Nov. 29, 1955 G. R. FRIE ET AL 2,725,099

DOOR OPERATOR

Filed Jan. 19, 1952 2 Sheets-Sheet 1

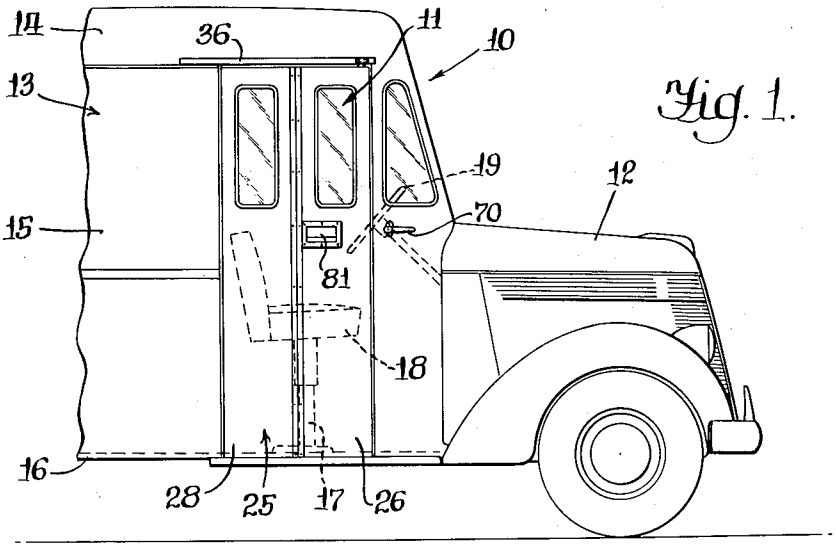


Fig. 1.

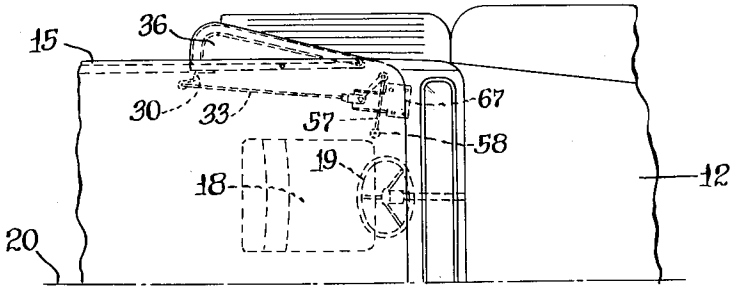


Fig. 2.

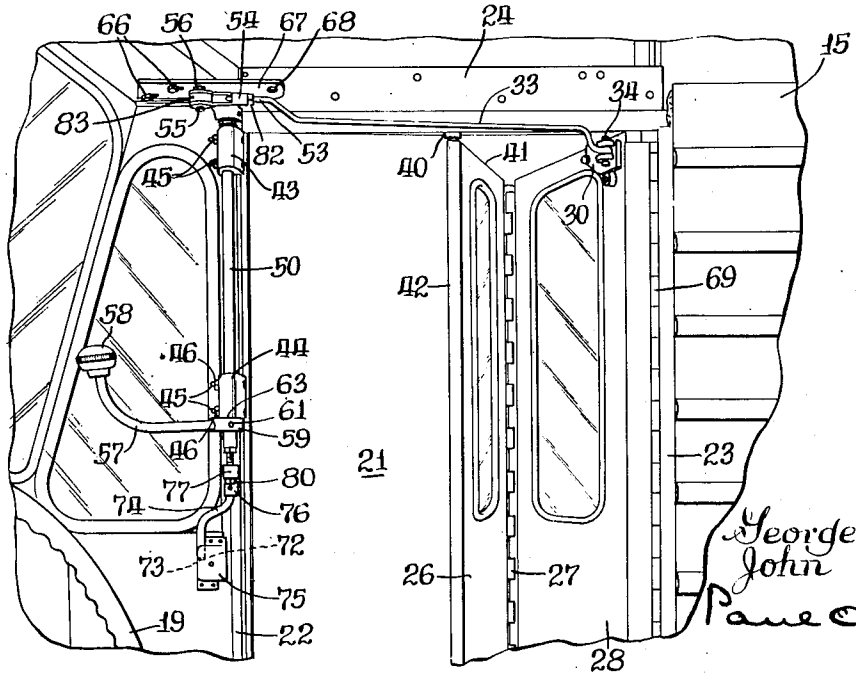


Fig. 3.

