July 2, 1957 S. F. LORIA 2,797,431

DOOR CHECK AND HOLDOPEN

Filed April 15, 1953 2 Sheets-Sheet 1

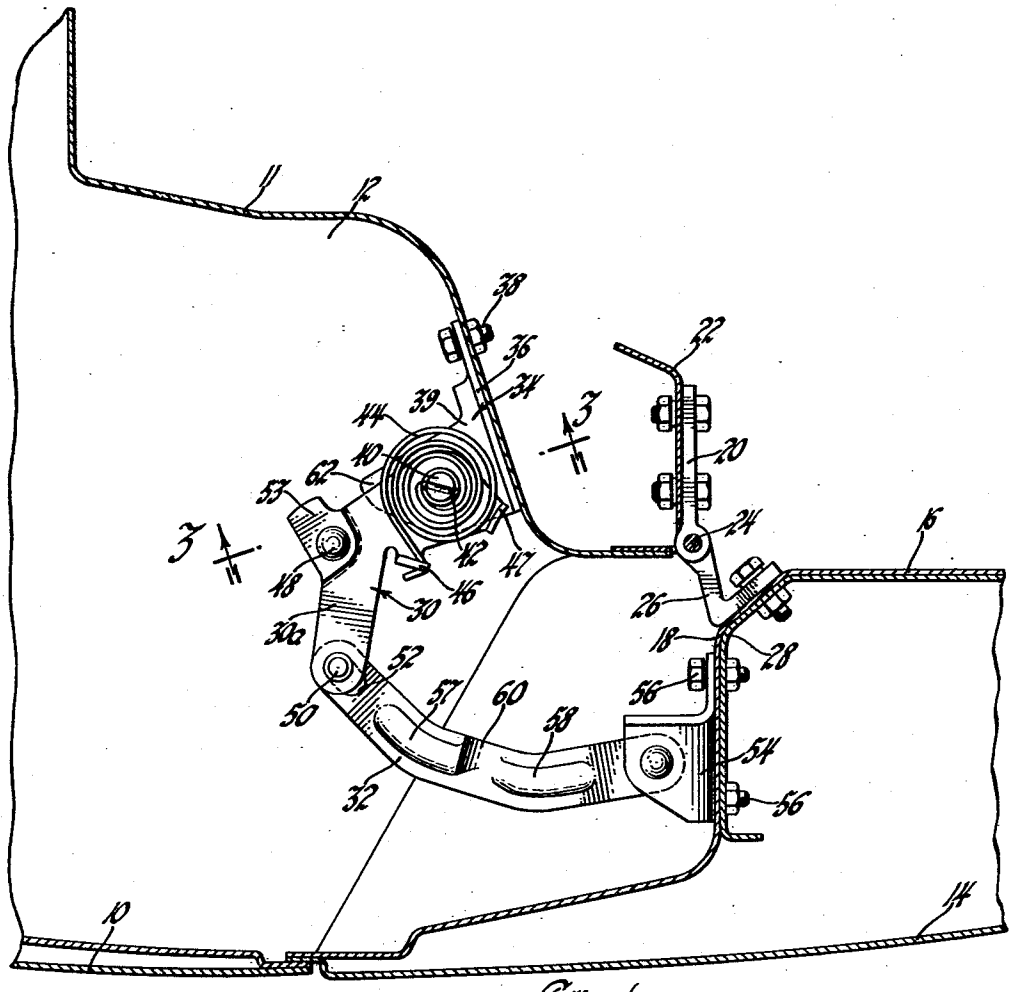


Fig. 1

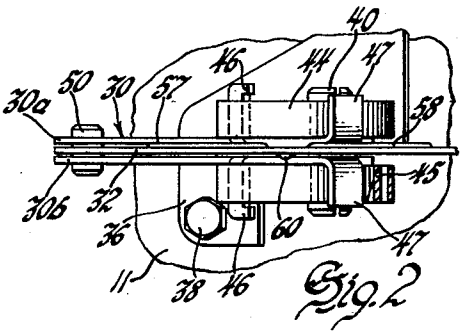


Fig. 2

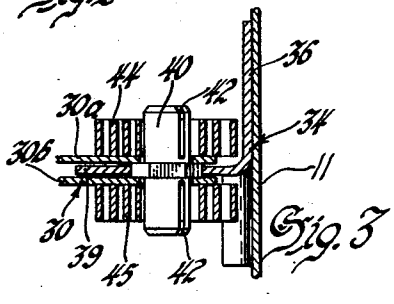


Fig. 3

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July 2, 1957 S. F. LORIA 2,797,431

