Sept. 18, 1951 R. F. MIHALYI 2,568,684

VESTIBULE DIAPHRAGM

Filed Oct. 24, 1947

FIG. 1.

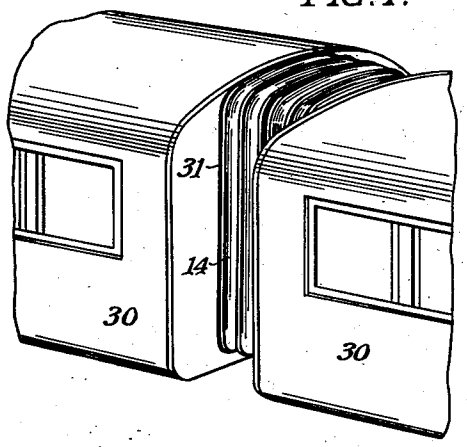


FIG. 2.

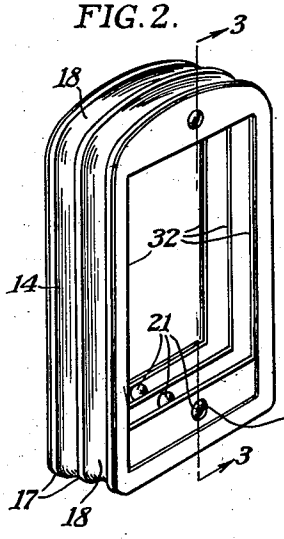


FIG. 3.

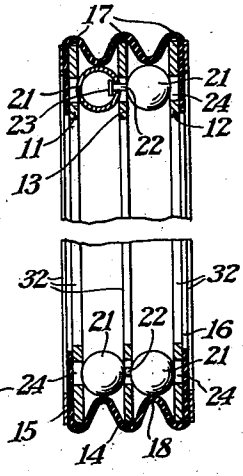


FIG. 4.

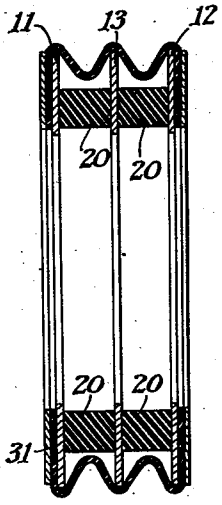


FIG. 5.

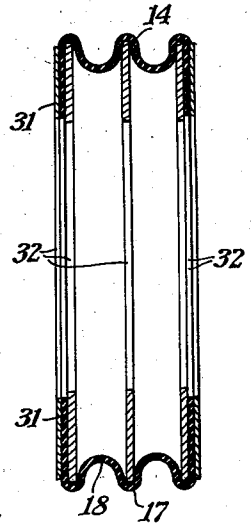


FIG. 7.

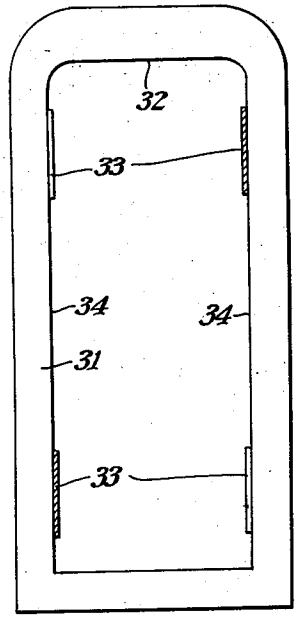


FIG. 8.

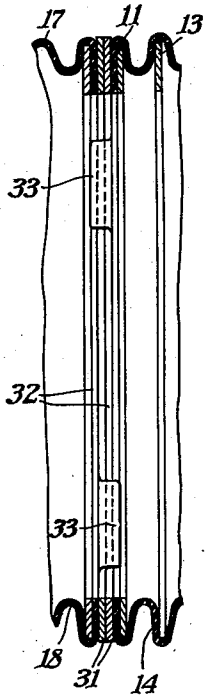


FIG. 6.

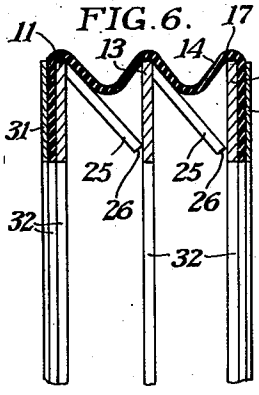


FIG. 9.

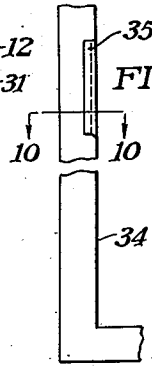
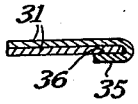


FIG. 10.



