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DOOR CHECK

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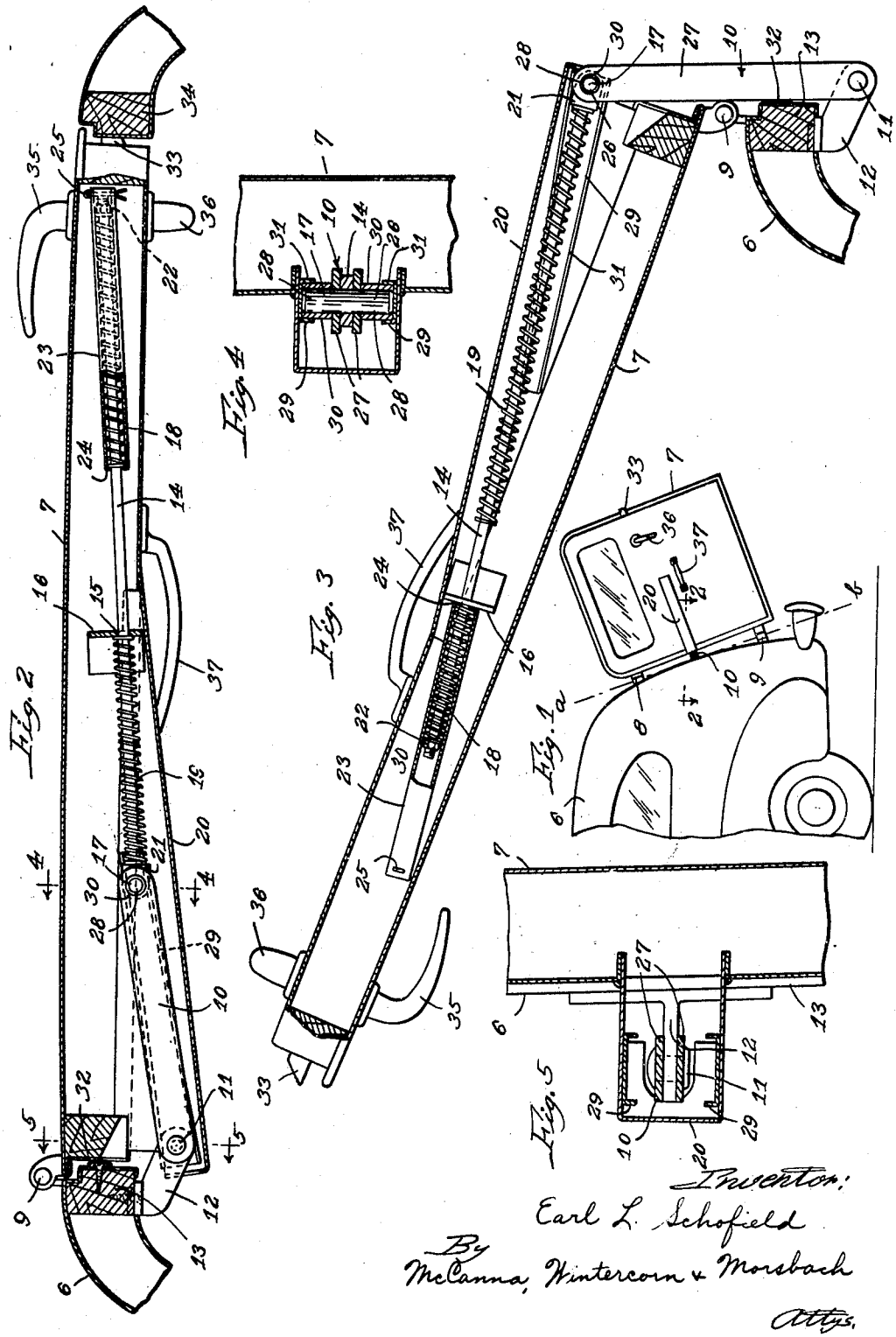


Fig. 2

Fig. 4

Fig. 3

Fig. 1a

Fig. 5

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DOOR CHECK

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31 Claims. (Cl. 16—85)

This invention relates to door checks generally and is more particularly concerned with one for use on the doors of motor vehicles to cushion the opening and closing so as to prevent damage to the door and hinges, or injury to a by-stander in the event of careless operation of the door.