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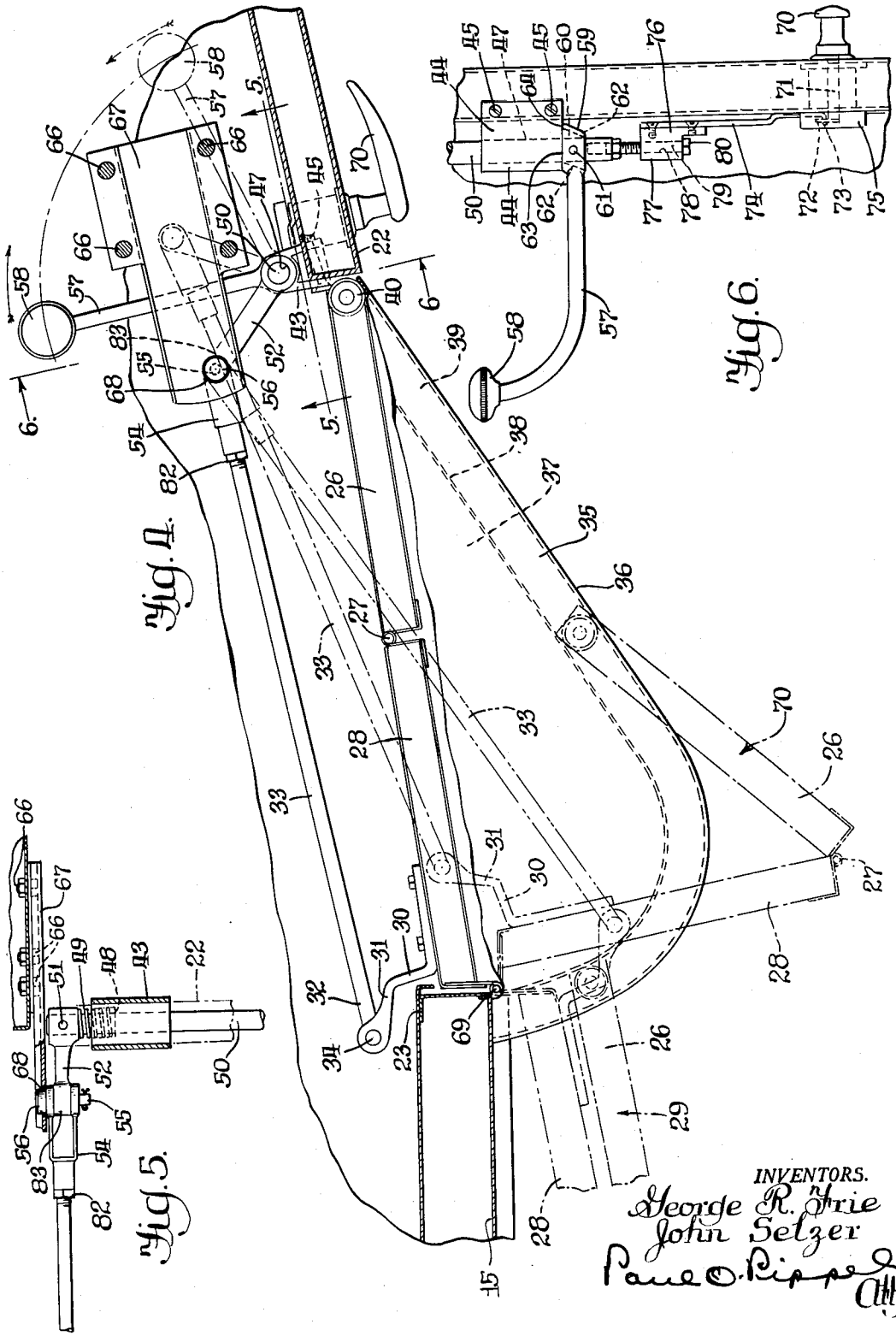


Fig. 4.

