

July 2, 1963

H. H. CASSEL ETAL

3,095,975

STORAGE RACK

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3 Sheets-Sheet 1

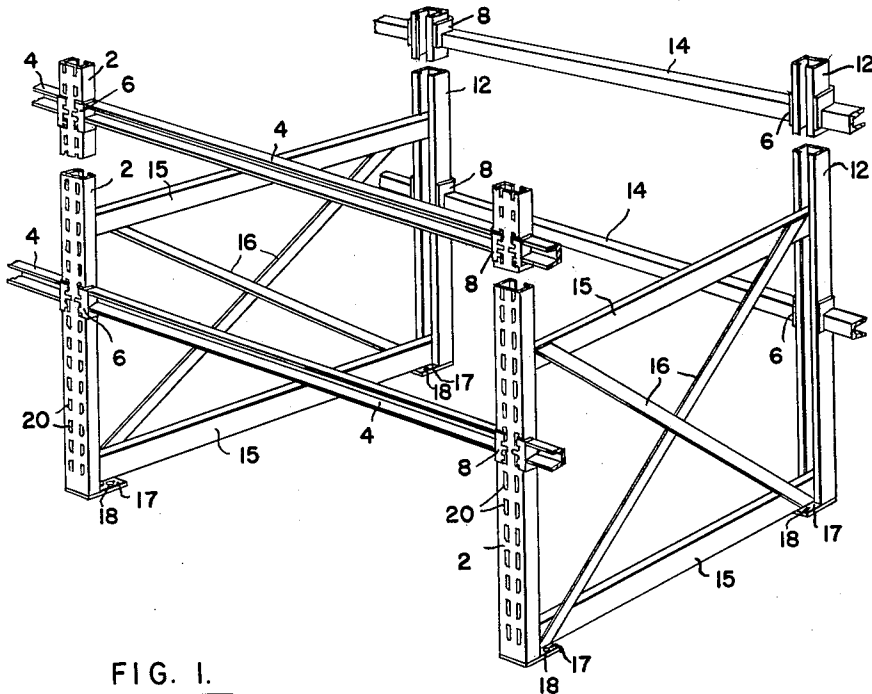


FIG. 1.

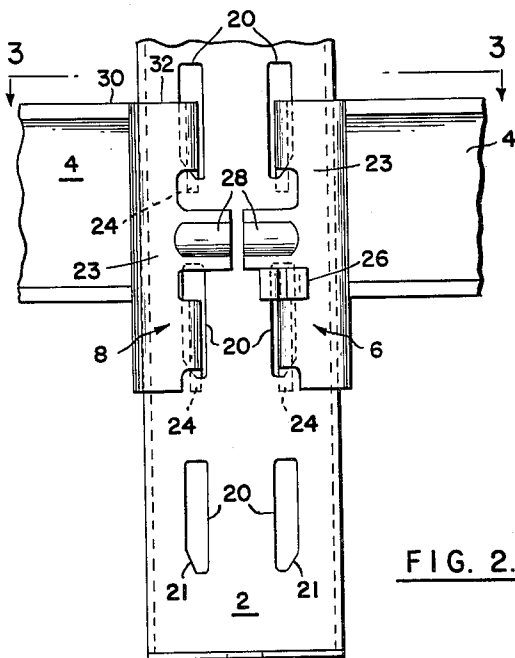


FIG. 2.

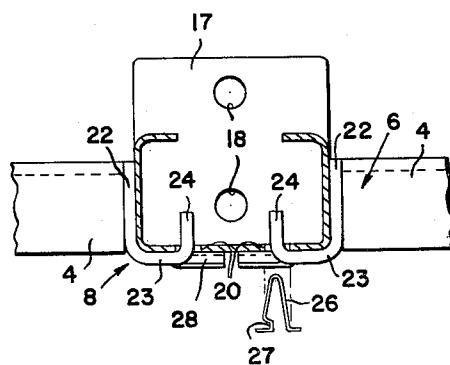


FIG. 3.

