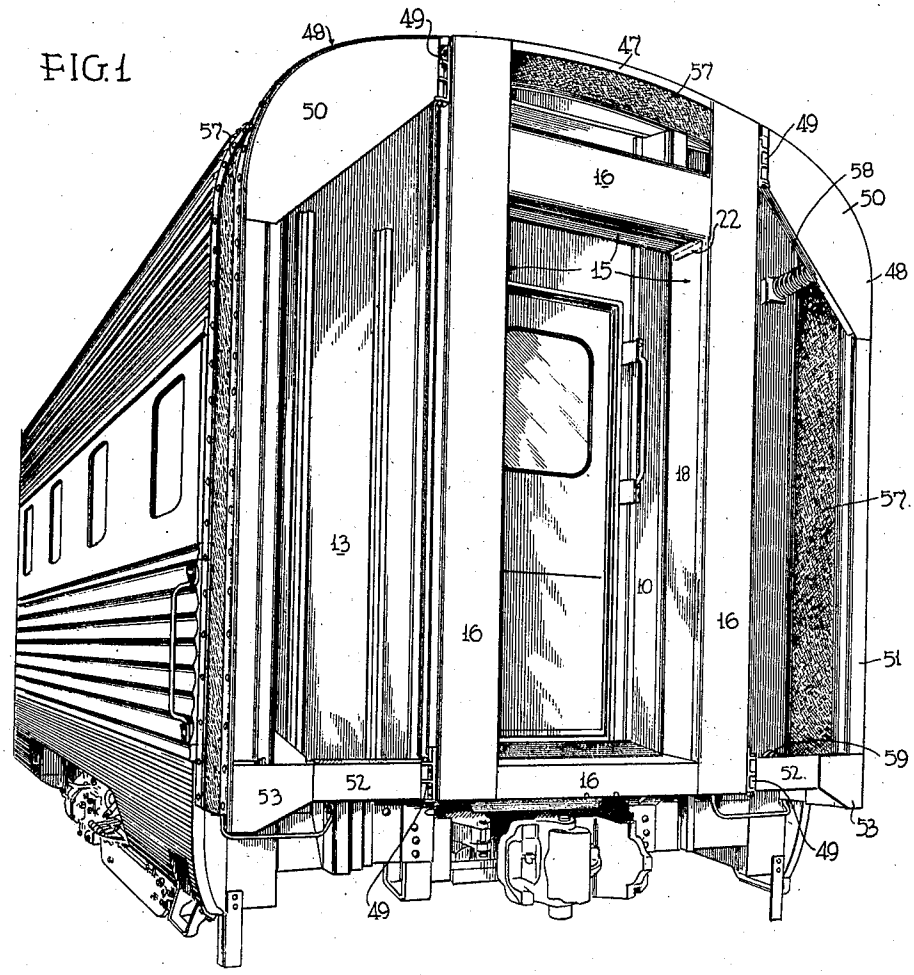
Jan. 19, 1943. A. G. DEAN 2,309,073

DIAPHRAGM FACE PLATE

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FIG. 1



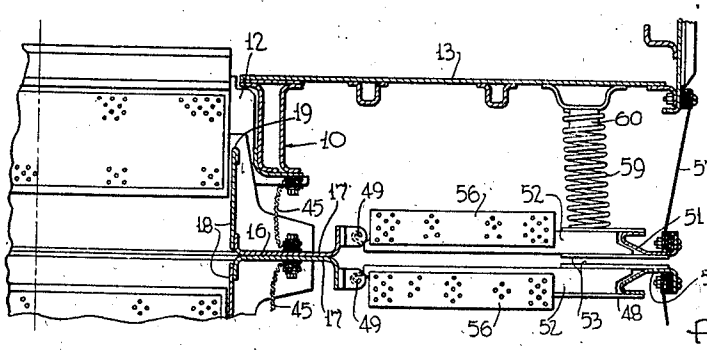


FIG. 6