Fig. 5.

Fig. 6.

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DOOR OPERATOR

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This invention relates to sectional doors for automotive vehicles such as door-to-door delivery trucks or the like and more particularly to the control linkage and the arrangement of the same for remotely opening and closing the door.

Foldable doors of the type wherein a pair of hinged panels or sections are hinged together and to a door jamb and are movable to an extended position to bridge the door opening to close the same and to an open position wherein one panel is folded upon the other panel which in turn lies substantially upon the exterior of the body side wall, are old per se. The operating or control linkage generally employed to actuate the door between its open and closed positions is usually complex, costly, and, as a whole, inefficient. Heretofore, no positive means were provided for maintaining the door locked in either its fully opened or closed positions. It is therefore the primary objective of the present invention to provide a foldable door, actuated by a novel control linkage, which is capable of being positively locked in either its opened or closed positions.

Another objective is the provision of simple releasing means for unlocking the door prior to its movement to or from the opened or closed positions.

A further object is to provide means whereby the door can be unlocked either from within or without the vehicle body.

A still further object is the provision of a control rod rotatable about its longitudinal axis to move the door between its opened and closed positions and is further movable axially to lock or unlock the door in its opened and closed positions.

The foregoing and other important objects and desirable features inherent in and encompassed by the invention, together with many of the purposes and uses thereof, will become readily apparent from a reading of the ensuing description in conjunction with the annexed drawings, in which:

Fig. 1 is a fragmental side elevational view of a vehicle embodying the door control linkage of the invention;

Fig. 2 is a plan view of one half of the vehicle shown in Fig. 1;

Fig. 3 is an enlarged view of the interior of one side of the vehicle illustrated in Fig. 1 showing the door partially opened;

Fig. 4 is a plan view taken substantially along line 4—4 of Fig. 1 showing the door operating mechanism; the dotted lines represent various positions of the door;

Fig. 5 is a detailed view taken substantially along line 5—5 of Fig. 4; and

Fig. 6 is a fragmentary sectional view taken substantially along line 6—6 of Fig. 4.

Referring to the drawings, wherein like reference characters designate like elements throughout the various views, there is shown the forward portion of a delivery type vehicle 10 which includes an operator's compartment 11 disposed rearwardly of the engine enclosure 12. The load carrying body 13 (partially shown) is integrally

constructed with the operator's compartment 11 and includes a roof section 14 connected to a pair of laterally spaced sheet metal side walls 15 which in turn are rigidly fastened to the body floor 16. The body floor 16 has a vertically extending member 17 attached thereto in the operator's compartment 11 for supporting a driver's seat 18 indicated in dotted outline. A steering wheel 19 spaced to the left of the longitudinal median line 20 of the vehicle 10 is mounted forwardly of the driver's seat 18.

Each side wall 15 has a door opening or doorway 21 formed therein whose side edges are defined by forward and rearward pillar posts 22, 23 and whose top and bottom edges are defined by a roof side rail 24 and the floor 16 respectively. Inasmuch as the vehicle side doors 25 and the operating mechanisms therefor are symmetrically disposed on each side of the longitudinal median line 20 of the vehicle, the door and mechanism for operating the same on one side of the line 20 only will be described in detail. The door 25 illustrated comprises a forward section or panel 26 hingedly connected along the entire length of one edge thereof by means of a suitable hinge 27 to a rearward section or panel 28 which in turn is similarly connected to the rearward pillar post 23. Referring to Fig. 4 it will be noted that the panels 26, 28 are extended and bridge the doorway 21 in their closed position. In the fully opened position, designated by numeral 29 and shown in dotted outline in Fig. 4, the forward panel 26 lies substantially parallel to the rearward panel 28 and the side wall 15, with the forward panel 26 outermost.

Rigidly fastened to the interior surface of the rearward panel 28 adjacent its top rearward corner is a Z-shaped bracket 30, one leg 31 of which extends inwardly and rearwardly when the door 25 is in its closed position as shown in Fig. 4. The free end of the leg 31 is bifurcated for receiving one end 32 of a rod 33. A pin 34 pivotally connects the rod 33 and the bracket 30 together. The purpose of the rod 33 will be described hereinafter.

