

United States Patent

[11] 3,561,608

[72] Inventor **John J. Weider**
Arlington Heights, Ill.
[21] Appl. No. **693,207**
[22] Filed **Dec. 26, 1967**
[45] Patented **Feb. 9, 1971**
[73] Assignee **Speedrack Incorporated**
Skokie, Ill.
a corporation of Illinois

2,595,599	5/1952	Naillon.....	211/176
2,605,004	7/1952	Gruenberg	214/16.4X
2,769,559	11/1956	Johnson	214/16.4
3,053,403	9/1962	Barton.....	214/16.4
3,199,683	8/1965	Graswich.....	248/243X
3,251,620	5/1966	Hassler.....	214/16.4X
3,323,655	6/1967	Foran et al.....	211/134

FOREIGN PATENTS

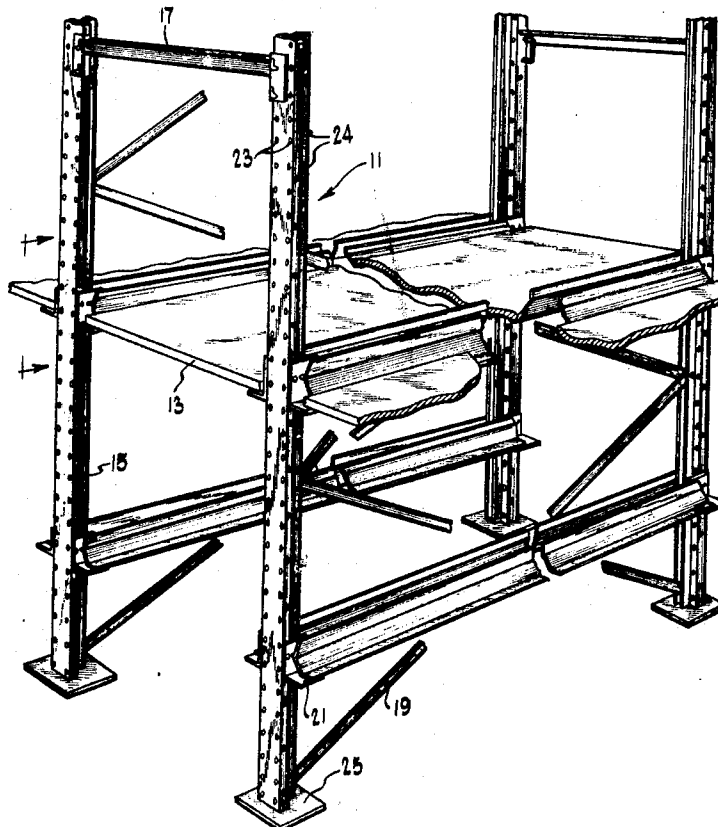
810,693	3/1959	Great Britain.....	211/148
911,150	11/1962	Great Britain.....	211/148