The rear door on hearses of the latest streamline design swings on an axis inclined about 20° to a vertical, and when not equipped with a double-action door check like that of my invention to aid the opening and to cushion the door at the limits of the opening and closing, requires considerable strength and skill as well as agility to operate the same. It is, therefore, the principal object of my invention to provide a door check for use on such doors, and other motor vehicle doors, embodying two spring means, one of which serves to prevent damage to the door by slamming besides affording a highly desirable spring pressure to aid in the start of the opening of the door, the other spring means serving to absorb the shock at the limit of the door opening movement and also affording spring pressure in a direction to aid in the start of the closing movement.

Another object consists in the provision of two compression springs on a plunger rod with relation to which an intermediate abutment member on the door is movable in the opening and closing of the door so that the door is substantially balanced in any intermediate position, the abutment shifting from engagement with the one spring to engagement with the other spring as the door passes the mid position.

Still another object consists in the provision of a door check of the kind mentioned in which the plunger rod has a link connecting the inner end thereof with the body and the door has a guideway provided therein for the outer end of the link whereby to insure correct positioning of the rod and link in all positions of the door and provide for the complete housing and concealment of the rod and link inside the door when the door is closed. the link being the only part exposed when the door is opened.

Another object of the invention consists in the provision of cage means for the one spring to keep the same under some compression while the same is inactive with the door closed whereby to eliminate likelihood of vibration and rattling when the vehicle is in motion; also, the provision of a taper in the guide for the link whereby the link is held rigidly in the small end of the guide when the door is closed for further anti-rattle protection.

The invention is illustrated in the accompanying drawing in which—

Figure 1 is a side view of the rear portion of a hearse or other motor vehicle showing the rear door swung out to a mid position so as to illustrate the inclination of the hinge axis responsible for the "throw-in" of the door;

Fig. 2 is a horizontal section approximately in the plane of the line 2—2 of Fig. 1 but showing the door closed;

Fig. 3 is a horizontal section in the same plane as Fig. 2 but showing the door fully opened, and

Figs. 4 and 5 are vertical sectional details taken on the lines 4—4 and 5—5 of Fig. 2.

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

In Fig. 1, the reference numeral 6 designates the body of a hearse or other motor vehicle and 7 the rear door mounted on hinges 8 and 9 for swinging movement on the inclined axis *a—b*. However, it should be understood that the door check of my invention is not limited to application to the rear doors of hearses but may be used on any vehicle on the side or rear doors thereof, wherever a similar problem due to inclination of the hinge pintle axis is presented. Then, too, in some cases, regardless of any "throw-in" or "throw-out" of the door, there may be occasion for a double-action door check and for that reason the invention should not be regarded as limited to the hearse application shown.

The door check comprises a link 10 pivoted at one end, as at 11, on a bracket 12 secured to the body 6 on the inner side thereof next to the door pillar 13, and a plunger rod 14 slidable freely in an opening 15 in an abutment bracket 16 mounted in a recess in the door 7, the rod 14 being pivotally connected, as at 17, with the outer end of the link 10 and carrying two coiled compression springs 18 and 19 thereon for engagement with the opposite sides of the abutment 16. When the door is closed, as shown in Fig. 2, the spring 19 is compressed by engagement with one side of the abutment 16, but when the door is opened as shown in Fig. 3, the spring 18 is compressed by engagement with the other side of the abutment 16. A tapered housing 20 of channel-shaped cross-section is provided on and projecting from the inner side of the door 7 to enclose the bracket 16 and that end of the rod 14 on which the spring 19 is mounted, the other end of the rod with the spring 18 thereon being movable freely in the space between the inner and outer walls of the door, as clearly appears in Figs. 2 and 3. When the door is closed as shown in Fig.