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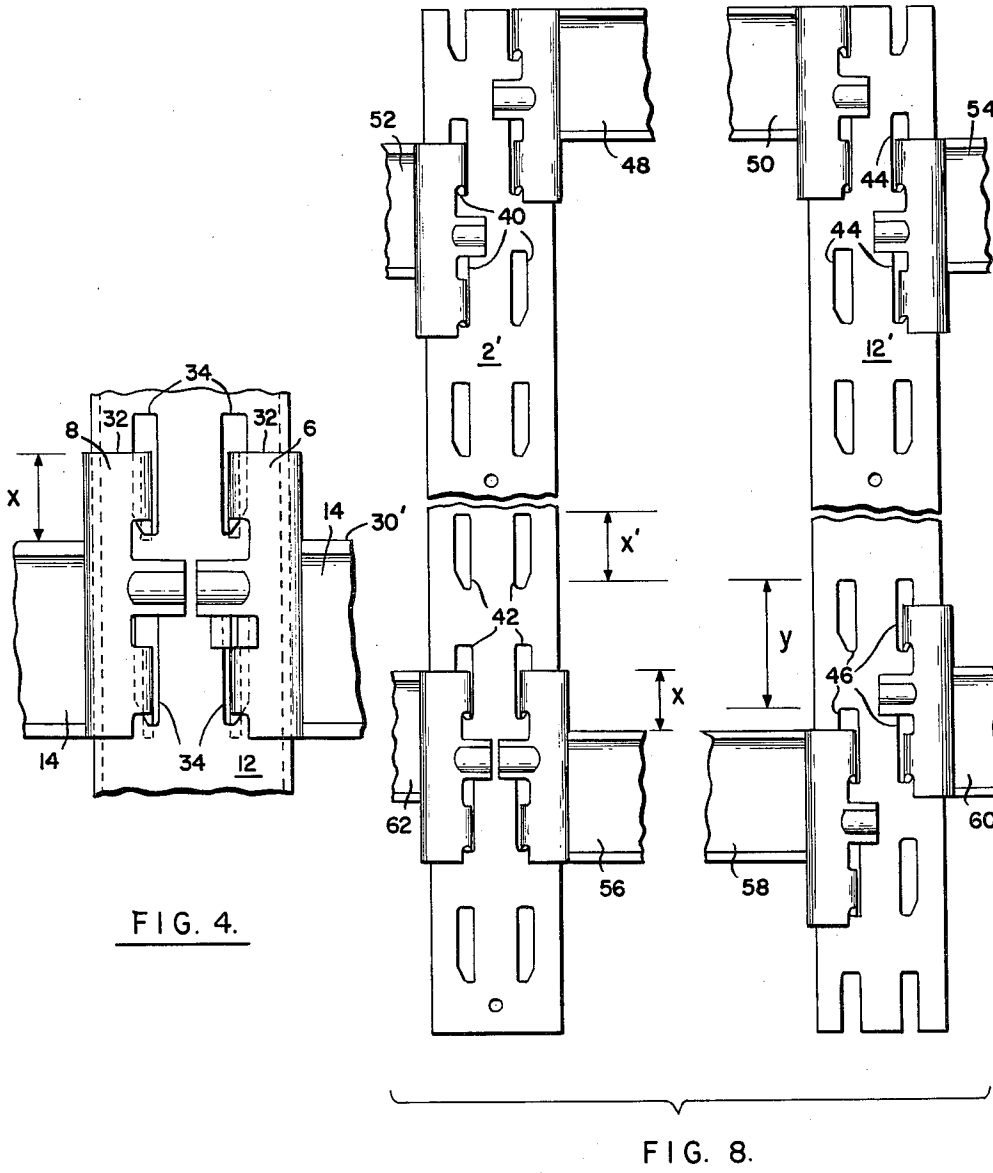
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3 Sheets-Sheet 3