DOOR CHECK AND HOLDOPEN

Filed April 15, 1953 2 Sheets-Sheet 2

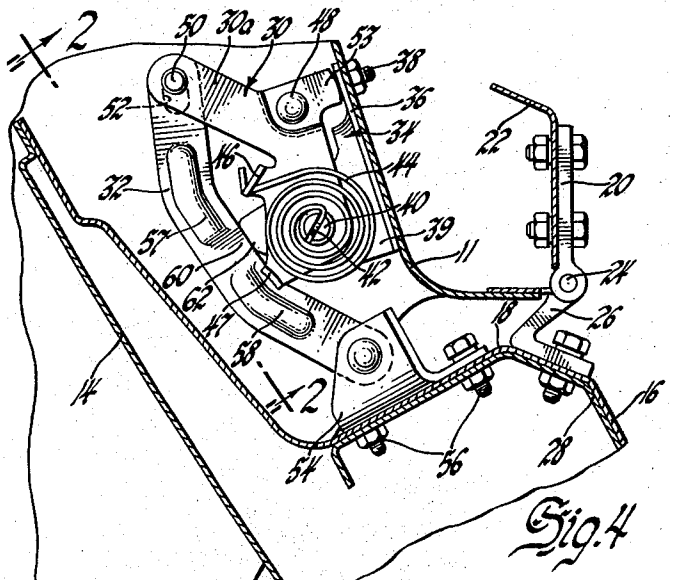


Fig. 4

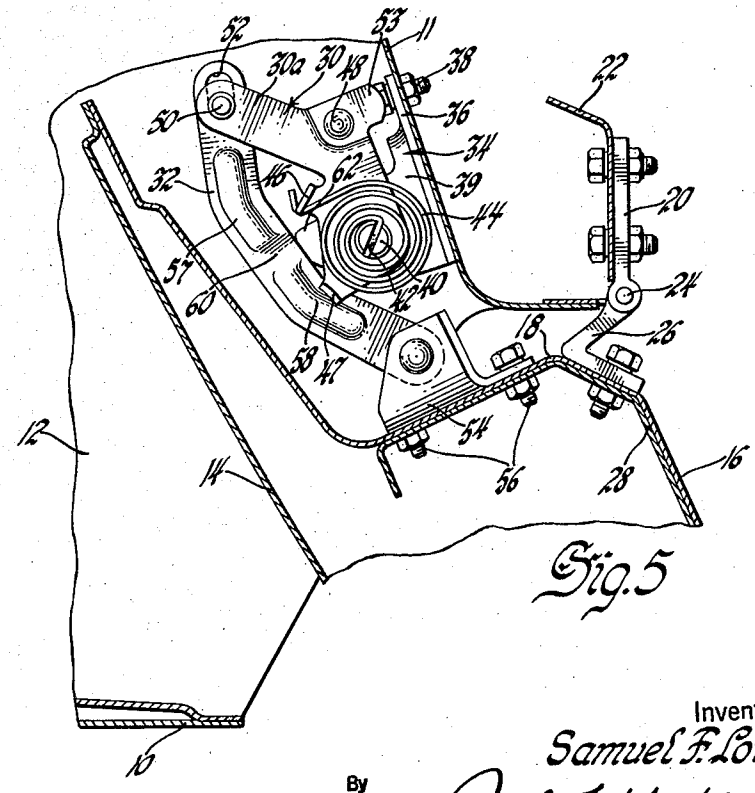


Fig. 5

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DOOR CHECK AND HOLDOPEN

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8 Claims. (Cl. 16—85)

This invention relates to a door check and holdopen, and more particularly to a door check and holdopen for automobile doors.

