

[54] **END DOOR FOR ENCLOSED RAIL CARS**

- [75] Inventor: **Donald J. Blunden**, Southfield, Mich.
 [73] Assignee: **Whitehead & Kales Company**, River Rouge, Mich.
 [22] Filed: **July 1, 1974**
 [21] Appl. No.: **484,424**

- [52] U.S. Cl. **105/378; 105/368 R; 160/199; 160/206; 160/213; 292/DIG. 32**
 [51] Int. Cl.² **B61D 19/00**
 [58] Field of Search **105/378, 368 R, 395; 160/206, 213, 199, 118; 292/218, DIG. 32; 16/1**

[56] **References Cited**

UNITED STATES PATENTS

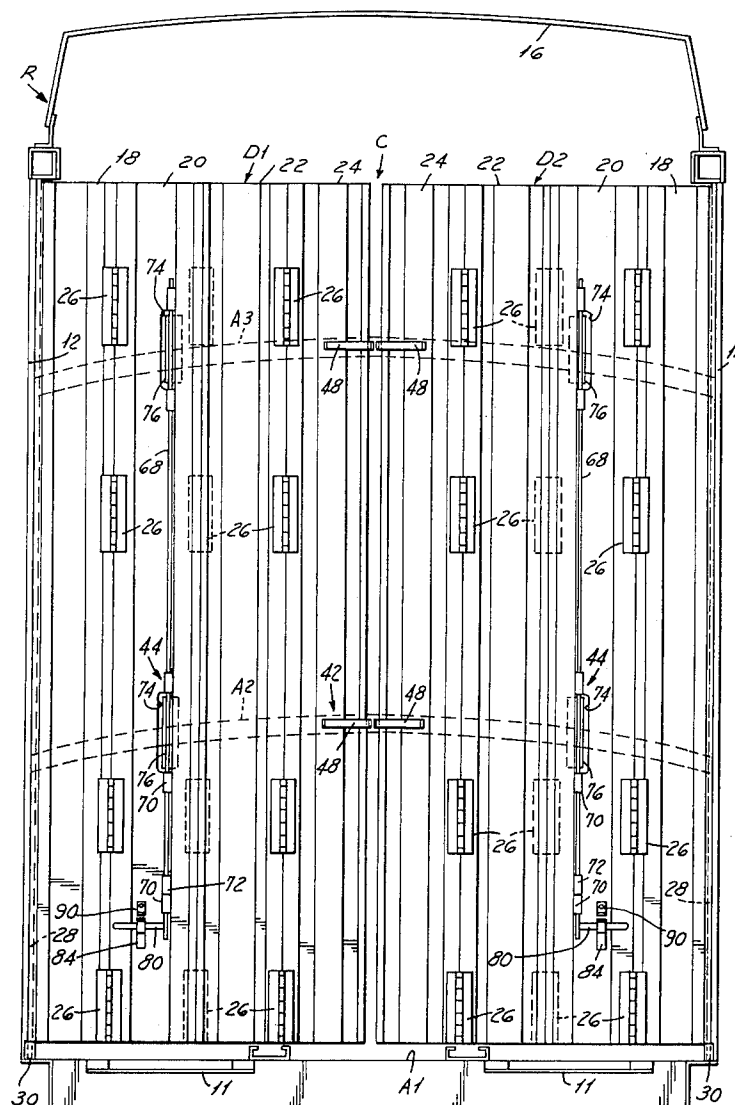
963,752	7/1910	Duner.....	160/206
2,690,141	9/1954	King.....	105/368 R X
3,544,145	12/1970	Cerutti.....	292/218 X
3,854,425	12/1974	Allen.....	105/368 R

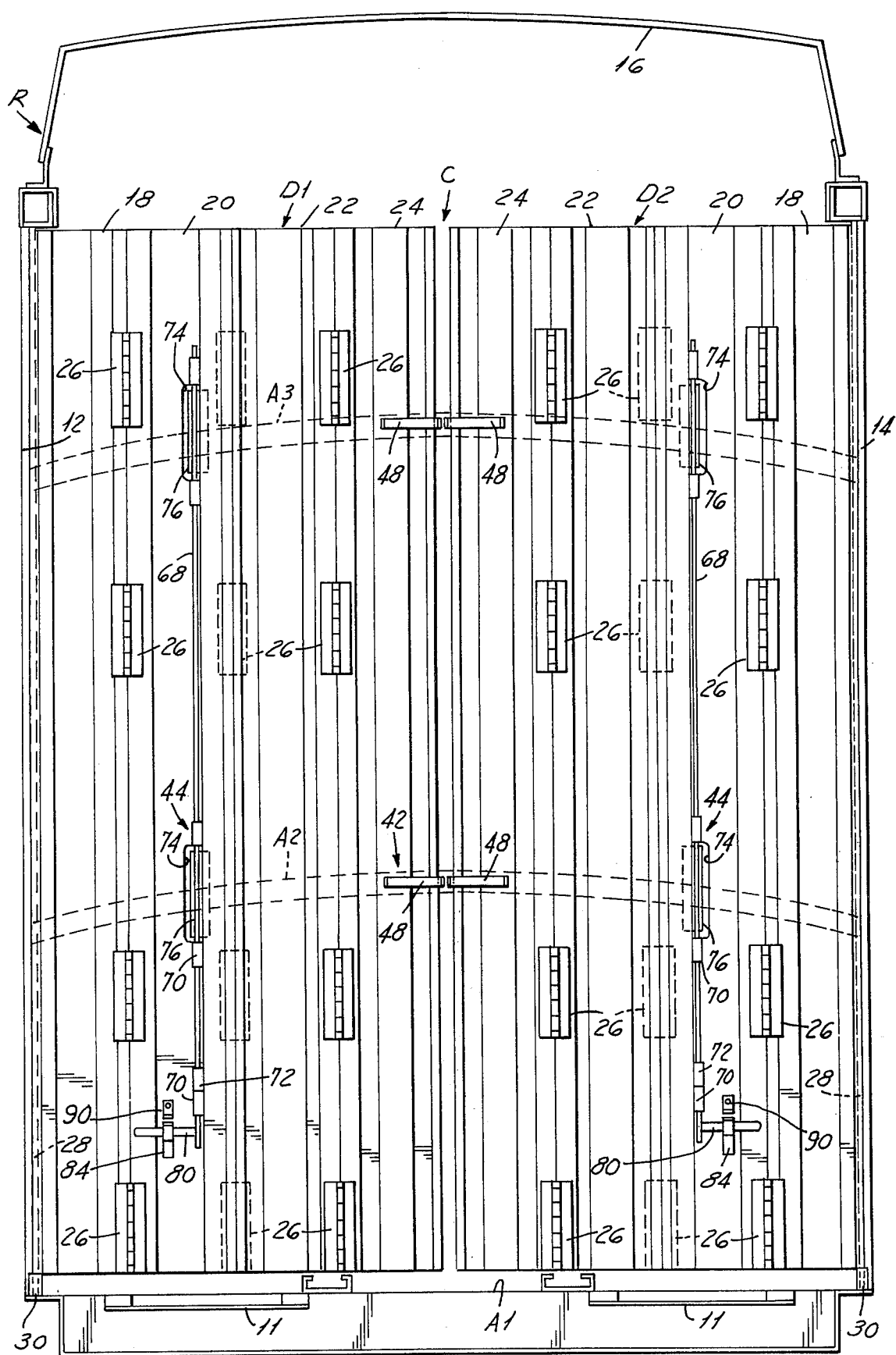
Primary Examiner—M. Henson Wood, Jr.
 Assistant Examiner—Randolph A. Reese
 Attorney, Agent, or Firm—Whittemore, Hulbert & Belknap