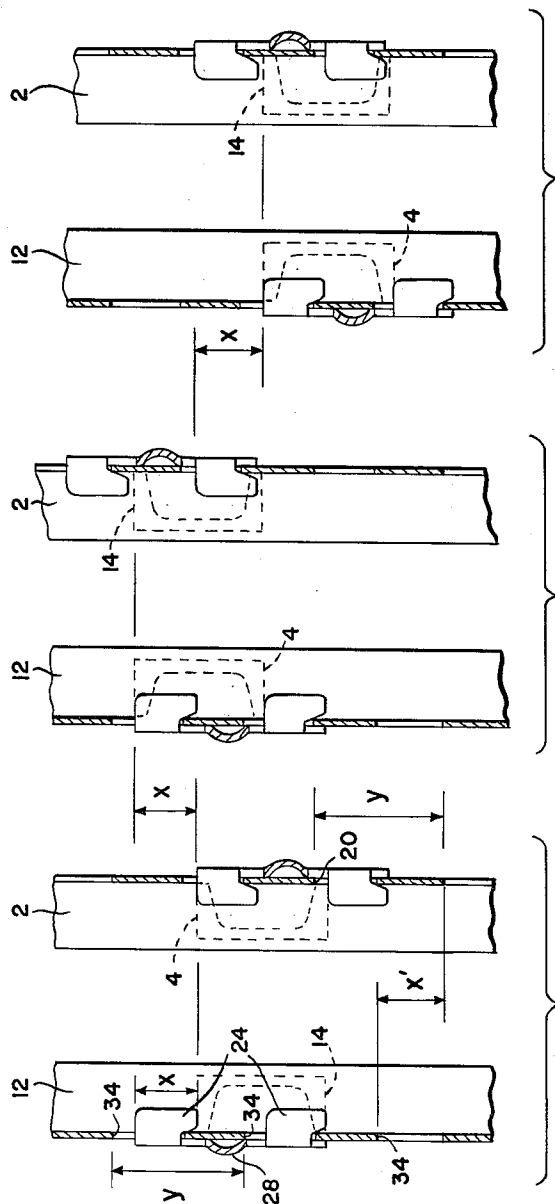


FIG. 7.

FIG. 6.

FIG. 5.

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3,095,975

STORAGE RACK

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The invention relates to storage racks, and more particularly to racks of the knock-down type constructed of detachably connected steel members, whereby a rack may be easily and quickly erected, dismantled, expanded or adjusted to suit various storage situations. Such racks generally are employed in the storage and handling of goods loaded on pallets.

The main object of the invention is to provide an improved rack construction having the combined features of more simple construction, better rigidity and greater flexibility in the vertical adjustment of horizontal stringers, or shelves, as compared to prior art racks. The typical rack comprises spaced parallel stringers detachably connected at their ends to vertical posts by means such as hooks, with suitable bracing being provided between opposite front and back posts. A rack may be subjected to severe stresses in the course of depositing and removing goods therefrom, involving for example jarring by a fork lift truck or the like, and also by virtue of its supporting heavy loads. Thus the rack obviously must be very rigid.

While reasonable rigidity is provided by bracing of the posts and by various means of locking the stringers into the posts, means advantageously are provided to resist angular movement of each stringer in a horizontal plane. According to the invention the above requirements are met by means of an improved detachable joint structure for connecting the stringers to the posts, as will be described in full hereafter.

A further consideration of importance is that of affording the greatest possible range of vertical adjustment of the stringers without sacrificing the strength of the product. It is important that vertical adjustment be effected with a minimum of effort and complexity. According to the invention disclosed herein, the increments of adjustment are not limited to the spacing of adjacent apertures or the like, but may be a fraction of such increments. The adjustments can be made rapidly with facility and the structure is a strong one.

Further objects and advantages will become apparent from the following description, read in conjunction with the accompanying drawings in which:

FIGURE 1 is a perspective view indicating the general structure of a storage rack constructed according to the invention;

FIGURE 2 is an elevation showing what will be referred to herein as "flush stringer" construction, wherein the stringer shelf is flush with the top of its connector plate;

FIGURE 3 is a cross-sectional view taken as indicated at 3-3 in FIGURE 2;

FIGURE 4 is an elevation showing what will be referred to herein as "dropped stringer" construction, wherein the stringer shelf is below the top of the connector plate;

FIGURES 5, 6 and 7 are related views intended to illustrate what is involved in setting the shelves to various heights; and

FIGURE 8 is an elevation illustrating an arrangement wherein the upper and lower portions of the posts are differently constructed.

