Dec. 30, 1969 A. G. DEAN ET AL 3,486,464

RETRACTABLE AND EXTENSIBLE RAILWAY CAR DIAPHRAGM

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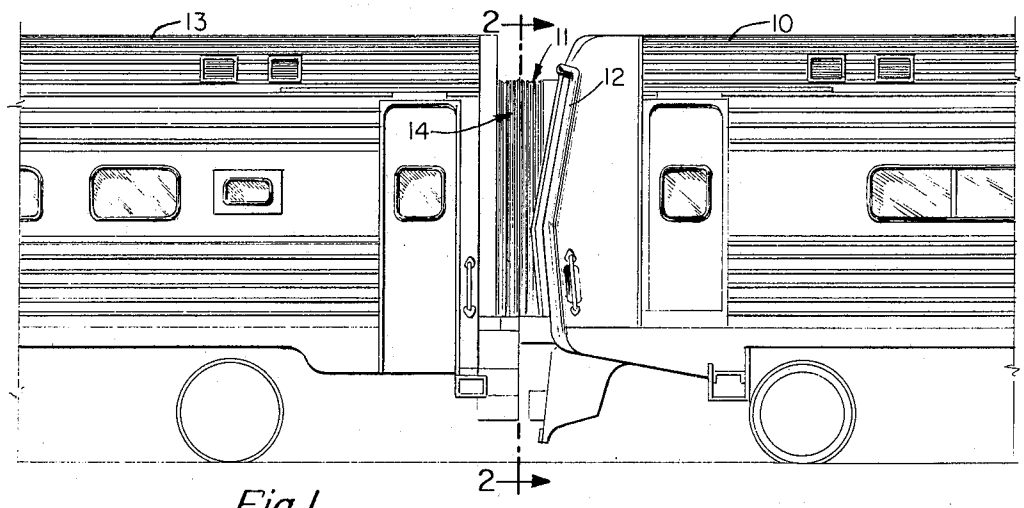