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DIAPHRAGM FACE PLATE

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FIG. 2

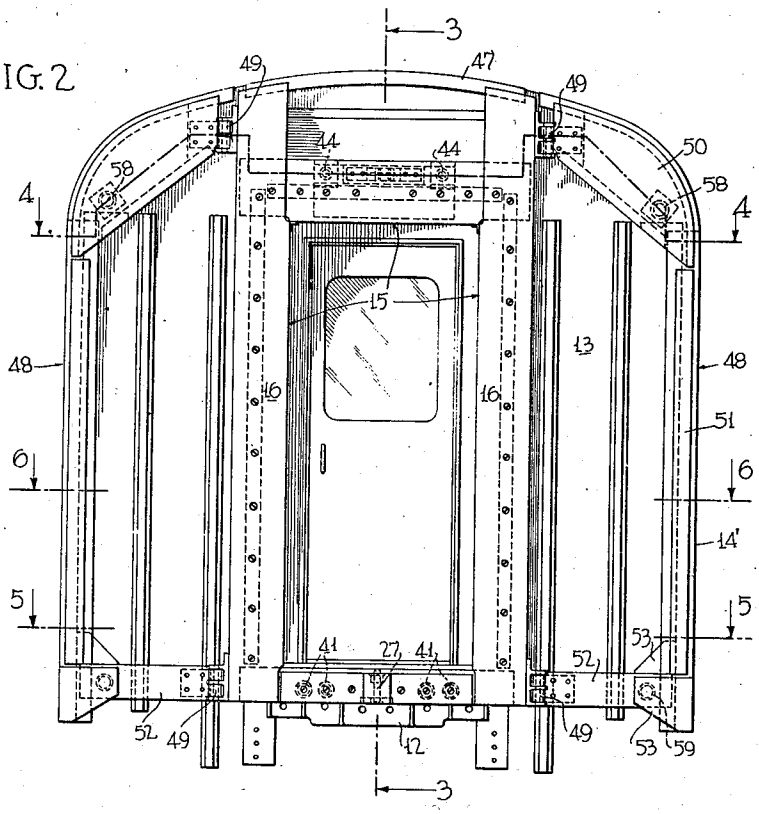


FIG. 8

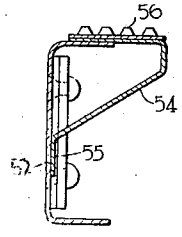
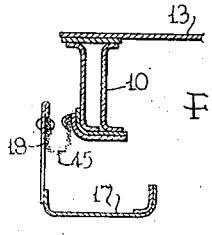


