Sept. 19, 1961 E. L. ALLEN ET AL 3,000,044

DOOR CHECK

Filed June 30, 1958 3 Sheets-Sheet 1

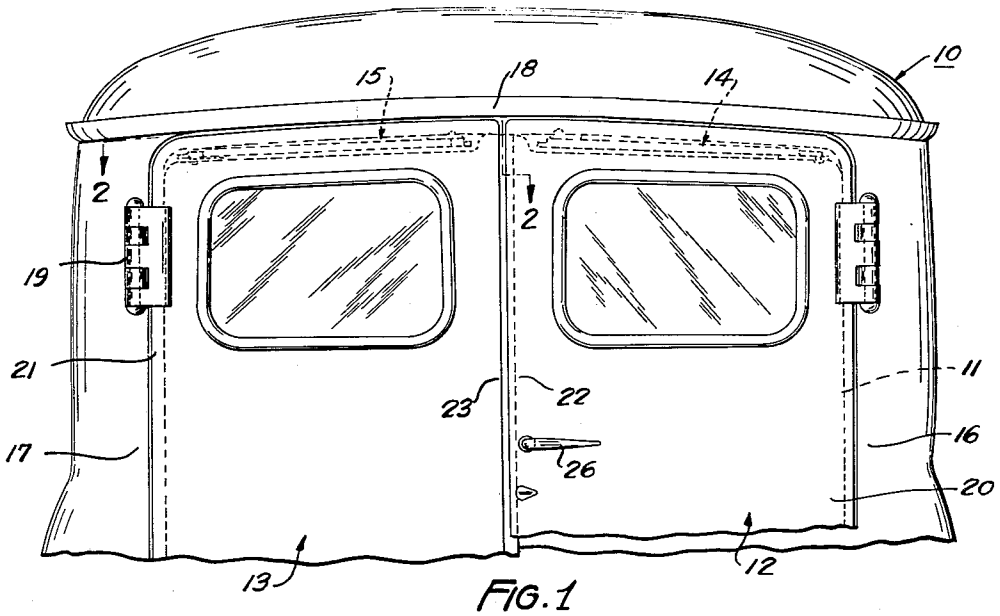


FIG. 1

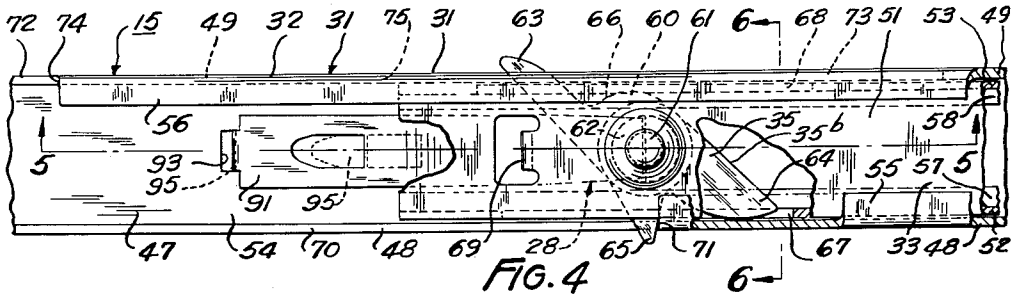


FIG. 4

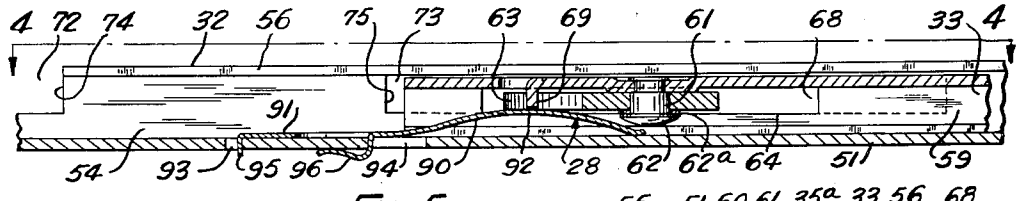


FIG. 5

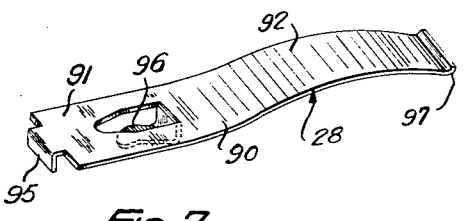


FIG. 7

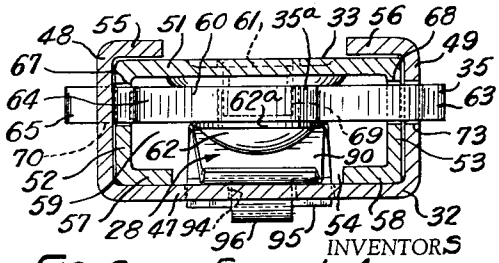