Fig. 1

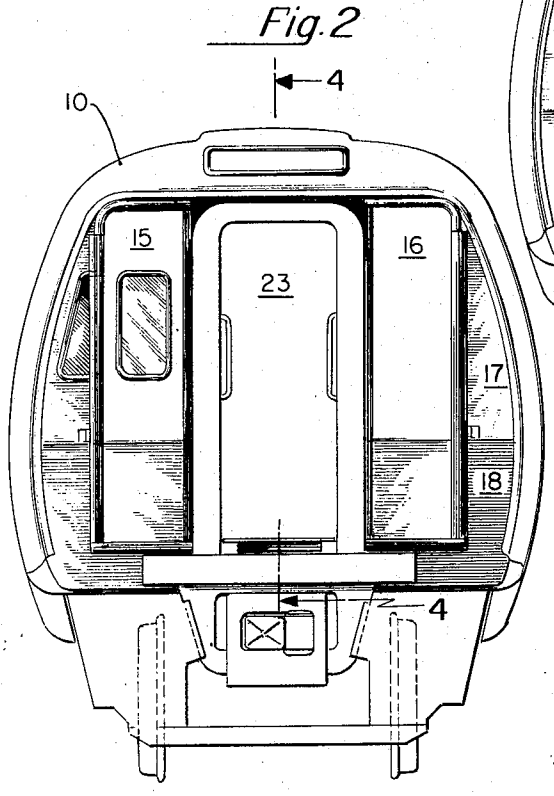


Fig. 2

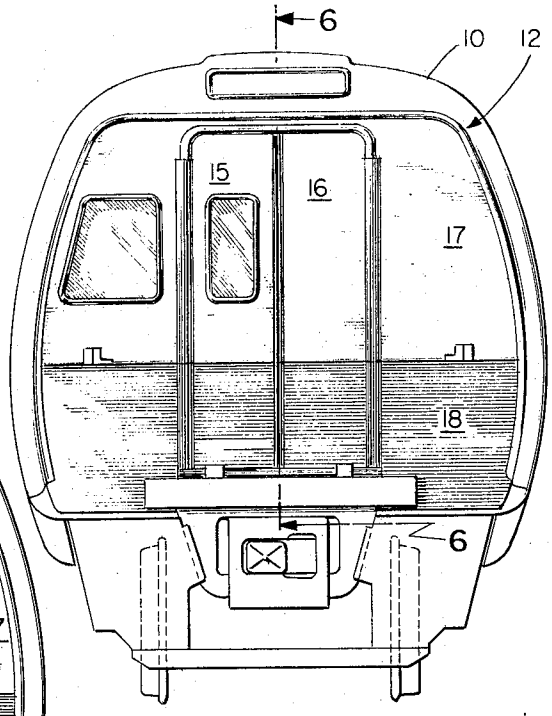


Fig. 3

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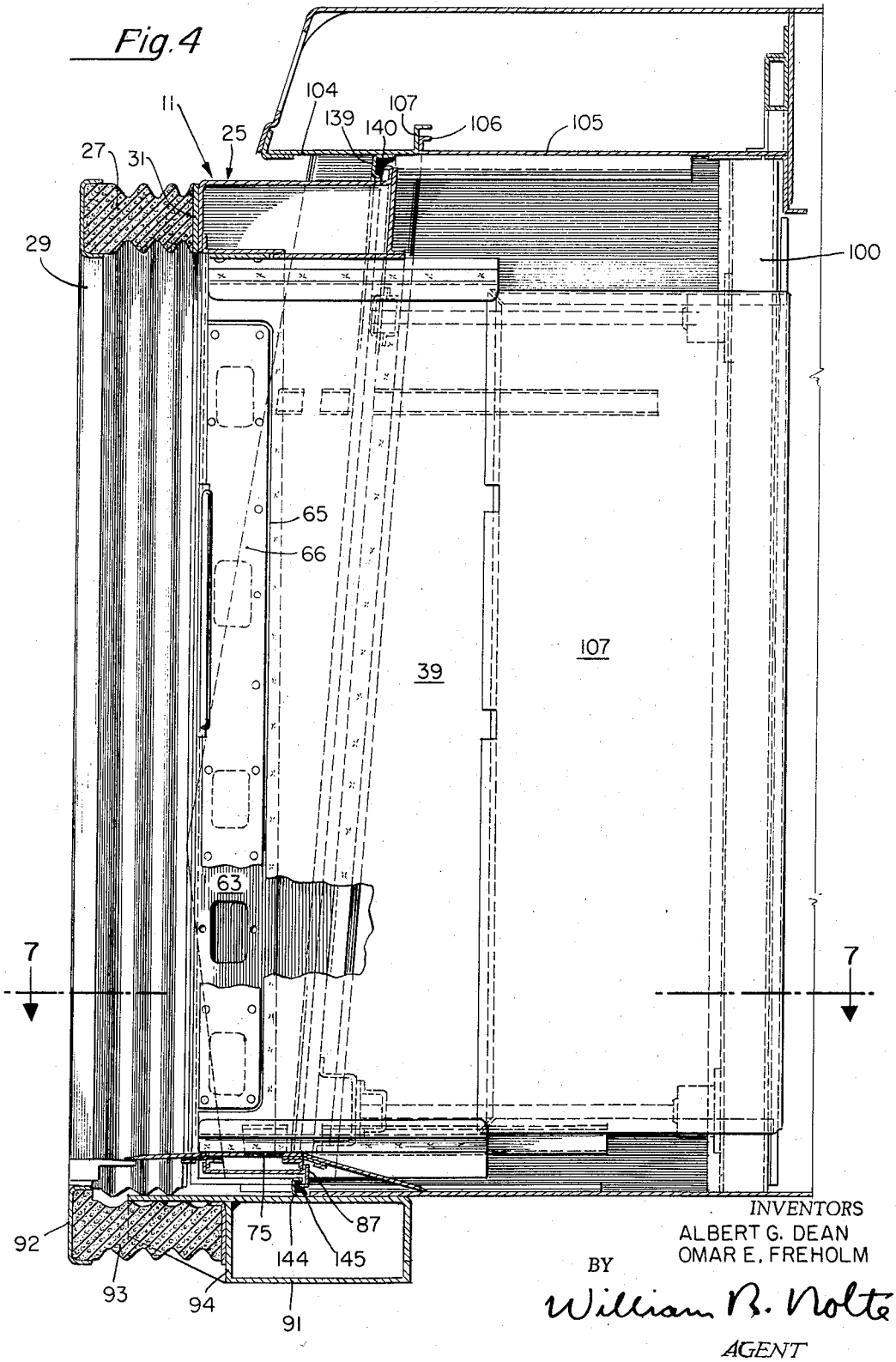
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RETRACTABLE AND EXTENSIBLE RAILWAY CAR DIAPHRAGM

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Fig. 4



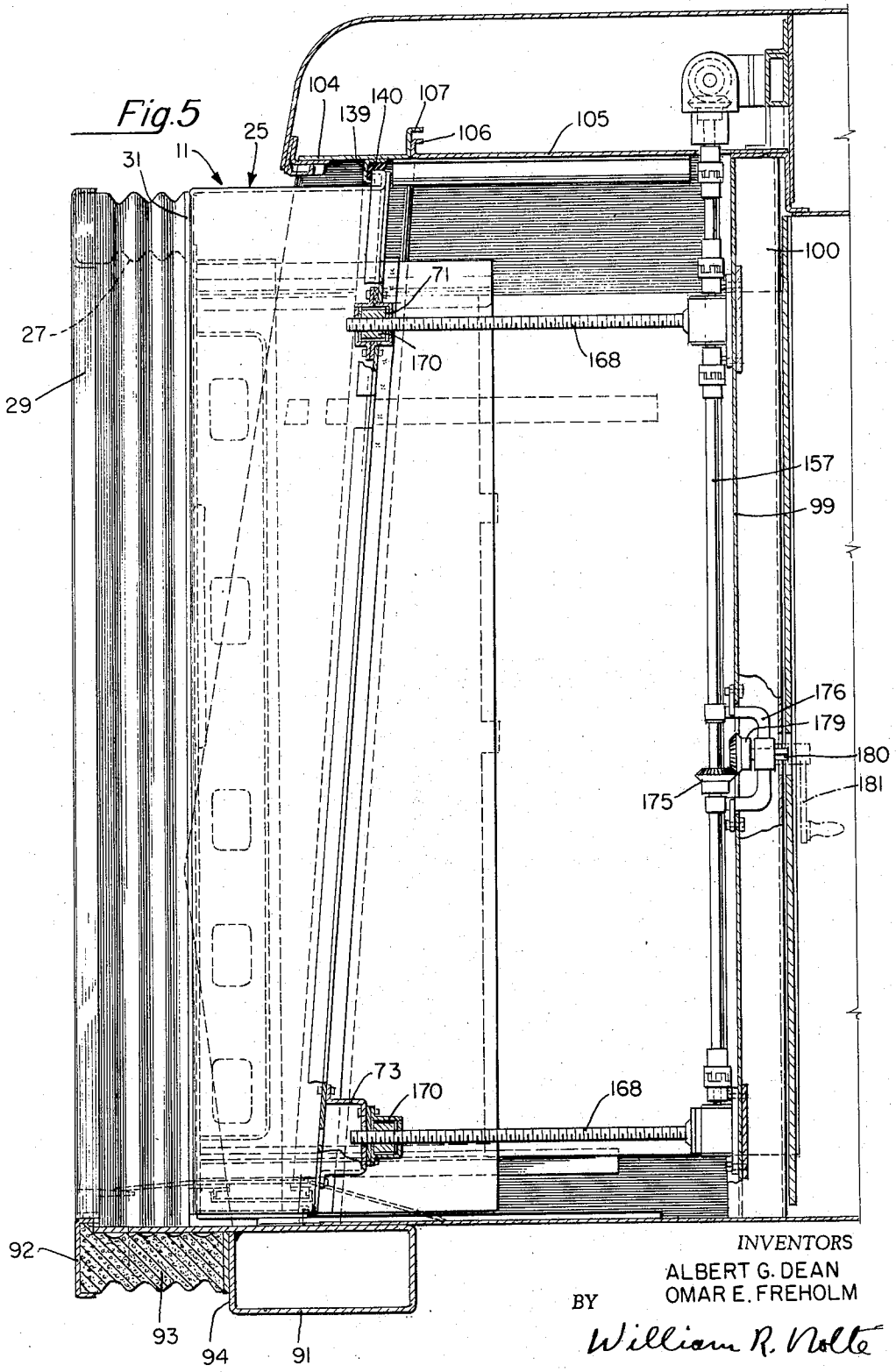
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RETRACTABLE AND EXTENSIBLE RAILWAY CAR DIAPHRAGM