FIG. 9



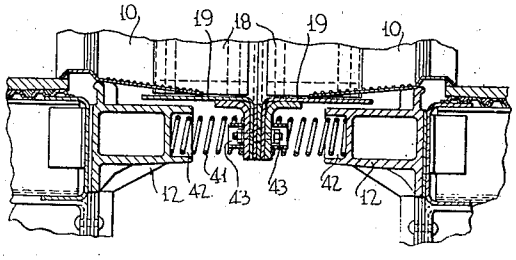


FIG. 7

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DIAPHRAGM FACE PLATE

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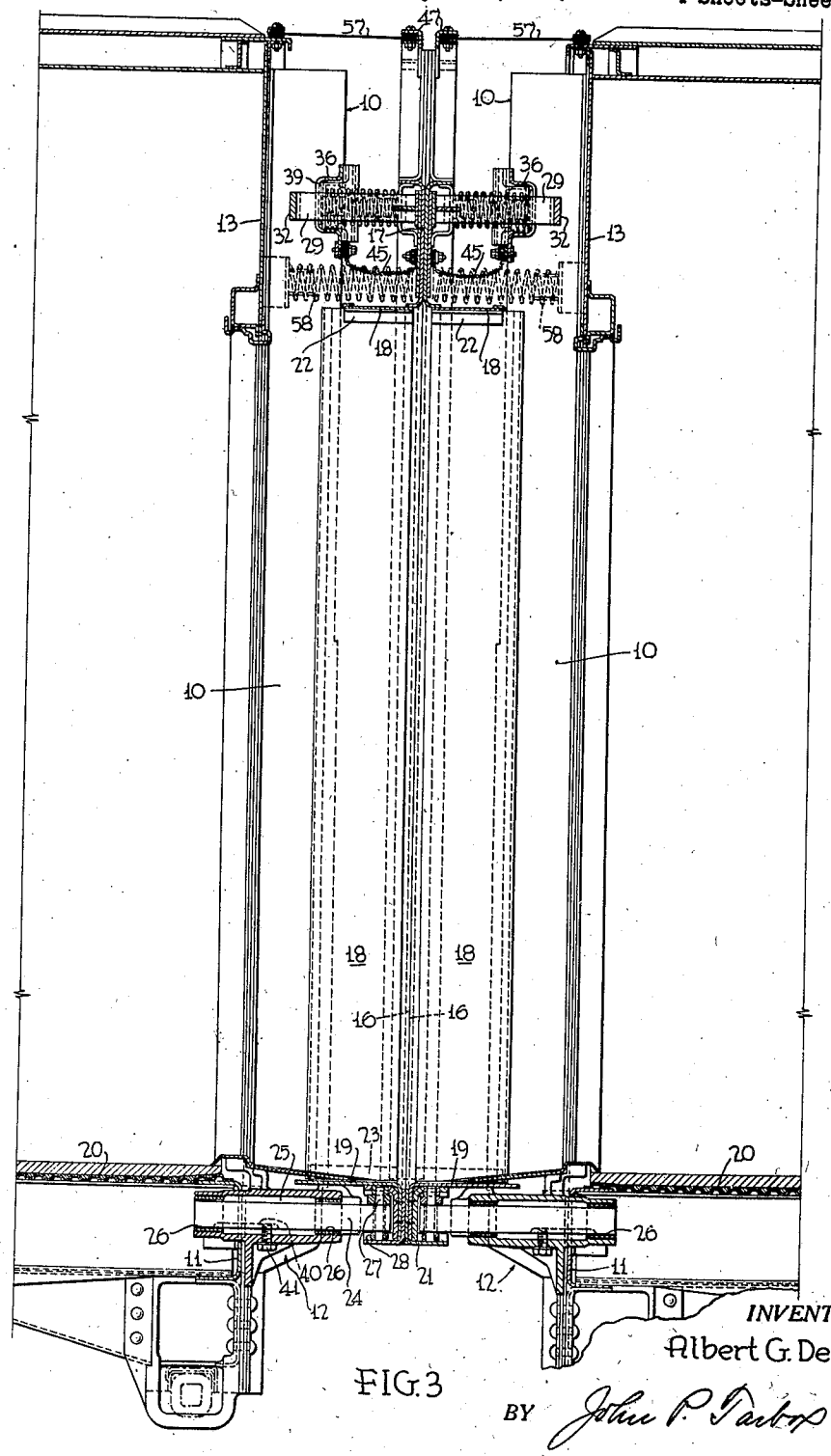