FIG. 6

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DOOR CHECK

Filed June 30, 1958 3 Sheets-Sheet 2

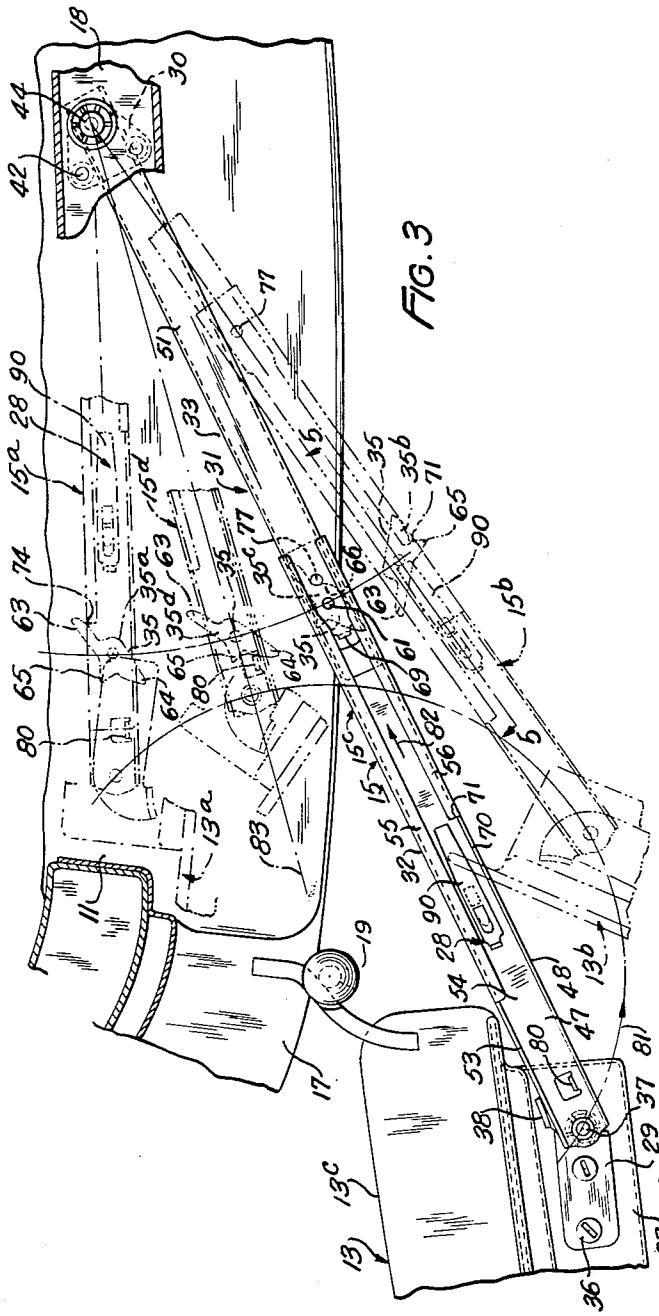


FIG. 3

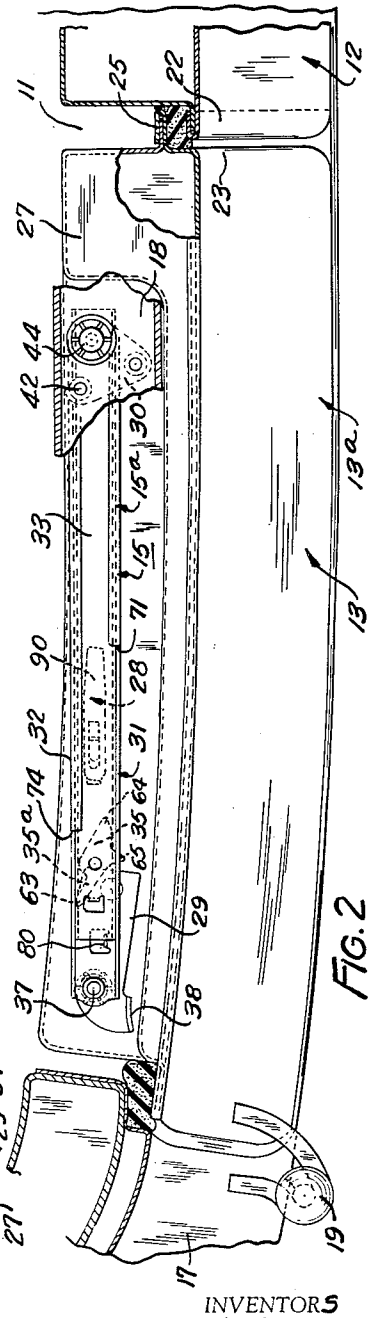


FIG. 2

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Filed June 30, 1958 3 Sheets-Sheet 3