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Fig.5



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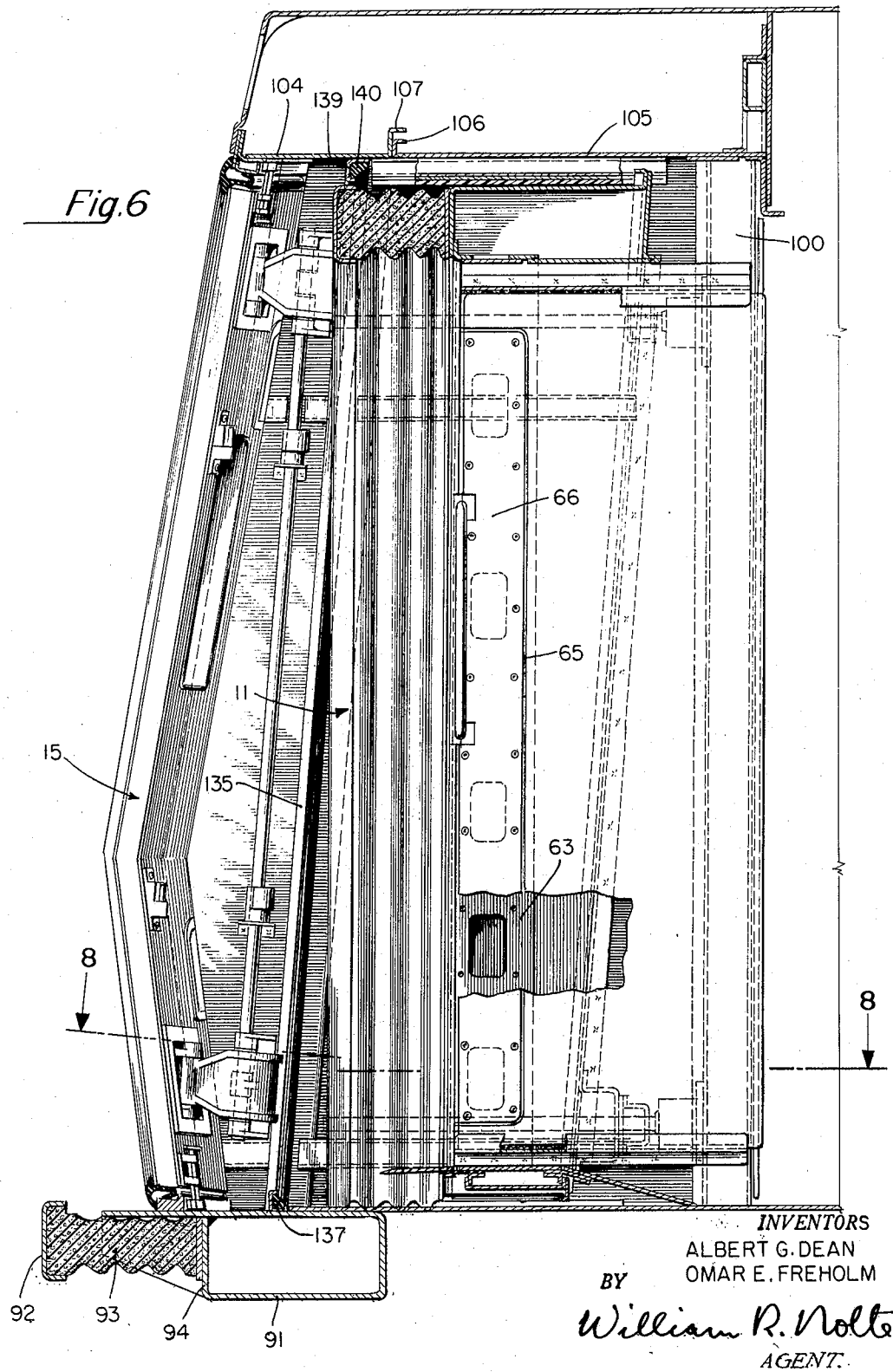
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RETRACTABLE AND EXTENSIBLE RAILWAY CAR DIAPHRAGM

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Fig.6



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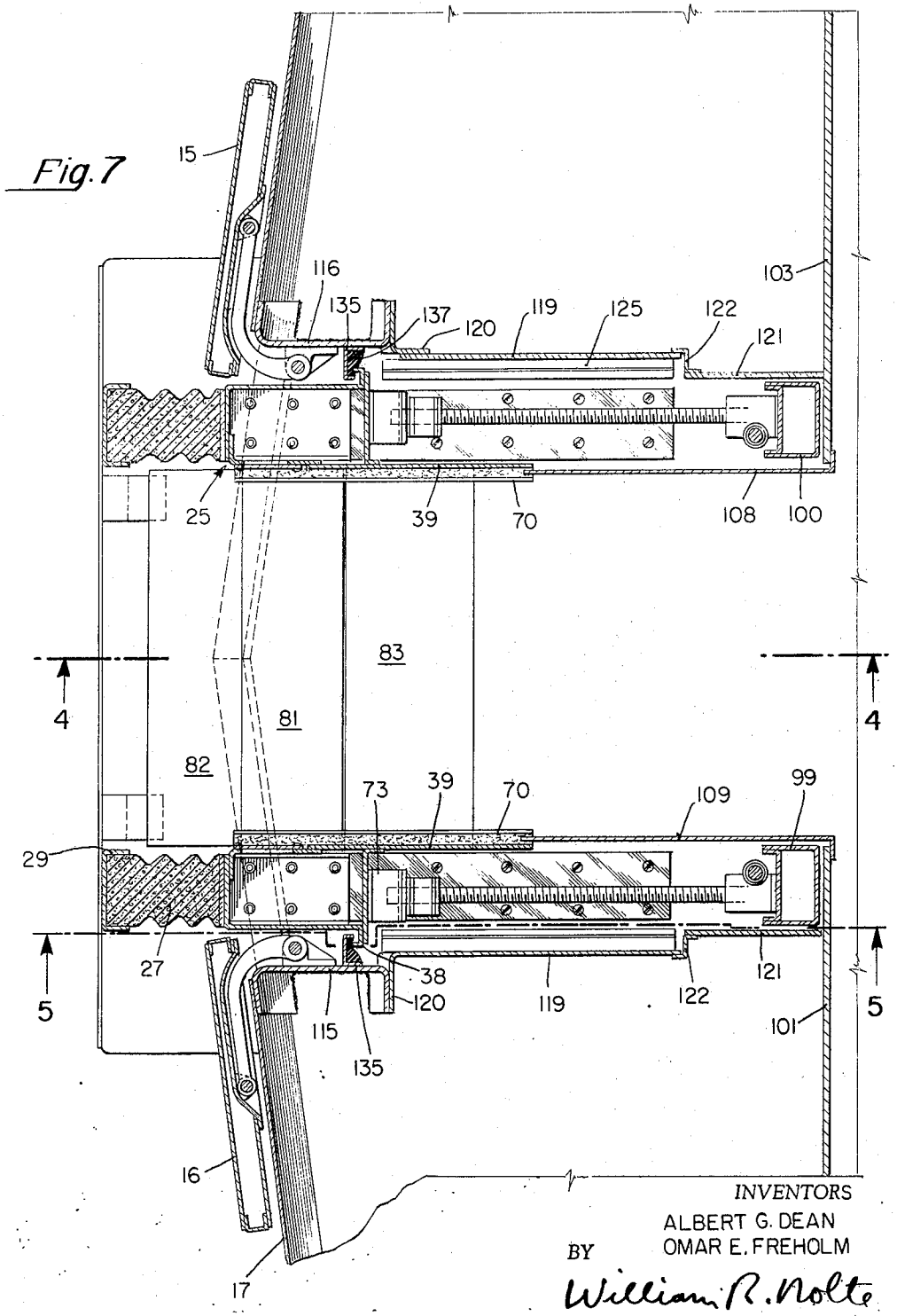
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RETRACTABLE AND EXTENSIBLE RAILWAY CAR DIAPHRAGM

