Jan. 1, 1952 N. E. PUTNAM 2,580,593

DOOR CHECK AND HOLD OPEN

Filed June 17, 1949 2 SHEETS—SHEET 1

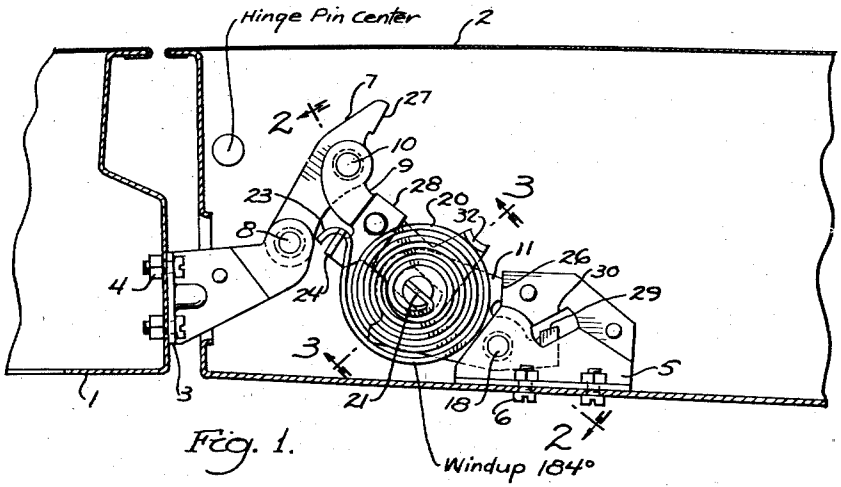


Fig. 1.

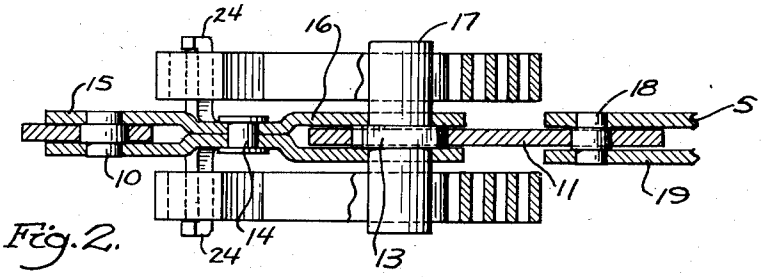


Fig. 2.

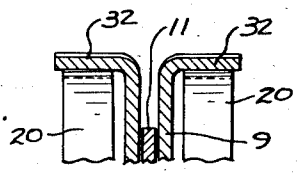


Fig. 3.

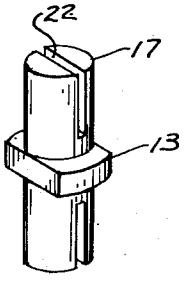


Fig. 4.

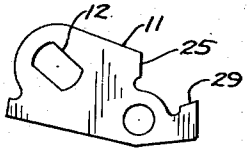


Fig. 5.