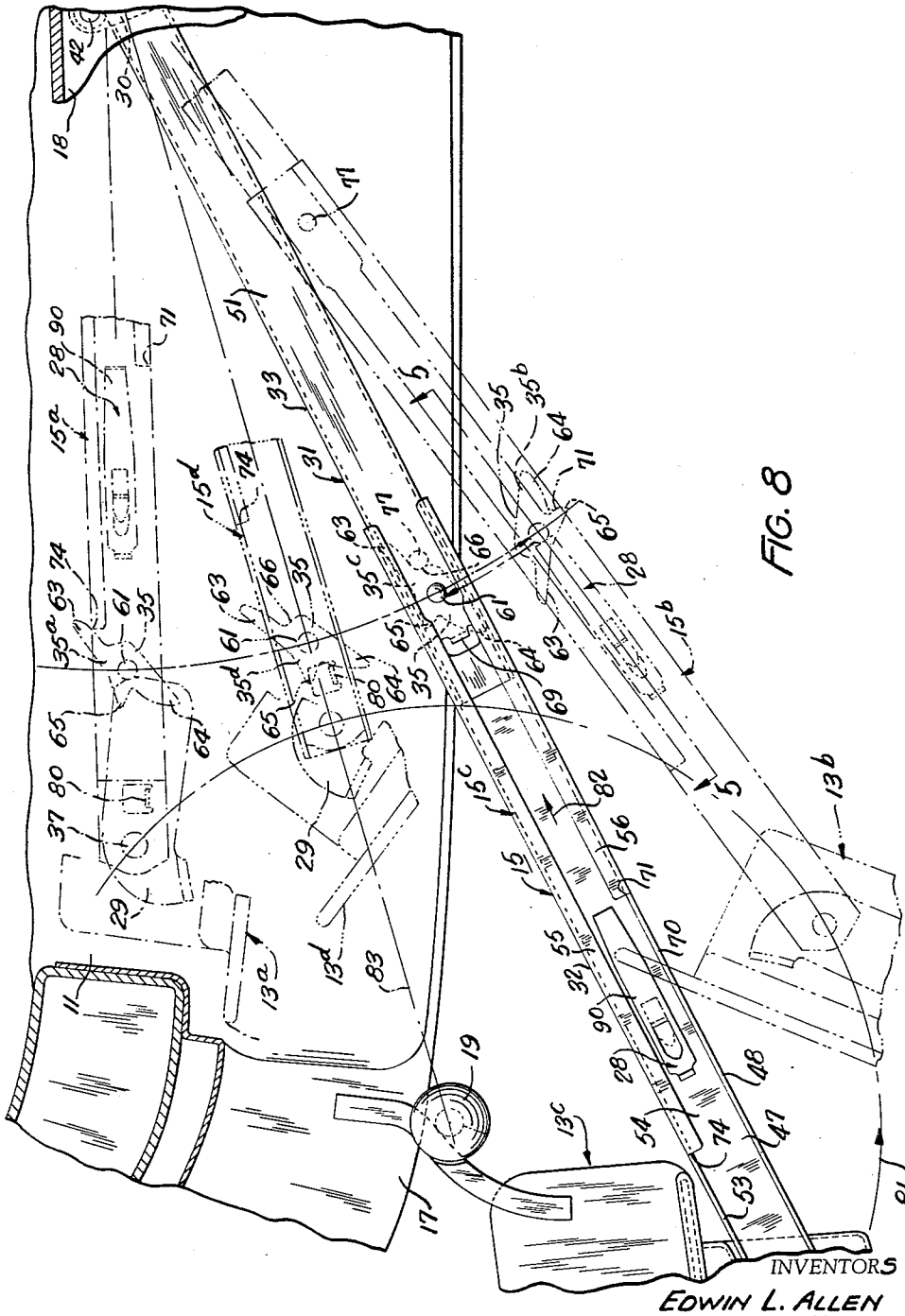


FIG. 8

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3,000,044
DOOR CHECK

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Filed June 30, 1958, Ser. No. 745,435
8 Claims. (Cl. 16—82)

This invention relates to holding devices of the kind used between a support structure and a part swingably connected therewith for checking the movement of the swingable part at different points of the swingable travel thereof and for releasably holding the swingable part in a rest position at at least one of such points.

By way of example and without limitation on the use thereof, the holding device of the present invention is herein disclosed as being of the two-position door check type and as being applied to a swingable vehicle door, in this case, a rear door of a panel delivery truck. In such delivery trucks it is desirable that the door check be capable of holding a rear door at either a substantially 180° full-open position or at a substantially 90° partially open position. The hinge arrangement and balance for such a rear door are usually such that when the door is on one side of the 90° position it will normally tend to fall shut and when the door is at, or on the other side of the 90° position, the door will normally tend to fall toward the full-open or 180° position.

The ability of such a truck door to be opened to the 180° position is desirable, so as to permit the rear end of the truck to be moved up close to a loading dock or platform without interference from the door. On the other hand, when the truck is standing at a curb or in a roadside position and the rear doors are opened, one of those doors, usually the left hand door, if opened to its 180° position, will extend into the adjacent traffic lane and will create a hazard. It is therefore important that the door check be capable of holding the door at the 90° open position so that the door will not extend into the adjacent traffic lane.

In many instances of vehicle use, the truck or the like having such a two-position door check applied thereto temporarily occupies a position in which the above-mentioned normal balance and swinging tendencies for the door do not prevail. For example, if the truck is standing on a street or road having a pronounced downward slope toward the curb side, the door will have a tendency to fall shut as soon as it is released by the operator after having been checked at the intermediate or 90° position of its opening movement. This tendency to fall shut when it is desired that the door remain open at the intermediate or 90° position may also result from a gust of wind but, in either case, is annoying and poses a problem.

It is further desirable that a door check of this type be automatic in its functioning, such that the different desired check and/or holding positions for the door will be established merely by manual swinging of the door and without need for any manual operation to be performed on the door check itself.

The present invention accordingly has, as one of its objects, the provision of a novel door check which will efficiently fulfill all of the above mentioned door holding requirements and which is of a relatively simple and practical form, capable of being readily manufactured and easily installed.

Another object is to provide a novel door check operable to check the movement of a door or the like at a desired point of the swingable travel thereof, and also having holding or detent means for releasably holding the door against an undesired movement thereof while the door is at such point.

Another object is to provide such a door check which will automatically assume an engaged condition for checking the door at a given intermediate open position, such as a 90° position, and is automatically releasable by a mere manual control swinging movement of the door to thereby permit further movement of the door to another predetermined open position or to its closed position, and which door check also includes holding or detent means for releasably holding the door at the given open position.

A further object is to provide a novel door check of the character above indicated and comprising relatively movable link members, and wherein the holding means comprises yieldably movable means on one link member and disposed in the path of the movement of the other link member for releasable holding engagement therewith.

Still another object is to provide a novel door check of the character mentioned above and having co-operative pawl and stop elements on the link members, and wherein the releasable holding means comprises a bowed resilient member mounted on one link member and engageable by projection means of the other link member, the projection means preferably comprising pivot pin means supporting the pawl.

This application is related, as to subject matter, to co-pending application Serial No. 635,754 filed January 23, 1957, now Patent No. 2,880,029, issued March 31, 1959.