2, the link 10 is also enclosed by the housing 20, also the outer portion of the bracket 12 attached to said link. Shoulders 21 are provided on the pivoted end of the rod 14 for engagement with the adjacent end of the spring 19, the shoulders being in spaced relation to the pivot 17. The spring 19 is compressed between the shoulders 21 and the abutment 16 when the door is closed. A nut 22 is threaded on the free end of the rod 14 for engagement with the outer end of the spring 18 to permit compression of the spring against the abutment 16 when the door is opened as shown in Fig. 3. A sleeve 23 surrounds the spring 18 and has an inturned annular flange 24 on the inner end thereof to serve as a seat for the adjacent inner end of the spring 18. A cotter pin 25 entered through registering holes in diametrically opposite sides of the outer end of the sleeve serves by engagement with the rod 14 to limit outward movement of the rod relative to the sleeve as shown in Fig. 2, so as to keep the spring 18 under a predetermined compression while the spring is inactive so long as the door is closed. In that way, there are no loose parts which would be free to move about and cause vibration or rattling when the car is in motion. The fact that the spring 19 is compressed so long as the door is closed makes it unnecessary to provide a similar housing for that spring.

The pivot 17 is provided by a cross-pin 26 extending through a hole in the end of the rod 14 and registering holes in the adjoining end of the two pieces 27 of the link 10 so as to provide projecting trunnions 28 to work in guides 29 on the door. The guides 29 are of sheet metal construction and channel-shaped in cross-section and are mounted on the inside of the housing 20, being welded or otherwise suitably secured to the opposed walls thereof. These guides are tapered so that the trunnions 28, which have rollers 30 thereon for rolling engagement with the flanges 31 of the guides, are disposed in spaced relation to the flanges at the outer end of the guide when the door is opened, as in Fig. 3, but the rollers move into snug engagement with the flanges at the inner end of the guide when the door is closed, as shown in Figs. 2 and 4. In that way, there are no loose parts at the link end of the door check assembly when the door is closed and rattling and vibration are avoided. On the other hand, the rollers 30 are movable freely in the guides otherwise so that the door can swing freely. When the door is fully opened, as shown in Fig. 3, the compression of the spring 18 urges the rod 14 inwardly so as to keep the link 10 in engagement with a rubber bumper pad 32 on the door pillar 13, the trunnions 28 under these conditions being disposed in the outer end of the guides 29. This inward thrust on the rod 14 insures proper travel of the trunnions 28 inwardly along the guides 29 when the door is swung toward closed position.

In operation, the door 7 is normally held closed by the usual latch 33 cooperating with a keeper plate on the door pillar 34, the latch being retractible by means of the outside handle 35 and also by means of the inside handle 36. When the latch 33 is retracted, the door will swing open to a slight extent under action of the compressed spring 19 and the latter will thereafter assist in the opening movement through a certain angularity until the spring 19 is fully expanded, that being when the door is approximately in the mid position shown in Fig. 1. The operator may, if he so desires, let go of the door at that point and let it drop to the fully open position without fear of damage to the door, or its hinges, due to the fact that the spring 18 is compressed in that movement of the door. The movement is limited by the engagement of the link 10 with the bumper 32 and, of course, at that point the spring 18 is still subject to some further compression so that even though the door might be thrown open violently, no damage would result and the shock would be properly cushioned by the spring 18. An inside handle 37 on the door facilitates the closing although the operator may take hold of the outer edge portion of the door in that operation. However, with the compressed spring 18 materially assisting the raising of the door toward the mid position of Fig. 1, the operator will usually find that even though the handle 37 is closer to the hinge axis *a*—*b* and does not, therefore, provide as good leverage, it can be used in closing the door without any difficulty. The spring 18 continues to assist the closing movement of the door until it is expanded to the extent shown in Fig. 2, which is when the door is approximately at the mid position. At that point, the operator may, if he so desires, let go of the door or may even slam it without danger of any damage because compression of the spring 19 commences soon after the door passes the mid position and continues up to the actual closing and latching of the door. As previously pointed out, once the door is closed there are no loose parts in the door check assembly which are apt to sound off when the car is in motion, vibration and rattling being prevented by keeping the spring 18 under a slight compression and by gripping the rollers 30 on the trunnions 28 in the link end of the door check assembly in the narrow inner end of the guides 29.