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Fig. 7



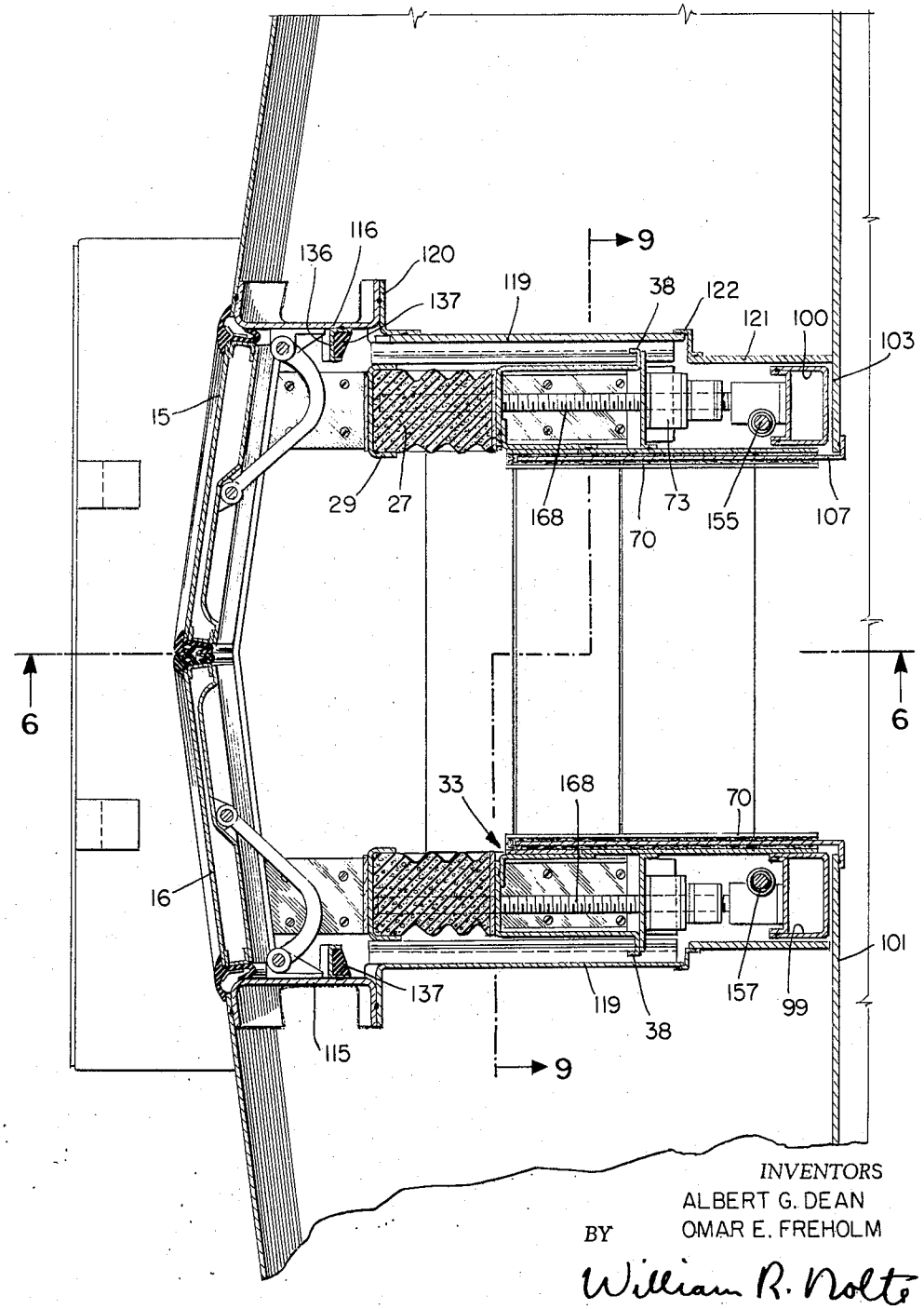
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RETRACTABLE AND EXTENSIBLE RAILWAY CAR DIAPHRAGM

