Sept. 4, 1956

A. JOHNSON ET AL

2,761,171

AUTOMOBILE DOOR HINGE EMBODYING
HOLD-OPEN AND ASSIST MEANS
Filed June 9, 1952

Fig. 2

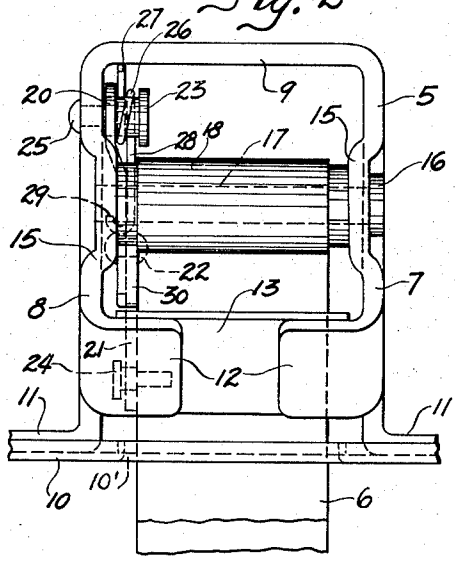


Fig. 1

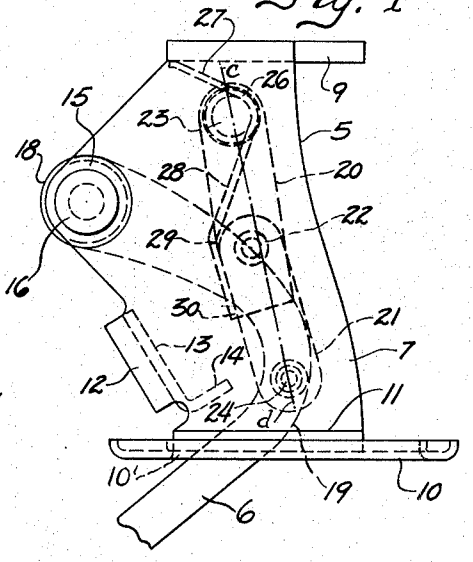
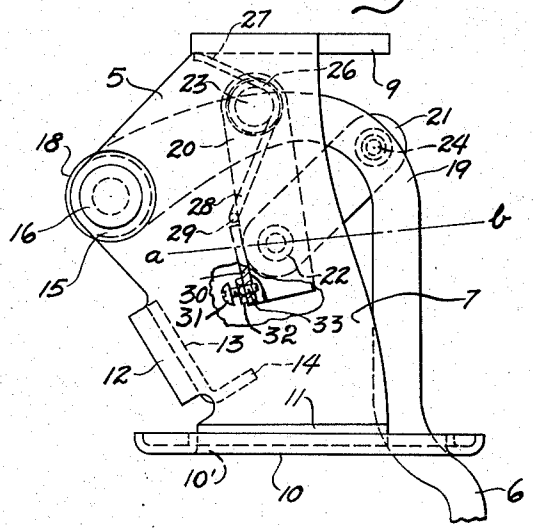


Fig. 3



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United States Patent Office 2,761,171
Patented Sept. 4, 1956

2,761,171

AUTOMOBILE DOOR HINGE EMBODYING HOLD-OPEN AND ASSIST MEANS

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Application June 9, 1952, Serial No. 292,489

13 Claims. (Cl. 16—50)

This invention relates to improvements in automobile door hinges and is more particularly concerned with the provision of novel hold-open and assist means.

Various designs of hold-open and assist means have been proposed, but many are too complicated and expensive in construction and are not practical for various reasons. It is, therefore, the principal object of our invention to provide hold-open and assist means of simpler and less expensive construction, designed to give satisfactory performance throughout the life of the car without ever being apt to require any attention.