FIG. 3

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DIAPHRAGM FACE PLATE

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FIG. 4

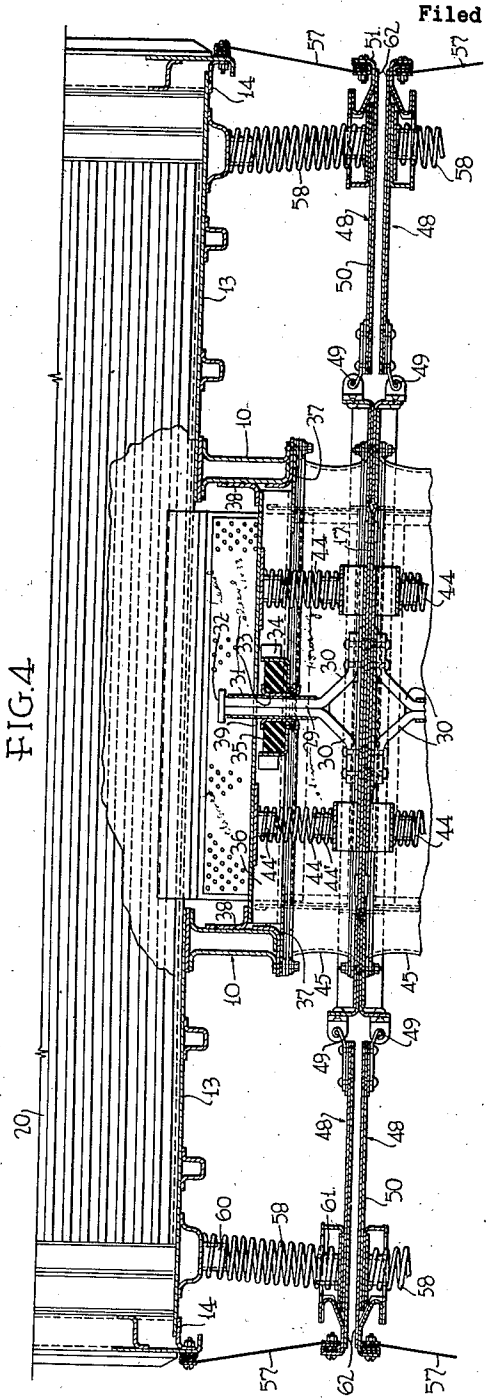
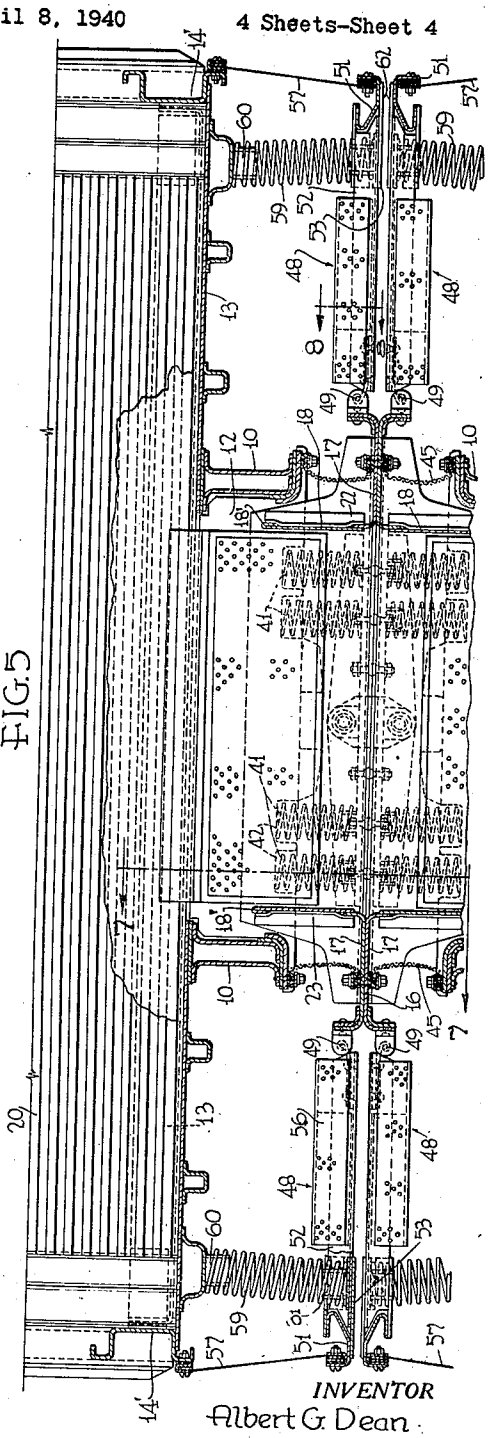


FIG. 5



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Patented Jan. 19, 1943 2,309,073

UNITED STATES PATENT OFFICE

2,309,073

DIAPHRAGM FACE PLATE

Albert G. Dean, Narberth, Pa., assignor to Edward G. Budd Manufacturing Company, Philadelphia, Pa., a corporation of Pennsylvania

Application April 8, 1940, Serial No. 328,406

6 Claims. (Cl. 105—10)

The invention relates to rail car end constructions and more particularly to a diaphragm face plate construction movably supported at such ends and the means for so supporting it.