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Fig.8



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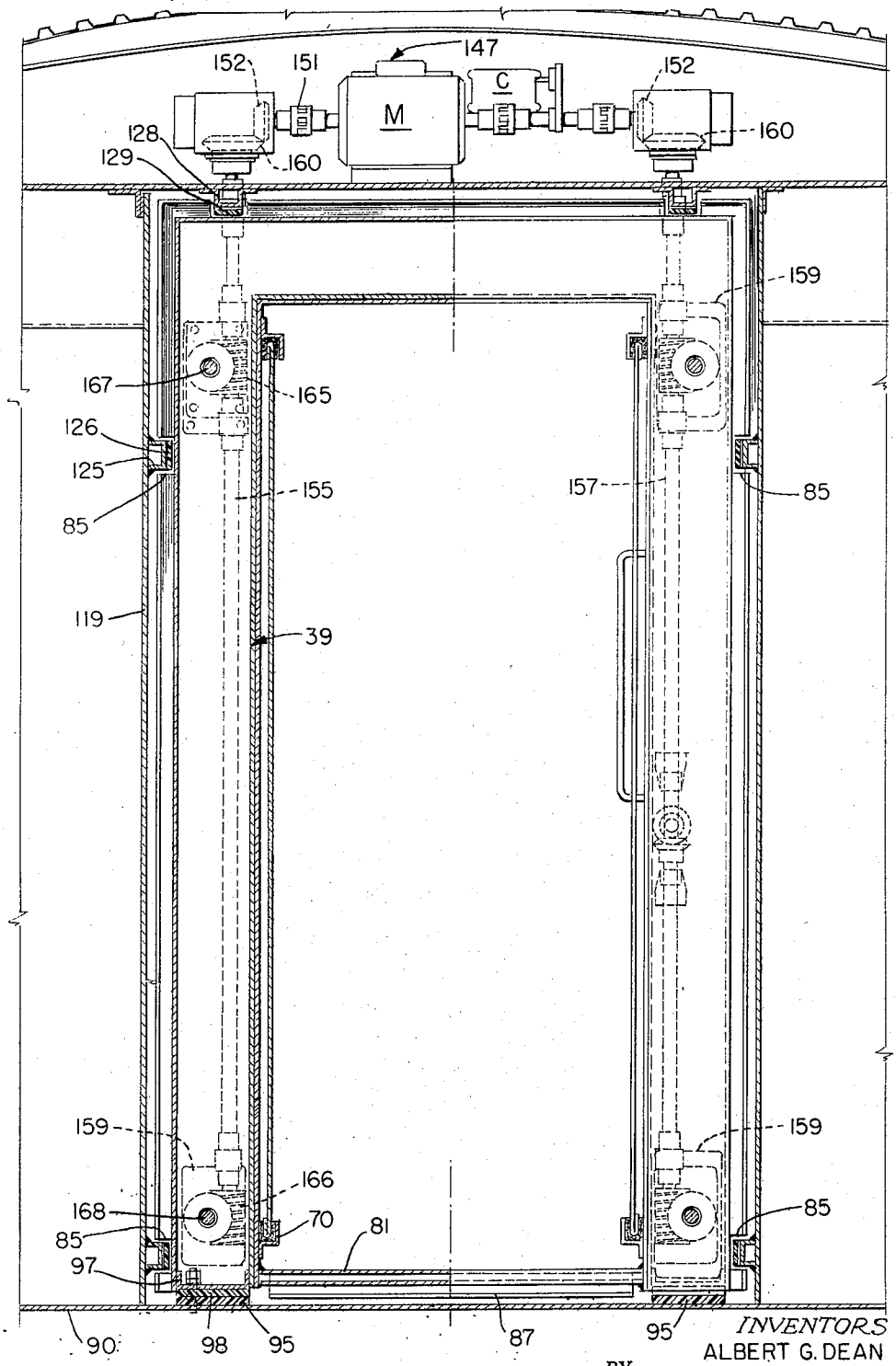


Fig. 9

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RETRACTABLE AND EXTENSIBLE RAILWAY CAR DIAPHRAGM

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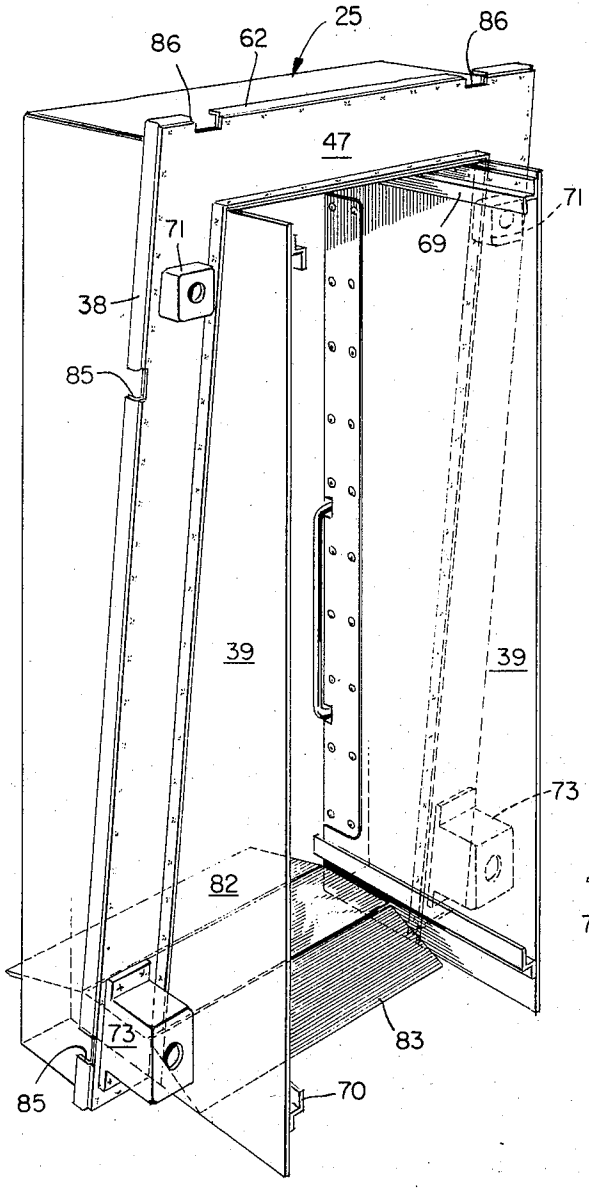