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Patented Sept. 18, 1951 2,568,684

UNITED STATES PATENT OFFICE

2,568,684

VESTIBULE DIAPHRAGM

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Application October 24, 1947, Serial No. 781,789

11 Claims. (Cl. 105—18)

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The present invention relates to vestibule diaphragms primarily designed for use in connection with trains, and more particularly to miniature or toy trains.

The present invention has as its principal object a vestibule diaphragm in which the parts are yieldably held in assembled relation, yet may move separately and independently to conform to the movement of the train.

Still another object of the invention is the provision of an arrangement by which the frame members are retained in relative spaced relation, yet are free to move separately and independently.

Yet another object of the invention is the provision of an arrangement for operatively connecting the frame members in assembled relation, yet permitting the frame members to separately and independently pivot about vertical axes.

And another object of the invention is the provision of a vestibule diaphragm construction which is simple, rugged, and highly effective in use.

To these and other ends, the invention resides in certain improvements and combinations of parts, all as will be hereinafter more fully described, the novel features being pointed out in the claims at the end of the specification.

In the drawings:

Fig. 1 is a perspective view of two miniature railroad cars or coaches connected by a pair of vestibule diaphragms constructed in accordance with the present invention;

Fig. 2 is a perspective view of a vestibule diaphragm constructed in accordance with one embodiment of the invention;

Fig. 3 is a vertical sectional view through the structure illustrated in Fig. 2, and taken substantially on line 3—3 thereof, showing the arrangement of the various parts;

Fig. 4 is a vertical sectional view through a modified form of vestibule diaphragm;

Fig. 5 is a view similar to Figs. 3 and 4 and taken through the preferred form of vestibule diaphragm construction;

Fig. 6 is a partial sectional view through another form of vestibule diaphragm;

Fig. 7 is an end view of the vestibule diaphragm, on a larger scale than the other views, showing the end plate and the connecting lugs by which two adjacent diaphragms may be connected releasably in assembled relation;

Fig. 8 is a partial vertical sectional view through a pair of connected diaphragms, showing the relation thereto of the connecting lugs;

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Fig. 9 is a partial end view of one of the end members or plates of a vestibule diaphragm, showing another form of connecting lug; and

Fig. 10 is a partial transverse sectional view through a pair of abutting end members or plates of adjacent vestibule diaphragms, showing the cooperating relation of a lug on one end member with the adjacent end member of another diaphragm to connect the diaphragms releasably;

Similar reference numerals throughout the various views indicate the same parts.

The vestibule diaphragm of the present invention comprises end frame members 11 and 12, and one or more intermediate members 13. These members are all formed from flat sheet material of suitable composition, and are of a contour best shown in Fig. 2. These members are also arranged in spaced parallel relation and are encased or enclosed by a flexible member such, for example, as a rubber tube 14 which is stretched over the frame members and the free ends adhesively or otherwise secured to the exposed faces 15 and 16 of the end members 11 and 12, as best shown in Figs. 3 to 6. This tube 14 is of a smaller size than the frame members so that when encasing the latter, the tube is stretched to a larger size at the planes of the members, as shown in 17, and then falls back to a smaller size between the frame members, as shown in 18, to cooperate with the frame members to provide a bellows-like structure.

This arrangement is illustrated in Fig. 5 in which the diaphragm is made up of only the frame members 11, 12, and 13 and the flexible tube 14. This embodiment allows the maximum freedom of individual movement of the frame members in all directions, namely: toward or away from each other, relative vertical or horizontal movement, as well as pivoting movement. In this embodiment, the tube 14 serves to retain the frame members in assembled spaced relation, yet permits the frame members to separately and independently move for purposes to be later described.

Fig. 4 shows a slightly modified arrangement in which small flexible rubber spacers 20 are positioned between the frame members. Two such spacers are provided between each pair of frame members. These pair of spacers are vertically aligned and are positioned substantially on the vertical center line of the diaphragm, such a line being indicated in 3—3 of Fig. 2. The engagement of the frame member

with the spacers along such a line provides parallel vertical axes about which the frame members may pivot relative to each other. Like the structure shown in Fig. 5, that shown in Fig. 4 permits some vertical movement as well as a small amount of movement at the frame members toward each other. Thus the embodiment shown in Fig. 4 differs from that shown in Fig. 5 only in limiting the movement of the frame members toward each other, by reason of the spacers **20**.

