providing vertically spaced top and bottom walls and an inner hinge member disposed between said top and bottom walls and pivotally connected thereto by a substantially vertical pintle, one of said hinge members being adapted to be secured to a body and the other to a door swingable to and from open position relative to the body about the substantially vertical pintle axis, the inner hinge member having laterally spaced substantially parallel inner and outer end portions and a transverse intermediate connecting portion, the improvement which consists in the provision of a substantially vertical torsion bar that is generally J-shaped mounted on one side of the intermediate portion of said inner hinge member, the torsion bar having a radius arm on one end of the vertical leg of the J, said radius arm having on the outer end thereof a substantially vertical detent projecting from one edge of said intermediate portion of said inner hinge member, a striker on one of the top and bottom walls of the outer hinge member, the striker engaging the detent to deflect the radius arm of the torsion bar and go past said detent in the door opening and closing movement of the hinge members relative to one another for a hold-open action, the other end of said torsion bar remote from said radius arm when free being normally in a vertical plane at an angle to the vertical plane of said radius arm and detent, and means securing said J-shaped portion of the torsion bar with all portions thereof substantially parallel to the transverse portion of said inner hinge member to provide a preload spring tension in said bar, the detent being movable with its radius arm relative to the inner hinge member upon engagement with the striker only in a direction to increase such spring tension in said bar.

2. A hinge structure as set forth in claim 1 including means positively limiting door opening movement after the hold-open action is obtained by deflection of said detent radius arm by said striker.

3. A hinge structure as set forth in claim 2 wherein the striker predetermines a hold-open position corresponding substantially to the fully opened position of the door but short of the operation of said means limiting door opening movement, the hinge structure including a second striker on the same wall with the first striker but ahead of it to come into engagement with the detent for a hold-open action in an intermediate position of the door.

4. A hinge structure as set forth in claim 1 wherein the radius arm of said torsion bar carrying the detent is disposed at such an angle in relation to the striker that a greater force is required to deflect the arm by engagement of the striker on the detent in the door closing direction than in a door opening direction.

5. A hinge structure as set forth in claim 2 wherein the striker predetermines a hold-open position corresponding substantially to the fully opened position of the door but short of the operation of said means limiting door opening movement, the hinge structure including a second striker on the same wall with the first striker but ahead of it to come into engagement with the detent for a hold-open action in an intermediate position of the door, the radius arm of said torsion bar carrying the detent being disposed at such an angle in relation to both strikers that a greater force is required to deflect said arm by engagement of either striker on the detent in a door closing direction than in a door opening direction.

6. A hinge structure as set forth in claim 1 wherein the striker is in the form of a roller rotatably mounted so as to turn as it rides against and past the detent in deflecting the detent radius arm.

7. A hinge structure as set forth in claim 1 wherein the striker is in the form of a roller rotatably mounted so as to turn as it rides against and past the detent in deflecting the detent radius arm, the detent being substantially cylindrical in form and the roller having the periphery thereof formed for non-slip engagement with said detent in riding thereon.

8. A hinge structure as set forth in claim 1 including

a second striker on the same wall with the first striker but ahead of it to come into engagement with the detent for a hold-open action in an intermediate position of the door.

9. A hinge structure as set forth in claim **8** wherein each of said strikers is in the form of a roller rotatably mounted so as to turn as it rides against and past the detent in deflecting the detent radius arm.

10. A hinge structure as set forth in claim **8** wherein each of said strikers is in the form of a roller rotatably mounted so as to turn as it rides against and past the detent in deflecting the detent radius arm, the detent being substantially cylindrical in form and each of said rollers having the periphery thereof formed for non-slip engagement with said detent in riding thereon.

References Cited

UNITED STATES PATENTS

3,085,286 4/1963 Whitehouse et al. ----- 16—180

FOREIGN PATENTS

1,226,584 6/1964 France.

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