Other objects and advantages of the invention will be apparent in the following detailed description and in the accompanying sheets of drawings forming a part of this specification and in which,

FIG. 1 is a partial rear end elevation of a vehicle having swingable doors equipped with door checks embodying the present invention;

FIG. 2 is a partial transverse horizontal section taken through the vehicle, as indicated by section line 2—2 of FIG. 1 and showing the closed position of the left hand door and the corresponding collapsed condition of its associated door check;

FIG. 3 is a partial transverse horizonal section similar to FIG. 2, but showing the left hand door as having been swung to its full open position, and also showing the corresponding fully extended door checking condition of the associated door check;

FIG. 4 is a larger scale partial plan view of the door check when viewed as indicated by the directional line 4—4 of FIG. 5 and with certain portions broken away, the device being shown in a partially extended door checking condition;

FIG. 5 is a partial vertical longitudinal section taken through the door check, as indicated by section line 5—5 of FIGS. 3 and 4;

FIG. 6 is a larger scale transverse section taken on section line 6—6 of FIG. 4;

FIG. 7 is a perspective view showing the holding or detent member in detached relation; and

FIG. 8 is a partial transverse horizontal section corresponding with a portion of FIG. 3 and showing the pawl positions on a larger scale.

The drawings show the novel door check of the present invention applied to a delivery truck 10 of the panel body type having a doorway 11 in the rear end thereof and a pair of rear doors 12 and 13 for closing such doorway. Door checks 14 and 15 of the novel construction provided by this invention are applied to the doors 12 and 13 for checking door movement at full open, and partially open, positions in the manner to be explained hereinafter, and embody holding means for releasably holding the doors in given checked positions thereof. The door checks 14 and 15 are identical in construction, with the exception that they are for right-hand and left-hand installation to suit the right-hand and left-hand doors 12 and 13 to which they are applied.

The doorway 11 of the truck 10 is defined by body portions constituting a doorframe structure which includes upright side edge or pillar portions 16 and 17 and a transverse top portion or lintel 18. The doors 12 and 13 are swingably mounted on the upright doorframe portions 16 and 17 by substantially vertical-axis hinge means comprising pairs of suitable hinges 19 which are attached to these doorframe portions and to the adjacent upright edge portions 20 and 21 of the doors. When the doors are in their closed position, as shown in FIGS. 1 and 2, their free edges 22 and 23 are in a meeting or engaged relation in or adjacent a common parting plane, and in this instance, the edge portion of the left-hand door 13 is provided with a stop flange 25 with which the edge portion of the right-hand door 12 has an abutting engagement in an overlapping relation thereto, as shown in FIG. 2.

The right-hand door 12 is here shown as provided with a suitable handle 26 for swinging the same and, if desired, a similar handle can be provided on the door 13. The doors 12 and 13 also include an upper edge wall 27 which is located adjacent to, and in a directly opposed relation below, the transverse doorframe portion 18 when the doors are in their closed position.

For a more detailed description of the invention, reference need be made only to the left-hand door 13 and to the door check 15 associated therewith. As shown in the drawings, the door 13 is swingable from the closed position 13^a of FIG. 2 to the intermediate and full open positions 13^b and 13^c of FIG. 3. The intermediate position 13^b is a substantially 90° open position and the position 13^c is a substantially 180° open position.

The location of the hinges 19 is such that if the door 13 is in its 90° position 13^b and is then released, it will normally tend to fall open toward its 180° position 13^c, and if the door is somewhat to the right of the 90° position 13^b when it is released, it will normally tend to fall shut. As will be explained more fully hereinafter, the door check 15 has an engaged condition providing an intermediate door-holding length for checking the opening movement of the door 13 at the 90° position 13^b and also has a second engaged condition, which in this case is its fully extended length, for checking the opening movement of the door at the 180° position 13^c.

As has been indicated in the early part of this specification, existing conditions may cause the door 13 to swing away from its checked position when it is desirable to have the door remain in such checked position. The present invention provides holding or detent means 28 for releasably holding the door in at least one such checked position, in this case the checked position 13^b, and which holding or detent means is further described hereinafter.

The door check 15 is in the form of an extensible articulated linkage which comprises, in general, a pair of anchorage or attaching members 29 and 30 for connecting the opposite ends of the linkage with the door and doorframe structures respectively, and a linkage unit 31 extending between the attaching members and comprising a pair of link members 32 and 33 having their adjacent ends in an overlapping or telescoping relation. The door check 15 also comprises a control pawl 35, which is effective between the link members 32 and 33 as hereinafter explained in greater detail, for establishing and releasing different door checking lengths for the linkage unit 31.

The attaching member 29 can be of any appropriate form and is here shown as comprising a suitable bracket of plate-like form adapted to be secured to the top edge wall 27 of the door 13 by the connecting screws 36. The outer end of the link member 32 is pivotally connected with the bracket 29 by a suitable pivot pin 37. The bracket 29 preferably includes a lug portion forming a stop 38 which is engageable with an edge of the link member 32 for a purpose to be explained hereinafter and as shown in FIG. 3.

The attaching member 30 can likewise be a bracket made of sheet metal or plate material and is mounted on the door frame portion 18 and secured thereagainst by the connecting screws 42. The outer end of the link member 33 is pivotally connected with the bracket 30 by a suitable pivot pin 44.

The link member 32 can be a substantially straight bar of an appropriate length and is here shown as being a sheet metal member of a channel-shaped cross-section having a substantially flat longitudinal web portion 47 and substantially parallel longitudinal side flanges 48 and 49. The link member 33 can likewise be a substantially straight bar of an appropriate length and is here shown as being a sheet metal member of a channel-shaped cross-section having a substantially flat longitudinal web portion 51 and substantially parallel longitudinal side flanges 52 and 53.

The channel recess of the link member 32 forms a longitudinal guideway 54 of a width and depth such that the link member 33 is snugly and telescopingly received in the guideway and is longitudinally slidable therein. The side flanges 48 and 49 of the link member 32 are provided with in-turned longitudinal edges defining a pair of retaining flanges 55 and 56 for retaining the link member 33 in the guideway 54. The longitudinal side and edge flanges 48, 49 and 55, 56 also form a stiffening means for increasing the rigidity of the link member 32.