In the embodiment shown in Figs. 2, 3, and 6, the frame members, like those shown in Figs. 4 and 5, may move relatively vertically and are independently and individually movable about the central vertical axis (line 3—3 Fig. 2). However in the embodiment shown in Figs. 2, 3, and 6, the movement of the frame members toward each other is restricted. To secure this result, the embodiment shown in Figs. 2 and 3 provides small balls **21** of metal or other rigid material positioned between the frame members as best shown in Fig. 3. These balls are preferably hollow and are connected by short links **22**, the ends **23** of which, inside the balls, are upset, as shown in Fig. 3, to retain the balls in proper assembled relation. In fact, these balls and connecting links are part of the well known pull-chain used for turning on electric light fixtures. In order to retain the balls in position, the frame members are provided with vertically aligned holes or apertures **24** in which the balls are partially recessed, the openings **24** in the center frame **13** also providing a passage for the connecting link **22**, all as shown in Fig. 3. Thus in the embodiment shown in Figs. 2 and 3 the tube **14** encases the frame members and yieldably connects the latter to retain them in assembled relation. The tube permits some relative vertical movement, and free independent pivoting movement, the frames pivoting on the balls which provide parallel vertical axes about which the frame members may independently pivot or rock for a purpose to be later described. The balls, however, effectively prevent the frame members from moving towards each other along the central vertical lines of the balls, as will be apparent from the inspection of Fig. 2.

In Fig. 6, the frame members are held in spaced relation by means of lugs or fingers **25** formed from and bent out of planes of certain of the frame members. These lugs extend across a space between the members and the free ends **26** thereof engage the adjacent frame members, as shown in Fig. 6.

The above-described vestibule diaphragm is adapted to be connected to a support such, for example, as a miniature railroad car **30**. This diaphragm is then releasably connected, in a manner to be later described, to a similar diaphragm connected to another car **30** so as to provide a flexible joint or connection therebetween, as in regular railroad cars or coaches. In order to protect the ends of the rubber tubing **14** secured to the faces **15** and **16** of the frame members **11** and **12**, the faces **15** and **16** preferably have secured thereto, in any suitable and well known manner, additional frame members or face plates **31**, see Figs. 3 to 8, which are the same shape as the frame members **11**, **12**, and **13**. The various frame members are preferably equal in height to the cars **30** but have a width considerably less than the cars, as clearly illustrated in Fig. 1. Also in order to more nearly resemble the vestibule diaphragm used on regular railroads, the frame members are provided with central normally aligned apertures **32** which correspond to the openings used on larger trains and through which passengers may proceed from one coach to another.

In assembling, one of the face plates **31** of the diaphragm is secured to an end of one of the cars **30**, and the other face plate **31** of another diaphragm is secured to an end of another car. The two cars with their attached diaphragms are then moved toward each other until the free or unattached end face plates are arranged in abutting relation, as shown in Fig. 8, to provide a continuous unbroken flexible vestibule diaphragm between the two cars **30**, as shown in Fig. 1. The two diaphragms are then releasably connected, in a manner to be presently described, so that they act, in effect, as a single unitary structure. These abutting end plates **31** are formed, in one embodiment, Figs. 7 and 8, with axially-extending, vertically-offset lugs or fingers **33** formed from the material of the plates **31** and positioned along the opposite edges **34** of the aperture **32**, as clearly illustrated in Fig. 7, the lugs on the two abutting plates being offset, as shown in Fig. 7. When the two diaphragms are brought together, so that the adjacent plates **31** abut, the lugs **33** of one end plate slide inside the aperture **32** of the other plate and frictionally engage the opposite edges **34** thereof to releasably connect the end plates, and hence the two diaphragms, as indicated in Fig. 7. By reason of the friction engagement of the lugs with the edges **34**, the two end plates are held against lateral movement which serves to prevent relative lateral movement of the diaphragms, the advantage of which will be apparent to those in the art.

Figs. 9 and 10 show another arrangement for locking the two diaphragms in assembled relation. To secure this result, the abutting end plates **31** are formed with bent-over lugs **36** formed on the edges **34** and positioned similarly to the lugs **33**. When adjacent diaphragms are to be connected, the abutting plates are brought together and turned relative to each other about a horizontal axis to cause the bent-over lugs of one end plate to slip over the edges **34** of the adjacent end plate and engage the inner surfaces **36** thereof as shown in Fig. 10. Then by a reverse movement the diaphragms are brought back into aligned relation with the lugs **35** in locking relation. Thus the lugs **35** serve to effectively lock the two diaphragms in assembled relation and also hold the plates **31** and the diaphragms against relative lateral movement.