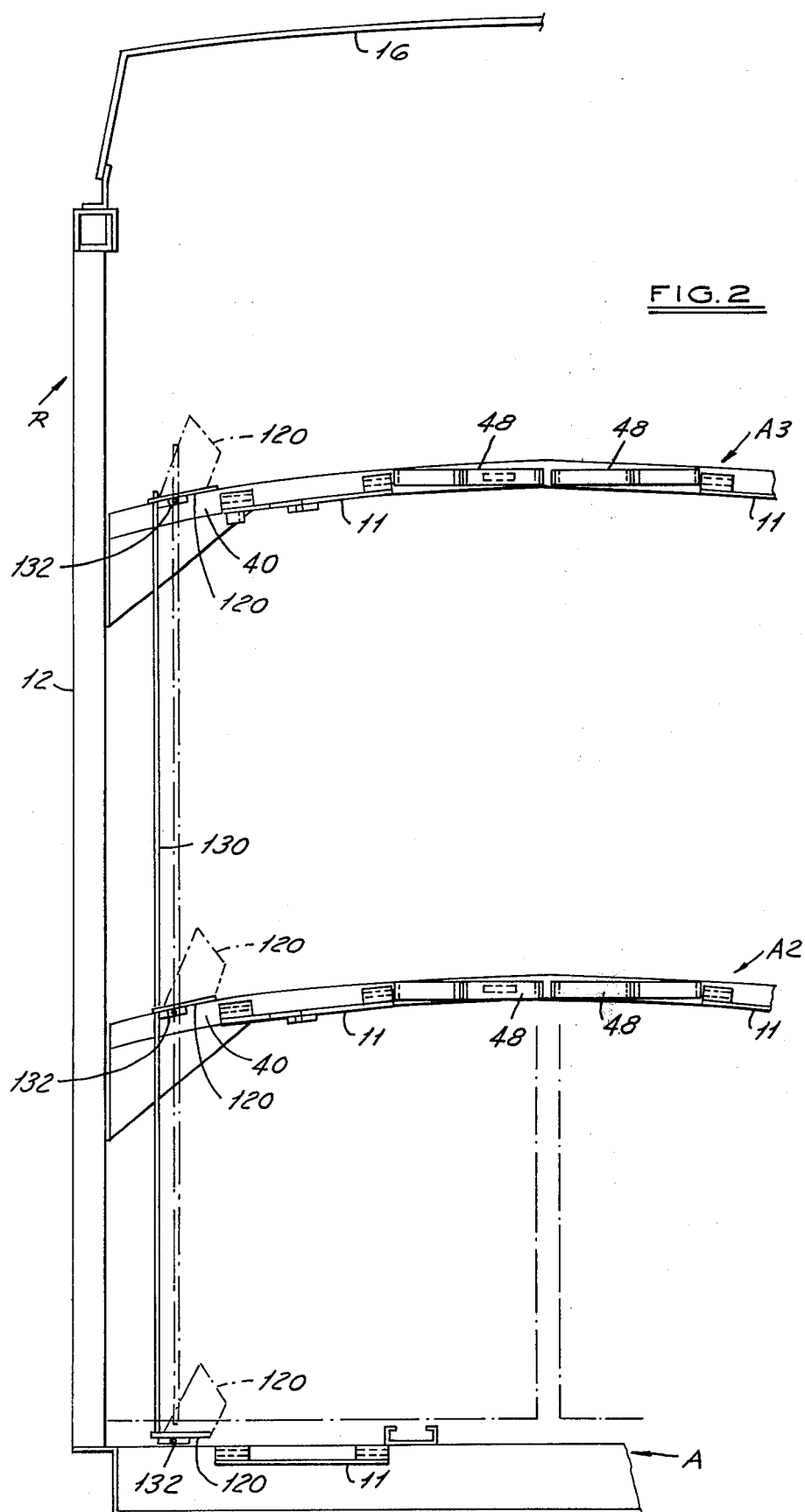
[57] **ABSTRACT**

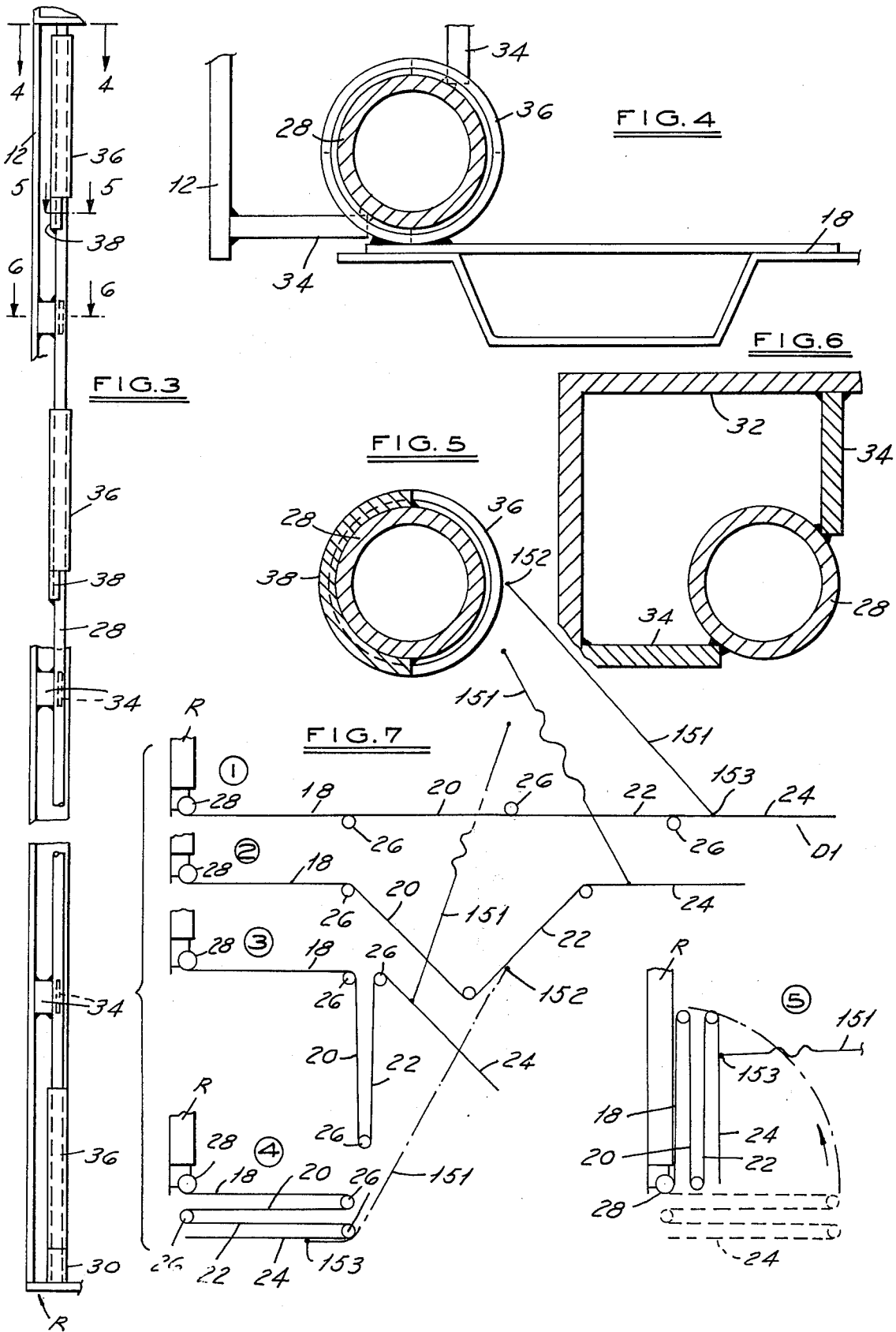
An end closure for a rail car which comprises a pair of foldable doors, each composed of a series of upright hinged panels. The first panel of each door is hinged at one side of the rail car. Each door may be secured across the end of the rail car in closed position when the panels are unfolded. The doors may be opened and secured in open position when the panels are folded and swung inward along the side of the rail car. The intermediate and upper decks of the rail car are formed with recessed or cutout portions to clear the panels when swung inward to open position. Hinged plates close or cover the cutout portions and also serve to hold the doors in open position.