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DOOR CHECK AND HOLD OPEN

Filed June 17, 1949 2 SHEETS—SHEET 2

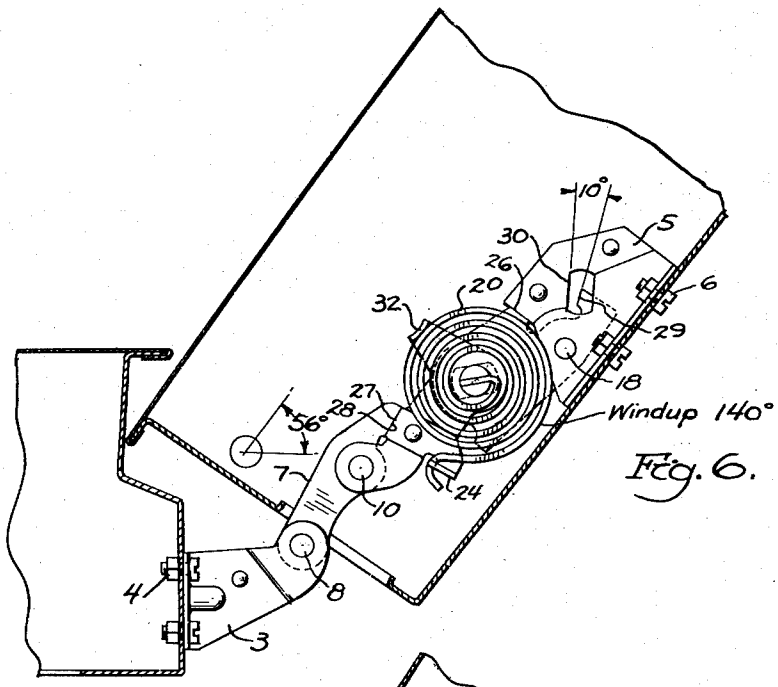


Fig. 6.

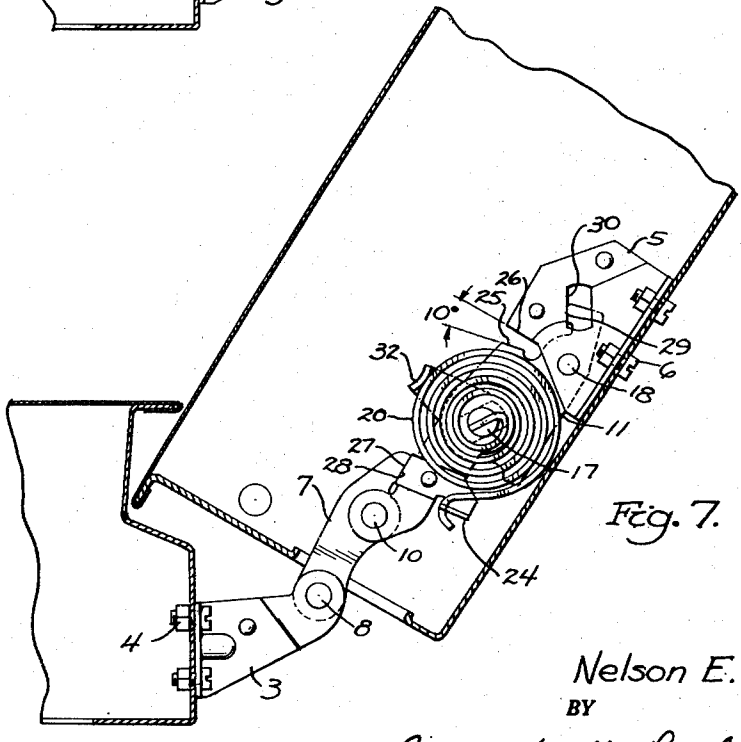


Fig. 7.

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Patented Jan. 1, 1952 2,580,593

UNITED STATES PATENT OFFICE

2,580,593

DOOR CHECK AND HOLD OPEN

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Application June 17, 1949, Serial No. 99,704

5 Claims. (Cl. 16—85)

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This invention relates to door checks and hold-opens. It has been found in present day automobiles that it is desirable to have not only a cushioned door check but also a door counterbalance and hold-open. That is a device which, after the door is unlatched, tends to either counterbalance or open the door, definitely prevent the door from swinging shut until manually pulled and provide a cushioned check when throwing the door open. This is desirable on account of the inclined hinged heavy doors that are now in use. It is desirable to counterbalance the natural closing action of the door from the closed position to nearly the normal open position.

The present invention is an improvement or variation on the door check and hold-open shown and described in Reissue Patent No. Re. 23,191 to Riley et al, dated January 17, 1950. It accomplishes the same purpose accomplished by the Riley door check and hold-open but it is so designed that it eliminates the rubber bumper of the Riley device and utilizes one type spring for three functions, (1) to tend to open or counterbalance the door once it is unlatched, (2) to hold the door at its open position, and (3) to provide a cushioned check when the door is thrown to its fully open position.

Referring to the drawings:

Fig. 1 is a cross section through part of the door and the body pillar showing a plan view or a top elevation of the improved door check and hold-open. Here the door is shown closed and the door check in its folded position.