Referring to FIGURE 1, the storage rack comprises front upright columns or posts 2 to which are connected

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one or more stringers 4 by means of "left hand" connector plates 6 and "right hand" connector plates 8. At the other side, or rear, of the rack there are provided posts 12 having stringers 14 connected thereto by means of the left and right-hand connector plates 6 and 8. Transverse bracing is provided by cross members 15 welded at their ends to the posts 2 and 12, and by straps 16 welded to these cross members in an X pattern. Each of the posts is provided with a foot plate 17 having holes 18 therein to accommodate floor screws or bolts if desired.

As most clearly shown in FIGURES 2 and 3, posts 2 have punched therein elongate apertures 20, each of which has its lower terminal portion tapered as indicated at 21 for the purpose mentioned hereafter. Each one of connector plates 6 and 8 comprises a steel member having a first portion 22 welded across one end of a channel-sectioned stringer 4 or 14 and adapted to flatly abut the side of a post 2 or 12. The remaining portions 23 of the plates 6 and 8 are bent at a right angle to the portion 22, whereby portions 23 flatly engage the front of a post, and has further portions turned inwardly and comprising hooks 24 adapted to be received in the apertures 20. The lower portions of the hooks 24, of course, are adapted to project behind the front face of a post and thereby to retain the connector plate in position. The tapering of each aperture 20, as indicated at 21, functions to cam a hook 24 received therein inwardly, i.e., toward the center of the post, thereby firmly holding the connector plate portion 22 against the side of the post.

Each one of plates 6 and 8 has an integral finger 28 which projects from portion 23 and also overlies the front face of a post. The finger 28 is arched (as will be more evident from FIGURE 5, discussed hereafter) in order to give it greater beam strength. Finger 28 extends beyond hooks 24 and thereby resists a force exerted tending to pivot the stringer 4 about the post 2 in the plane of FIGURE 2 and consequently improves the stability of the rack. It will be evident that the finger 28, in conjunction with the hooks 24 acting from behind the front side of the post, effectively prohibit movement in a horizontal plane.

As shown in FIGURE 2, the top shelf surface 30 of the stringer 4 is established at a level flush with the upper edges 32 of connector plates 6 and 8 in the course of welding the stringer to each connector plate. The sole difference between the structure of connector plates 6 and 8 is that their hooks 24 are turned in opposite directions.

It is desirable to provide means for locking the connector plates in position with respect to the posts 2 or 12, and to this end a spring metal clip 26 is illustrated. Clip 26 is essentially V-shaped and includes a bent portion forming an indentation 27. The clip is pinched in the act of projecting it through an aperture 20 above a hook 24 and, when released, the clip expands to its pre-pinned condition so that the edge of aperture 20 is received in indentation 27 whereby the clip is locked in place.

Turning next to FIGURE 4, it will be seen that each rear post 12 also is provided with elongate apertures 34 identical with previously described apertures 20. The illustrated left and right-hand connector plates 6 and 8, respectively, also are identical with the structure thereof previously described. The sole difference insofar as FIGURE 4 is concerned is that stringers 14 are not welded flush with the top edges of the connector plates 6 and 8, but are below such top edges by a dimension x. Thus the stringers 14, having their upper shelf surfaces 30' disposed below the upper edges 32 (FIGURE 4) of the connector plates 6 and 8 by the dimension x, will be referred to hereafter as of "dropped shelf" type.

The significance of the latter feature will be better understood by referring next to FIGURES 5, 6 and 7.

From these figures it will be noted that the apertures 20 in a post 2 are spaced uniformly on the basis of increments y , and the apertures 34 in a post 12 also are spaced at increments y . It will be understood that for the purpose of description y is measured between the respective tops of adjacent apertures, but also that it actually corresponds to, and may be considered as, the center-to-center distances of adjacent apertures. However, the apertures 20 and 34 in a pair of opposite posts 2 and 12 are not arranged at the same level, the series of apertures 34 in post 12 being all off-set by a distance x' from the series of apertures 20 in post 2. The distance x' is equal to the previously mentioned dimension x , by which amount the stringer 14 is below the top of connector plates 6 and 8, both x and x' being equal to one-half the spacing y of apertures 20 and of apertures 34.