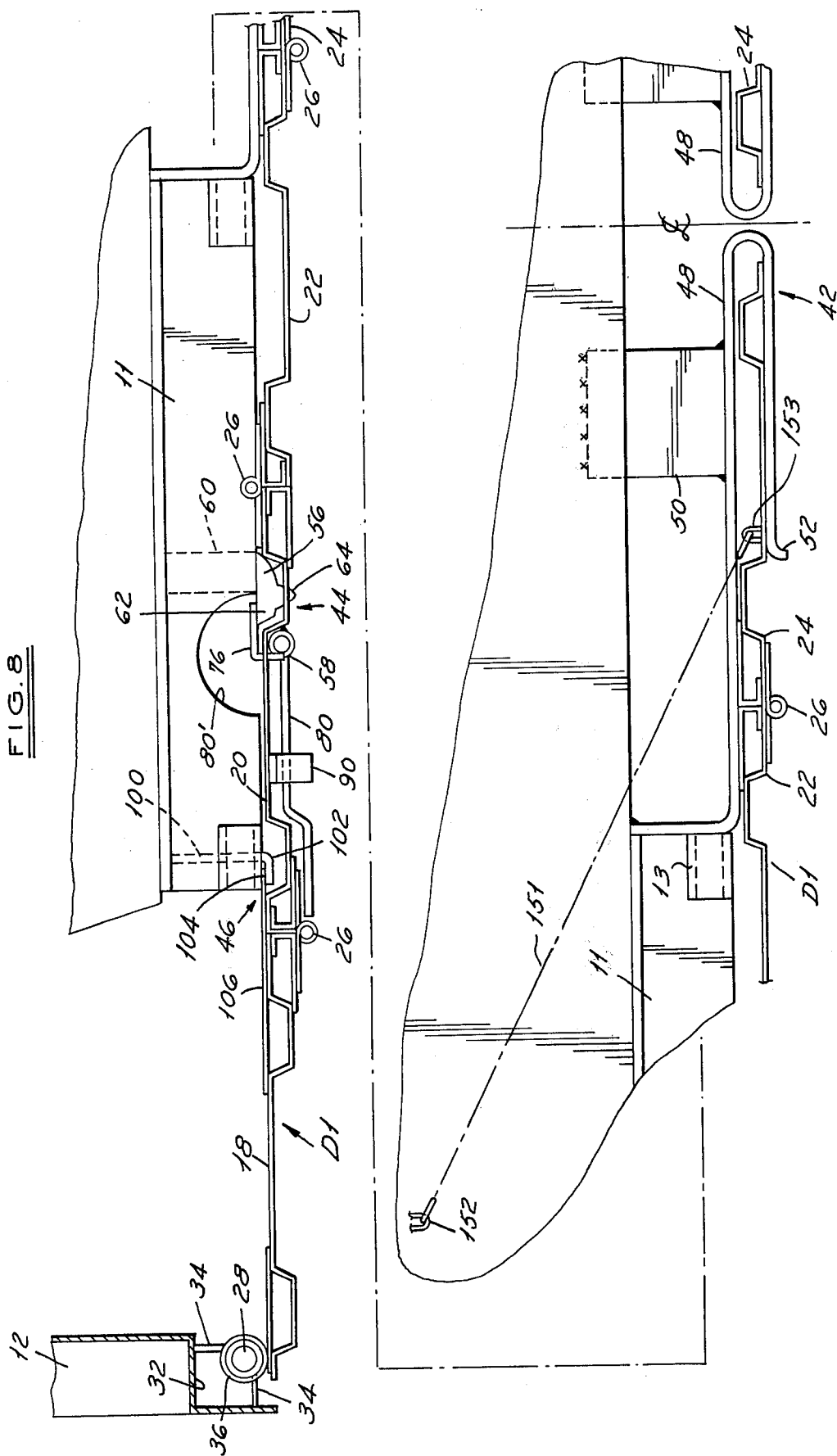
16 Claims, 15 Drawing Figures











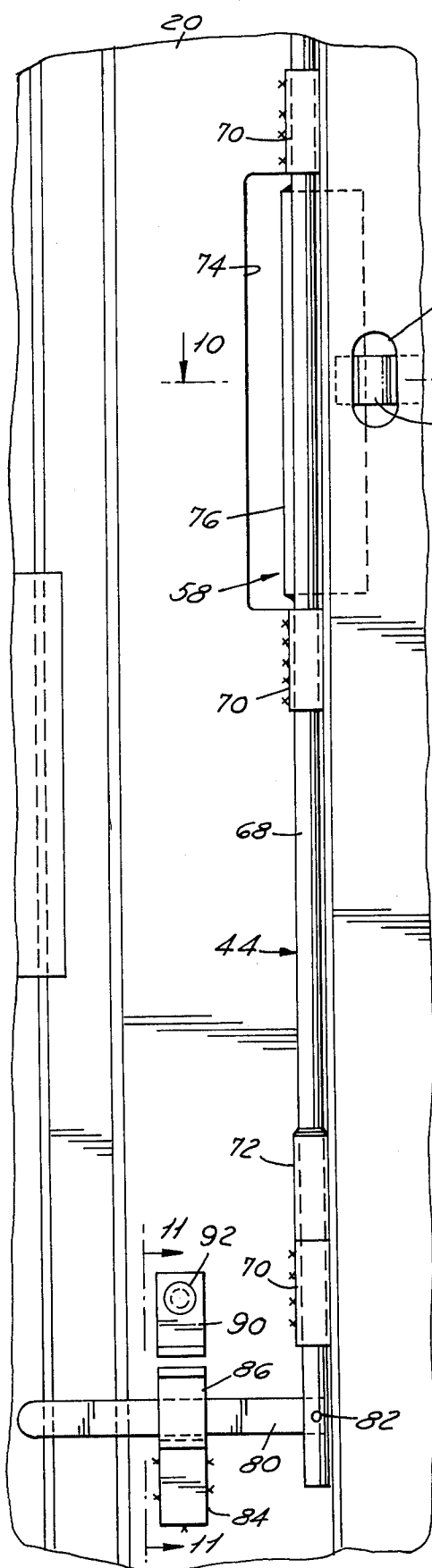


FIG. 9

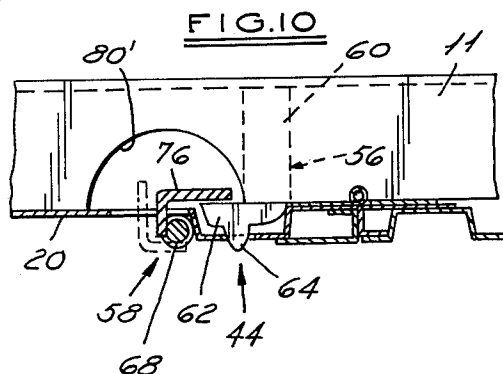
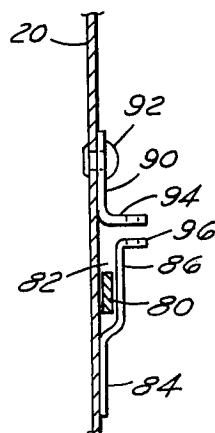