In accordance with our invention, a toggle linkage is provided, connected at one end to one of the hinge members at a portion thereof displaced radially from the substantially vertical hinge axis and connected at the other end to the other of the hinge members at a portion thereof displaced radially from the hinge axis, one of the toggle links being urged by means of a torsion spring to turn away from the hinge axis so as to give a desirable assist action that is helpful both in closing and opening the door besides serving its primary function as a hold-open element to maintain the linkage at a near dead-center position yieldingly holding the door open.

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

Fig. 1 is a plan view of an automobile door hinge embodying a hold-open device made in accordance with our invention showing the parts in what corresponds to the fully opened position of the door;

Fig. 2 is a view of Fig. 1 taken from the left, and

Fig. 3 is a view similar to Fig. 1 showing same equipped with adjustable means for limiting the relative pivotal movement of the toggle links and the parts in the other extreme position corresponding to the closed position of the door.

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

Referring to the drawing, the reference numeral 5 designates the outer, generally U-shaped, sheet metal hinge member that is mounted on the body pillar of the automobile, and 6 the inner hinge member that is mounted on the door pillar. Hinge member 6 is bolted to the inner side of the door, substantially as shown, for example, in Atwood Patent No. 2,345,562, issued April 4, 1944. The outer hinge member 5, being U-shaped, provides opposed substantially horizontal top and bottom walls 7 and 8, respectively, interconnected by a substantially vertical wall 9. A face plate 10 is welded, or otherwise suitably secured, to the attaching flanges 11, to further reinforce the hinge member and improve its appearance on the automobile body by concealment of the attaching flanges, the face plate having an opening therein indicated at 10' through which the shank portion of the inner hinge member 6 extends and is movable between the extreme open position, shown in Fig. 1, and the closed position, shown in Fig. 3. The flanges 11 are bolted to the pillar on the face exposed in the door opening, similarly as shown in said Atwood patent. Lugs 12 bent toward one another from the edge portions of walls 7 and 8 are welded to a cross-piece 13, on which a flange 14 is provided which is adapted to serve as a stop for engagement by the inner hinge member positively to limit the door opening movement if the door should be swung a little past the open position shown in Fig. 1, as, for example, if the door is flung open violently, or excessive pressure is applied to the open door tending to open it farther. Embossed portions 15 are provided on walls 7 and 8 to provide supports for the hinge pintle 16 that is received in a bearing hole 17 provided therefor in the inner end portion 18 of the inner hinge member 6. The generally U-shaped gooseneck portion 19 of the inner hinge member is on a radius large enough so that the cross-portion of the U clears the body pillar in the open position of the door, as should be clear in Fig. 1, the door being swung through approximately 60° from closed to open position, as can be seen by comparison of Figs. 1 and 3.

In accordance with our invention, toggle links 20 and 21 are provided, pivotally connected together at one end by a rivet 22, and pivotally connected by means of the link 20 to the outer hinge member 5 as by means of a stud 23 entered through a hole provided in the outer end of that link, and pivotally connected by means of the link 21 to the inner hinge member 6, as by means of a stud 24 entered through a hole provided in the outer end of that link. The stud 23 is riveted to the lower wall 8 of the outer hinge member 5, as indicated at 25, at a predetermined radial distance from the pintle 16, as clearly appears in Figs. 1 and 3. The stud 24 is secured to the bottom edge of hinge member 6 in the gooseneck portion 19 thereof at a greater radial distance from pintle 16, as clearly appears in Figs. 1 and 3. A torsion spring 26 is coiled around the stud 23 and has one tangentially extending end portion 27 fixed by abutment with the wall 9, its other tangentially extending end portion 28 being hooked onto the edge portion of link 20, as indicated at 29, whereby to urge the link 20 in a counterclockwise direction as viewed in Figs. 1 and 3. A flange 30 struck upwardly from one edge portion of the link 20 serves as a stop, which, by engagement with the edge portion of link 21, prevents these links from reaching a dead-center position on line *c—d* (Fig. 1) and predetermines the oblique angularity of the two links with respect to one another in their near dead-center position, as shown in Fig. 1, so that the force required in the way of a push or pull on the door to close it when it is being held open by this toggle linkage can be definitely predetermined, taking into consideration, of course, the spring loading afforded by the spring 26, which tends to maintain the linkage in the near dead-center position yieldingly to hold the door open. If desired, a screw 31 with a lock nut 32 on it may be provided, threading through a hole 33 in the flange 30 as indicated in Fig. 3 for abutment with the edge of the link 21 radially outwardly from the pivot 22, to permit increasing the angularity of link 21 away from a dead-center relationship to link 20 to whatever extent seems necessary or desirable when the door is being hung, the screw 31 being locked by means of its lock nut 32 in the adjusted position. Otherwise, the flange 30 may be bent inwardly toward link 21 more or less to limit the approach to dead-center relationship. The end of link 21 is concentric with pivot stud 22 so that the link can swing from the closed position (Fig. 3) to the open position (Fig. 1) in contact with flange 30.