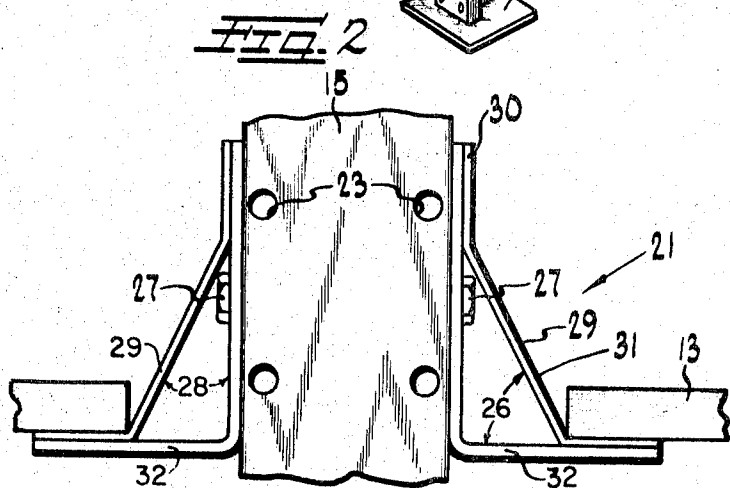
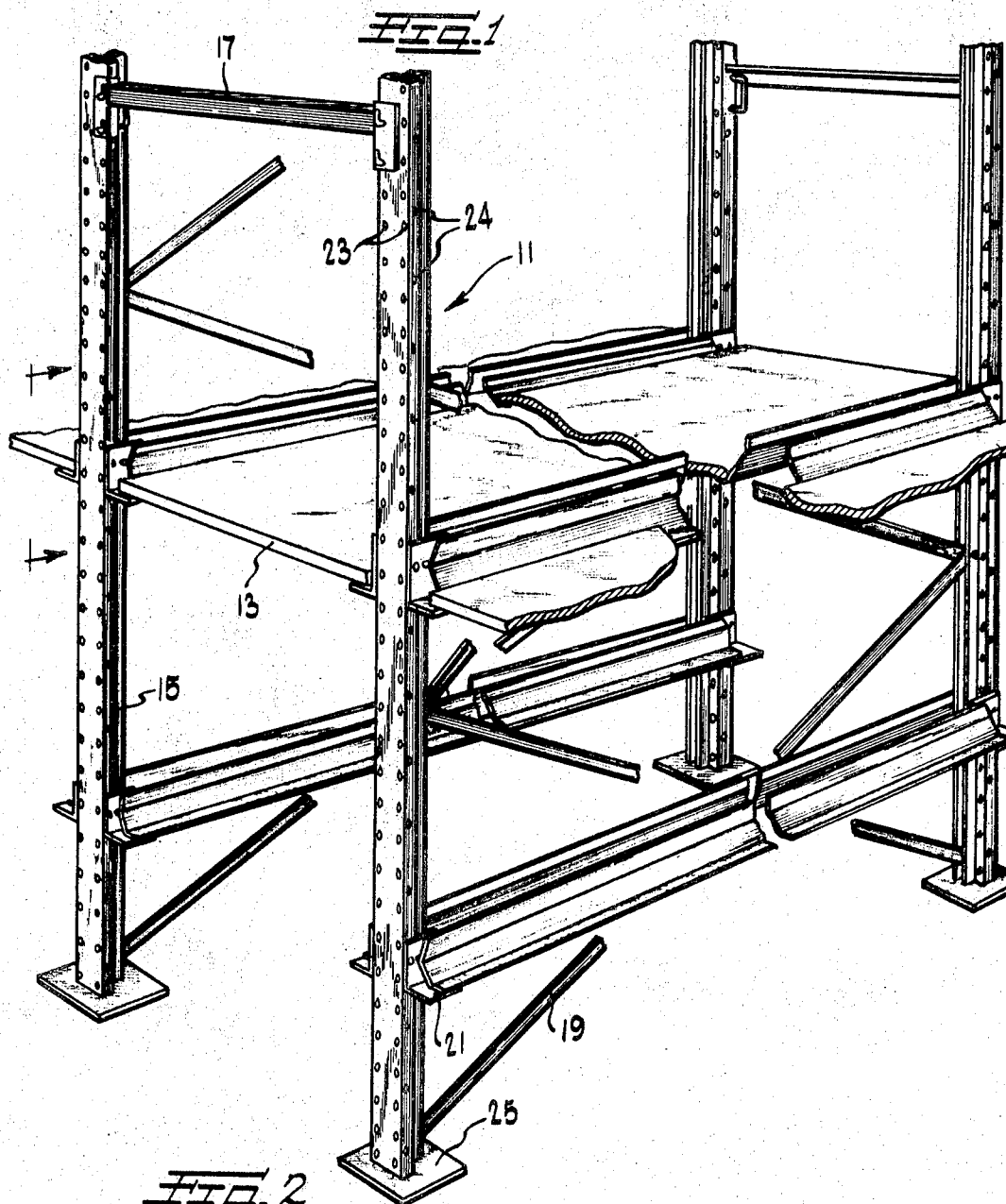
Primary Examiner—David J. Williamowski
Assistant Examiner—Andrew V. Kundrat
Attorney—Anderson, Luedeka, Fitch, Even & Tabin