The doorway lintel or roof side rail 24 has rigidly fastened thereto a guide plate 35. As shown in Fig. 4, the guide plate 35 extends laterally from the side wall 15 and increases in width from front to rear. The outer marginal edge of the plate 35 is turned downwardly to provide a depending flange 36. Secured to the underside of the guide plate 35 as by welding or the like is a second plate 37 which has a depending flange 38 spaced from the flange 36 to form a guide track 39. As best shown in Fig. 4, the guide track 39 extends laterally rearwardly from the forward pillar post 22 in a straight line and is curved toward and ends adjacent the rearward pillar post 23. A track roller 40 is rotatably mounted on the top maginal edge 41 of the forward panel 26 adjacent the forward edge 42 thereof and is adapted to be received between the flanges 36, 38 of the guide track 39.

As best shown in Figs. 3 and 4, a pair of vertically spaced brackets 43, 44 are rigidly fastened to the forward pillar post 22 by means of bolts 45 and nuts 46. The brackets 43 and 44 are each provided with a bore 47 vertically aligned with the corresponding bore formed in the other bracket. The upper bracket 43 is also countersunk to form a shoulder 48 for contacting one end of a coil spring 49. A shaft 50 is journaled in the bores 47 and is capable of sliding vertically as well as rotating with respect to the brackets 43, 44. Attached to the upper extremity of the shaft 50 by means of a pin 51 is an arm 52 which is movable with the shaft. The coil spring 49 encircles the shaft 50 and bears against the shoulder 48 and the underside of the arm 52. It will be obvious from the foregoing that the spring 49 continually urges the arm 52 together with the shaft 50 vertically upwardly.

The forward end 53 of the rod 33 is threaded for receiving a bifurcated attachment element 54. The at-

tachment element 54 may be moved along the rod 33 to vary the distance between the element and the pin 34. A lock nut 82 is then tightened to secure the element 54 in its adjusted position. The free end 83 of the arm 52 is inserted between the bifurcations of the element 54 and is pivotally connected thereto by means of a pin 55. The pin 55, as shown in Figs. 3 and 5, has an enlarged head portion 56, the purpose of which will be explained hereinafter.

Positioned below the lower bracket 44 adjacent the lower end of the shaft 50 is a door operating lever 57 provided with a suitable hand grip 58 which is within convenient reach of the vehicle operator to actuate the door 25. The lever 57 has an enlarged end collar 59 opposite the hand grip 58 provided with a slot 60 through which the shaft 50 extends. A pin 61 connects the collar 59 to the shaft 50 whereby the operating lever 57 is nonrotatably secured to the shaft. The end surfaces 62 of the slot 60 are parallel and inclined to the longitudinal axis of the shaft 50 when the lever 57 is in the position shown in Fig. 6 to enable the operating lever 57 to pivot vertically downwardly about pin 61. The coil spring 49, which urges the shaft 50 upwardly, maintains the upper surface 63 of the enlarged collar 59 in fully abutting relationship with the underside of the lower bracket 44 as shown in Fig. 6. Swinging of the hand grip 58 vertically downwardly about pivot pin 61 causes only that portion 64 of the collar disposed on the opposite side of the pivot pin 61 from the hand grip 58 to engage the bracket 44 and cam the shaft downwardly against the resilient action of the spring 49.

Fastened to the transversely extending roof header 65 by means of bolts 66 is a rearwardly extending plate 67. The plate 67 has an aperture 68 formed therein having substantially the same diameter as the head portion 56 of pin 55 for receiving the head portion when the door 25 is in certain positions as will be described hereinafter.