The link member 33 preferably also has the longitudinal edge portions of the side flanges 52 and 53 thereof deflected inwardly to form edge flanges 57 and 58. The side and edge flanges 52, 53 and 57, 58 increase the rigidity of the link member 33 and, in addition, the edge flanges 57 and 58 provide suitable bearing area for sliding co-operation with the web portion 47 of the link member 32. The link member 33 is disposed in the link member 32 with its longitudinal channel recess 59 facing toward the longitudinal web portion 47 of the latter link member. The channel recess 59 and the guideway 54 are thus in communicating relation and form a longitudinal enclosure space between the link members.

The pawl 35 is mounted on one of the link members, in this case, the link member 33 adjacent the inner end thereof with the body portion 60 of the pawl located in the channel recess 59. The web portion 51 of the link member 33 is provided with a fixed pivot pin 61 on which the pawl 35 is swingably mounted. The pivot pin 61 extends into the guideway 54 and toward the web portion 47 and has a rounded head 62 spaced from the latter and disposed in an exposed relation in the guideway.

As best seen in FIGS. 4, 5 and 6, the pawl 35 is provided with substantially oppositely extending first and second control fingerh 63 and 64, and is also provided at an intermediate point thereof with a stop finger 65 located in a substantially radially extending relation to the axis of the pivot pin 61. The pawl is also provided with a stop shoulder 66 which is formed on the body portion 60 adjacent the junction of the control finger 63 with the latter. The longitudinal side flanges 52 and 53 of the link member 33 are provided with openings 67 and 68 (see FIGS. 4, 5 and 6) adjacent the location of the pawl 35 to accommodate the control fingers 64 and 63, respectively, and permit movement of those control fingers between extended and retracted positions during swinging of the pawl on the pivot pin 61.

At a point adjacent the pawl 35, the link member 33 is provided with a projection, in this case, a lug 69 deflected from the web 51 and extending into the channel recess 59. The lug 69 is engageable by one or the other of the control fingers 63 and 64 and prevents a full rotation of the pawl 35 on the pivot pin 61.

A retarding washer 62^a, disposed between the pawl and the head of the pivot pin 61, prevents a too-free oscillation of the pawl such as might be caused by inertia effects and might render the pawl positions inaccurate. The washer 62^a provides a frictional or drag effect on the pawl

and can be a wavy spring washer or a washer made of a suitable friction material.

From the construction of the door check **15** as thus far described, it will be seen that the link member **33** is telescopingly slidable in the link member **32** and is confined by the side flanges of the latter to a substantially straight-line relative longitudinal movement between the link members. It will also be seen that since the pawl **35** is pivotally mounted on the link member **33**, it will be movable with the latter along the link member **32** during such relative longitudinal sliding movement.

To accommodate this longitudinal translatory movement of the pawl **35**, one of the side flanges of the link member **32**, in this instance the side flange **48**, is cut away (see FIG. 4) for a portion of its depth and for a substantial portion of its length to provide a clearance opening **70** therein for the pawl. The side flange **48** is provided with a control stop **71** which, in this instance, is formed by an edge or shoulder carried by this flange and located at the inner end of the clearance opening **70**.

The other side flange of the link member **32**, in this instance the side flange **49**, is cut away for a portion of its length to provide a clearance opening **72** (see FIGS. 4 and 5) and at another point therealong is provided with a clearance opening **73**. The openings **72** and **73** accommodate the control finger **63** of the pawl **35** during swinging thereof and thus represent locations spaced apart along the link member **32** at which the swinging of the pawl can take place, such locations accordingly being conveniently referred to as "swing locations." The side flange **49** of the link member **32** is also provided with a pair of longitudinally spaced control stops **74** and **75** which, in this instance, are formed by the edge portions or shoulders of the side flange **49** which face toward the respective clearance openings **72** and **73**. The control stops **71**, **74** and **75** are engageable by the fingers of the pawl **35** in a manner and for the purposes explained in detail hereinafter.

As shown in the drawings, one of the link members, in this instance the link member **32**, is provided adjacent the inner end thereof with a control stop **77** (see FIGS. 3 and 8) which is preferably in the form of a fixed pin mounted on the web portion **47**. The stop **77** projects into the guideway **54** between the longitudinal edge flanges **57** and **58** of the link member **33** and is engageable by a stop means provided on the latter link member, when the door check is in its fully extended condition shown in full lines in FIGS. 3 and 8, to thereby establish an extended holding length for the door check **15**. The stop means of the link member **33** which engages the control stop **77** is, in this case, the stop shoulder **66** of the pawl **35** while the latter is held against swinging by one or both of the side flanges **48** and **49** which are then in covering relation to the clearance openings **67** and **68**. The engagement of the stop shoulder **66** of the pawl with the control stop **77** also prevents a complete axial separation between the overlapped inner ends of the link members **32** and **33**.

The link member **32** is also provided with a control stop **80** adjacent the outer end thereof and which control stop projects into the guideway **54** so as to be engageable with the pawl **35** when the door check is actuated to its fully contracted or collapsed condition as the door **13** approaches its closed position. The control stop **80** is here shown as being an inwardly deflected lug formed by a portion of the web **47** of the link member **32**. The control stop **80** is offset from the longitudinal center line of the door check **15** so as to be relatively closer to the side flange **48**. This offset relation of the control stop **80** causes it to produce counterclockwise swinging of the pawl **35** when translatory movement of this control stop with the link member **32** causes this stop to engage the pawl in the manner represented in the phantom line showing of the check device at position 15^d of FIGS. 3 and 8.

During the movement of the link member **32** along the link member **33**, the pawl **35** has two different trip locations along the door check **15**, one such trip location being adjacent the bracket **29** and the other being at an intermediate point of the link member **32**. When the pawl **35** is at the first of these trip locations, it is successively actuated to two different trip positions. Likewise, when the pawl **35** is at the second trip location, it is actuated to two other different trip positions.