FIG. 10

FIG. 11



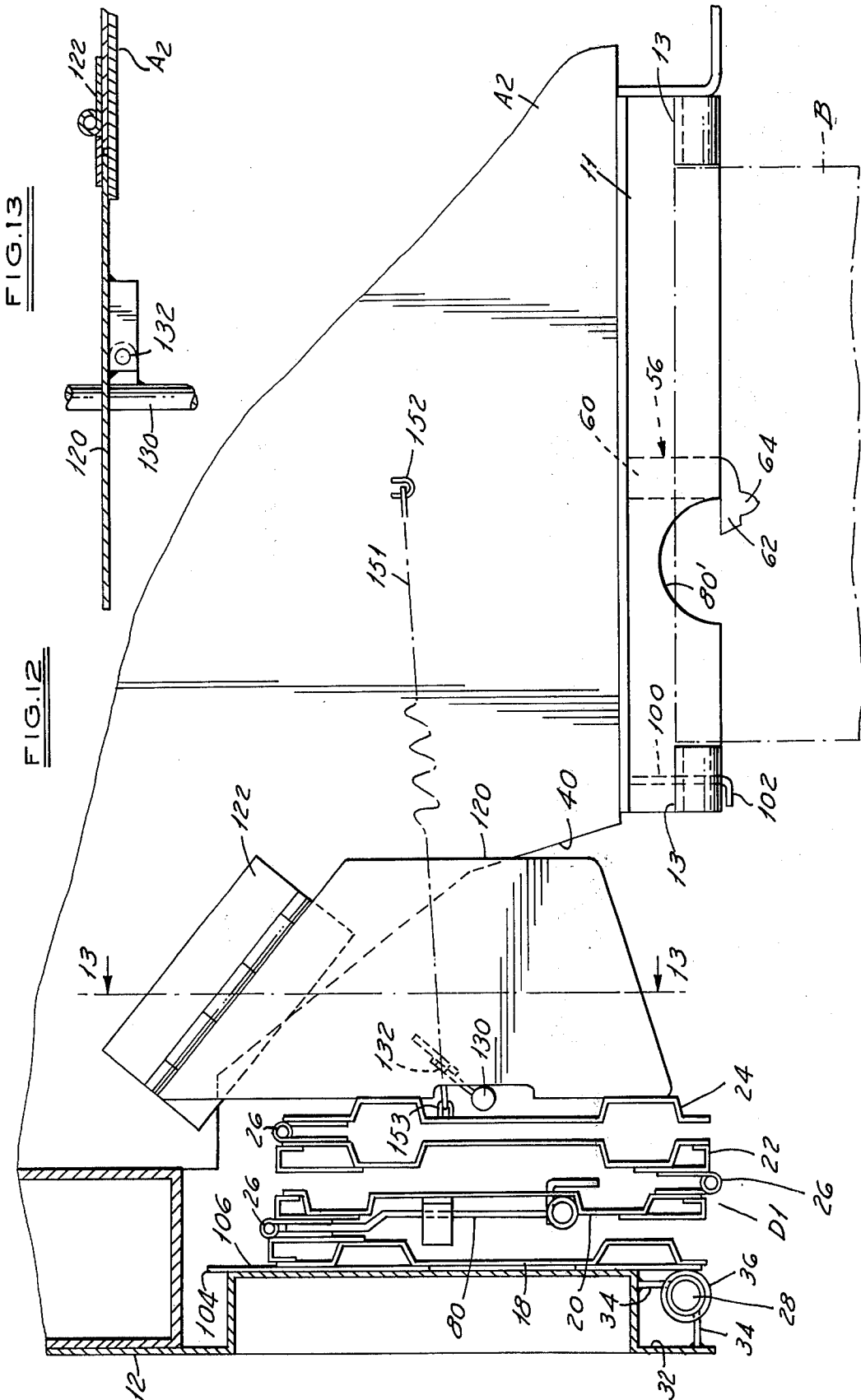


FIG.14

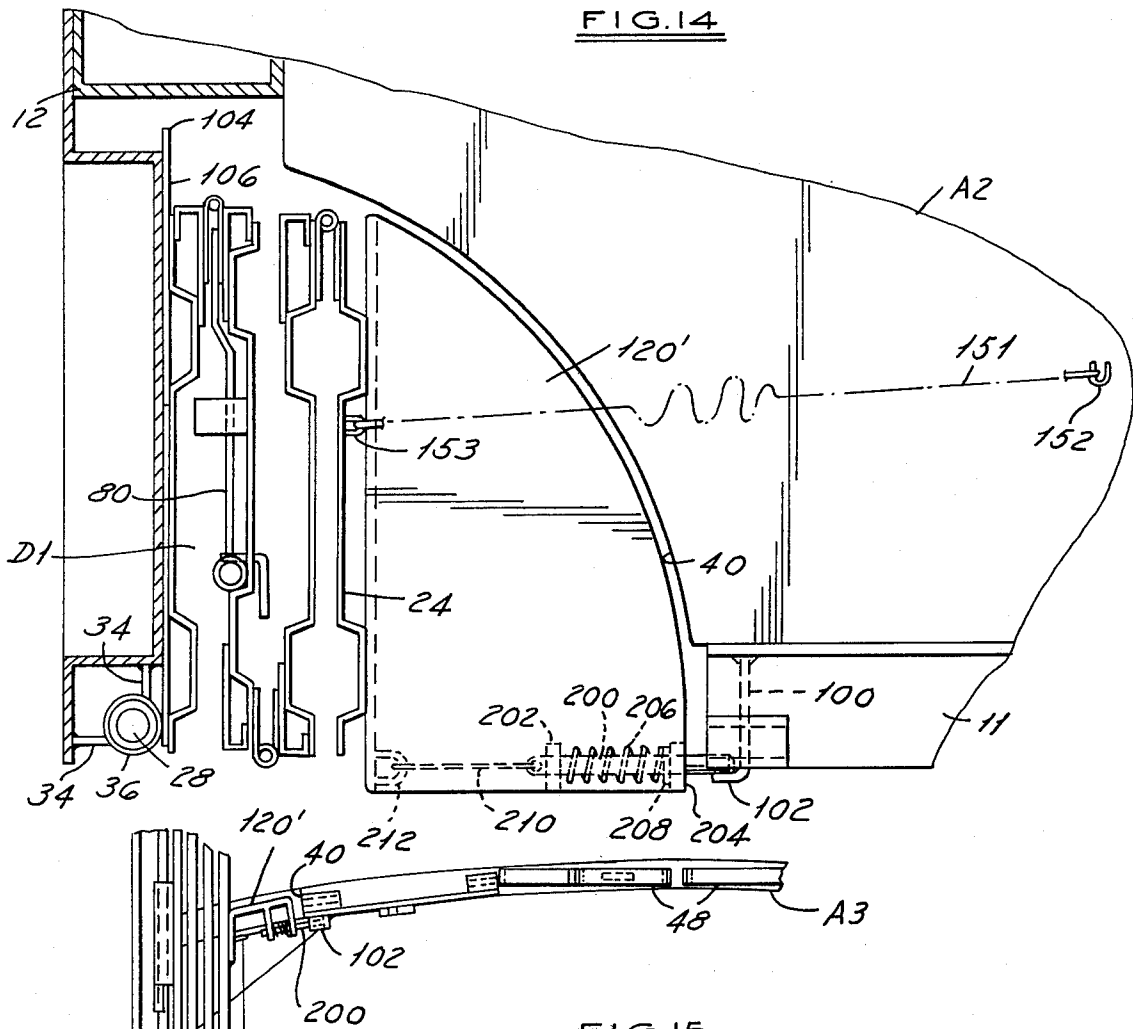
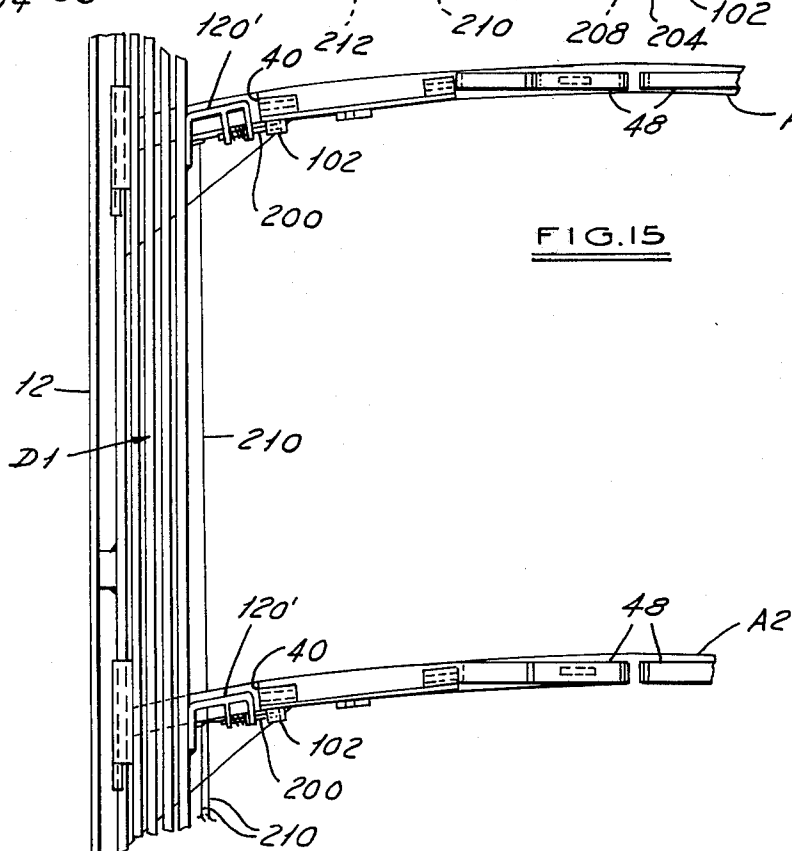


FIG.15



END DOOR FOR ENCLOSED RAIL CARS

SUMMARY OF THE INVENTION

The general object of this invention is to provide an end closure for a rail car which protect the car from illegal or unauthorized entry and which will also protect the contents from flying objects. The closure comprises one and preferably a pair of foldable doors which can easily and quickly be moved from closed to open position. When closed, the panels unfold and extend across the open end of the rail car. When open, the panels fold upon one another and are swung to an out-of-the way place along the side or sides of the rail car.

Further objects of the invention include the provision of means for securing the door or doors in the closed position, such means being readily accessible and easy to operate. Means are also provided for securing the door or doors in the open position. In this connection, the upper and intermediate decks of the rail car are preferably provided with recessed or cutout portions to allow inward swinging of the folded panels to the open position without interference. The means for securing the door panels in the open position will preferably also serve to substantially close or cover these cutout portions when the door or doors are open. This is important from the standpoint of protecting the railroad personnel from injury.

Additional objects are to provide an end closure which is characterized by safety in transit, in particular one having means for preventing the door from swinging out to the rear or beyond the side of the rail car, which has ease of operation and is a relatively simple mechanism.

Other objects and advantages of this invention will become more apparent as this description proceeds and upon reference to the accompanying specification, claims and drawings in which:

FIG. 1 is an end view of a rail car having an end closure constructed in accordance with the present invention.