One feature of the invention is that it provides an improved door check and holdopen; another feature of the invention is that it provides a spring counterbalance action to offset the weight of the door; a further feature of the invention is that it provides improved means to hold the door in a normal open position; an additional feature of the invention is that it provides an improved spring cushioned check for the door when the door is thrown beyond its normal open position to its fully open position; still another feature of the invention is that it provides a door check and holdopen device which is mounted on the exterior surface of the door and the body, and it is not necessary to form the door or the body with openings to receive part of the check and holdopen mechanism; yet another feature of the invention is that it provides a door check and holdopen comprising a pair of pivotally joined toggle links which are in extended relation when the door is closed and in folded relation when the door is open; still another feature of the invention is that the links are pivotally joined by means of a pin and slot connection to provide for bodily movement of one link and for pivotal movement of the other link against the force of a cushioning spring when the door moves to fully open position.

Other features and advantages of the invention will be apparent from the following description and from the drawings, in which:

Fig. 1 is a fragmentary horizontal section through a portion of the door and fender of an automobile with the door closed showing the improved door check and holdopen in top plan view;

Fig. 2 is an elevational view, partly in section, of a portion of the apparatus shown in Fig. 1, and taken along the line 2—2 of Fig. 4;

Fig. 3 is a fragmentary section taken along the line 3—3 of Fig. 1;

Fig. 4 is a view similar to Fig. 1, but showing the position of the parts when the door is in its normal open position; and

Fig. 5 is a view similar to Fig. 1, but showing the position of the parts when the door is in its fully open position.

Most modern automobiles are provided with so called "tumble-in" doors which have the hinge axis inclined so that the door tends to close by gravity. This construction makes it easier to close the door and also permits the door to be opened when the car is parked next to a curb or other obstruction. Since the door is quite heavy, a door check and holdopen device is provided to partially counterbalance the weight of the door so that the door is easy to open, to hold the door in its normal open position, and to provide a resilient door check to cushion the door when it is thrown to fully open position. The invention provides a novel and improved door check and holdopen device of this type, and the door check and holdopen of the invention is particularly advantageous since it is so constructed that it is mounted on exterior surfaces of the door and the body. Because of this construction, it is not necessary to provide openings in the door or body to receive links or other parts of the door check and holdopen device, and this greatly simplifies sealing problems on the door and body.

Referring now more particularly to the drawings, **10** is an automobile outer body panel comprising a part of the bulging portion of a fender which extends rearwardly and merges with the contour of the door. **11** is the inner fender panel, and a space **12** is provided between the inner and outer panels **10** and **11**.

The door has an outer panel **14** which merges with the contour of the outer fender panel **10**, and an inner panel **16** which extends out to the outer panel **14** at the forward edge of the door to provide a hinge face **18** on the door. The door is hinged to the body by means of two vertically spaced hinges, one of which is shown in the drawings as comprising a hinge strap **20** bolted to a reinforcing bracket **22** on the body and pivotally connected by means of a hinge pin **24** to a mating hinge strap **26** which is bolted to the door, a reinforcing panel **28** being provided on the inner surface of the inner door panel **16**.

The door check and holdopen comprises a first toggle link designated generally at **30**, which is pivotally mounted on the body, and a second toggle link **32** which is pivotally mounted on the door. A first bracket designated generally at **34** is formed of a body portion **36** secured to the inner body panel **11** by means of bolts **38**, and a right angularly extending flange portion **39** which projects from the body portion **36** of the bracket. A pin **40** is mounted on the bracket flange **39** and projects from both sides of this flange. The pin **40** is rigidly secured to the flange **39** and is not rotatable with respect thereto, and, as shown best in Fig. 3, the pin is formed at each end with an axially extending slot **42** in each of which is received the inner end of one of a pair of spiral clock-type springs **44** and **45**. The outer end of each spring is hooked over an ear **46** which extends from opposite sides of the link **30** and tabs **47** which are bent from the link **30** limit the expansion of the springs **44** and **45**. As shown best in Figs. 2 and 3, the link **30** is formed of two duplicate stamped parts **30*a*** and **30*b*** which straddle the flange portion **39** of the bracket **34** and which are pivotally mounted on the pin **40**. A rivet **48** secures the parts **30*a*** and **30*b*** together, and at one end of the link a pin **50**, which extends between the two spaced stampings, provides a pivotal mounting for the link **32**, which is formed with an elongated slot **52** through which the pin **50** extends.