Fig. 10

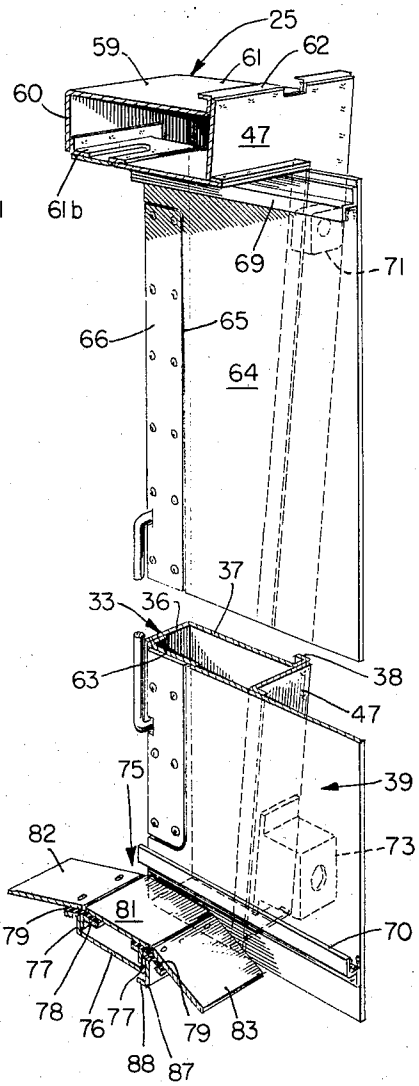


Fig. 11

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RETRACTABLE AND EXTENSIBLE RAILWAY CAR DIAPHRAGM

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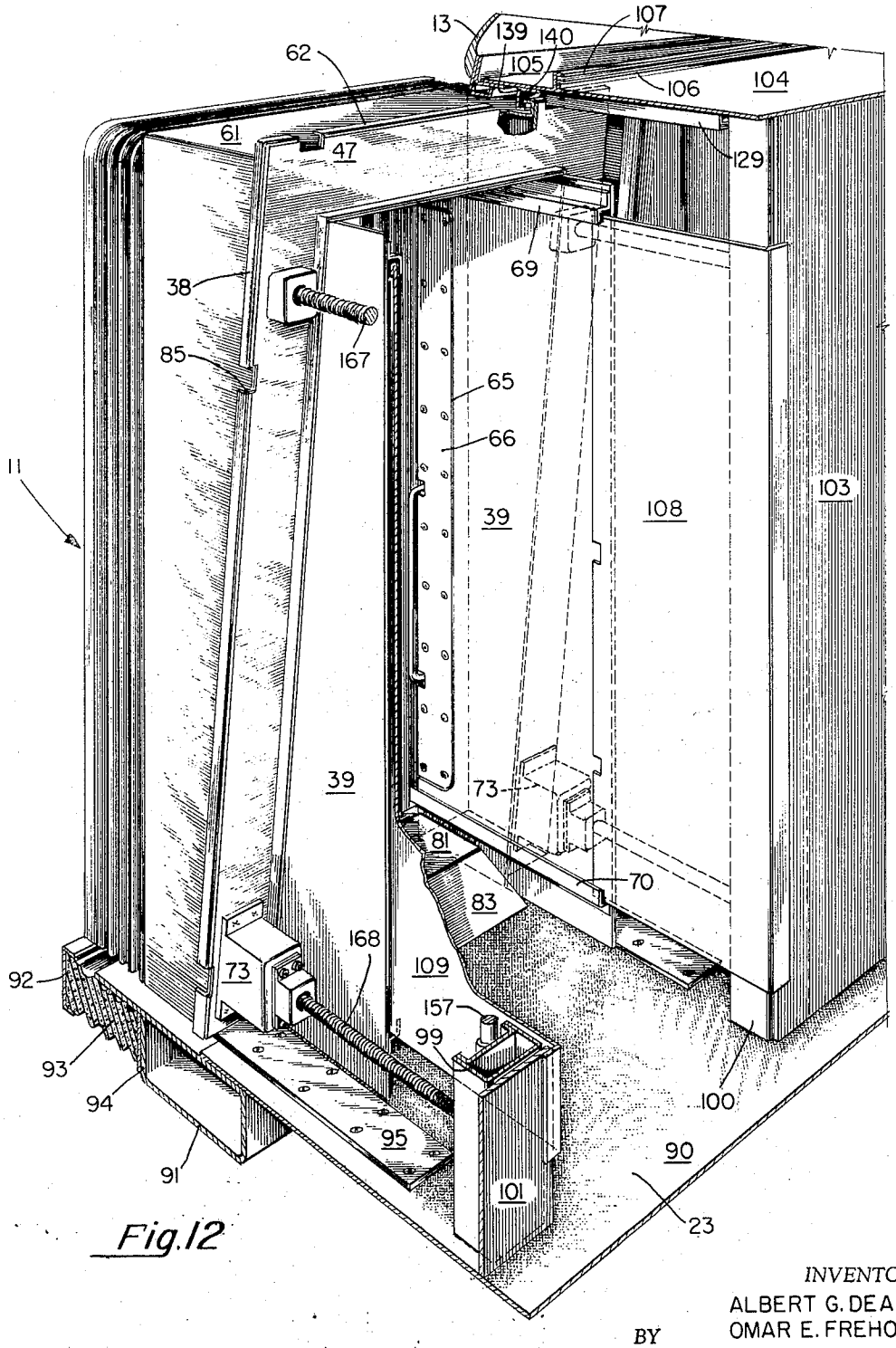


Fig. 12

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United States Patent Office 3,486,464 Patented Dec. 30, 1969

3,486,464

RETRACTABLE AND EXTENSIBLE RAILWAY CAR DIAPHRAGM

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Int. Cl. B61d 17/22; B60d 5/00
U.S. Cl. 105—8 6 Claims

ABSTRACT OF THE DISCLOSURE

An extensible and retractable diaphragm arrangement with an operating mechanism to position the same between its retracted and extended states. The diaphragm is mounted within the vestibule end of a car which has an exterior streamlined nose construction. By-parting vestibule doors are flush with the front end of the car in their closed position but can be swung open in alignment with the front face of the car to permit extension of the diaphragm. A separate frame supports the diaphragm. A diaphragm actuating mechanism consisting of a screw jack arrangement moves the supporting frame in or out to retract or extend the diaphragm.

It has been proposed to provide a railcar having a streamlined nose portion which can operate in an independent coupled first state, and alternatively in a second coupled state. The streamlined end in the latter coupled state may be in working engagement with another car to enable passengers to walk between the cars so coupled. By-parting doors are provided on the streamlined end which enables extension of diaphragm apparatus from within its vestibule to engage a diaphragm apparatus of the next adjacent car. When it is desired to operate the car with a streamlined nose independently of the coupled car, the diaphragm apparatus must be withdrawn into the vestibule of the car and the doors closed once again. Due to the high speeds of operation of the car and its versatility of operating arrangements special problems have been encountered.

It is an object of this invention therefore to provide improved retractable diaphragm apparatus for the streamlined end of a railcar having advantages over prior art arrangements and which has versatility and ease of operation.

For a better understanding of the present invention together with other and further objects thereof reference is had to the following description taken in conjunction with the accompanying drawings and its scope will be pointed out in the appended claims.

In the drawings, FIG. 1 is a side elevational view of a streamlined or slant nosed car in coupled engagement with a flat or blunt nosed car with the diaphragms of the two cars so coupled in working engagement with one another;

FIG. 2 is a vertical view taken along the line 2—2 of FIG. 1 and showing the end of the streamlined car with its diaphragm in a fully extended position;

FIG. 3 is a view similar to that shown in FIG. 2 but with the diaphragm apparatus retracted within the vestibule of the car and with its doors in a closed flush condition;

FIG. 4 is a vertical sectional view taken along the lines 4—4 of FIG. 2 showing the diaphragm apparatus in its fully extended position;

FIG. 5 is a view similar to FIG. 4 showing a portion of the diaphragm actuating mechanism which is effective to move the diaphragm in or out;

FIG. 6 is a vertical sectional view taken along the lines 6—6 of FIG. 3 and showing the slant nosed construction of the front end of the car as well as a portion of the hinge apparatus by which the doors are swung open;

FIG. 7 is a sectional view taken along the lines 7—7 of FIG. 4 showing the lower portion of the diaphragm in its extended position;

FIG. 8 is a sectional view similar to FIG. 7 but taken along the lines 8—8 of FIG. 6 and showing the diaphragm in its withdrawn position into the vestibule of the car and the by-parting doors in their closed state;

FIG. 9 is a vertical sectional view taken along the lines 9—9 of FIG. 8 showing the interior structural arrangement of the frame supporting the diaphragm;

FIG. 10 is a three-quarter perspective view showing the diaphragm frame removed from the vestibule of the car body;

FIG. 11 is a partial view of that shown in FIG. 10 and indicating the cross-sectional construction of the threshold sides and top of the frame;

FIG. 12 is a three-quarter vertical perspective view of the frame with the compressible diaphragm on the front surface thereof and showing the manner by which the screw jack mechanism causes the frame to slide relative to the floor of the car.