Assuming that the door 25 is in its fully closed position, as shown in full lines in Fig. 4, the disposition of the parts is as follows. The door panels 26 and 28 are in alignment and bridge the doorway to completely close the same. The track roller 40 is at the end of the guide track 39 adjacent the forward pillar post 22 and the door operating lever 7 extends inwardly substantially normally to the side wall 15. The shaft 50 together with the arm 52 is maintained in a raised position by coil spring 49. In this position the head portion 56 of the pin 55 is insertable in the aperture 68 and extends through the plate 67. The door operating lever 57 which is also carried by the shaft 50 is in the position shown in Fig. 6 and limits the upward movement of the shaft. It will be obvious from the foregoing that the door operating mechanism together with the door 25 to which it is attached is locked in the closed position. Rotational movement of the shaft 50, which is necessary to actuate the rod 33 to open the door 25, is prevented by the plate 67 which engages the head portion 56 of the pin 55. It will be observed that the pin 34 is disposed inwardly of a vertical plane which passes through the pin 55 and pivotal connection 69 of the rear panel 28 and the rearward pillar post 23. In order to release the head portion 56 from the plate 67, the driver merely moves the operating lever hand grip 58 downwardly in a vertical plane. The operating lever 57 is then pushed forwardly to rotate the shaft 50 and arm 52 in a clockwise direction as viewed in Fig. 4. Rotation of arm 52 pulls rod 33 forwardly and, through the connection 34 of the rod to the bracket 30, which is attached to the rear panel 28, causes outward rotation of the rear panel about the pivotal connection 69 of the same to the rearward pillar post 23. Forward movement of the rod 33 continues until the pivotal connection 69, pin 34, and pin 55 lie in the same vertical plane whereupon its limit of forward movement is reached. In this position (represented by numeral 70 in Fig. 4) the door 25 is approximately half open, the rear panel 28 having pulled the front panel 26 along the guide track 39. The momentum acquired by the door 25 during its initial opening movement is sufficient to cause the pin 34 to move outwardly of the vertical plane passing through the pin 55 and the pivotal connection 69. Thereafter reverse or counterclockwise rotation of the operating lever 57 will move the rod 33 rearwardly to the position shown in Fig. 4 which is designated by numeral 29 and represents the fully opened position of the door 25. The forward panel 26 is superimposed upon the rearward panel 28 which in turn is substantially parallel to the side wall 15 rearwardly of the doorway 21. The operating lever 57 is rotated during the last half of the door opening movement to the same position it was in just prior to the start of the door opening operation. Consequently, the head portion 56 is vertically aligned with the aperture 68 formed in the plate 67 and is free to enter the same to lock the door in its fully opened position. In fact, the spring 49 which continually urges the head portion 56 upwardly will assist the locking movement of the head portion and maintain the head portion and plate engaged until released by sliding the shaft 50 downwardly.

To close the door 25 it is again necessary to depress the hand grip 58 downwardly to lower the shaft 50 and disengage the head portion 56 from the plate 67 before the operating lever 57 can be rotated to close the door. The operating lever 57 is pushed in a clockwise direction for approximately 90° and then the rotational movement is reversed as in the case when opening the door 25. The panels 26, 28 are swung about the pivotal connection 69 and the forward panel 26 unfolds with respect to the rearward panel 28 with a motion opposite to their motion while opening. The proper folding and unfolding movements of the door sections 26, 28 are insured during the opening and closing operations by the guide track 39 in cooperation with the track roller 40.

From the foregoing it will be obvious that the head portion 56 of the pin 55 is always in vertical alignment with the aperture 68 formed in plate 67 when the door is in its fully opened or closed positions. Hence the door is capable of being positively locked in either its closed or opened positions.

As best shown in Figs. 1, 4, and 6, a handle 70 is rotatably mounted in the side wall 15 just forwardly of the forward pillar post 22. The handle 70, which is operable from without the operator's compartment 11, is rigidly connected to an inwardly extending shaft 71. The inwardly disposed end of the shaft 71 has a short arm 72 secured thereto which engages a small flange 73 formed on the lower end of a link 74. The inwardly disposed end of the shaft 71, the arm 72, and the lower end of the link 74 are all enclosed in a casing 75 which is fastened to the interior surface of the side wall 15. The link 74 extends upwardly toward the lower end of the shaft through a guide slot (not shown) formed in the casing 75. A bracket member 76, having an offset portion 77, is secured to the upper end of the link 74. The offset portion 77 is provided with a vertically extending bore 78 for loosely receiving a bolt 79 adjustably connected to the lower end of the shaft 50 and depending vertically therefrom. In operation, assuming that the door 25 is in its fully closed position and locked, the vehicle operator turns the handle 70 clockwise, as viewed in Fig. 1, causing arm 72 to move link 74 downwardly carrying with it bracket member 76. The offset portion 77 engages the head 80 of the bolt 79 and forces the shaft 50 downwardly to release the head portion 56 from the locking plate 67. The operator may then pull the forward panel 26 outwardly and rearwardly and move both panels 26, 28 to their fully opened position. A small recess 81 is formed in the forward panel 26 to enable the operator to easily grasp the panel and impart an opening movement to the same. From the foregoing it will be obvious that the means for releasing the lock