The other end of link **32** is pivotally connected to a second mounting bracket **54** which is secured to the hinge face **18** of the door by means of bolts **56**.

Fig. 1 shows the door closed, and with the door in this position, the links **30** and **32** are in extended relation and the springs **44** and **45** have been wound so that energy is stored in the springs and force is exerted thereby through the link **30** to aid in opening the door. In accordance with conventional practice, this force is not sufficient to overcome the weight of the door, and preferably when the automobile is level the door has a slight tendency to close.

Fig. 4 shows the position of the parts when the door is open to its normal holdopen position, i. e., the position in which it will be held by the action of the door check and holdopen. In this position the door has been swung around the axis of hinge pin **24**, the hinge edge of the door swinging inwardly into the space **12** in the fender. The links **30** and **32** have moved from extended relation to folded relation, and it will be noted that with the parts in this position, the force of the springs is more in line

with the opening movement of the door than it is when the parts are in the position of Fig. 1, so that the spring force is more effective when the door is open than it is when the door is closed.

Each stamped part of link **30** is provided with a projecting lug **53** which engages the surface of the body portion **36** of the body bracket **34** when the door is in its normal holdopen position, preventing further pivotal movement of the link **30** in a clockwise direction as the parts appear in Figs. 1, 4 and 5. Link **32** is formed with longitudinally extending ribs **57** and **58** to prevent deformation of the link, and in the central portion of the link between these ribs there is formed a distorted portion **60** which is bent out of the plane of the link to provide a stop element which will engage the face of a projection **62** on the flange portion **39** of the body bracket **34**. The purpose of the bent portion **60** is to ensure its engagement with the projection **62** in the event the parts are not quite in alignment. When the door has been opened to the normal holdopen position shown in Fig. 4, the springs hold the door in this position because of the increased effect of the spring force, as pointed out above.

In the event the door is thrown open, it may move to a fully open position, as shown in Fig. 5, beyond the normal holdopen position of Fig. 4. The door check and holdopen device provides a yieldable force to cushion the door when it is thrown to this position, and the door check and holdopen automatically returns the door to the normal holdopen position of Fig. 4. When the inertia of the moving door throws it past the position of Fig. 4 to the fully open position of Fig. 5, link **32** moves bodily, sliding along the face of the projection **62**, so that the pin **50** moves to the other end of the slot **52**, this action camming link **30** and causing it to pivot in a reverse direction (counterclockwise as the parts appear in Figs. 1, 4 and 5) against the force of the springs **44** and **45**, which are caused to rewind slightly. When the inertia of the door is exhausted, the unwinding force of the springs will pivot the link **30** again in a clockwise direction until the lug **53** is stopped by the surface of the body portion **36** of the support bracket **34**, this pivotal movement causing the pin **50** to slide back to the outer end of slot **52**, and the door is then held in the normal holdopen position of Fig. 4. The proportioning of the parts may be such as to provide any desired angle of movement between fully open position and holdopen position, preferably about six degrees of movement being provided between these two positions. In addition to the bodily or sliding movement of the link **32** along the face of the projection **62**, said link may pivot about an axis formed by the face of said projection. If desired, the parts may be so proportioned that pivotal movement exceeds, or even completely supersedes, sliding movement of the link, and the apparatus will operate properly so long as relative movement between link **32** and projection **62** causes reverse pivotal movement of link **30** against the force of springs **44** and **45**.

When the door is manually closed, the springs **44** and **45** are wound, storing energy which opposes the closing force and provides a desired counterbalance effect to the weight of the door and to the "tumble-in" or gravity force of the door caused by the inclined hinge axis.

While I have shown and described one embodiment of my invention, it is capable of many modifications. Changes, therefore, in the construction and arrangement may be made without departing from the spirit and scope of the invention as set forth in the appended claims.

I claim:

1. A door check and holdopen of the character described adapted to be mounted between door and body members, including: a pair of pivotally joined toggle links; a first bracket having a body portion secured to said body member and a flange portion pivotally connected to a first of said links; a second bracket secured to said door member and pivotally connected to the second link; spring means connected to said first link to urge the door toward open position; and means on each link substantially midway between the ends thereof adapted simultaneously to abut said first bracket to define an open position for said door.