Referring now to FIGS. 1 to 3 inclusive of the drawings, there is shown a railway passenger car **10** employing the retractable diaphragm apparatus **11** of the present invention, which extends from its streamlined nose end portion **12**. The retractable diaphragm enables the car to operate either in a coupled state or independently in an uncoupled state. By way of example, the streamlined car **10** is shown coupled with a blunt nosed car **13**, enabling the cars to operate in tandem. Its diaphragm apparatus **14** engages the diaphragm apparatus **11** of the streamlined end of car **10**. The diaphragm apparatus **14** of car **13** is of the type described and claimed in the co-pending application for patents of Albert G. Dean entitled "Railway Car Diaphragm Buffer Structure," Ser. No. 560,311 filed June 24, 1966, now Patent No. 3,399,632, issued Sept. 3, 1968, and assigned to the same assignee as the present application.

As seen in FIG. 2 it is noted that the streamlined end **12** of car **10** includes by-parting doors **15**, **16** which have been swung open. The doors are folded back against the front intersecting panel surfaces **17**, **18** of the car. With the doors so positioned the retractable diaphragm apparatus of the present invention as at **11** is enabled to be extended as indicated also in FIG. 1. Conversely when the diaphragm apparatus is retracted within the vestibule **23** the doors **15** and **16** may be closed as shown in FIG. 3. In this latter state the car **10** is enabled to operate independently to utilize the streamlined configuration of its front end. Certain features of the aforementioned doors **15** and **16** and their associated hinge apparatus are described and claimed in the co-pending application for patent also of Albert G. Dean entitled "Hinge and Door Apparatus," Ser. No. 701,360, filed Jan. 29, 1968, and assigned to the same assignee as that of the present invention.

Referring now to FIGS. 4 and 10 it is observed that the diaphragm apparatus **11** comprises an inverted U-shaped frame **25** with a resilient rubber sponge like diaphragm member **27** also of U-shape configuration extending around the front faces of two upright sides and the top of the frame. A front face plate member **29** which is of a channel construction engages the front portion of the cushion member and a rear sandwich plate member **31** supports its rear surface. The latter plate may in turn be suitably secured to the front face of the frame **25**.

As best seen in FIGS. 10, 11 the sides and the top of the frame **25** are of hollow box construction. Each side

or leg 33 consists of an outer side angle 35 having a front flange which defines a front face 36 and a side flange defining an outer face 37, the latter terminating in a forwardly turned lip portion 38. An inside composite plate member 39 is joined at its forward end to the front flange 36 and extends a distance beyond rear U-shaped plate 41 which closes the rear portion of the hollow frame. It will be noted that each of the depending side portions of the frame are of tapering cross-sectional area, being wider at the top than at the bottom. The top transverse portion of the U frame likewise consists of an outermost or top angle member 59 having a vertical front face flange portion 60 and a top horizontally disposed planar surface 61 which terminates in with forwardly inclined lip portion 62. An inside or lower composite plate 61*b* closes off the inside top of the frame by extending between flange 60 and plate 47. The aforementioned composite vertical side plates 39 consist of an apertured inner angle member 63 which is overlapped by a much wider vertical plate 64. The latter includes a cut-out as at 65 to accommodate a removable plate 66 which may be suitably secured to the first mentioned angle plate 63. The removal of plate 66 enables access within the hollow frame to permit installation and disassembly of the aforementioned cushion member 37 and face plate 29 which constitutes the diaphragm. An upper horizontally disposed slide angle track 69 and a like disposed lower slide track 70 are secured to the inside faces of side plates 39 and serve a purpose which will be later described. Upper hollow spacing fittings 71 and a lower larger spacer fittings 73 are affixed to the rear end plate 47 of the hollow frame and serve to mount the drive apparatus for extending and retracting the frame. In addition a threshold apparatus 75 extends between and is affixed to the bottom inside surfaces of the side plate 39. The threshold consists of a lower channel member 76 having its opposed flanges 77 extending in an upright orientation, and includes angle members 78 received between the upright flanges 77. A flexible rubber-like flap member 79 overlaps the top flange of the angles so as to have a free portion extending beyond the channel member 76. A central plate 81 overlaps portions of the flap elements and is secured to the aforementioned angle members 78. In addition forward threshold plate 82 is secured to the foremost flap 79 and a like rear threshold plate 83 is secured to the trailing flap member 79. Since the flap elements are of resilient material the plates 82 and 83 are suitably hinged by the former material constituting the flap.

With reference to FIG. 10 it is noted that the aforementioned inturned lip portion 61 of the frame includes a pair of cut-outs 85 spaced along the length of the lip and in a similar manner the topmost inturned lip 62 likewise includes cut-outs as at 86 to enable tracking of the frame during its fore and aft motion. In addition the aforementioned threshold device 75 also includes a downwardly extending angle member 87 having an inturned lip portion as at 88 which functions in a manner similar to the lip portions 61, 62 to provide sealing engagement as will later be described.

Referring now to FIG. 12 it is noted that the vestibule structure of the front end of the car consists of a vestibule floor plate 90 which rests upon hollow end sill 91 of the floor frame of the car. Resilient buffer plate 92 including resilient buffer cushion means 93 are suitably secured to the front surfaces of the end sill 91 as at 94. In order to permit fore and aft sliding movement of the diaphragm frame 25 relative to floor 90, spaced apart bearing plates 95 are secured to the floor. As seen in FIGS. 8 and 9 the bottom of the frame 33 includes in each leg portion thereof a transverse channel member 97 having a sheet of bearing material 98 affixed to its lower surface thereof. The weight of the diaphragm frame is thus transmitted through bearing plate 98 into sliding contact upon the aforementioned bearing strips 95 affixed to the floor 90 of the vestibule.