In operation, when the door is being opened, the resistance of spring 26 increases as the pivot 24 approaches a dead-center position in relation to pivot 22, indicated by the dot and dash line *a—b* in Fig. 3, namely, during the first 15° or so of door opening movement. This built-up spring tension is expended in the further opening movement of the door, to assist such opening and at the same

time move the links 20 and 21 toward the near dead-center relationship shown in Fig. 1, in which position the links and spring acting together serve yieldingly to resist closing of the door. The closer the links 20 and 21 come to actual dead-center relation, the greater, of course, is the force required in the way of a push or pull on the door to close it, and the size of the spring 26 is also an important factor. This spring is selected not only with a view to its functioning as a hold-open element, but also with a view to its serving as an assist element. In the closing of the door, the spring 26 cooperating with the linkage 20—21 affords appreciable resistance to the initial movement, and thereafter the resistance diminishes rapidly, once the toggle has been "broken." The spring 26 builds up tension during the first 45° or so of door closing movement, during which the link 21 swings through approximately 90° toward the dead-center position *a—b*, and, then, in the final 15° or so of door closing movement the tension stored in the spring 26 is partially expelled in assisting the door closing movement as the pivot 24 moves inwardly away from the dead-center line *a—b*.

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

We claim:

1. In a hinge comprising a pair of hinge members pivoted relative to one another for relative pivotal movement about a hinge axis, the improvement consisting in the provision of a pair of elongated toggle links pivotally connected together at one end, one of said links being pivoted at its other end on one of said members at a portion thereof displaced radially from the hinge axis and the other of said links being pivoted at its other end on the other of said members at a portion thereof displaced radially from the hinge axis, means on the pivotally connected ends of the links limiting the pivotal movement of said links relative to one another when they reach a nearly aligned relationship which is when the hinge members reach their fully opened position, whereby said links provide a hinge hold-open action, and spring means acting between the pivoted end of one of said links and the hinge member on which it is pivoted tending to turn said link normally away from the hinge axis about its pivotal connection with the associated hinge member, said links being of a predetermined length in relation to one another and arranged with respect to the hinge members so that one of said links oscillates back and forth past a right angle dead center position relative to the other of said links in the opening and closing movements of said hinge members, so that the spring means serves to assist in opening and closing of the hinge besides playing a part in the hold-open action by resisting movement of the links from their nearly aligned relationship.

2. In a hinge comprising a pair of hinge members pivoted relative to one another for relative pivotal movement about a hinge axis, the improvement consisting in the provision of a pair of elongated toggle links pivotally connected together at one end, one of said links being pivoted at its other end on one of said members at a portion thereof displaced radially from the hinge axis and the other of said links being pivoted at its other end on the other of said members at a portion thereof displaced a greater distance radially from the hinge axis, means limiting the pivotal movement of said links relative to one another when they reach a nearly aligned relationship, and spring means associated with the link pivoted nearer the hinge axis and acting between the pivoted end of said link and the hinge member on which it is pivoted tending to turn said link away from the hinge axis, the link pivoted farther from the hinge axis being arranged to move from one side to the other of a substantially right angle dead center position relative to the other link in the opening and closing of the hinge.