The actuation of the door check **15** will now be described in detail with reference to the above-mentioned two trip locations, and the above-mentioned different trip positions of the pawl **35** will also be described with reference to the drawings. For such detailed description of operation let it be assumed that the door **13** is in its full open or 180° position 13^c shown in FIGS. 3 and 8 and that the door is about to be swung therefrom in a closing direction, as indicated by the arcuate directional arrow **81**. At this time the pawl **35** occupies a substantially fully retracted position 35^c in the guideway **54**, as shown in broken lines in FIGS. 3 and 8, and has the stop shoulder **66** thereof in engagement with the stop pin **77** of the link member **32**. This engagement of the pawl with the stop pin **77** is at this time retaining the door **13** against opening movement beyond its 180° position and the check device is in its fully extended condition 15^c shown in full lines in FIGS. 3 and 8.

The closing movement of the door **13** from such fully open position 13^c advances the link member **32** along the link member **33**, as indicated by the straight directional arrow **82**, and thereby moves the control stop **80** into cooperation with the pawl **35** whose relative location then is in the first trip location and adjacent the bracket **29**. When the door **13** reaches a position 13^d in which the door check is substantially on the dead-center line **83** and is in its fully collapsed condition 15^d shown in phantom lines in FIGS. 3 and 8), the control stop **80** has come into engagement with the pawl **35** and has swung the latter in a counterclockwise direction to the trip position 35^d in which the control fingers **63** and **64** of the pawl project outwardly from opposite sides of the link member **33**.

As the door **13** swings further toward its fully closed position 13^a the door check **15** moves inwardly of the vehicle body and beyond the dead-center line **83**, whereby the door check is subjected to a lengthening or expanding action by a partial withdrawal of the link member **32** along the link member **33**, as represented by the condition of the door check as shown at 15^a in FIGS. 2, 3 and 8. During this lengthening action, the control finger **63** of the pawl **35** is engaged by the control stop **74** of the link member **32** which may or may not cause a further counterclockwise swinging of the pawl to the position 35^a and, when the door **13** has reached its fully closed position 13^a of FIG. 2, the pawl **35** will be in this position.

When the pawl **35** is in the position 35^a, the door check **15** is in a condition such that during the next opening movement of the door **13**, the control finger **63** will be actuated by the control stop **74** and rotated thereby in a counterclockwise direction to its second trip position whereupon the stop finger **65** will be in a ready position for engagement by the control stop **71**. When the door arrives at the 90° open position 13^b shown in phantom lines in FIGS. 3 and 8, the pawl **35** will still be at the second trip location and the stop finger **65** will be engaged by the control stop **71**, causing the pawl to thereupon assume the checking position 35^b. The engagement of the control stop **71** with the stop finger **65**, limits further expanding movement of the door check and establishes a holding length for the door check (see FIGS. 3 and 4) by which the door is restrained against further swinging in the opening direction and is maintained at the 90° open position 13^b.

When the stop finger **65** is thus engaged by the control stop **71** and the pawl swung by the latter to the position 35^b, the control finger **63** is in an extended position projecting somewhat from the channel recess **59** through the

side flange openings 68 and 73 of the link members 33 and 32. At this time the control finger 64 of the pawl engages the inner surface of the side flange 48 of the link member 32 and which engagement prevents rotation of the pawl in the counterclockwise direction beyond the full line position 35^b shown in FIG. 4. With the control finger 63 in this extended position it will be engageable by the control stop 75 in response to shortening of the linkage unit 31 to cause swinging of the pawl 35 in a clockwise direction for retracting the stop finger 65.

If the vehicle operator wishes to swing the door 13 from its checked 90° position 13^b of FIG. 3 to its closed position 13^a, he can readily do so by an immediate and direct swinging of the door to such closed position. If, however, the operator wishes to swing the door from the 90° position 13^b to the fully open position 13^c, he must first cause or initiate a trip actuation of the pawl 35 for retracting the stop finger 65. This is accomplished by imparting to the door a partial closing movement, as a control movement to cause or initiate such trip actuation of the pawl, after which the door can be freely swung to the fully open position 13^c.

This control swinging of the door 13 from the 90° position 13^b in the closing direction need be for only a small arcuate distance for initiating the trip actuation of the pawl 35 for retracting, or partially retracting, the stop finger 65 and causes control stop 75 to engage the control finger 63 and swing the pawl in a clockwise direction. The control swinging of the door in the closing direction need only be sufficient to cause this clockwise swinging of the pawl to move the control finger 64 to an extended position where it will be engageable by the stop shoulder 71 during the subsequent swinging of the door toward its full-open position. The stop shoulder 71 will continue to act against the control finger 64 as the door swings toward the full-open position, causing clockwise swinging of the pawl 35 until the pawl finally assumes its fully retracted position 35^c.

The control swinging of the door 13 in the closing direction could, of course, be carried through a sufficient arcuate distance to cause substantially all of the clockwise swinging of the pawl 35 from the position 35^b of FIG. 4 to the phantom line position 35^c of FIGS. 3 and 8. In that case, the side edge of the control finger 63 remains in engagement with the control stop 75 for a longer interval and the clockwise swinging of the pawl is produced to a major extent by this control stop.

When the pawl 35 has been thus moved to substantially its fully retracted position 35^c by the above-explained action of the stops 75 and 71 against the control fingers 63 and 64 and the door is swung to its fully open position 13^c, the stop shoulder 66 of the pawl will finally be engaged by the stop pin 77, thereby checking the door in the fully open position by preventing opening movement beyond the 180° position, as previously mentioned above. While the door is left in the fully open position 13^c, the pawl 35 remains in its fully retracted position 35^c, such that the link member 32 will be freely movable along the link member 33 during the succeeding closing movement of the door. From the foregoing detailed description of the operation, it will be seen that the general functioning of the door check 15 with respect to the action of the pawl 35 has been carried through a full cycle of operation during the closing and opening swinging movements of the door.