Referring now to FIGS. 7 and 12 it is noted that the vestibule 23 includes upright rear posts 99, 100 which support end back vertical plates 101 and 103 defining the rear end of the vestibule. The posts moreover at their top extremities support the upper ceiling plates 104, 105, see FIG. 4, which are joined along angular lip portions 106, 107 respectively. Vertical wraparound plates 108 and 109, FIG. 12, are likewise supported by the aforementioned vertical posts 99, 100. The aforementioned plates 108, 109 overlap the previously referred to composite side plates 39 of the frame 33. The top and bottom edges of the aforementioned side plates 107, 109 are received in the slide tracks 69, 70 affixed to side plates 39.

As best seen in FIGS. 7, 8 and 9 the vestibule structure at its forward ends includes a pair of collision posts 115 and 116 of channel shaped cross-section which are disposed forwardly of the previous mentioned posts 99 and 100. A vertically disposed panel 119 disposed in a fore and aft direction is secured at its forward end to the aforementioned collision post 116 by angle member 120. A second panel 121 is disposed a slight distance inboard of panel 119 and is connected to it by means of Z connector 122. The rear end of the panel 121 is likewise secured to the aforementioned rear post 120 and abuts along its edge to the previously referred to rear plate 103. As seen in FIG. 9 a pair of slide guides, each in the form of a channel 125, and having a layer of bearing material 126 thereon are provided top and bottom along the vertical length of panel 119 to guide the fore and aft movement of the frame 33. Similar guides 128 having bearing surfaces 129 are disposed in fore and aft direction to control the movement of the frame 33. It is noted (see also FIG. 12) that the guides 129 are received within the cut-outs 80 along the top lip of rear plate member 47.

Referring to FIGS. 6, 7 and 8 it is noted that the inboard faces of collision posts 115, 116 include channel members 135 extending in a slightly vertical direction from the floor to the ceiling of the vestibule area. A resilient rubber-like cushion material 137 is received within the channel members. When the diaphragm frame 33 is moved from its withdrawn position as indicated in FIG. 8 to its extended position as indicated in FIG. 7 the outward extending lips 61 projecting beyond the outside faces of the frame coact with the aforementioned cushion material 137. Moreover as seen in FIG. 12 the top of the rear plate 47 of the diaphragm frame 33 likewise engages a similar channel and seal 139 and 140 respectively. Furthermore, referring to the view indicated in FIG. 4 it is noted that the aforementioned downwardly depending lip portion 87 at the bottom of the threshold member 75 engages a like transverse angle 144 and cushion member 145. Thus it is noted that in the extended position of the diaphragm frame apparatus the same forms a weather-tight seal with the remaining structure of the vestibule thereby preventing the entry of noise, dirt and the like.

Referring now to FIGS. 5 and 9 it is noted that a drive system as indicated by reference character 147 is provided to actuate the aforementioned retractable diaphragm frame 25. For this purpose a motor M provided with a suitable source of electrical energy, rotates, through composite top shaft 151, a pair of bevel gears 152 disposed on its opposite ends. A limit switch device 153 is effective to count the number of rotations of shaft 151 and control its rotation in the desired direction. A pair of vertically disposed composite shafts 155 and 157 are suitably secured as by bracket devices 159 to top and bottom portions of the aforementioned vestibule posts 100 and 101. Rotative power from the horizontally disposed upper beveled gear units 152 is transmitted to bevel gears 160 secured to the tops of shafts 155 and

157 respectively. Shafts 155 and 157 each include upper and lower threaded worm gear elements 165, 166 respectively at the level of the brackets 159 which engage thread wheel element 167 keyed to threaded shafts 168 disposed at right angles to the first named shafts. As best seen in FIG. 5 the forward ends of the latter shafts 168 are threadedly engaged with captive nut means 170 which in turn are suitably secured to the aforementioned upper and lower spacer fittings 71, 73 respectively.

Alternative manual means are provided in lieu of the electrical drive by motor M to actuate the diaphragm frame and its cushion diaphragm element 27. For this purpose shaft 157 includes a bevel pinion gear 175 affixed thereto midway along its length. Bracket support means 176 are likewise provided and secured to the upright post 99. The bracket which is U shaped in form includes a mating bevel pinion gear 179 which meshes with the aforementioned bevel gear 175. The bevel gear 179 includes a stub shaft portion 180 which is mounted for rotation in and extends through the bracket and the upright post. A crank arm 181 may be affixed to the end of the shaft 180 and rotated in the desired direction to transmit motion through the drive shaft to either retract or extend the diaphragm apparatus.

While there has been described what at present is considered the preferred embodiment of this invention it will be obvious to those skilled in the art that various changes and modifications may be made therein without departing from the invention, and it is therefore aimed in the appended claims to cover all such changes and modifications as fall within the sphere of this invention.

What is claimed is:

1. In a railcar having a nose portion defining a streamlined surface, door means movable between a closed position and an open position, said door means defining a portion of said streamlined surface when in their closed position and movable to an open position to provide a doorway opening in said streamlined surface, vestibule means including a floor, ceiling and sidewalls, diaphragm means mounted for movement between a retracted position completely housed within said vestibule means to an extended position projecting forwardly of said doors in their open position, and drive means for moving said diaphragm means between its retracted and extended positions.

2. In the railcar as set forth in claim 1 wherein said railcar includes buffer means extending forwardly of said nose portion and includes a resilient buffer face plate, and wherein said diaphragm means include inverted U-shaped frame means comprising a top portion and leg portions extending downwardly to said floor, threshold means

extending between the leg portions adjacent said floor, diaphragm cushion and face plate means secured to said frame means, said face plate means upon movement of said diaphragm means to its extended position being coplanar with said buffer face plate.

3. In the railcar as set forth in claim 2 wherein said drive means include motor and drive shaft means mounted to said vestibule means, and further including driven shaft means connected to said drive shaft means and said downwardly extending leg portions, to cause said diaphragm means to be moved between its retracted and its extended positions.

4. In the railcar as set forth in claim 3, including, gear means associated with said driven shaft means, and crank means connectible with said last named gear means, whereupon manual rotative movement of said crank in one direction is effective to move said diaphragm means in one direction to retract the same and upon manual rotative movement of said crank in opposite direction is effective to move said diaphragm means to its extended position.

5. In the railcar as set forth in claim 2, including, first seal means, secured to said floor ceiling and sidewalls encircle said vestibule, and second seal means secured to said top portion, said leg portion and said threshold, said second seal means being movable into cooperative sealing engagement with said first sealing means upon movement of said diaphragm means to its said extended position.

6. In the railcar as set forth in claim 2, including spaced apart bearing strip means disposed parallel to and on opposite sides of the longitudinal axis of said car, said bearing strip means being interposed between said floor and said downwardly extending leg portions of said diaphragm means, said bearing strip means supporting said diaphragm means during movement of the latter between its retracted and extended positions.

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U.S. Cl. X.R.

105—10, 15, 17, 21