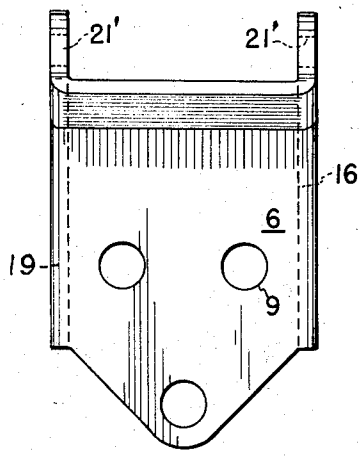
March 5, 1968 J. H. MARCHIONE 3,371,374

DOOR HINGE EMBODYING TORSION BAR HOLD-OPEN MEANS

Filed Aug. 11, 1966

FIG. 4



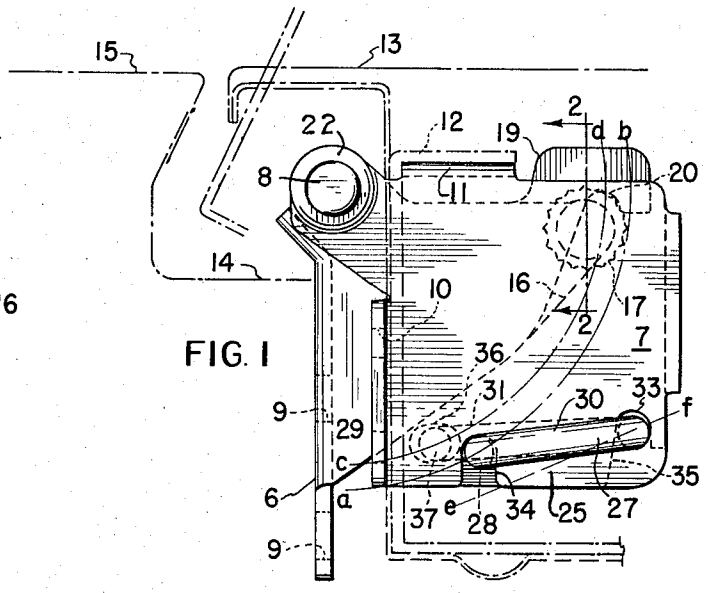


FIG. 1

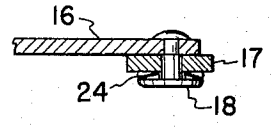


FIG. 2

FIG. 5

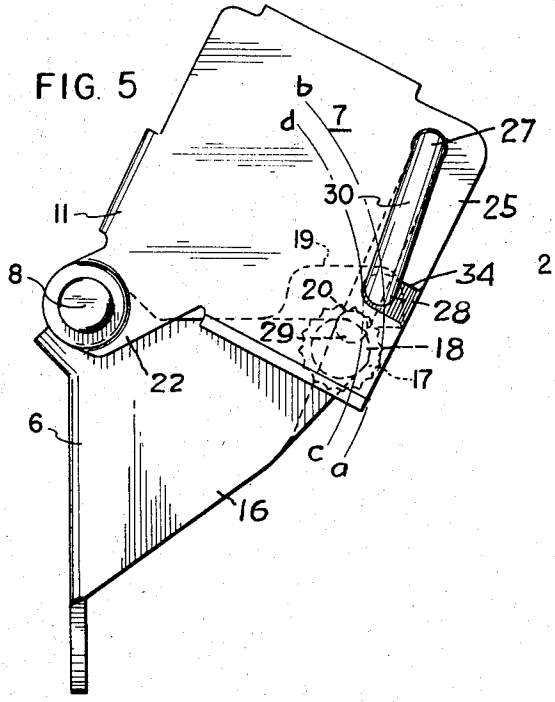
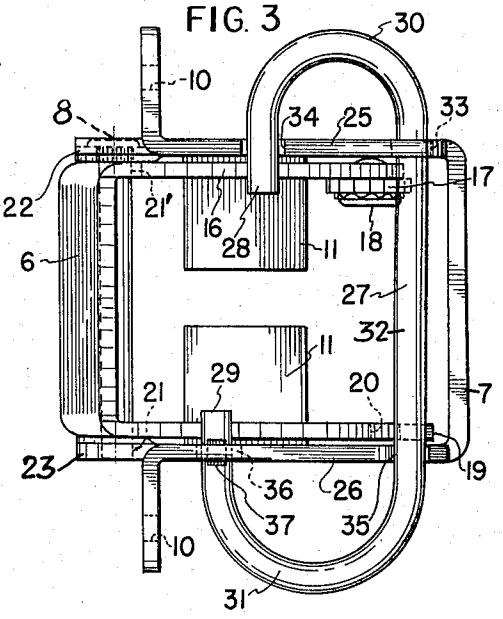