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

I claim:

1. A door check comprising pivotally connected link and rod members, the rod member being relatively long and the link member being relatively short, the link member being pivotally connected at its end remote from the rod member to a door pillar adjacent the hinged edge of the door, and being only long enough to reach from its pivot on the pillar past the hinged edge of the door in the fully opened position of the latter, when the rod member is disposed nearly at right angles thereto, said link serving to limit the door opening movement by abutment with a surface stationary with the door pillar, an abutment on the door in spaced relation to the hinged edge thereof having an intermediate portion of said rod slidable therein, and coiled compression springs mounted on said rod on opposite sides of the abutment, one of which is compressed against the abutment in the closing of the door and the other of which is compressed against the abutment in the opening of the door.

2. A door check comprising pivotally connected link and rod members, the rod member being relatively long and the link member being relatively short, the link member being pivotally connected at its end remote from the rod member to a door pillar adjacent the hinged edge of the door and being only long enough to reach from its pivot on the pillar past the hinged edge of the door in the fully opened position of the latter,

when the rod member is disposed nearly at right angles thereto, an abutment on the door in spaced relation to the hinged edge thereof having an intermediate portion of said rod slidable therein, coiled compression springs mounted on said rod on opposite sides of the abutment, one of which is compressed against the abutment in the closing of the door and the other of which is compressed against the abutment in the opening of the door, said link serving to limit the door opening movement by abutment with a surface stationary with the door pillar, and guide means on the door for that portion of the link pivotally connected with the rod.

3. A door check comprising pivotally connected link and rod members, the rod member being relatively long and the link member being relatively short, the link member being pivotally connected at its end remote from the rod member to a door pillar adjacent the hinged edge of the door and being only long enough to reach from its pivot on the pillar past the hinged edge of the door in the fully opened position of the latter, when the rod member is disposed nearly at right angles thereto, an abutment on the door in spaced relation to the hinged edge thereof having an intermediate portion of said rod slidable therein, and a coiled compression spring mounted on said rod arranged to be compressed against the abutment in the opening of the door, said link serving to limit the door opening movement by abutment with a surface stationary with the door pillar.

4. A door check comprising pivotally connected link and rod members, the link member being pivotally connected at its end remote from the rod member to a door pillar adjacent the hinged edge of the door, an abutment on the door in spaced relation to the hinged edge thereof having an intermediate portion of said rod slidable therein, coiled compression springs mounted on said rod on opposite sides of the abutment, one of which is compressed against the abutment in the closing of the door and the other of which is compressed against the abutment in the opening of the door, said link serving to limit the door opening movement by abutment with a surface stationary with the door pillar, and elongated guides on the door for that portion of the link pivotally connected with the rod, said guides being formed wider at the outer end and narrower at the inner end so as to allow freedom of movement of the link in the opening and closing movements of the door but hold the link rigidly when the door is closed.

5. A door check comprising, in combination, a rod having pivotal connection with a door pillar adjacent the hinged edge of the door, an abutment on the door in spaced relation to the hinged edge thereof having an intermediate portion of said rod slidable therein, coiled compression springs mounted on said rod on opposite sides of the abutment, one of which is compressed against the abutment in the closing of the door and the other of which is compressed against the abutment in the opening of the door, and means on said rod for holding the last named spring spaced from the abutment and under a predetermined preload compression while the door is closed.

6. A door check comprising, in combination, a rod having pivotal connection with a door pillar adjacent the hinged edge of the door, an abutment on the door in spaced relation to the hinged edge thereof having an intermediate portion of said rod slidable therein, coiled compression springs mounted on said rod on opposite sides of the abutment, one of which is compressed against the abutment in the closing of the door and the other of which is compressed against the abutment in the opening of the door, and a sleeve surrounding the last named spring and movable freely endwise with respect to the rod and spring, said tube having means on the outer end thereof for abutment with the outer end of the rod to limit inward movement of the tube relative to the rod, and said tube having means on the inner end thereof providing an abutment for the adjacent end of the spring to hold the spring under predetermined compression while the door is closed.