The reasons for the above will follow from an explanation of what is involved in vertical adjustment of the stringers. Starting with FIGURE 5, although the apertures 20 and 34 are at different levels, stringers 14 and 4 are at the same level by virtue of the dimension x , or in other words because of the fact that stringer 14 is of the drop shelf type and stringer 4 is of the flush shelf type. Now, it is obvious that if it is desired to raise or lower the stringers 4 and 14 by an increment y all that is necessary is the relocation of each hook 24 in the aperture 20 or 34 which is directly above or below that aperture in which it presently is inserted. Assume, however, that it is desired to raise or lower the stringers by an increment of adjustment which is less than the spacing y of the apertures. According to the invention, this is made possible by a reversal of the stringers 4 and 14 from front to rear of the rack and vice-versa. For example, as seen in FIGURE 6 the stringers 4 and 14 have been raised by only the dimension x by the removal of stringer 4 from post 2 to post 12 and the removal of stringer 14 from post 12 to post 2. It may be noted that in FIGURES 5 and 6 the connector plates secured to post 12, in each figure, are at the same level, but by virtue of the fact that in FIGURE 6 a flush shelf stringer 4 is employed instead of a dropped shelf stringer 14 there results a shelf which is higher by the dimension x . Referring to and comparing next the FIGURES 5 and 7, there is illustrated the case in which it is desired to lower the stringers by the amount x . Thus, by a reversal of the stringers 4 and 14 shown in FIGURE 5 the situation illustrated in FIGURE 7 results. Comparing FIGURES 5 and 7, although the connector plates secured to post 2 in these figures are at the same level, the level of stringer 14 in FIGURE 7 is lower than that of the stringer 4 associated with post 2 in FIGURE 5, by virtue of the fact that in the latter case a flush rather than a dropped type shelf stringer is employed.

In the description reference has been made to the fact that the difference between stringers 4 and 14 is that stringer 14 is below the upper edge of its associated connector plates 6 and 8 by a dimension x , whereas stringer 4 is flush with the top of its associated connector plates. It should be understood, however, that what is really of significance is the relative height of the stringer with respect to the hook of each connector plate, which hooks actually are determinative of the height of the shelves.

In prior art racks the apertures in opposite front and back posts would be oriented at the same level, whereas according to the above-described form of the invention this is not true. However, as illustrated in FIGURE 8 both of the above systems may be employed. FIGURE 8 represents a combination of two views, the one at the left being what would be seen in looking at the front of the rack and that on the right being what would be seen in looking at the rear side of the rack. The front post 2' has apertures 40 at its upper level and apertures 42 at its lower level, and similarly the rear post 12' has upper apertures 44 and lower apertures 46. It will be noted that the apertures 40 in front post 2' are aligned

horizontally with the apertures 44 in rear post 12'. However, this is not the case with respect to the lower apertures 42 and 46, in that the apertures 42 are off-set by a distance x' from the level of apertures 46. The spacing or increments of these apertures is indicated by the dimension y , and the distance x' , as in the case of FIGURES 2 to 7, is one-half the dimension y . In consequence of this arrangement, at the upper level of posts 2' and 12' a shelf is made up by a pair of stringers 48 and 50, both of which are of the flush shelf type previously defined. Similarly, a pair of flush shelf stringers 52 and 54 makes up a single shelf. It should be understood, of course, that a pair of similar dropped shelf type stringers also could be employed to make up a single shelf. At the lower portions of posts 2' and 12', however, a single shelf is made up by stringers 56 and 58, the former being of the dropped shelf type and the latter being of the flush shelf type. Similarly, a pair of dropped and flush type stringers 60 and 62, respectively, make up a further shelf. The reason for such an arrangement is that in an actual installation of a storage rack finer increments of vertical adjustment at the upper levels may not be needed whereas at the lowest level this may be an important factor. Thus in the case of FIGURE 8 the combination of two types of systems is employed.

It will be understood that various modifications of the specifically disclosed forms of the invention may be effected without departing from the scope thereof as defined by the following claims.