2. Apparatus of the character claimed in claim 1, wherein said links are pivotally joined by means of a pin and slot connection, bodily movement of said second link upon final opening movement of the door beyond said open position camming the first link to partially rewind the spring means and to cause pivotal movement of said first link against the force of said spring means to cushion the final opening movement of the door.

3. In an automobile having a body and a door hingedly mounted thereon, a door check and holdopen of the character described, including: a pair of pivotally joined toggle links; a first bracket having a body portion secured to the automobile body and a flange portion pivotally connected to a first of said links; a second bracket secured to said door and pivotally connected to the second link; spring means connected between said first bracket and said first link to urge the door toward open position; and means on each link adapted to abut said first bracket to define a normal hold-open position for said door, said links being joined by a pin and slot connection adjacent one end of said links to provide for bodily movement of said second link and for pivotal movement of said first link against the force of said spring means when the door moves to fully open position, whereby during the engagement of the links with the stop means the spring is rewound slightly and the door is cushioned as it is thrown open beyond the normal hold-open position.

4. Apparatus of the character claimed in claim 3, wherein the flange portion of said first bracket has a projection abutting said second link when the door is in its holdopen position, said second link sliding upon said projection through force exerted on said second link by said second bracket when the door moves to fully open position.

5. In an automobile having a body and a door hingedly mounted thereon, a door check and holdopen of the character described, including: a pair of pivotally joined toggle links; a first bracket having a body portion secured to the automobile body and a flange portion pivotally connected to a first of said links; a second bracket secured to said door and pivotally connected to the second link; spring means connected between said first bracket and said first link to urge the door toward open position; and means on each link adapted to abut said first bracket to define a normal hold-open position for said door, said links being joined by a pin and slot connection adjacent one end of said links so that movement of said second link relative to said first bracket when the door opens beyond holdopen position causes pivotal movement of said first link against the force of said spring, whereby during the engagement of the links with the stop means the spring is rewound slightly and the door is cushioned as it is thrown open beyond the normal hold-open position.

6. A door check and hold-open of the character described adapted to be mounted between door and body members, including: a pair of toggle links pivotally joined by means of a pin and slot connection adjacent one end of said links; means for pivotally mounting each link on a different one of said members, said links being in extended relation when the door is closed and in folded relation when the door is open; spiral spring means engaging one of said links to urge the door toward open position; stop means supported from said body member; and means on each link adapted simultaneously to engage said stop means as the door is urged toward open position by said spring means whereby further opening of the door is limited to define a normal holdopen position for said door, said pin and slot connection causing bodily movement of the other link to cam said one link pivotally

against the force of said spring to define a fully open position for said door whereby during the engagement of the links with the stop means the spring is rewound slightly and the door is cushioned as it is thrown open beyond the normal hold-open position.

7. A door check and hold-open of the character described adapted to be mounted between door and body members, including: a pair of pivotally joined toggle links; means for pivotally mounting each link on a different one of said members; spring means engaging one of said links to urge the door toward open position; stop means supported from one of said members, said stop means being spaced from both links when the door is closed; and means on each link adapted simultaneously to engage said stop means as the door is urged toward open position by said spring means whereby further opening of the door is limited to define a normal hold-open position for said door, said links being in extended relation and defining an obtuse angle therebetween when the door is closed and being in folded relation and defining an acute angle therebetween when the door is open.

8. A door check and hold-open of the character described adapted to be mounted between door and body members, including: a pair of pivotally joined toggle

links; means for pivotally mounting each link on a different one of said members; spring means engaging only one of said links to urge the door toward open position; stop means supported from said body member; and means on each link adapted simultaneously to engage said stop means as the door is urged toward open position by said spring means whereby further opening of the door is limited to define a normal hold-open position for said door, said links being pivotally connected together by means of a pin and slot connection to provide for bodily movement of one link and for pivotal movement of the other link against the force of said spring means when the door moves to fully open position, whereby during the engagement of the links with the stop means the spring is rewound slightly and the door is cushioned as it is thrown open beyond the normal hold-open position.

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