mechanism from without the vehicle will not interfere with the operation of releasing means disposed within the vehicle body. The bolt **79** is free to move relatively downwardly with respect to the offset portion **77** by virtue of the one-way connection between the bolt and bracket member **76** described above.

The embodiment of the invention chosen for the purposes of illustration and description herein is that preferred as the result of selective tests based upon the requirements for achieving the objects of the invention and developing the utility thereof in the most desirable manner, due regard being had to existing factors of economy, simplicity of design and construction, production methods and the improvements sought to be effected. It will be appreciated, therefore, that the particular structural and functional aspects emphasized herein are not intended to exclude, but rather to suggest, such other adaptations and modifications of the invention as fall within the spirit and scope of the invention as defined in the appended claims.

What is claimed is:

1. In an automotive vehicle, the combination comprising, a vehicle body including a side wall having a doorway provided with a folded door including a pair of mated panels hinged together, one of said panels being further hinged along one edge to said side wall, said door being movable between a closed position wherein said panels bridge said doorway and an open position wherein one panel is folded into abutting relationship upon the other panel when the latter lies substantially parallel against said side wall; a vertically extending rod supported by said side wall, said rod being rotatable about its longitudinal axis for moving said door between its open and closed positions, said rod further being movable along its longitudinal axis with respect to said side wall; structure interconnecting said rod and one of said panels, said structure including a pivot pin having a head portion; locking means disposed above said pivot pin for positively securing said door in its open and its closed positions, spring means for continually urging said head portion toward said locking means; a handle member operatively connected to said rod, said member being movable in a first plane to open and close said door and in a second plane normal to said first plane to disengage said head portion from said locking means against the action of said spring means by moving said rod along its longitudinal axis.

2. The combination as set forth in claim 1, in which said locking means includes a plate attached to said vehicle body, said plate having a vertically extending aperture for receiving said head portion when said door is in its open and its closed positions.

3. In an automotive vehicle, the combination comprising, a vehicle body including a side wall having a doorway provided with a foldable door including mated panels being further hinged along one edge to said side wall, said door being movable between a closed position wherein said panels are extended and bridge said doorway and an open position wherein one panel is folded into superimposed collapse upon the other panel when the latter is opened outwardly into substantially parallelism with the side wall; bracket means attached to said side wall; a vertically extending rod supported by said bracket means, said rod being rotatable about its longitudinal axis for moving said door between its open and closed positions, said rod further being movable vertically with respect to said bracket means; means interconnecting said rod and said door including a first arm rigidly connected to one end of said rod and movable therewith, a second arm rigidly connected to one of said panels, a link, and means pivotally connecting said first and second arms to opposite ends of said link, said means including a pivot pin carried by said first arm having a head portion for connecting said first arm to said link; locking means disposed above said first arm for positively securing said door in its open and its closed positions, said means being engageable by said head portion; resilient means for continually urging said rod and head portion vertically upwardly toward said locking means; and releasing means for moving said rod and head portion vertically downwardly against the action of said resilient means to disengage said head portion from said locking means.

4. In an antomotive vehicle, the combination comprising, a vehicle body including a door opening and a door including a plurality of foldable sections mounted upon a substantially vertical hinge at a side of said door opening, said door being movable between a closed position wherein said sections are extended and bridge said opening and an open position wherein one section is folded into superimposed collapse upon another section when the latter is opened outwardly into substantially parallelism with the side wall; actuating means including a vertically extending rod mounted on said side wall, said rod being rotatable about its longitudinal axis to move said door between its open and closed positions, a first arm rigidly connected to one end of said rod, a second arm rigid with one of said sections, a link, and means pivotally connecting said first and second arms to said link, said means including a pair of pivot pins having head portions; locking means for positively securing said door in its open and its closed positions, said means being engageable by the head portion of one of said pivot pins; and releasing means operable from within said vehicle body for disengaging said locking means.