Fig. 2 is an inverted section on the line 2—2 of Fig. 1.

Fig. 3 is a fragmentary sectional view on the line 3—3 of Fig. 1.

Fig. 4 is a detailed perspective of the main pivot pin between one of the toggle arms and the lever.

Fig. 5 is a detailed view of the lever.

Fig. 6 is a view similar to Fig. 1 but showing the door in its full hold-open position.

Fig. 7 is a similar view showing the door and the door check and hold-open thrown to the fullest open position.

1 designates the body pillar, 2 the door, 3 is the angle bracket secured to the body pillar by screws and nuts 4. 5 designates an angle bracket secured by screws and nuts 6 to the inside panel of the door. The toggle arm 7 is pivoted by pin 8 to an arm of the pillar bracket 3. The toggle arm 9 is pivoted to the toggle arm 7 by pivot pin 10. The lever 11 (see Fig. 5) has a key slot 12

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arranged to take the key 13 (see Figs. 2 and 4). Toggle arm 9 is made up of two strips that are riveted together by the pin 14. These strips are spaced at their ends to form yoke members; one, the yoke 15, straddles the toggle arm 7 at the knee, and the other, the yoke 16, straddles the pin 17 which carries the key 13. The yoke 16 has turned up ears 32 to centralize and minimize friction between the coils of spring 20. This main pivot pin 17 pivots the toggle arm 9 to lever 11. This lever 11 is pivoted by pin 18 to the yoke 19 formed by the door angle bracket 5. Each clock or spiral spring 20 has one end 21 hooked into one of the slots 22 of the pin 17. The other end 23 is hooked over the turned up lug 24 of the toggle arm 9. There are two of these clock springs (see Fig. 2). Lever 11 has a stop shoulder 25 adapted to encounter shoulder 26 on the door angle bracket 5.

The operation is as follows: When the door is closed as shown in Fig. 1 the clock springs 20 are put under considerable stress. The toggle arms 7 and 9 are folded to a position slightly less than a right angular position. The clock springs are wound up 184°. The door, in the position shown in Fig. 6 has opened 56° and the clock springs have been unwound to 140°. When the door check and hold-open is installed, the clock springs are put under a wind-up stress and wound up 140° as shown in Fig. 6. The 140° is found to be a desirable stress to counterbalance the door on which this check and hold-open is designed to be used. Different degrees of wind-up will be used with different doors. The wind up or stress of 140° is in the whole length of the spring. As the door is closed to the position shown in Fig. 1, the toggle arms fold up approximately 90° while the spring has been wound up only 44° since the spring center is mounted in a slot 22 of the stationary pin 17 and outer end is hooked over lug 24 which rotates approximately 44° in relation to the door. While the spring is being wound up approximately 90° at its outer end in passing from the position shown in Fig. 6 to that shown in Fig. 1, it is being unwound approximately 46° at the inner end (compare Fig. 6 and Fig. 1). Hence the total wind-up is 44°, that is, from 140° in Fig. 6 to 184° in Fig. 1.

The wind-up of 140° in the final hold-open position is ordinarily so calculated as to exert through the toggle considerably more energy than necessary to counterbalance the door to prevent the door from swinging closed by its own effort. The variations of the spring load acting on the toggle arms 7 and 9 from 184° of wind-up

in the closed position to 140° of wind-up in the hold-open position aid in opening the door to the full open position and tend to prevent the door from swinging closed from any open position after it has been given an initial swing from the unlatched position.

From the position of the door check and hold-open parts in Fig. 1, it will be seen that the stop **25** on lever **11** is up against stop **26** on the door bracket. It is held in this position by the spring stress operating on the lever **11** through the key **13** of pin **17**. As the door swings open, even though the springs unwind approximately 44°, there is still sufficient spring load to keep the two stops together, see Fig. 6, but when the toggle arms reach the near straight line or center line position shown in Fig. 6, the stop **27** on the extended end of toggle arm **7** engages the stop **28** on the other toggle arm **9** and the toggle arms cannot throw beyond this near straight line position and are now locked. In other words, they cannot throw over center. This is the full hold-open position shown in Fig. 6.