3. In a hinge comprising a pair of hinge members pivoted relative to one another for relative pivotal movement about a hinge axis, the improvement consisting in the provision of a pair of elongated toggle links pivotally connected together at one end, one of said links being pivoted at its other end on one of said members at a portion thereof displaced radially from the hinge axis and the other of said links being pivoted at its other end on the other of said members at a portion thereof displaced radially from the hinge axis, means limiting the pivotal movement of said links relative to one another when they reach a nearly aligned relationship, spring means acting between the pivoted end of one of said links and the hinge member on which it is pivoted tending to turn said link normally away from the hinge axis about its pivotal connection with the associated hinge member, and a positive stop on one of said hinge members engageable by the other of said hinge members to limit opening movement.

4. In a hinge comprising a pair of hinge members pivoted relative to one another for relative pivotal movement about a hinge axis, the improvement consisting in the provision of a pair of elongated toggle links pivotally connected together at one end, one of said links being pivoted at its other end on one of said members at a portion thereof displaced radially from the hinge axis and the other of said links being pivoted at its other end on the other of said members at a portion thereof displaced a greater distance radially from the hinge axis, means limiting the pivotal movement of said links relative to one another when they reach a nearly aligned relationship, spring means associated with the link pivoted nearer the hinge axis and acting between the pivoted end of said link and the hinge member on which it is pivoted tending to turn said link away from the hinge axis, the link pivoted farther from the hinge axis being arranged to move from one side to the other of a substantially right angle dead center position relative to the other link in the opening and closing of the hinge, and a positive stop on one of said hinge members engageable by the other of said hinge members to limit opening movement.

5. In a hinge comprising a generally U-shaped outer member providing spaced substantially horizontal and parallel arms, and an inner member disposed between said arms having opposed substantially parallel longitudinal edges disposed in spaced substantially parallel relation to said arms, said inner member being pivoted on a substantially vertical pintle disposed in approximately 90° relation to and supported at its opposite ends on the arms of the U-shaped member, said hinge members being movable relative to one another through a predetermined angularity, the improvement consisting in the provision of a pair of elongated toggle links pivotally connected together at one end and disposed in the space between one longitudinal edge of the inner hinge member and an adjacent arm of the outer hinge member approximately parallel to the edge of the inner hinge member, one of said links being pivoted at its other end on said outer hinge member at a portion thereof displaced radially from the hinge pintle and the other link being pivoted at its other end on said inner hinge member at a portion thereof displaced radially from the hinge pintle, spring means acting between the pivoted end of one of said links, and the outer hinge member on which it is pivoted tending to turn said link normally away from said pintle around its pivotal connection with the outer hinge member, and means limiting pivotal movement of the links relative to one another when they reach a nearly aligned relationship to one another.

6. In a hinge comprising a generally U-shaped outer member providing spaced substantially horizontal and parallel arms, and an inner member disposed between said arms having opposed substantially parallel longitudinal edges disposed in spaced substantially parallel relation to said arms, said inner member being pivoted on a

substantially vertical pintle disposed in approximately 90° relation to and supported at its opposite ends on the arms of the U-shaped member, said hinge members being movable relative to one another through a predetermined angularity, the improvement consisting in the provision of a pair of elongated toggle links pivotally connected together at one end and disposed in the space between one longitudinal edge of the inner hinge member and an adjacent arm of the outer hinge member approximately parallel to the edge of the inner hinge member, one of said links being pivoted at its other end on said outer hinge member at a portion thereof displaced radially from the hinge pintle and the other link being pivoted at its other end on said inner hinge member at a portion thereof displaced a greater distance radially from the hinge pintle, means limiting the pivotal movement of said links relative to one another when they reach a nearly aligned relationship, and spring means associated with the link pivoted nearer the hinge pintle acting between the pivoted end of said link and the outer hinge member on which it is pivoted tending to turn said link away from said pintle, the link pivoted farther from the hinge pintle being arranged to move from one side to the other of a substantially right angle dead center position relative to the other link in the opening and closing of the hinge.