It is among the objects of the invention to lighten the weight of such structures and to simplify the means for supporting the same from the end wall of the car with which they are associated.

The light weight is attained by utilizing drawn or rolled sections of light gauge sheet metal such as stainless steel in fabricating the face plate, and simplicity of support is attained by the utilization of a single pair of central supporting stems, one at top and one at bottom, the bottom one of which is guided on widely spaced guides to form a support carrying the weight of the face plate, while the inwardly projecting stem at the top cooperates with guiding means to prevent lateral movement and to limit the outward movement of the top of the face plate. Springs arranged on opposite sides of the center stems at top and bottom constantly urge the face plate outwardly, and simple means for limiting such outward movement is provided in connection with the center stems. Provision is also made to permit the plate to swing about substantially the central vertical plane of its support through the stems. The mounting of the face plate is preferably such that the bottom stem does not project any appreciable extent beyond the inner face of the end sill and the top stem does not project through the end wall plate of the car.

Other and further objects and advantages and the means through which they are attained will become apparent from the following detailed description when read in connection with the drawings forming a part hereof.

In the drawings:

Fig. 1 is a view in perspective of a car end equipped with the diaphragm face plate construction of the invention.

Fig. 2 is an end elevational view showing the diaphragm face plate in place thereon.

Fig. 3 is a fragmentary vertical longitudinal central sectional view taken through the ends of two coupled cars equipped with the invention, the section being on an enlarged scale and taken substantially on the line 3—3 of Fig. 2.

Figs. 4 and 5 are similar fragmentary horizontal sectional views taken respectively on the lines 4—4 and 5—5 of Fig. 2.

Fig. 6 is a fragmentary horizontal sectional view taken substantially on the line 6—6 of Fig. 2.

Fig. 7 is a fragmentary vertical sectional view taken substantially on the line 7—7 of Fig. 5.

Fig. 8 is a vertical sectional detail on the line 8—8 of Fig. 5.

Fig. 9 is a detail horizontal sectional view through a door post and the adjacent diaphragm face plate structure, showing a slight modification of the arrangement of the flexible diaphragm connecting the post and adjacent plate.

According to the form of the invention shown in the drawings, it is applied to a car end having longitudinally deep box section posts 10 at each side of the doorway opening, these posts being connected at the bottom to the end sill 11 and against its outer face. Extending between the posts, and rigidly secured to both the end sill and posts as by rivets (not shown) is a rigid buffer casting 12 designed with box cross sections and ribbing to add strength thereto, and to enable it to carry the entire weight of the diaphragm face plate.

The posts are secured to the outer face of the end plate 13 extending from top to bottom and secured at the bottom to outer face of the end sill and at top and sides of the roof as indicated in Figs. 3 and 4 by an angle 14, or directly to the side wall corner posts 14', as indicated in Fig. 5.

As shown in Figs. 1 and 2, the face plate proper may comprise a rectangular frame 15 extending around the doorway opening and having an outer wide flat face 16 in position to abut a similar face on the end plate of an adjacent coupled car. Figs. 3, 4, 5 and 6 show this relation between adjacent cars. Since the face plates and their supporting means on adjacent cars are similar, only one need be described.

The face plates proper are preferably built up of drawn or rolled sections of high tensile stainless steel spot welded together to constitute them a unitary light weight structure. The top, bottom and side elements of the frame 15 are, as indicated in Figs. 3, 4, 5, 6 and 7 of generally L-shape in section. The side elements as well as the top element of the frame 15 may be built up of inwardly facing channels 17, the bottom walls of which provide the abutting faces 16, and preferably lighter gauge wide finish strips 18 bridging the space between the posts and channels, welded to the inner side walls of the channels 17, and having their free edges formed with a reverse bend 18' to provide a finished edge. These finish strips are spaced from the posts, see Figs. 5 and 6, a distance permitting the desired movement between the diaphragm face plate and the posts.

As shown in Figs. 2 and 4, the bottom of channel 17 of top element of rectangular frame 15 is offset at its ends and overlaps at its ends the inside of the bottom wall of the channels 17 of the side elements and is welded thereto; at this location the inner side walls of the side channels 17 are cut away.