7. A door check comprising cooperating link and rod members, the link member comprising spaced link pieces pivotally connected at their ends remote from the rod to a door pillar adjacent the hinged edge of the door, said rod having one end thereof entered between the other ends of said link pieces for pivotal connection therewith, a crosspin forming said pivotal connection with the opposite ends thereof projecting to form trunnions, elongated channel guides on the door slidably receiving said trunnions, an abutment on the door in spaced relation to the hinged edge thereof having an intermediate portion of said rod slidable therein, and coiled compression springs mounted on said rod on opposite sides of the abutment, one of which is compressed against the abutment in the closing of the door and the other of which is compressed against the abutment in the opening of the door, said link serving to limit the door opening movement by abutment with a surface stationary with the door pillar.

8. A door check comprising cooperating link and rod members, the link member being pivotally connected at one end to a door pillar adjacent the hinged edge of the door, one of said link and rod members forming a clevis for pivotally connecting the other end of the link member with the adjacent end of the rod, a crosspin for said pivotal connection having the opposite ends thereof projecting to form trunnions, elongated channel guides on the door slidably receiving said trunnions, an abutment on the door in spaced relation to the hinged edge thereof having an intermediate portion of said rod slidable therein, and a coiled compression spring mounted on said rod arranged to be compressed against the abutment in the opening of the door, said link serving to limit the door opening movement by abutment with a surface stationary with the door pillar.

9. A door check as set forth in claim 8, including rollers on said trunnions for anti-friction rolling contact with the channel guides.

10. A door check as set forth in claim 8, wherein the channel guides are tapered from one end toward the other, so as to permit freedom of movement of the trunnions in the opening and closing movements of the door but prevent lateral movement of the trunnions transversely relative to the guides when the door is closed.

11. A door check comprising, in combination, a rod having pivotal connection with a door pillar adjacent the hinged edge of the door, an abutment on the door in spaced relation to the hinged edge thereof having an intermediate portion of said rod slidable therein, coiled compression springs mounted on said rod on opposite sides

of the abutment, one of which is compressed against the abutment in the closing of the door and the other of which is compressed against the abutment in the opening of the door, means whereby the pivotal connection for said rod is held rigidly against vibration while the door is closed, and means whereby the spring that is adapted to be compressed against the abutment in the opening of the door is maintained under a slight preliminary compression while the door is closed, so as to prevent vibration thereof.

12. A door check comprising pivotally connected link and rod members, the link member being pivotally connected at its end remote from the rod member to a door pillar adjacent the hinged edge of the door, an elongated housing of generally channel-shaped cross-section provided on the inner side of the door extending away from the hinged edge substantially at right angles thereto, an abutment in said housing in spaced relation to the hinged edge of the door having an intermediate portion of said rod slidable therein, coiled compression springs mounted on said rod on opposite sides of the abutment, one of which is compressed against the abutment in the closing of the door and the other of which is compressed against the abutment in the opening of the door, said link serving to limit the door opening movement by abutment with a surface stationary with the door pillar, and elongated guides in said housing for the pivotally connected ends of said link and rod members, whereby the rod member is maintained in a plane substantially parallel to the door while the link moves from a position in said plane to a position substantially at right angles thereto in the operation of the door.

13. In a vehicle comprising a body and a door hingedly mounted on the body on an axis inclined with respect to a vertical toward the body so that the door tends by gravity to throw-in or throw-out when moved one way or the other from a mid-position in which the door is balanced in a neutral vertical plane, the door being movable through substantially ninety degrees either way from said middle position to fully closed or fully opened position, two door check compression spring means, one of which is loaded in the closing movement of the door from a mid-position and the other of which is loaded in the opening movement of the door from a mid-position, whereby the gravity pull in the movement of the door in either direction from mid-position is substantially balanced to effectively cushion accidental violent opening or closing of the door.