7. In a hinge comprising a generally U-shaped outer member providing spaced substantially horizontal and parallel arms, and an inner member disposed between said arms having opposed substantially parallel longitudinal edges disposed in spaced substantially parallel relation to said arms, said inner member being pivoted on a substantially vertical pintle disposed in approximately 90° relation to and supported at its opposite ends on the arms of the U-shaped member, said hinge members being movable relative to one another through a predetermined angularity, the improvement consisting in the provision of a pair of elongated toggle links pivotally connected together at one end and disposed in the space between one longitudinal edge of the inner hinge member and an adjacent arm of the outer hinge member approximately parallel to the edge of the inner hinge member, one of said links being pivoted at its other end on said outer hinge member at a portion thereof displaced radially from the hinge pintle and the other link being pivoted at its other end on said inner hinge member at a portion thereof displaced radially from the hinge pintle, spring means acting between the pivoted end of one of said links and the outer hinge member on which it is pivoted tending to turn said link normally away from said pintle around its pivotal connection with the outer hinge member, means limiting pivotal movement of the links relative to one another when they reach a nearly aligned relationship to one another, and a positive stop on the outer hinge member limiting opening movement of the inner hinge member.

8. In a hinge comprising a generally U-shaped outer member providing spaced substantially horizontal and parallel arms, and an inner member disposed between said arms having opposed substantially parallel longitudinal edges disposed in spaced substantially parallel relation to said arms, said inner member being pivoted on a substantially vertical pintle disposed in approximately 90° relation to and supported at its opposite ends on the arms of the U-shaped member, said hinge members being movable relative to one another through a predetermined angularity, the improvement consisting in the provision of a pair of elongated toggle links pivotally connected together at one end and disposed in the space between one longitudinal edge of the inner hinge member and an adjacent arm of the outer hinge member approximately parallel to the edge of the inner hinge member, one of said links being pivoted at its other end on said outer hinge member at a portion thereof displaced radially from the hinge pintle and the other link being pivoted at its other end on said inner hinge member at a portion thereof displaced a greater distance radially from the hinge pintle, means limiting the pivotal movement of said links relative to one another when they reach a nearly aligned relationship, spring means associated with the link pivoted nearer the hinge pintle acting between the pivoted end of said link and the outer hinge member on which it is pivoted tending to turn said link away from said pintle, the link pivoted farther from the hinge pintle being arranged to move from one side to the other of a substantially right angle dead center position relative to the other link in the opening and closing of the hinge, and a positive stop on the outer hinge member limiting opening movement of the inner hinge member.

9. A hinge as set forth in claim 1 wherein the means on the pivotally connected ends of the links limiting the pivotal movement of said links relative to one another when they reach a nearly aligned relationship is adjustable so as to change the extent of hold-open effect.

10. A hinge as set forth in claim 2 wherein the means limiting pivotal movement of said links relative to one another when they reach a nearly aligned relationship is adjustable, whereby to increase or decrease the hold-open effect.

11. A hinge as set forth in claim 3 wherein the means limiting pivotal movement of said links relative to one another when they reach a nearly aligned relationship is adjustable, whereby to increase or decrease the hold-open effect.

12. A hinge as set forth in claim 4 wherein the means limiting pivotal movement of said links relative to one another when they reach a nearly aligned relationship is adjustable, whereby to increase or decrease the hold-open effect.

13. A hinge as set forth in claim 5 wherein the means limiting pivotal movement of said links relative to one another when they reach a nearly aligned relationship is adjustable, whereby to increase or decrease the hold-open effect.

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