Since the general arrangement and functioning of the check device 15 have now been made known, the feature of the detent means 28 can be described. As has already been indicated above, the detent means 28 is intended to become effective for releasably holding the door 13 from falling shut when the opening swinging of the door has been checked by the engagement of the stop shoulder 71 with the stop finger 65 of the pawl 35 when the latter is in the control position 35^b shown in FIGS. 3, 4 and 8 of the drawings.

As representing one form of construction which the detent means 28 may assume, FIGS. 4 and 5 of the drawings show a resiliently flexible bowed member in the form of a plate spring 90 located in the guideway 54 and engageable by projection means of the link member 33, in this case, by the pivot pin 61 of the pawl 35. The spring 90 is elongated in the direction of the guideway 54 and is mounted on the web portion 47 of the link member 32. The spring 90 comprises a substantially flat end portion 91 lying against the web portion 47 and a longitudinally and convexly bowed portion 92 extending along the link member 32 in an upwardly arched relation to the web portion 47 thereof.

For connecting the spring 90 with the link member 32, the web portion 47 is provided with openings, in this case two longitudinally spaced slots 93 and 94, and the spring is provided with lug projections 95 and 96 having an engaged position in the slots. The lugs 95 and 96 are formed by deflected portions of the spring lying on one side thereof and are located at or adjacent the ends of the flat portion 91.

The slot 93 extends transversely of the web portion 47 and the slot 94 extends longitudinally of the web portion, such that the shape and arrangement of the slots is that of a substantialy T-shaped arrangement with the slot 93 forming the top of the T and the slot 94 forming the stem of the T and being in a spaced or detached relation to the top.

The shape of the lugs 95 and 96 and the engagement thereof in the slots 93 and 94 provide a detachable connection for the spring by which the latter is mounted on the web portion 47. The lug 95 is a substantially right-angularly disposed lug extending transversely of the flat portion 91 and merely engages in the slot 93. The lug 96, however, is of a fingerlike shape extending along the spring 90 toward the lug 95 and engageable with the underside of the web portion 47 after having been inserted through the slot 94.

From the construction and arrangement of the slots 93, 94 and the lugs 95, 96 just described, it will be recognized that the lugs can be readily inserted into the slots by a suitable movement of the spring 90 along the guideway 54 accompanied by a sufficient flexing of the spring to cause the lug 96 to be moved through the slot 94 and into holding engagement with the underside of the web portion 47. When the lugs 95, 96 have been thus engaged in the slots 93, 94 and have been made to assume the locations shown in FIG. 5, it will be recognized that the lugs will securely hold the spring in place in the check device 15 with the bowed portion 92 of the spring extending along the guideway and toward the pivot pin 61 of the pawl 35.

The location of the slots 93 and 94 longitudinally of the link member 32 is such, in relation to the control stop 71 and in relation to the pivot pin 61 and the length of the spring 90, that when the spring is assembled in the check device 15, its bowed portion 92 will lie adjacent the pivot pin 61 when the control stop 71 is in engagement with the stop finger 65 of the pawl for checking the opening movement of the door at its intermediate or 90° position 13^b. This is the position of the spring 90 relative to the control stop 71 and the pivot pin 61 as shown in FIGS. 4 and 5 of the drawings and from which showing it will be seen that any swinging of the door in the closing direction from its intermediate checked position 13^b will cause the bowed portion of the spring to move with the link member 32 so as to bring the convex side of such bowed portion into engagement with the rounded head 62 of the pivot pin. The resistance to flexing offered by the bowed portion 92 produces a holding co-operation between this bowed portion and the head 62 of the pivot pin such that the door will be releasably held in the checked position 13^b and will be normally prevented from swinging toward its closed position.

If the operator wishes to move the door 13 from its

intermediate checked position 13b to its closed position 13a, he merely applies a pushing force to the door whereby the link member 32 will carry the spring 90 past the pivot pin 61 by a pushing of the bowed portion 92 beneath the rounded head 62. As soon as the bowed portion 92 has moved beneath and past the head 62, the door will swing freely to its closed position 13a.

The height of the bowed portion 92 is preferably such that this portion of the spring will clear the lug 69 of the link member 33, as shown in FIG. 5, during movement of the spring by the link member 33 relative to the link member 32. To facilitate the flexing of the bowed portion 92 of the spring during movement thereof under the head 62, the free end of the spring is preferably provided with a convexly curved bearing or contact portion 97 for sliding contact with the surface of the web portion 47.

By reason of the detachable connection provided for the spring 90 by the co-operating slot and lug elements 93, 95 and 94, 96, it will be seen that the spring can be readily removed from the check device 15 whenever the feature of the detent means 28 is not needed or not desired. Although the detent means 28 is here shown as being located in the check device to be effective for holding the door in its intermediate checked position 13b, it will be recognized that the same detent means can also be provided in the check device to be effective therein for holding the door at any other checked position thereof such as at its full-open checked position 13c.

With respect to the stop 38 of the bracket 29, which is engageable by a side edge of the link member 32 as mentioned above, it is pointed out that this engagement occurs when the door has swung to its full-open and checked position 13c. At this time the linkage unit 31 has been extended to its full length and is under tension. The engagement of the stop 38 by the link member 32 under these conditions prevents further transverse relative swinging between this link member and the bracket 29, such that the door 13 is powerfully resisted against further swinging in the opening direction. This door checking function thus provided by the stop 38 prevents the application of excessive loads to the hinges 19, and consequently, reduces the likelihood of springing or otherwise damaging such hinges.