FIG. 2 is a fragmentary end view similar to FIG. 1 but with most of the end closure structure removed. This view illustrates the means for securing the folded door panels in open position which means also serves to substantially close or cover the cutout portions in the upper and intermediate decks.

FIG. 3 is a fragmentary detail of a portion of FIG. 1 showing the mounting of one of the foldable doors at the side of the rail car.

FIG. 4 is a sectional view taken on the line 4—4 in FIG. 3.

FIG. 5 is a sectional view taken on the line 5—5 in FIG. 3.

FIG. 6 is a sectional view taken on the line 6—6 in FIG. 3.

FIG. 7 diagrammatically illustrates various positions of a foldable door, including the open position, closed position and intermediate positions.

FIG. 8 is a fragmentary top plan view with parts in section showing one of the doors in its unfolded closed position across the end of the rail car.

FIG. 9 is a fragmentary elevational view of a portion of FIG. 1, on an enlarged scale, illustrating part of the means for securing a door in the closed position.

FIG. 10 is a fragmentary sectional view taken on the line 10—10 in FIG. 9.

FIG. 11 is a fragmentary sectional view taken on the line 11—11 in FIG. 9.

FIG. 12 is a fragmentary plan view with parts in section overlooking the intermediate deck and showing one of the doors folded in the open position and held there by the means provided to close or substantially cover the clearance or cutout portion formed in that deck.

FIG. 13 is a fragmentary sectional view taken on the line 13—13 in FIG. 12.

FIG. 14 is similar to FIG. 12 but illustrates a modification.

FIG. 15 is a fragmentary end view of the rail car further illustrating the modified structure of FIG. 14.

Referring now more particularly to the drawings, the rail car is generally designated R and is shown as having the elongated longitudinally extending decks A1, A2 and A3, which in this instance are especially adapted for the transport of road vehicles. A bridge B may be provided to transfer vehicles to and from the rail car or from one car to another, and to support the bridge B, angle bridge supports 11 are secured to the ends of the decks usually having sockets 13 by means of which the bridge may be pinned to the angle bridge support. These angle bridge supports are spaced apart the same distance as the spacing between wheels of the vehicles to be transported, with one flange of the bridge support secured to the end of the deck and the other projecting horizontally outwardly. It will be understood, of course, that the rail car may be used for the transport of any cargo.

The rail car has the side walls 12 and 14, is preferably closed on the top by the roof structure 16 and is open ended. The rail car will also, of course, be provided with wheels, not shown, for running on railroad tracks.

The end closure structure for one end of the rail car is generally designated C and comprises a pair of doors D1 and D2 each adapted to extend across approximately one-half the end of the rail car so that together the two doors provide substantially a full end closure. The doors D1 and D2 are foldable doors and are mirror images of one another so that a description of one will suffice for both. It will be understood that a similar closure may be provided for the opposite end of the rail car.

The door D1 comprises a series of elongated upright or vertical rectangular panels 18, 20, 22 and 24 which are marginally hinged together along their adjacent edges by hinges 26. The hinges provide for alternate folding of the successive panels in opposite directions as will be apparent from the diagrammatic view in FIG. 7. Thus it will be seen that the hinges between the panels 18 and 20 and between the panels 22 and 24 provide for inward folding with respect to the rail car, whereas the hinges between panels 20 and 22 provide for outward folding. The panels may fold upon one another in the manner clearly shown in FIGS. 7 and 12 to open the door, and may unfold into a coplanar relationship to close the door as seen in FIGS. 7 and 8.

These door panels may be of any desired cross section although in the present instance they are shown as being corrugated. The corrugations improve the strength of the structure.

The door D1 is pivotally mounted upon an elongated vertical hinge pin or rod 28 which is disposed at the side 12 of the rail car at one end thereof. As shown in FIG. 3, the hinge rod 28 has its lower end supported in

a socket 30 fixed upon an end corner portion of the lower deck A1 adjacent the side of the rail car. The rod extends vertically upwardly from socket 30 within the recessed portion 32 at the end of the side wall 12, being anchored therein by the anchor plates 34 which may be welded or otherwise permanently secured to the hinge rod and to the recessed portion 32 of the side wall. Preferably this rod is supported by the anchor plates in substantially a true vertical condition despite possible departures from vertical of the rail car side wall structure.

The panel 18 of the door has the aligned vertically spaced tubular hinge members 36 rigidly secured thereto which are sleeved upon the hinge rod for free rotation. The hinge members 36, except the lowermost one, are vertically supported by semi-circular abutments 38 welded or otherwise permanently secured to the hinge rod 28. The lowermost hinge member 36 is supported upon the socket 30. The panel 18 is thus supported on the hinge rod, and it is free to turn enabling it to swing from the closed position of FIG. 8 in which it extends transversely across the end of the rail car to the open position of FIG. 12 in which it extends longitudinally of the rail car along the inner side wall.

FIG. 7 shows diagrammatically the open and closed positions of the door D1 and several intermediate positions. In the No. 1 position, the door D1 is closed with respect to the rail car in which position the panels 18-24 are coplanar and extend transversely across the end of the rail car. In order to open the door, the panels 20 and 22 are folded outwardly to laterally withdraw the end panel 24, after which the panels successively assume the No. 3 and No. 4 positions in which they ultimately are folded upon one another. Thereafter they are swung inward to the open position shown in position No. 5.

Since the door D1 is disposed close to the ends of the upper and intermediate decks A2 and A3, these decks are formed with recessed or cutout portions 40 at their rear side corners to allow inward swinging of the folded panels to the No. 5 position of FIG. 7 without interference. FIG. 12 clearly shows the cutout portion 40 in deck A2, and it will be understood that deck A3 has a similar cutout portion. No such cutout or clearance portions need be formed in the lower deck A1 provided that the doors are mounted above the lower deck as here shown. The rail car is shown as being of the tri-level type but could of course have only one or two decks. The number of decks is not critical.

The door D1 is secured in the unfolded, closed position across the end of the rail car by panel-retaining structure 42, 44 and 46. The panel-retaining structure 42 comprises the generally U-shaped retainers or clips 48 secured to the ends of the upper and intermediate decks A2 and A3. The clips 48 are disposed near the longitudinal center line of the rail car for retaining the door panel 24. As seen in FIG. 8, the clips 48 are return-bent or U-shaped members rigidly secured to the ends of the upper and intermediate decks by brackets 50. These clips 48 define slots which open laterally outwardly to allow the panel 24 to be slipped into and out of the clip with a straight, non-pivotal, lateral sliding movement as will be clear from positions Nos. 1 and 2 in FIG. 7. The legs of the clip may be flexibly resilient and preferably the free leg is turned out where indicated at 52 to facilitate entry of the panel 24. The panel

24 has a tight fit in the clips and is held firmly due to the springy nature of the clips.