The bottom element of the rectangular frame 15, as shown in Fig. 3, may comprise an angle member 19 having vertical and horizontal arms, the vertical arm being offset and extended at the ends to overlap and be secured to the side elements in the same manner as is the top element, and the horizontal arm forming a widened walkway plate arranged approximately in the plane of the car flooring 20. At the central portion, an angle 21 has its vertical arm overlap the vertical arm of the angle 19 and is welded thereto, its other arm extending horizontally. The two angles 19 and 21 thus together form in this central region an inwardly facing channel bottom element, see Fig. 3.

As shown in Figs. 2 and 3, the finish strips 18 at top and sides are interconnected by angle strips 22 and the horizontal arm of angle 19 of the bottom element is similarly connected by angle strips 23 to the strips 18 of the side elements, see Figs. 3 and 5.

The face plate proper formed by the rectangular frame 15 described is preferably supported for bodily relative approach and separation and swinging movements with respect to the car end at but two points; namely, directly in the vertical longitudinal central plane thereof, by means extending inwardly from the top and bottom elements of the frame.

The bottom such means may comprise a strong center stem 24 slidably mounted in a longitudinal bore 25 in the buffer casting 12 and supported therein in widely spaced bearings 26, which may be rubber cushioned for sound deadening, arranged adjacent the ends of the bore. In this case, the boss carrying the bore is extended inwardly through an opening in the end sill, Fig. 3. At its outer end, the stem 24 is connected to the frame 15, by a vertical pivot pin 27 secured in a bracket 28, which is telescoped within the channel formed by angles 19, 21, and strongly secured thereto. Suitable bearing bushings may surround the pin above and below the stem. This pivotal connection permits swinging of the frame as a whole about the pin as a center, as in rounding curves in the track.

The upper end of the frame is mounted entirely without the end plate 13 to permit in and out movement to allow accommodation for humps or depressions in the track and also to permit lateral swinging movement about the pivot pin 27 of the center stem 24.

To this end the top channel 17, see Fig. 4, is reinforced by one or more thicknesses of metal welded to its inner face. Upon this reinforced stucture is rigidly secured as by rivets an inwardly projecting stem 29 having a transversely widened base 30. Preferably this stem may be readily formed by bending two heavy gauge strip stock pieces as shown, and joining them together to form the uniform section stem portion 29 and the wide base 30 rigidly secured to the reinforced top element, as described. The uniform section stem portion may be surrounded by a bearing sleeve 31 and its inner end is formed with a head 32. A channel section bearing sleeve 33 surrounds the sleeve 31 so as to permit free sliding movement between the sleeves, and allow the top of the frame 15 to move in and out in accordance with the track conditions.

Lateral movement of the top of the frame is limited by a box-like housing 34 between which and the sleeve 33 are arranged rubber blocks 35 designed to cushion lateral shocks and deaden the sound, and also to permit, due to the resilience of the rubber, the turning movement about the pivot pin 27. Outward swinging movement of the top of the frame, as when the cars are uncoupled, is limited by the head 32 striking the sleeve 33 and again the rubber block 34 serves to cushion the shock and deaden the sound. Of course, it will be understood that there is sufficient play between the pivot pin 27 and the hole in the stem 24, as is indicated in Fig. 3, to permit the limited in and out movement of the top of the frame permitted by the top connection.

The box-like housing 33 guiding the stem 29 is itself strongly secured to the sides and bottom of a transverse outwardly facing flanged channel 36 spaced from end plate 13 secured at its ends to the posts 10, on its outer side by flat plates 37 overlapping the outer faces of the posts and the flanges of the channel, and on its inner side by angles 38, Fig. 4. An opening 39, Fig. 3, in the bottom of the channel permits the passage therethrough of the head 32 of stem 29.

The outward movement of the stem 24 is limited as by a groove 40 and a screw 41 threaded into the casting 12 and having its end projecting into the groove 40, see Fig. 3, and as already pointed out, outward movement of the upper stem 29 is limited by the head 32 striking the sleeve 33.