FIG. 3



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DOOR HINGE EMBODYING TORSION BAR HOLD-OPEN MEANS

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10 Claims. (Cl. 16—145)

ABSTRACT OF THE DISCLOSURE

This hinge has a scalloped roller as a striker mounted on a vertical pin for rotation relative to one of the hinge members, the other hinge member carrying a vertical torsion bar with the upper end bent in a semi-circle to provide a laterally extending arm with a substantially vertical detent portion projecting from its outer end, which is supported on the hinge member independently of the other hinge member so as to maintain a preload spring tension, the detent portion being disposed in the path of arcuate movement of the striker roller and movable relative to the torsion bar by deflection of said arm by said roller in a direction to increase the spring tension in said bar when said roller comes into engagement with said detent in the door opening and closing movements for a hold-open action in fully open position, the scalloped periphery of the roller causing the detent to drop into a scallop upon each engagement, thereby forcing the roller to turn through a certain angularity in each movement of the roller past the detent. Friction means resist turning of the roller so that the same scallop is engaged by the detent in each operation in the door opening and closing operation, until the roller is turned to a new position. The other end portion of the torsion bar serves by engagement with a stop on the other hinge member to limit the door opening movement positively after the detent passes the roller.

This application relates to improvements on the constructions disclosed in my copending application, Ser. No. 411,445, filed Nov. 16, 1964.

This invention relates to automobile door hinges and is more particularly concerned with the provision in cage-type hinges of novel torsion bar hold-open means designed to give a thoroughly reliable hold-open action in the fully or nearly fully open position of the door, the hold-open means locking and unlocking smoothly and quietly and being out of engagement otherwise so as to allow freedom of movement of the door throughout the rest of the opening and closing movements, that being especially important in doors designed to have an upward swing as they are opened, as in such cases the opening effort should be reduced to a minimum.

In accordance with the disclosure of the copending application, a torsion-type spring bar or rod of generally C-shape is provided having one vertical end portion on one radius arm entered in a hole in one side of the hinge cage and the other vertical end portion on the other radius arm entered in a slot in the other side of said cage in such a way that a torsional stress is loaded therein in its mounting on the cage, the mounting being such that the bar is retained at four points of contact, namely, at opposite ends of the two radius arms, the bar being securely locked against vertical displacement by means of a notch in the one end portion, thereby becoming a tightly locked part of one half of the hinge adapted to be deflected by striker means on the other half of the hinge as the door reaches fully opened position, so that the door cannot be closed until the movable end of the torsion bar

is again deflected by the striker means moving in the opposite direction, the bar and striker parts being so arranged that in their engagement less effort is required for the striker means to deflect and pass the torsion bar in the door opening movement than is required for the striker means to deflect and pass said bar in the opposite direction in the door closing movement. A scalloped or so-called star roller is employed as the striker means, the scallops on the periphery thereof being so close together as to be certain of a scallop seating on contact with the torsion bar in the first operation in the event there is not direct alignment of a scallop with the bar beforehand, and the scallops insuring that the roller will be forced to turn under all sorts of operating conditions, such as ice, rust, abrasives, and whatever might tend to cause the roller to stick or freeze and could otherwise cause malfunctioning or noisy operation. A wavy washer is preferably employed in connection with the roller to prevent its spinning freely after the torsion bar is passed in closing the door, thus reducing likelihood of a scallop not being properly aligned with the torsion bar on the next opening of the door.

The principal novel feature of the present invention is the provision of a positive stop projection on the one half of the hinge cage against which the anchored end of the torsion bar on the other half of the hinge cage is arranged to strike after the roller has deflected the movable end of the torsion bar when the door reaches fully opened position, thereby utilizing the torsion bar for an additional function without adding appreciably to the cost of the hinge as a whole.

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

FIG. 1 is a plan view of a cage-type hinge embodying the improved hold-open means of my invention, showing the parts in what corresponds to the closed position of the automobile door;

FIG. 2 is a sectional detail on the line 2—2 of FIG. 1;

FIG. 3 is a side view of FIG. 1;

FIG. 4 is a side view of the body half of the hinge shown in FIG. 1, omitting the roller; and

FIG. 5 is a view similar to FIG. 1 but showing the parts in what corresponds to the fully opened position of the automobile door with the door stop on the body half of the hinge engaging the fixed end of the torsion bar for positively limiting door opening movement.