14. A door check comprising pivotally connected link and rod members, the link member being pivotally connected at its end remote from the rod member to a door pillar adjacent the hinged edge of the door, an abutment on the door in spaced relation to the hinged edge thereof having an intermediate portion of said rod slidable therein, a coiled compression spring mounted on said rod and arranged to be compressed against the abutment in the opening of the door, said link serving to limit the door opening movement by abutment with a surface stationary with the door pillar, and elongated guides on the door for that portion of the link pivotally connected with the rod, said guides being formed wider at the outer end and narrower at the inner end so as to allow freedom of movement of the link in the opening and closing movements of the door but hold the link rigidly when the door is closed.

15. A door check comprising pivotally connected link and rod members, the link member being pivotally connected at its end remote from the rod member to a door pillar adjacent the hinged edge of the door, an abutment on the door in spaced relation to the hinged edge thereof having an intermediate portion of said rod slidable therein, a coiled compression spring mounted on said rod and arranged to be compressed against the abutment in the closing of the door, said link serving to limit the door opening movement by abutment with a surface stationary with the door pillar, and elongated guides on the door for that portion of the link pivotally connected with the rod, said guides being formed wider at the outer end and narrower at the inner end so as to allow freedom of movement of the link in the opening and closing movements of the door but hold the link rigidly when the door is closed.

16. A door check comprising, in combination, a rod having pivotal connection with a door pillar adjacent the hinged edge of the door, an abutment on the door in spaced relation to the hinged edge thereof having an intermediate portion of said rod slidable therein, a coiled compression spring mounted on said rod arranged to be compressed against the abutment in the opening of the door, and a sleeve surrounding said spring and movable freely endwise with respect to the rod and spring, said tube having means on the outer end thereof for abutment with the outer end of the rod to limit inward movement of the tube relative to the rod, and said tube having means on the inner end thereof providing an abutment for the adjacent end of the spring to hold the spring under predetermined compression while the door is closed.

17. A door check comprising pivotally connected link and rod members, the rod member being relatively long and the link member being relatively short, the link member being pivotally connected at its end remote from the rod member to a door pillar adjacent the hinged edge of the door and being only long enough to reach from its pivot on the pillar past the hinged edge of the door in fully opened position, when the rod member is disposed nearly at right angles thereto, said link serving to limit the door opening movement by abutment with a surface stationary with the door pillar, an abutment on the door in spaced relation to the hinged edge thereof having an intermediate portion of said rod slidable therein, a coiled compression spring mounted on said rod arranged to be compressed against the abutment in the opening of the door, and a sleeve surrounding said spring and movable freely endwise with respect to the rod and spring, said tube having means on the outer end thereof for abutment with the outer end of the rod to limit inward movement of the tube relative to the rod, and said tube having means on the inner end thereof providing an abutment for the adjacent end of the spring to hold the spring under predetermined compression while the door is closed.

18. A door check for a vehicle door comprising, in combination, a rod having a linked pivotal connection with a door pillar adjacent the hinged edge of the door, an abutment on the door in spaced relation to the hinged edge thereof having an intermediate portion of said rod slidable therein, coiled compression springs mounted on said rod on opposite sides of the abutment, one of which is compressed against the abutment in the closing of the door and the other of which is

compressed against the abutment in the opening of the door, and means whereby the link connection for said rod is held rigidly against vibration while the door is closed.

19. A door check comprising pivotally connected link and rod members, the link member being pivotally connected at its end remote from the rod member to a door pillar adjacent the hinged edge of the door, an elongated housing of generally channel-shaped cross-section provided on the inner side of the door extending away from the hinged edge substantially at right angles thereto, an abutment in said housing in spaced relation to the hinged edge of the door having an intermediate portion of said rod slidable therein, a coiled compression spring mounted on said rod arranged to be compressed against the abutment in the opening of the door, said link serving to limit the door opening movement by abutment with a surface stationary with the door pillar, and elongated guides in said housing for the pivotally connected ends of said link and rod members, whereby the rod member is maintained in a plane substantially parallel to the door while the link moves from a position in said plane to a position substantially at right angles thereto in the operation of the door.