What is claimed is:

1. A rack structure comprising a pair of spaced, upright front post members, a horizontal stringer spanning said post members and having connector elements at the ends thereof, each of said front post members having plural means uniformly spaced vertically, each of said means being adapted to accommodate the connected element at one end of said stringer for the support thereof, a pair of rear upright post members spaced from each other and from said front post members, a second horizontal stringer connecting said rear post members and having connector elements at the ends thereof, each of said rear post members having plural means uniformly spaced vertically, each of the last-mentioned means being adapted to accommodate the connector element at one end of said second stringer and having the same spacing as that of said first-mentioned means, the first-mentioned means on said front post members being vertically staggered with respect to the second-mentioned means on said rear post members, the vertical relationship of the upper supporting surface of the first-mentioned stringer to its associated connector elements differing from that relationship of the second stringer to its associated connector elements by a dimension equal to the vertical distance by which the first-mentioned means are staggered with respect to the second-mentioned means, whereby said stringers are interchangeable with respect to the front and rear post members to permit vertical height adjustments of the stringers in an amount less than the distance between two vertically adjacent openings in the posts.

2. A rack structure according to claim 1, wherein said means comprise apertures in said posts and said connector elements have projections receivable by said apertures.

3. A rack structure according to claim 1, wherein said connector elements have hook portions engageable with said means for the connection of the stringers to the posts.

4. A rack structure according to claim 1, wherein said means comprise apertures in the front face of each post, and wherein each said connector element comprises a plate abutting one end of said stringer and having a portion overlying at least a part of the said front of one of the posts, the last-mentioned portion having at least

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one hook projecting through one of said apertures and engaging the lower edge thereof.

5. A rack structure according to claim 4, wherein said element has a separate finger portion overlying and engaging the front face of said one post and extending beyond said aperture thereby to limit pivoting of its associated stringer member about said post in a horizontal plane.

6. A storage rack comprising a pair of spaced upright front post members; a pair of upright rear post members spaced from each other and from said front post members; each of said post members having therein a series of vertically spaced apertures, the respective series of apertures in the posts being substantially identical individually and having the same center-to-center spacing, the apertures in said front post members being staggered vertically with respect to the apertures in said rear post members by an amount equal to approximately one-half said center-to-center spacing; a horizontal stringer spanning said front post members and connected thereto at its ends by connector elements, each of said connector elements having at least one projection engageable with an aperture in one of said post members; a second horizontal stringer spanning said rear post members and connected thereto by connector elements equivalent to the first-mentioned connector elements; the vertical relationship between the upper supporting surface of the first-mentioned stringer and the projections on its associated connector elements being different from that relationship of said second stringer to the projections on its associated connector elements by an amount approximately equal to one-half said center-to-center spacing of the apertures; whereby the first-mentioned and second stringers are interchangeable between said front and rear post members for height adjustments equal to one-half said center-to-center spacing or multiples thereof.

7. A storage rack according to claim 6, wherein each said projection is in the form of a hook.

8. A storage rack according to claim 6, wherein each said connector element is provided with two said projections, each in the form of a hook.

9. A storage rack according to claim 6, wherein each said connector element comprises a plate abutting and affixed to the end of a stringer and having a portion ex-

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tending parallel thereto, the last-mentioned portion having at least one hook portion extending normally thereto and adapted to project through one of said apertures in a post member.

10. A rack structure comprising a pair of spaced, upright front post members, a horizontal stringer spanning said post members and having connector elements at the ends thereof, each of said front post members having plural means uniformly spaced vertically, each of said means being adapted to accommodate the connector element at one end of said stringer for the support thereof, a pair of rear upright post members spaced from each other and from said front post members, a second horizontal stringer connecting said rear post members and having connector elements at the ends thereof, each of said rear post members having plural means uniformly spaced vertically, each of the last-mentioned means being adapted to accommodate the connector element at one end of said second stringer and having the same spacing as that of said first-mentioned means, the first-mentioned means on said front post members being vertically staggered with respect to the second-mentioned means on said rear post members by an amount equal to one-half said spacing, the vertical relationship of the upper supporting surface of the first-mentioned stringer to its associated connector elements differing from that relationship of the second stringer to its associated connector elements by a dimension also equal to one-half said spacing, the connector elements associated with said first-mentioned and second stringer members being of equivalent construction, and said means on said front and rear post members also being of substantially equivalent construction, whereby said stringers are interchangeable with respect to the front and rear post members to permit vertical height adjustments of the stringers equal to half said spacing or multiples thereof.

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