If the door is thrown open with considerable force or violence, the stops **25** and **26** can separate 10° as shown in Fig. 7 and the spring will be wound up from the inner end as shown in Fig. 7. The stops **29** and **30** are so spaced as to allow 10° movement (Fig. 6). Hence, the spring load increasing from additional wind-up of the inner end tends to prevent the checking toggle (now the second toggle set up) from straightening out. This checking toggle is composed of arms **7** and **9** as one member and lever **11** as the other member. The resistance of this toggle against straightening out, due to increasing spring load, cushions the impact of the door movement and the door is finally arrested when the positive stop **29** on lever **11** encounters the stop **30** on the door angle bracket **5**.

It will be seen, therefore, that a single clock spring serves three functions, first as a counterbalance, second to load a toggle for a hold open, and third for loading a second toggle acting as a check. When the door is unlatched the spring is under considerable stress, however, due to the folded position of toggle arms **7** and **9** and the spring is least effective. As the toggle arms gradually straighten out the spring load becomes more effective, due to the mechanical advantage gained. The spring is still under considerable stress, when the door is in its fully open position and most effective on the toggle to keep the door in this position. The third function which is completely novel is that of loading another toggle and serving to cushion and ease the final check of the door, when the door is thrown open by violence and passes beyond the fully hold-open position.

What I claim is:

1. A door check and hold-open having in combination a bracket for securing to the body pillar, a bracket for fastening to the door, a pair of toggle arms pivoted to each other and one of them pivoted to one of said brackets, a lever pivoted to the other bracket and to the end of the other toggle arm, said arms being disposed at an acute angle to each other when the door is closed, a stop on one of the toggle arms for stopping the unfolding and straightening of the toggle arms during the opening of the door at a position just short of the straight line or longitudinally aligned position thereof corresponding to the fully open position of the door whereby said arms are locked together and thereby constitute one member of a second toggle, said lever constituting the other member of said second toggle, a pair of stops or shoulders, one on the lever, a clock spring having one end applied to the lever and the other end applied to one of said toggle arms and put under stress when the check is applied to the door and operating to hold the two said stops together and thereby tending to counterbalance the tendency of the door to swing closed, the said spring unwinding and diminishing in torque but acting through the primary toggle with a mechanical advantage upon the door as the door is thrown to the fully open position but still providing stress on the door to keep the same in the fully open position, and a second pair of stops, one on the lever, said second stops so spaced as to allow the lever a limited arc of movement with the two locked toggle arms to thereby provide a second toggle straightening action which can be resisted by one end of the clock spring tending to wind up said clock spring and thereby cushion the impact when the door is thrown beyond the fully open position.

2. A door check and hold-open having in combination a bracket for securing to the body pillar, a bracket for fastening to the door, a pair of toggle arms pivoted to each other and one of them pivoted to one of said brackets, a lever pivoted to the other bracket and to the end of the other toggle arm, said arms being disposed at an acute angle to each other when the door is closed, a stop on one of the toggle arms for stopping the unfolding and straightening of the toggle arms during the opening of the door at a position just short of the straight line or longitudinally aligned position thereof corresponding to the fully open position of the door whereby said arms are locked together and thereby constitute one member of a second toggle, said lever constituting the other member of said second toggle, a pair of stops or shoulders, one on the lever, a spring having one end applied to the lever and the other end applied to one of said toggle arms and put under stress when the check is applied to the door and operating to hold the two said stops together and thereby tending to counterbalance the tendency of the door to swing closed, the said spring diminishing in torque but acting through the primary toggle with mechanical advantage upon the door as the door is thrown to the fully open position but still providing stress on the door to keep the same in the fully open position, and a second pair of stops, one on the lever, said second stops so spaced as to allow the lever a limited arc of movement with the two locked toggle arms to thereby provide a second toggle straightening action which can be resisted by the inner end of the spring and thereby cushion the impact when the door is thrown beyond the fully open position.