The diaphragm plate is continuously urged outwardly toward its outer position by spring means. Such means may consist at the bottom, as shown in Fig. 5, of four coiled compression springs 41, arranged, two and two, symmetrically on opposite sides of the center stem 24 and having their opposite ends engaged, on the one hand, in recesses at 42, on the buffer casting 12 and, on the other hand, fitting over cylindrical projections 43 on the reinforced bottom element 19 of the frame 15, see Fig. 7.

At the top, the spring means may consist of two compression coil springs 44, see Fig. 4, arranged symmetrically on the opposite sides of the central stem 29 and engaging at their opposite ends over projections 44' secured, respectively, to the reinforced bottom wall of channel 36 and to the reinforced top element of the frame 15.

When two cars equipped with the novel diaphragm plates are coupled together as shown in Fig. 3, the springs of both plates will be compressed to hold the faces 16 of the plates in firm engagement, due to the manner of supporting the plates, at all times, even when rounding curves in the track or going over humps and depressions in the track, so that quietness of operation is assured.

To close the space between the rectangular frame 15 of the diaphragm plate and the sides and top of the doorway as defined by the posts 10 and the cross channel 36, any usual form of flexible diaphragm 45 may be provided. At the sides this diaphragm 45 is secured, respectively, to the outer faces of the posts 10 and to bottoms of the channels 17; at the top, to the channel 36 and a reinforced portion of cross channel 17, see Fig. 3.

An alternative method of securing the diaphragm 45 at the sides of the doorway opening is

shown in Fig. 9. In this form the diaphragm is secured, respectively, to the laterally inner fact of the post and to the finish strip 18. In some instances, this method of securement may be preferable since it avoids countersinking of face 16 to accommodate the heads of the diaphragm securing bolts flush with said face, and it takes care of the in and out movement of the top of the face plate with less width of diaphragm.

The face plate construction so far described will be all that is required, if it is not desired to close the entire space between two adjacent cars to maintain their streamline continuity. It will be seen that the manner of supporting the face plate applies equally well to the case where it extends merely around the doorway opening or where it carries additional means for association with similar means on an adjacent car for closing the entire gap at sides and top between two cars when coupled together.

Such additional means supported by and constituting extensions of the plate proper as already described will now be described.

The diaphragm plate structure proper consisting of the rectangular frame 15 already described may be extended to the roof by so extending the bottom and outer side walls of the side element channels 17 to the roof and connecting them at the top by a transverse angular member 47, Figs. 1, 2 and 3, conforming to the roof contour.

It may be extended out to the sides of the car by lateral wings 48, Fig. 2, hinged top and bottom to the top and bottom of the channels 17 and their upward extensions by the vertical pivot hinges 49 having their cooperating leaves secured respectively to the reinforced side wall of the members 17 and to the wings 48, see Figs. 4 and 5.

Each wing may comprise a top plate 50 which may be built up out of several laminations, as shown in Fig. 4, reinforced in its outer margin by an angular section marginal member 51 conforming to the contour of the body, and extending from adjacent the end of the member 47 over the curved side portion of the roof down to the bottom of the body, and connected to a transverse bottom channel 52 as by gussets as 53. The channel 52 may be stiffened by closing it to box section by applying a second channel 54, Fig. 8, so that its top side wall overlaps and is secured to the top side wall of channel 52 and its bottom side wall is inclined and flanged at 55, the flange being secured to the bottom wall of channel 52, a roughened strip 56 may be secured to the top of the reinforced structure so produced, to provide an anti-slip surface and the reinforced member may be used as a step, to afford a workman's ready access to parts of the structure for assembly and repair.

The space between the outer periphery of the so-extended diaphragm plate structure at sides and top, as defined by the members 51, 50 and 47, and the corresponding outer contour of the car end is preferably closed by a flexible elastic diaphragm 57 of rubber or the like secured respectively to the periphery of the car body and the periphery of the diaphragm plate structure. The wings 48 are continuously urged outwardly to keep the diaphragm taut by coil springs, as 58 and 59, disposed, respectively, between plate 50 of each wing and the end wall of the car body and between the member 52 and the end wall of the body. These springs have their ends held in place on the car body by projections 60 and, on the wings, by projections 61 disposed in sockets reinforcing the wings at these points.