From the accompanying drawings and the foregoing detailed description it will now be readily understood that this invention provides a novel check device for checking the swinging movements of a door, or other swingable member, and in which a holding or detent means provided in the device automatically becomes effective for releasably holding the door against undesired movement away from a checked position thereof.

Although the novel check device of the present invention has been illustrated and described herein to a somewhat detailed extent, it will be understood, of course, that the invention is not to be regarded as being limited correspondingly in scope, but includes all changes and modifications coming within the terms of the claims hereof.

Having described our invention, we claim:

1. In a check device for use between a support structure and a door structure swingably connected therewith, a pair of relatively longitudinally movable link members having their outer ends adapted for pivotal connection with the respective structures, one of said link members having a longitudinal guideway in which the other link member is slidable, stop means on said one link member, a pivot pin on said other link member, a pawl swingable on said pivot pin, said pawl being movable to effective and ineffective positions and when in said effective position being engageable with said stop means for checking the swinging movement of said door structure at an intermediate point of the permissible swingable travel thereof, and yieldable holding means on said one link member and engageable with said pivot pin for releasable holding co-operation between said link members when said door structure is at said intermediate point.

2. A door check as defined in claim 1 and wherein said holding means comprises a plate member having a convexly-bowed resilient portion located in said guideway, the convex side of said bowed portion being engageable with said pivot pin.

3. In a check device for use between a support structure and a door structure swingably connected therewith, a pair of relatively longitudinally movable link members having their outer ends adapted for pivotal connection with the respective structures, one of said link members being a channel-shaped member having a longitudinal guideway in which the other link member is slidable, stop means on said one link member, projection means on said other link member and projecting into said guideway and comprising a pivot pin having its top exposed in said guideway, a pawl swingable on said pivot pin, said pawl being movable to effective and ineffective positions and when in said effective position being engageable with said stop means for checking the swinging movement of said door structure at an intermediate point of the swingable travel thereof, and a plate member attached to said one link member and having a convexly bowed resilient portion lying in said guideway, the convex side of said bowed portion being engageable with the top of said pivot pin for producing a releasable holding co-operation between said link members when said door structure is at said intermediate point.

4. In a check device for use between a support structure and a door structure swingably connected therewith, a pair of relatively longitudinally movable link members having their outer ends adapted for pivotal connection with the respective structures, one of said link members being a channel-shaped member having web and flange portions encompassing a longitudinal guideway in which the other link member is slidable, said web portion having openings therein, stop means on said one link member, a pivot pin mounted on said other link member and projecting into said guideway, a pawl swingable on said pivot pin, said pawl being movable to effective and ineffective positions and when in said effective position being engageable with said stop means for checking the swinging movement of said door structure at a given point of the swingable travel thereof, and a holding member having a bowed resilient plate portion lying in said guideway and engageable on the convex side thereof with said pivot pin for releasable holding co-operation between said link members when said door structure is at said given point, said holding member also comprising a mounting portion having spaced lugs projecting therefrom and releasably engaged in said openings whereby said holding member is detachably connected with said one link member.

5. In a check device for use between a support structure and a door structure connected therewith for swinging in opposite directions, a pair of relatively longitudinally slidable link members having their outer ends adapted for pivotal connection with the respective structures, a pivot pin on one of said link members, co-operable elements on said link members comprising a pawl pivotally mounted on said pivot pin and control elements carried by the other link member, said pawl having finger means movable by swinging of the pawl from an ineffective position out of the path of movement of said other link member to an effective position extending into said path of movement and vice versa, said control elements comprising a stop element engageable with said finger means when the latter is in said effective position for checking the swinging movement of said door structure at an intermediate point of the swingable movement thereof in one direction and other control elements engageable with said finger means for automatically causing the swinging of said pawl in response to relative longitudinal movement between said link members, and yieldable holding means

on said other link member and extending into the path of said pivot pin for holding co-operation with the latter when the door structure is at said intermediate point for releasably holding said door structure from swinging away from said intermediate point in the opposite direction.

6. In a check device for use between a support structure and a door structure swingably connected therewith, a pair of relatively longitudinally movable link members having their outer ends adapted for pivotal connection with the respective structures, one of said link members being a channel-shaped member having web and flange portions and containing a longitudinal guideway in which the other link member is slidable, co-operable elements carried by said link members comprising control elements on the flanges of said one link member and a pawl carried by said other link member, projection means on said other link member and comprising a pivot pin supporting said pawl for swinging movement, said pawl having finger means movable by swinging of the pawl from an ineffective position out of the path of movement of said control elements to an effective position extending into said path of movement and vice versa, said control elements comprising a stop element engageable with said finger means when the latter is in said effective position for checking the swinging movement of said door structure at an intermediate point of the swingable movement thereof and other control elements engageable with said finger means for automatically causing the swinging of said pawl in response to relative longitudinal movement between said link members, and yieldable holding means on the web portion of said one link member and engageable with said projection means for releasable holding co-operation between said link members when said door structure is at said intermediate point.

7. A door check device comprising a pair of relatively longitudinally slidable link members at least one of

which has parallel flanges and a web portion therebetween, cooperably engageable check elements on said link members for establishing an effective holding length for the check device, said web portion having longitudinally spaced openings therein, projection means on the other link member and extending toward said web portion, and a plate spring on said one link member and having a convexly bowed portion extending in the direction of the longitudinal spacing of said openings and the convex side of said bowed portion being engageable by said projection means for producing a releasable auxiliary holding action between said link members, said spring being disposed on one side of said web portion and attached thereto by having a first lug engaged in one of said openings and a second lug extending through the other opening and bearing against the opposite side of said web portion.

8. A door check device as defined in claim 7 wherein said spring has a free end portion at one end of said bowed portion and a flat portion at the other end of said bowed portion and lying against said one side of said web portion, and wherein said first and second lugs are connected with said flat portion and said second lug comprises a finger extending toward the first lug.

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