3. A door check and hold-open having in combination a bracket for securing to the body pillar, a bracket for fastening to the door, a pair of toggle arms pivoted to each other and one of them pivoted to one of said brackets, a lever pivoted to the other bracket and to the end of the other toggle arm, said arms being disposed at an acute angle to each other when the door is closed, a stop on one of the toggle arms for stopping the unfolding and straightening of the toggle arms during the opening of the door at a position just short of the straight line or longitudinally aligned position thereof corresponding to the fully open position of the door whereby said arms are locked together and thereby con-

stitute one member of a second toggle, said lever constituting the other member of said second toggle, a pair of stops or shoulders, one on the lever, a clock spring having one end applied to the lever and the other end applied to one of said toggle arms and put under stress when the check is applied to the door and operating to hold the two said stops together and thereby tending to counterbalance the tendency of the door to swing closed, the said spring unwinding and diminishing in torque but acting through the primary toggle with a mechanical advantage upon the door as the door is thrown to the fully open position but still providing stress on the door to keep the same in the fully open position, and a second pair of stops, one on the lever, said second stops so spaced as to allow the lever movement with the two locked toggle arms of an approximately 10° swing which can be resisted by one end of the clock spring tending to wind up said clock spring and thereby cushion the impact when the door is thrown beyond the fully open position.

4. A door check and hold-open having in combination a bracket for securing to the body pillar, a bracket for fastening to the door, a pair of toggle arms pivoted to each other and one of them pivoted to one of said brackets, a lever pivoted to the other bracket and to the end of the other toggle arm, said arms being disposed at an acute angle to each other when the door is closed, a stop on one of the toggle arms for stopping the unfolding and straightening of the toggle arms during the opening of the door at a position just short of the straight line or longitudinally aligned position thereof corresponding to the fully open position of the door whereby said arms are locked together and thereby constitute one member of a second toggle, said lever constituting the other member of said second toggle, a pair of stops or shoulders, one on the lever, a spring having one end applied to the lever and the other end applied to one of said toggle arms and put under stress when the check is applied to the door and operating to hold the two said stops together and thereby tending to counterbalance the tendency of the door to swing closed, the said spring diminishing in torque but acting through the primary toggle with a mechanical advantage upon the door as the door is thrown to the fully open position but still providing stress on the door to keep the same in the fully open position, and a second pair of stops, one on the lever, said second stops so spaced as to allow the lever movement with the two locked toggle arms of an approximately 10° swing which can be resisted by one end of the spring and thereby cushion the impact when the door is thrown beyond the fully open position.

5. A door check and hold-open having in combination a bracket for securing to the body pillar, a bracket for fastening to the door, a pair of toggle arms pivoted to each other and one of them pivoted to one of said brackets, a lever pivoted to the other bracket and to the end of the other toggle arm, said arms being disposed at an acute angle to each other when the door is closed, a stop for stopping the unfolding and straightening of the toggle arms during the opening of the door at a position just short of the straight line or longitudinally aligned position thereof corresponding to the fully open position of the door whereby said arms are locked together and thereby constitute one member of a second toggle, said lever constituting the other member of said second toggle, a pair of stops or shoulders, one on the lever, a spring having one end applied to the lever and the other end applied to one of said toggle arms and put under stress when the check is applied to the door and operating to hold the two said stops together and thereby tending to counterbalance the tendency of the door to swing closed, the said spring diminishing in torque but acting through the primary toggle to give a mechanical advantage upon the door as the door is thrown to the fully open position but still providing stress on the door to keep the same in the fully open position, and a second pair of stops, one on the lever, said second stops so spaced as to allow the lever a limited arc of movement with the two locked toggle arms to thereby provide a second toggle straightening action which can be resisted by one end of the spring and thereby cushion the impact when the door is thrown beyond the fully open position, the said lever having two shoulders to form the said two stops on the lever and the door bracket having two shoulders to form the other two said stops to limit the independent swing of the said lever.

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REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
Re. 23,191	Riley et al.	Jan. 17, 1950