Thus, the outer peripheries of the wings, which have smooth faces 62, associated with one car will be held substantially in contact with the similar opposed faces 62 of the wings of an adjoining coupled car, by the springs pressing them outwardly and the outer flexible elastic diaphragms will be held taut to close the space between the peripheries of the adjacent bodies in substantial streamline continuation of said bodies, and the flexible mounting of the main diaphragm plate structure, together with the lateral wings flexibly mounted thereon permits the diaphragm structure on adjacent cars to maintain their face to face relation at substantially all times when in the coupled relation, thus insuring smooth and relatively quiet operation.

The structure herein shown and described also permits the diaphragm face plate structure to be readily assembled as a sub-assembly and thus easily and quickly applied to the car body by reason of its simple mounting thereon through the upper and lower centrally arranged mounting stems.

While a preferred specific embodiment of the invention has been described herein, it will be understood that changes and modifications may be made without departing from the spirit and scope of the appended claims.

What I claim is:

1. A rail car comprising an end wall including end door posts, a reinforced end sill structure connecting the lower ends of said door posts, a transverse member connecting the door posts above the door opening, a diaphragm face plate structure extending around the doorway opening and supported solely as respects its weight by top and bottom center stems extending inwardly thereof and supported and guided by means on said transverse member and reinforced end sill structure, respectively, the transverse member supporting and guiding the top stem being spaced outwardly from the plane of the end wall to permit said stem to be disposed entirely outside the plane of the end wall.

2. A rail car comprising an end wall having a doorway opening therein and including upper and lower transverse members, a diaphragm face plate surrounding the doorway opening and mounted for movement toward and away from said members, said mounting comprising a pair of center stems, one above and one below the door opening, supported and guided, respectively, in said transverse members and arranged to carry substantially the entire weight of said face plate, at least one of said stems being cushioned against lateral movement, and means associated with both said stems limiting the outward movement thereof, the upper transverse member being disposed outwardly of the plane of the car end wall to permit movement of the associated stem outside the plane of the end wall.

3. In a rail car having an end wall provided with a doorway opening therein and including a cross member above and below said opening, the combination of said end wall with a diaphragm face plate extending at least around said doorway opening and having an inwardly extending stem at top and bottom cooperating with guide means in said transverse members of the end wall and forming the sole load supporting and guiding means for said diaphragm face plate, the cross member above the doorway opening being disposed outwardly of the plane of the car end

wall to permit movement of the associated stem substantially entirely outside said plane.

4. A rail car comprising an end wall having a doorway opening therein and including transverse members arranged, respectively above and below said openings, a diaphragm face plate structure extending around the doorway opening and supported and guided from the end wall for in and out and pivotal movement with respect to said wall, said supporting and guiding means consisting solely of a pair of centrally-arranged stems, one connected to the face plate below the doorway opening and extending inwardly and supported and guided by the bottom transverse member and arranged to carry substantially the entire vertical load of said face plate, and the other connected to the face plate above the doorway opening and extending inwardly and supported and guided by the upper transverse member, the stems together carrying all the lateral loads of the face plate.

5. A rail car according to claim 4 in which sound-deadening means is inserted between each of the stems and the respective transverse members in which they are supported and guided, said means serving also to cushion the vertical and lateral loads of said face plate.

6. A rail car comprising an end wall having a doorway opening therein and including transverse members arranged, respectively, above and below said doorway opening, a diaphragm face plate structure extending around the doorway opening and supported and guided for in and out and pivotal movement with respect to said end wall, said supporting and guiding means consisting solely of a pair of centrally-arranged stems, one pivoted to the face plate below the doorway opening, extending inwardly and supported and guided by the bottom transverse member and arranged to carry substantially the entire vertical load of said face plate, and the other rigidly secured to the face plate above the doorway opening, extended inwardly and supported and guided for sliding and pivotal movement in the top transverse member, the stems together carrying all the lateral loads on the face plate.

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