The panel 20 is retained against the ends of decks A2 and A3, specifically against the angle bridge supports 11, by the retaining structure 44. Such structure includes hooks 56 carried by the angle bridge supports 11 and the latch mechanism 58 carried by the panel 20. Each hook 56 has a body portion 60 which is rigidly secured to the horizontal flange of an angle bridge support and a projecting hook portion 62. It also has a rearwardly projecting nose 64 which is adapted to extend through a hole 66 in panel 20 in the closed position of the door as shown in FIGS. 8 and 9.

The latch mechanism 58 on panel 20 is disposed along the outer side thereof and includes a vertical shaft 68 which is supported for rotation in the aligned sleeves 70 welded or otherwise permanently secured to panel 20. Tube sections 72 welded or otherwise permanently secured to the shaft 68 rest upon the sleeves 70 to sustain the load.

At about the level of each of the intermediate and upper decks A2 and A3, the door panel 20 is formed with an opening 74 to clear an angle-shaped latch 76. One leg of each latch 76 is secured permanently to the shaft 68 and the other leg is adapted to latch behind the hook portion 62 of a hook 56 in the manner illustrated in FIGS. 8 and 10. It will be noted that the angle bridge support 11 is cut out at 80' to permit the latches 76 to rotate from latching to unlatching positions without interference.

The shaft 68 of the latch mechanism 58 is adapted to be rotated by a laterally projecting handle 80 which is pivoted by pin 82 to the lower end of the shaft where it is easy to reach to permit the handle to swing up and down. FIG. 9 illustrates the shaft 68 in the latched position, that is in the position in which the latches 76 engage the hooks 56 as in FIGS. 8 and 10. It is retained in this position by reason of the handle 80 being disposed within the slot 82 defined between the panel 20 and the keeper 84 secured to the panel. This keeper is a vertical tab whose lower portion is secured to the panel and whose upper portion 86 is spaced from the panel to define the slot 82. The handle 80 can be pivoted upwardly for removal from the open upper end of the slot to enable it to be used to rotate the shaft 68 to the unlatched position, but is normally held in the slot by the pivoted retainer 90 shown as an angle-shaped member having one leg secured to the panel 20 by the pivot 92 and the other leg 94 overlying the slot. This retainer 90 can be pivoted clear of the slot to permit withdrawal of the handle 80, but normally hangs down by gravity in the locking position shown. The retainer 90 may be secured in the position of FIGS. 9 and 11 to lock the handle 80 in the slot by applying a padlock for example across the leg 94 of the retainer 90 and the projecting part 96 of the keeper 84, thereby preventing unauthorized opening of the door.

The retaining structure 46 for door panel 18 comprises angle members 100 permanently secured to the horizontal flange of angle bridge sections 11 on the decks A2 and A3 and having the flange or abutment portion 102 engageable by the projecting lips 104 of the plates 106 secured to the panel 18 when the panel is in the closed or FIG. 8 position. When panel 18 is swung outward from the FIG. 12 position to the FIG. 8 position, the lips 104 engage the abutment 102 to prevent further outward swinging of the panel.

When the door assumes the unfolded closed position of FIG. 8 across the end of the rail car, it cannot fold or move away from the closed position as long as the retaining structure 44 remains latched. This structure holds the panels 20 and 22 firmly against the angle bridge supports 11 of the intermediate and upper decks A2 and A3 so that panel 18 cannot swing inward. Panel 18 obviously cannot swing outward because of the retaining structure 46. The retaining structure 44 also retains panels 20 and 22 from swinging outward and in this manner retains the panel 24 against withdrawal from the clips 42. The nose 64 of the hook 60 engages in the opening 66 of panel 20 to serve as a visual guide to indicate that the latches 76 are properly engaged with the hooks 56.

As stated above, the intermediate and upper decks A2 and A3 have cutout portions 40 to clear the folded panels when they are swung from the No. 4 position to the No. 5 position in FIG. 7. These cutout portions are preferably closed in the open or No. 5 position of the door panels to protect railroad personnel from injury. For such purpose, hinged plates 120 are provided for the intermediate and upper decks, pivoted to such decks by the hinges 122. FIG. 12 shows one of the plates 120 in a substantially horizontal position overlying and substantially closing the cutout portion 40 of deck A2 when the door D1 is in the open, folded position. An identical plate 120 is provided for the cutout in the upper deck A3. The plates 120 are connected together for simultaneous operation by a readily accessible vertical rod 130 which is hinged to the plates 120 by hinge pins 132 that extend parallel to the pivot axes of hinges 122 so that the plates 120 may be withdrawn from the horizontal operation position of FIG. 12 to the raised position shown in dotted lines in FIG. 2 to permit the door D1 to be unfolded and swung outward to the closed position. It will be noted that a similar plate 120 is provided at the level of the lower deck A1 even though no cutout portion in the lower deck need be provided. The plate 120 at the level of the lower deck may be dispensed with but preferably is hinged to the lower end of the operating rod 120 as a means of stabilizing it. The rod is within easy reach of a workman.

As a safety measure, a flexible linear member such as a chain or cable 151 is secured to an eye 152 on the underside of one of the decks and to an eye 153 on the panel 24 of the door. The length of the cable 151 is such that the door cannot swing laterally outwardly beyond the side of the rail car nor rearwardly up to an abutting car. In FIG. 7, position 4 shows the cable taut in the folded, transverse position of the panels. The cable is slack in positions 2 and 3 to permit the panels to swing within a limited range but not rearwardly far enough to hit an abutting car. Panel 24 is directly controlled by the cable. Panel 22, hinged to panel 24 is also controlled by the cable. Panel 18 cannot swing outwardly beyond abutment 102. Panel 20 is controlled by panels 18 and 22. More than one such cable can be employed, if desired.

In use, let it be assumed that the door D1 is locked in the closed position shown in FIGS. 1 and 8. FIG. 7 diagrammatically illustrates the door closed in position No. 1. To open the door, the retaining structure 44 is first released. This is accomplished by rotating the shaft 68 to move the latches 76 to the dotted line position of FIG. 10 with respect to the hook portions 62. The han-

dle 80 is used to rotate the shaft 68 after the handle is lifted out of slot 82.

The panels 20 and 22 are thereafter partially folded to the No. 2 position of FIG. 7, laterally withdrawing the panel 24 from the clips 48. The panels are then successively folded to the positions Nos. 3 and 4 in FIG. 7, after which the folded panels are swung inward to the No. 5 position along the side of the rail car. It will be understood of course that the plates 120 must be retracted to the raised dotted line positions of FIG. 2 to enable the folded panels to be swung inwardly to the No. 5 position. Thereafter the panels 120, by operation of the rod 130, are lowered to the operative substantially horizontal position of FIG. 12 overlying the cutout portions 40 in the intermediate and upper decks A2 and A3. The cutout portions thus are substantially closed to protect the operating personnel from injury. The plates 120 in their operative positions also engage the panel 24 of the open, folded door to retain it in that position.

When it is desired to return the door D1 to the closed position in which its panels are coplanar and extend across the end of the rail car as in position No. 1 of FIG. 7, the plates 120 must first be raised to the dotted line position of FIG. 2 by operation of the rod 130 to release the door.