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

Referring to the drawings, the reference numeral **6** designates the inner or body half of a cage-type hinge to which the outer or door half **7** is pivotally connected by a pintle **8**. The parts **6** and **7** are both of sheet metal construction, part **6** having bolt holes **9** for reception of bolts for fastening it to the body, and part **7** also having bolt holes **10** for reception of bolts to fasten it to the door. Flanges **11** on the door half are suitably welded on an angular reinforcement plate **12**, as indicated in FIG. 1. Enough of the hinged edge of the door is shown at **13** in FIG. 1 as well as of the door pillar at **14** on the body **15** to show the relationship of the hinge to the door and body and enable a clearer understanding of the invention. The body part **6** and door part **7** are both of channel-shaped cross-section. The upper wall **16** of the body half **6** carries the fluted or star roller **17** on a rivet **18**, and the lower wall **19** provides the hook-shaped door stop **20** on the outer end thereof. The body half **6** fits inside door half **7** as clearly indicated in FIGS. 1 and 3, the pintle **8** extending through coaxially aligned holes **21** provided in the projecting ears **22** and **23** on the door half **7** and registering holes **21'** provided in the top and bottom walls **16** and **19** of the

body half 6. The rivet 18 previously mentioned is of a shouldered form and provides a mounting behind the head thereof for a wavy spring washer 24 which by its frictional engagement with the face of the roller 17 serves to hold the same against turning too freely.

The top and bottom walls 25 and 26 of the channel-shaped door half 7 support the vertically disposed hold-open torsion bar 27 for cooperation of the movable upper extremity 28 with the roller 17 and the fixed lower extremity 29 with the stop 20, these portions 28 and 29 moving in arcs *a–b* and *c–d*, respectively, as indicated in FIG. 1, in the door opening and closing movements. The extent of deflection of the movable extremity 28 necessary to pass the roller 17 is evident from the arc *a–b*. Torsion bar 27 is generally C-shaped. The movable extremity 28 is defined on the downturned vertical end of the semi-circular upper radius arm 30. The latter is struck on a shorter radius than the semi-circular lower radius arm 31, the upturned vertical end 29 of which forms the stop for limiting the door's opening movement after the hold-open roller 17 has deflected the end 28 in its passing the roller. The torsion bar 27 is bent from high carbon steel round bar stock with the lower radius arm 31 normally in a vertical plane at an angle relative to the vertical plane of the upper radius arm 27, as indicated by the dotted line *e–f* in FIG. 1, which is merely illustrative of an 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 27 is concerned. The torsion bar is heat-treated before assembly on the outer hinge part 7, and, in the assembling operation, the intermediate portion 32 of the bar is first entered in the hole 33 by slipping the extremity 28 through the hole and later entering the extremity 28 in the notch 34 provided in the edge portion of the top wall 25 at the correct radial distance from hole 33, after which, when the torsion bar 27 is moved downwardly far enough for the extremity 29 to clear the bottom of the lower wall 26, the lower end portion of the intermediate portion 32 of the torsion bar is entered in notch 35 in the edge portion of the lower wall 26 and then the extremity 29 is forced inwardly to align it with the slot 36 provided in the bottom wall 26 at the appropriate radial distance from notch 35, whereupon the extremity 29 is anchored in the slot 36 by moving the torsion bar upwardly until the notch or groove 37 in the end portion 29 is aligned with and receives the lower wall 26 on one side of slot 36 to lock the bar in place. In this way I preload the torsion bar to the desired extent and make it a permanently assembled spring part of the outer hinge part 7 while permitting a limited amount of spring restrained oscillation of the upper radius arm 30 as required for the hold-open action when the roller 17 engages and deflects the radius arm 30 when the automobile door is swung to fully opened position, the extremity 28 in that operation engaging in one of the scallops of the roller 17 as the roller engages this extremity and deflects it as it moves past the roller, the roller in this operation being turned through a small angle, holding the door in the fully opened position. A small amount of door movement is still permitted after the extremity 28 of the torsion bar has been deflected and passed the roller, as seen in FIG. 5, where the other extremity 29 of the bar is shown in engagement with the notch 20 in the bottom wall 19 of the body half 6 of the hinge. Less angular movement beyond the hold-open position is usually provided for a rear door than for a front door.

In operation, the scalloped or star roller 17 will be turned through whatever small angularity may be necessary to engage one of its scallops with the movable extremity 28 of the torsion bar 27 upon engagement of the roller with the bar in the first opening of the door and, of course, the roller is turned through a certain