20. In a vehicle comprising a body and a door hingedly mounted on the body on an axis inclined with respect to a vertical toward the body so that the door tends by gravity to throw-in or throw-out when moved one way or the other from a mid-position in which the door is balanced in a neutral vertical plane, the door being movable through substantially ninety degrees either way from said middle position to fully closed or fully opened position, two door check compression spring means, one of which is loaded in the closing movement of the door from a mid-position and the other of which is loaded in the opening movement of the door from a mid-position, whereby the gravity pull in the movement of the door in either direction from mid-position is substantially balanced to effectively cushion accidental violent opening or closing of the door, the door check compression spring means arranged to be loaded in the opening movement of the door being preloaded and arranged to be subjected to further loading in the opening movement of the door from mid-position.

21. In a vehicle comprising a body and a door hingedly mounted on the body, the door being movable through substantially one hundred eighty degrees from fully closed to fully opened position, two door check means, one of which is loaded in the closing movement of the door from a mid-position and the other of which is loaded in the opening movement of the door from a mid-position, whereby the door is substantially in balanced relation to the body in the mid-position, the door check means arranged to be loaded in the opening movement of the door being preloaded and arranged to be subjected to further loading in the opening movement of the door from mid-position.

22. A door check comprising pivotally connected link and rod members, the rod member being relatively long and the link member being relatively short, the link member being pivotally connected at its end remote from the rod member to a door pillar adjacent the hinged edge of the door and being only long enough to reach from its pivot on the pillar past the hinged edge of the door in the fully opened position of the latter, when the rod member is disposed nearly at right angles thereto, said link serving to limit the door opening movement by abutment with a surface stationary with the door pillar, an abutment on the door in spaced relation to the hinged edge thereof having an intermediate portion of said rod slidable therein, and door cushioning means operative between the rod and abutment.

23. A door check comprising pivotally connected link and rod members, the link member being pivotally connected at its end remote from the rod member to a door pillar adjacent the hinged edge of the door, an abutment on the door in spaced relation to the hinged edge thereof having an intermediate portion of said rod slidable therein, door cushioning means operative between the rod and abutment, said link serving to limit the door opening movement by abutment with a surface stationary with the door pillar, and elongated guides on the door for that portion of the link pivotally connected with the rod, said guides being formed wider at the outer end and narrower at the inner end so as to allow freedom of movement of the link in the opening and closing movements of the door but hold the link rigidly when the door is closed.

24. A door check comprising cooperating link and rod members, the link member being pivotally connected at one end to a door pillar adjacent the hinged edge of the door, one of said link and rod members forming a clevis for pivotally connecting the other end of the link member with the adjacent end of the rod, a crosspin for said pivotal connection having the opposite ends thereof projecting to form trunnions, elongated channel guides on the door slidably receiving said trunnions, an abutment on the door in spaced relation to the hinged edge thereof having an intermediate portion of said rod slidable therein, and door cushioning means operative between the rod and abutment, said link serving to limit the door opening movement by abutment with a surface stationary with the door pillar.

25. A door check comprising pivotally connected link and rod members, the link member being pivotally connected at its other end to a door pillar adjacent the hinged edge of the door, an elongated housing of generally channel-shaped cross-section provided on the inner side of the door extending away from the hinged edge substantially at right angles thereto, an abutment in said housing in spaced relation to the hinged edge of the door having an intermediate portion of said rod slidable therein, door cushioning means operative between the rod and said abutment, said link serving to limit the door opening movement by abutment with a surface stationary with the door pillar, and elongated guides in said housing for the pivotally connected ends of said link and rod members, whereby the rod member is maintained in a plane substantially parallel to the door while the link moves from a position in said plane to a position substantially at right angles thereto in the operation of the door.