FIGS. 14 and 15 disclose a modification of the invention. As there shown, the cutout portions 40 in the intermediate and upper decks A2 and A3 are closed by plates 120' which are permanently affixed to the end panel 24 of the door. Plates 120' are mounted on the inner surface of the door panel 24 so as not to be visible from the outside of the rail car when the door is closed. As seen in FIGS. 14 and 15 the plates 120' substantially close the cutout portions 40 when the door is in the closed position. Plates 120' each has a spring-pressed pin 200 which when extended is adapted to engage behind the abutment 102 of the angle member 100 carried by the angle bridge support 11. The pin 200 is slidably supported in guides 202 and 204, and a compression coil spring 206 surrounding the pin bears against the guide 202 and against a fixed collar 208 on the pin to normally urge it to its extended position. The pin is withdrawn so as to be released from the abutment 102 to permit closing of the door by a cable or cord 210 which extends from the end of the pin through an eye 212 on the plate 120' down to the level where an operator can reach it. Preferably the cables or cords from the pins 200 of the plates 120' at each of the intermediate and upper deck levels are connected together for simultaneous operation.

The upper and intermediate decks are crowned as shown in FIG. 15 so that the plates 120' will extend under the decks without interference when the door is closed.

What I claim as my invention is:

1. An end closure for a rail car having upper and lower decks, comprising a foldable door, said door having a series of upright panels, means pivotally mounting the first end panel of the series at one side of the rail car adjacent one end thereof, means hinging all of said panels together so as to fold in overlying relation to one another and to unfold into substantially coplanar relation, said door being adapted to be disposed in closed position across the end of the rail car in the unfolded condition of said panels, means for securing said door in said closed position, said door being adapted to be

disposed in open position in the folded condition of said panels with said panels swung inward about the axis of said pivotal mounting means along one side of the rail car, said upper deck having a recessed portion to clear said folded panels when they are swung inward to said open position as aforesaid, and means for substantially closing said recessed portion in the open position of said door.

2. The end closure defined in claim 1, wherein said means for closing said recessed portion comprises a member mounted on the upper deck for movement between an operative position substantially closing said recessed portion and a position withdrawn therefrom, and means for moving said member from one such position to the other.

3. The end closure defined in claim 2, wherein said member when in its operative position serves to hold said door in its open position.

4. The end closure defined in claim 1, wherein said means for closing said recessed portion comprises a member pivotally mounted on the upper deck for movement between an operative position substantially closing said recessed portion and a position withdrawn therefrom, and a control rod hinged to said member for moving the same from one such position to the other, said member in its operative position serving to hold said door in its open position.

5. The end closure defined in claim 1, wherein said means for closing said recessed portion comprises a member affixed to said door in a position to substantially close said recessed portion when said door is in its open position.

6. The end closure defined in claim 5, wherein said member is affixed to the last panel of the series.

7. The end closure defined in claim 6, including means carried by said member cooperable with a part on said rail car to secure said door in open position.

8. The end closure defined in claim 7, wherein said last-mentioned means comprises a spring-pressed pin normally extended to a position engageable with said part, and means for retracting said pin.

9. The end closure defined in claim 8, wherein said member is affixed to the inner side of said last end panel, and the end of said upper deck is formed to clear said member in the closed position of said door.

10. An end closure for a rail car comprising a foldable door, said door having a series of upright panels, means pivotally mounting the first end panel of the series at one side of the rail car adjacent one end thereof, means hinging all of said panels together so as to fold in overlying relation to one another and to unfold into substantially coplanar relation, said door including in addition to said first end panel a last end panel at the opposite end of the series of panels and two panels intermediate said end panels, first means for securing said door in closed position across the end of the rail car in the unfolded condition of said panels, and second means for securing said door in open position in the folded condition of said panels with said folded panels swung inward about the axis of said pivotal mounting means along said one side of the rail car, said first securing means including an abutment fixed with respect to the rail car and engageable with said first end panel to prevent outward swinging thereof beyond the transverse closed position of said door, said first securing means also including releasably engageable members one of which is fixed with respect to the rail car and the

other of which is carried by an intermediate panel, said members being engageable with one another in the closed position of said door, and said first securing means also including a retainer fixed with respect to the rail car having a slot opening transversely of the rail car in a direction toward said pivotal mounting means adapted to receive the last end panel of the series in the closed position of the door, whereby when said releasably engageable members are released, said intermediate panels can be partially folded to withdraw said last end panel from said retainer slot, said intermediate and last end panels can be folded upon said first end panel, and all of said folded panels can be swung inwardly to said open position.

11. The end closure defined in claim 10, wherein said first end panel is hinged to one intermediate panel for inward folding only, said last end panel is hinged to the other intermediate panel for inward folding only, and said intermediate panels are hinged together for outward folding only.

12. An end closure for a rail car comprising a foldable door, said door having a series of upright panels, means pivotally mounting the first end panel of the series at one side of the rail car adjacent one end thereof, means hinging all of said panels together so as to fold in overlying relation to one another and to unfold into substantially coplanar relation, first means for securing said door in closed position across the end of the rail car in the unfolded condition of said panels, second means for securing said door in open position in the folded condition of said panels with said folded panels swung inward about the axis of said pivotal mounting means along said one side of the rail car, and safety means for restricting swinging of said door when unsecured.

13. The end closure defined in claim 12, wherein said safety means includes a flexible linear member fixed at one end with respect to said rail car and at the other end to one of the door panels.

14. The end closure defined in claim 13, wherein said safety means includes abutment means preventing outward swinging of said first end panel beyond the position it assumes in the open position of said door.

15. An end closure for a rail car comprising a foldable door, said door having a series of upright panels, means pivotally mounting the first end panel of the series at one side of the rail car adjacent one end thereof, means hinging all of said panels together so as to fold in overlying relation to one another and to unfold into substantially coplanar relation, said door including in addition to said first end panel a last end panel at the opposite end of the series of panels and two intermediate panels, first means for securing said door in closed position across the end of the rail car in the unfolded condition of said panels, second means for securing said door in open position in the folded condition of said panels with said folded panels swung inward about the axis of said pivotal mounting means along said one side of the rail car, said first securing means including an abutment fixed with respect to the rail car and engageable with said first end panel to prevent outward swinging thereof beyond the transverse closed position of the door, and safety means for restricting swinging of said door outwardly beyond the end of the rail car and preventing swinging of said door laterally outwardly beyond the side of the rail car, said safety means including said abutment and also including a flexible

9

linear member fixed at one end with respect to said rail car and at the other end to said last end panel.

16. The end closure defined in claim 15, wherein said first end panel is hinged to one intermediate panel for inward folding, said last end panel is hinged to the other

10

intermediate panel for inward folding, and said intermediate panels are hinged together for outward folding.

* * * * *

10

15

20

25

30

35

40

45

50

55

60

65