5. The combination as set forth in claim 4, in which resilient means are provided for continually urging said head portion of said one pivot pin toward said locking means.

6. The combination as set forth in claim 5, in which further releasing means operable from without said vehicle body are provided for disengaging said locking means from said head portion.

7. In an automotive vehicle, the combination comprising, a vehicle body including a side wall having a doorway provided with a foldable door including mated panels hinged together, one of said panels being further hinged along one edge to said side wall, said door being movable between a closed position wherein said panels are extended and bridge said doorway and an open position wherein one panel is folded into superimposed collapse upon the other panel when the latter is opened outwardly into substantially parallelism with the side wall; actuating means for moving said door between its open and closed positions, said means including a vertically extending rod mounted on said side wall for rotation about its longitudinal axis, a first arm rigidly connected to one end of said rod, a second arm rigid with one of said panels, and a link pivotally connected at opposite ends to said first and second arms; locking means for positively securing said door in its open and its closed positions, said means being adapted to embrace a vertically extending portion of said actuating means and prevent rotation of said vertically extending rod; resilient means for continually urging said vertically extending portion of said actuating means vertically toward said locking means; and releasing means for overcoming said resilient means and simultaneously disengaging said locking means from said vertically extending portion of said actuating means, said releasing means being capable of moving said vertically extending rod vertically along its longitudinal axis away from said locking means and allow rotation of said rod.

8. In an automotive vehicle, the combination comprising, a vehicle body including a side wall having a doorway provided with a foldable door including a pair of panels hinged together, one of said panels being further hinged along one edge to said side wall, said door being movable between a closed position wherein said panels are extended and bridge said doorway and an open position wherein one panel is folded into superimposed collapse upon the other panel when the latter is opened outwardly

into substantially parallelism with the side wall; actuating means for moving said door between its open and closed positions including a vertically extending rod adapted to rotate about its longitudinal axis to move said door between its open and closed positions; locking means for positively securing said door in its open and its closed positions, said means being engageable by said actuating means to prevent rotation of said rod; and releasing means for disengaging said locking means from said actuating means and allowing rotation of said rod, said releasing means being capable of moving said rod axially along its longitudinal axis to disengage said actuating means from said locking means.

9. In an automotive vehicle, the combination comprising, a vehicle body including a side wall having a doorway provided with a door hinged along one edge thereof to said side wall, said door being actuatable between a closed position and an open position; actuating means for opening and closing said door including a rod supported by said body for rotational movement about its longitudinal axis and for reciprocating movement along its longitudinal axis, said rod being adapted to rotate to open and close said door; and releasable locking means for positively securing said door in its open and its closed positions, said means being engageable by said actuating means to prevent rotation of said rod, said rod being movable along its longitudinal axis to disengage said actuating means from said locking means.

10. In an automotive vehicle, the combination comprising, a vehicle body including a side wall having a doorway provided with a foldable door including a pair of panels hinged together, one of said panels being further hinged along one edge to said side wall, said door being

movable between a closed position wherein said panels are extended and bridge said doorway and an open position wherein one panel is folded into superimposed collapse upon the other panel when the latter is opened outwardly into substantially parallelism with the side wall; actuating means for moving said door between its open and closed positions, said means including a rod rotatable about its longitudinal axis for moving said door between its open and closed positions; locking means for positively securing said door in its open and its closed positions, said means being engageable by said actuating means to prevent rotation of said rod; first releasing means operable from within said vehicle body for disengaging said locking means from said actuating means and allowing rotation of said rod; and second releasing means operable from without said vehicle body for disengaging said locking means from said actuating means and allowing rotation of said rod, said first and second releasing means being capable of moving said rod axially along its longitudinal axis to disengage said actuating means from said locking means.

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