26. A door check comprising pivotally connected link and rod members, the rod member being relatively long and the link member being relatively short, the link member being pivotally connected at its end remote from the rod member to a door pillar adjacent the hinged edge of the door and being only long enough to reach from its pivot on the pillar past the hinged edge of the door in the fully opened position of the latter, when the rod member is disposed

nearly at right angles thereto, an abutment on the door in spaced relation to the hinged edge thereof having an intermediate portion of said rod slidable therein, and a coiled compression spring mounted on said rod arranged to be compressed against the abutment in the closing of the door, said link serving to limit the door opening movement by abutment with a surface stationary with the door pillar.

27. A door check comprising, in combination, a rod having pivotal connection with a door pillar adjacent the hinged edge of the door, an abutment on the door in spaced relation to the hinged edge thereof having an intermediate portion of said rod slidable therein, coiled compression springs mounted on said rod on opposite sides of the abutment, one of which is compressed against the abutment in the closing of the door and the other of which is compressed against the abutment in the opening of the door, and means on said rod for holding one of said springs spaced from the abutment and under a predetermined preload compression while the door is in one limit position, said spring being subjected to further compression by engagement with the abutment when the door is moved to the other extreme position.

28. A door check comprising, in combination, a rod having pivotal connection with a door pillar adjacent the hinged edge of the door, an abutment on the door in spaced relation to the hinged edge thereof having an intermediate portion of said rod slidable therein, coiled compression springs mounted on said rod on opposite sides of the abutment, one of which is compressed against the abutment in the closing of the door and the other of which is compressed against the abutment in the opening of the door, and a sleeve surrounding one of said springs and movable freely endwise with respect to the rod and spring in one direction, said tube having means on one end which by engagement with the rod limits movement of the tube in the other direction, and said tube having means on the other end thereof providing an abutment for the adjacent end of the spring to hold the spring under a predetermined compression while the door is in one limit position, said tube being arranged to be engaged at the last mentioned end by the abutment on the door in the movement of the door to the other extreme position so as to subject the spring to further compression.

29. A door check comprising, in combination, a rod having pivotal connection with a door pillar adjacent the hinged edge of the door, an abutment on the door in spaced relation to the hinged edge thereof having an intermediate portion of said rod slidable therein, a coiled compression spring surrounding the rod, and a sleeve surrounding said spring and movable freely endwise with respect to the rod and spring in one direction, said tube having means on one end which by engagement with the rod limits movement of the tube in the other direction, and said tube having means on the other end thereof providing an abutment for the adjacent end of the spring to hold the spring under a predetermined compression while the door is in one limit position, said tube being arranged to be engaged at the last mentioned end by the abutment on the door in the movement of the door to the other extreme position so as to subject the spring to further compression.

30. A door check comprising cooperating link and rod members, the link member comprising spaced link pieces pivotally connected at their ends remote from the rod to a door pillar adjacent the hinged edge of the door, said rod having one end thereof entered between the other ends of said link pieces for pivotal connection therewith, a cross-pin forming said pivotal connection with the opposite ends thereof projecting to form trunnions, elongated channel guides on the door slidably receiving said trunnions, an abutment on the door in spaced relation to the hinged edge thereof having an intermediate portion of said rod slidable therein, and a coiled compression spring mounted on said rod and arranged to be compressed against the abutment in the closing of the door, said link serving to limit the door opening movement by abutment with a surface stationary with the door pillar.

31. A door check comprising cooperating link and rod members, the link member comprising spaced link pieces pivotally connected at their ends remote from the rod to a door pillar adjacent the hinged edge of the door, said rod having one end thereof entered between the other ends of said link pieces for pivotal connection therewith, a cross-pin forming said pivotal connection with the opposite ends thereof projecting to form trunnions, elongated channel guides on the door slidably receiving said trunnions, an abutment on the door in spaced relation to the hinged edge thereof having an intermediate portion of said rod slidable therein, and a coiled compression spring mounted on said rod and arranged to be compressed against the abutment in the opening of the door so as to cushion said door opening movement, said link serving to positively limit the door opening movement by abutment with a surface stationary with the door pillar.

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