It will thus be apparent from the above description that the vestibule diaphragms of the present invention provide a flexible connection between the two cars **30**. Due to the flexibility of the diaphragms, the various members may move vertically relative to each other in case the adjacent sections of the track are not in vertical alignment. The diaphragms also provide a flexible connection which is desirable in starting or stopping. When the train goes around a curve, the diaphragm tubing is compressed on the inside of the curve and is stretched on the outside, as is apparent. In so doing, the various frame members are caused to pivot or rock separately and independently out of parallel relation about separate and distinct parallel vertical axes. In the arrangement shown in Fig. 5 the flexible tube **14** alone affords the pivoting axis, while in the structures shown in Figs. 2 and 3 the balls **21** provide the pivots, and in Figs. 4 and 6 the rubber spacers

20 and the lugs 25 respectively support the frame members for the pivoting action.

Thus the vestibule diaphragm of the present invention provides an arrangement for yieldably or resiliently connecting the frame members to retain the latter in assembled relation while maintaining the spacing between the members, yet allowing the members freedom of movement so as to conform to the movement of the adjacent cars to which they are attached to provide the necessary freedom of movement, yet providing a stable connection between the two cars.

While certain embodiments of the invention have been disclosed, it is to be understood that the inventive idea may be carried out in a number of ways. This application is, therefore, not to be limited to the precise details described but is intended to cover all variations and modifications thereof falling within the scope of the appended claims.

I claim:

1. A vestibule diaphragm for a miniature railroad car comprising a plurality of spaced frame members, and a flexible tube initially of smaller size than said members enclosing and connecting said members to retain the latter in assembled relation.

2. A vestibule diaphragm for a miniature railroad car comprising a plurality of spaced independent frame members, and a flexible tube initially of smaller size than said members to enclose and retain the latter in spaced assembled relation, said tube being stretched to a larger size at the planes of said members and being smaller than said members between the latter to provide a bellows-like structure.

3. A vestibule diaphragm for a miniature railroad car comprising a plurality of thin planar frame members, and a tube of flexible material initially of smaller size than said members, stretched over the edges of said frames to connect the latter together yieldably and to maintain the frames in assembled relation, said frames serving to stretch said tube to the size of said frames in the planes of the latter and connecting said frames to said tube for independent pivoting movement about parallel axes.

4. A vestibule diaphragm for a miniature railroad car comprising a plurality of spaced frame members of equal size, and a flexible tube of smaller size than said frame and stretched over and flexibly connecting the latter, said tube being stretched to the size of said frames at the planes thereof but being of smaller size than said frames between the latter, said tube also serving to maintain said frames in spaced relation, yet permitting said frames to move toward or away from each other and to pivot individually about parallel axes.

5. A vestibule diaphragm for a miniature railroad car comprising a plurality of spaced frame members, a flexible member encasing and yieldably connecting said members, vertically aligned means positioned between said members to space the latter, and means for mounting said frame members for separate and independent movement about parallel vertical axes passing through said spacing means.

6. A vestibule diaphragm for a miniature railroad car comprising a plurality of spaced frame members, a flexible member encasing and yieldably connecting said members, and vertically aligned means positioned between said members to space the latter and to provide a plurality of vertical axes about which the frame may individually and separately pivot.

7. A vestibule diaphragm for a miniature railroad car comprising a plurality of spaced flat frame members, vertically aligned balls positioned between said members to space the latter, and a flexible casing enclosing said frame members to retain the latter in assembled relation and cooperating with said balls to afford parallel vertical axes about which the frame members may pivot relative to each other.

8. A vestibule diaphragm for a miniature railroad car comprising a plurality of spaced flat frame members, vertically aligned balls positioned between said members to space the latter, a flexible casing enclosing said frame members to retain the latter in assembled relation and cooperating with said balls to afford parallel vertical axes about which the frame members may pivot relative to each other, and means on said members for retaining said balls in position between said members.

9. A vestibule diaphragm for a miniature railroad car comprising a plurality of spaced flat frame members, vertically aligned resilient spacers positioned between said members to space the latter but permit slight relative axial movement, said spacers affording vertical axes about which the frame members may pivot independently and relative to each other, and a flexible casing enclosing said members to retain the latter and said spacers in assembled relation.

10. A vestibule diaphragm for a miniature railroad car comprising a plurality of spaced frame members, and a flexible tube initially of smaller size than said frame member stretched over the latter to retain said members in spaced assembled relation but affording flexible connections by which said members may pivot independently relative to each other.

11. A vestibule diaphragm for a miniature railroad car comprising a plurality of independent frame members arranged in spaced relation, and a flexible tube initially of smaller size than said members stretched over and encasing the latter to maintain said members in assembled relation, said tube being stretched to the size of said members at the planes thereof but being of a smaller size between said frames to provide a bellows-like flexible connection between said members to permit the latter to move yieldably toward and away from each other and to afford pivot connections by which said members may pivot independently relative to each other.

RICHARD F. MIHALYI.

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