angularity as the extremity 28 rolls on it while being deflected thereby in passing it as the door reaches fully opened position. The wavy spring 24 exerts sufficient frictional drag on the roller to hold it against any further turning the moment the extremity 28 of the torsion bar gets out of mesh with the roller. Consequently, the two parts mesh perfectly upon each and every engagement thereafter, the roller 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 17 and 28 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 quite 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 last portion of the door opening movement 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 and the hold-open means 17–28 have been operated, the anchoring end or extremity 29 of the torsion bar 27 performs its function of positively limiting further door opening movement when this extremity engages in the notch 20 in the lower wall 19 of the body half 6 of the hinge. There is no danger of the extremity 29 being disengaged from slot 36 in this operation, because whatever load is applied on the extremity 29 in this stop operation is in a direction parallel to the groove 37, namely, in the plane of the radius arm 31, as seen in FIG. 5. There is no likelihood of the torsion bar ever being overstressed and taking a set in a direction away from the roller 17 to any appreciable extent, which might result in malfunctioning of the hold-open means or unreliable hold-open action. The torsion bar should easily last the life of the car and 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 roller 17 and its spring washer 24. If the roller 17 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 foregoing 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 pair of plates pivotally connected by a pintle, one of which is adapted to be secured to a body and the other to a door swingable to and from an open position relative to the body about a substantially vertical pintle axis, the improvement consisting in the provision of an elongated substantially vertical torsion bar mounted on one of said plates with a preload spring tension therein, the bar having laterally extending radius arms on its opposite ends, the first of which has a substantially vertical detent end portion on its outer end and the other having a substantially vertical anchor end portion on its outer end, the detent end being supported on said plate independently of the other plate so as to maintain the preload spring tension and being movable relative to said torsion bar plate by deflection of said arm in a direction to increase spring tension in said bar, a striker mounted on and projecting from the other of said plates so that it comes into en-

gagement with the detent to deflect said first mentioned arm to increase said spring tension in said torsion bar above preload spring tension in the door opening and closing movements of the plates relative to one another for a hold-open action, and a stop on the same plate with said striker arranged by engagement with the anchor end portion on the other arm of said bar to limit further opening movement of said plates after deflection of said detent portion on the first mentioned arm by said striker.

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

3. A hinge structure as set forth in claim 1, wherein the stop for engagement with the anchor end portion of said torsion bar is located in such relation to said striker so as to predetermine whether there is any freedom of movement of the door in the fully opened position and the extent thereof.

4. A hinge structure as set forth in claim 1, wherein the anchor end portion has a groove provided in one side thereof receiving an edge portion of the plate to lock said anchor end portion in said plate, the anchor end portion in coming into abutment with the stop approaching the stop in a direction approximately parallel to the groove and hence substantially at right angles to the direction of disengagement of the grooved end relative to the said plate so that there is no likelihood of disengagement of the plate from the groove.

5. In a hinge comprising a pair of generally channel-shaped hinge members that interfit in opposed relationship to one another and are pivotally connected by a pintle, each of said hinge members having vertically spaced top and bottom walls, and one hinge member 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 a substantially vertical pintle axis, the improvement which consists in the provision of an elongated substantially vertical torsion bar that is generally C-shaped mounted at its opposite ends on the top and bottom walls on the first of said hinge members with a preload spring tension therein, the bar having generally semi-circular shaped radius arms on opposite ends, the first of which has a substantially vertical detent extremity on the outer end and the other of which has a substantially vertical anchor extremity on its outer end, the detent extremity being supported on said first hinge member independently of the other hinge member so as to maintain the preload spring tension and being movable relative to the first hinge member by deflection of said arm in a direction to increase said spring tension in said bar above preload tension, a striker mounted on and projecting from one of the walls of the other of said hinge members so that it comes into engagement

with the detent extremity to deflect said first mentioned arm in the direction to increase spring tension in said torsion bar above preload tension 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, and a stop provided on the other wall of the last mentioned hinge member arranged to strike the anchor extremity on said torsion bar for positively limiting door opening movement after the hold-open action.

6. A hinge structure as set forth in claim 5, wherein the radius arm carrying the detent extremity is disposed at such an angle in relation to the striker that a greater force is required to deflect said arm by engagement of the striker on the detent in a door closing direction than in a door opening direction.

7. A hinge structure as set forth in claim 5, wherein the stop for engagement with the anchor extremity of said torsion bar is so located relative to said striker so as to predetermine whether there is any freedom of movement of the door in the fully opened position and the extent thereof.

8. A hinge structure as set forth in claim 5, wherein the anchor extremity has a groove provided in one side thereof receiving an edge portion of the wall of the first hinge member to lock said anchor extremity in said wall, the anchor extremity in coming into abutment with the stop approaching the stop in a direction approximately parallel to the groove and hence substantially at right angles to the direction of disengagement of the grooved end relative to said wall so that there is no likelihood of disengagement of the wall from the groove.

9. A hinge structure as set forth in claim 1 wherein the striker is a rotary roller having a scalloped periphery, the detent end of the torsion bar upon engaging said periphery entering a scallop, thereby forcing the roller to turn through a predetermined angularity in the movement of the roller past the detent.

10. A hinge structure as set forth in claim 1 wherein the striker is a rotary roller having a scalloped periphery, the detent end of the torsion bar upon engaging said periphery entering a scallop, thereby forcing the roller to turn through a predetermined angularity in the movement of the roller past the detent, the structure further including means frictionally resisting turning of the roller so as to insure proper positioning of the scallop engaged by the detent so that the same scallop is engaged by the detent in each operation in the door opening and closing movement.

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