[54] **SELF-ALIGNING RACK STRUCTURE**
7 Claims, 5 Drawing Figs.
[52] U.S. Cl..... 211/176,
211/183
[51] Int. Cl..... A47f 5/00
[50] Field of Search..... 214/16.4,
16.42; 211/176, 182, 183; 248/243; 108/106;
211/148, 148B

[56] **References Cited**
UNITED STATES PATENTS
754,816 3/1904 Schriefer..... 248/243X
1,407,593 2/1922 Smith..... 214/38.42

ABSTRACT: A rack structure is provided which is designed to support a plurality of material carriers such as conventional pallets thereon in vertically structured disposition. The rack structure is adapted to support the material carriers and to position the carriers generally centrally between the columns of the structure as the carrier is placed in position for storage.





INVENTOR
John J. Weider

Anderson, Quedeka, Fitch, Evers & Tablin
ATTORNEYS

Fig. 3

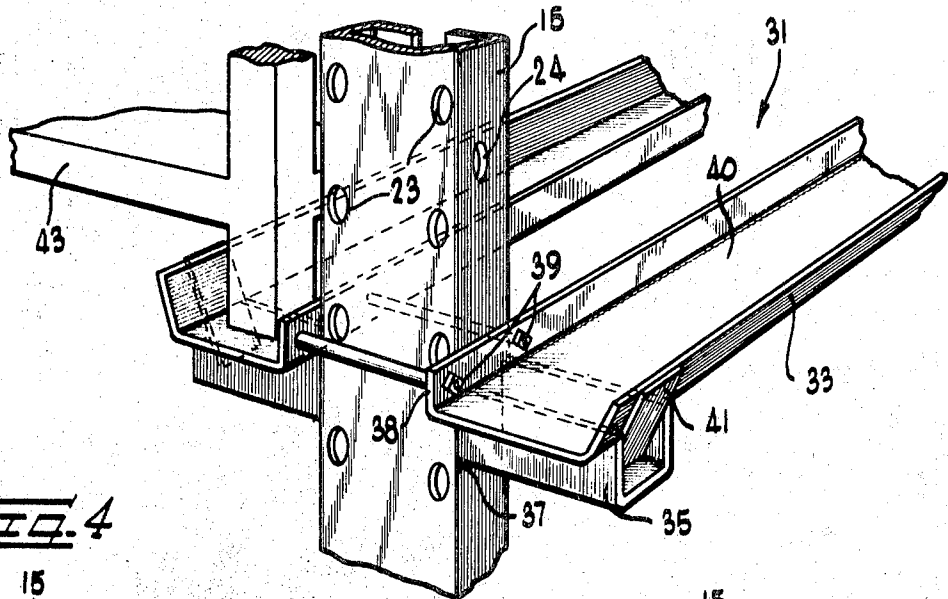


Fig. 4

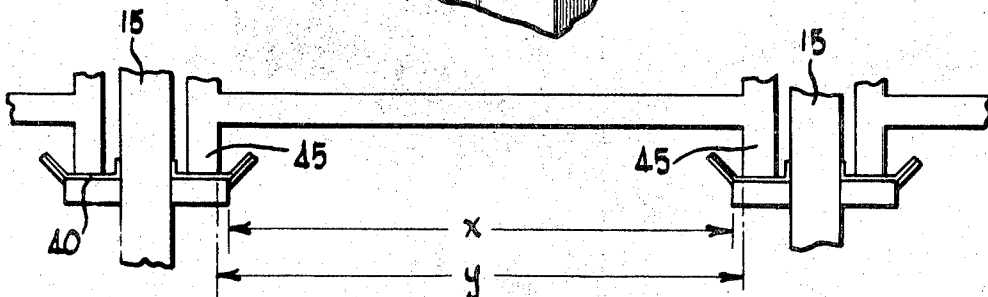
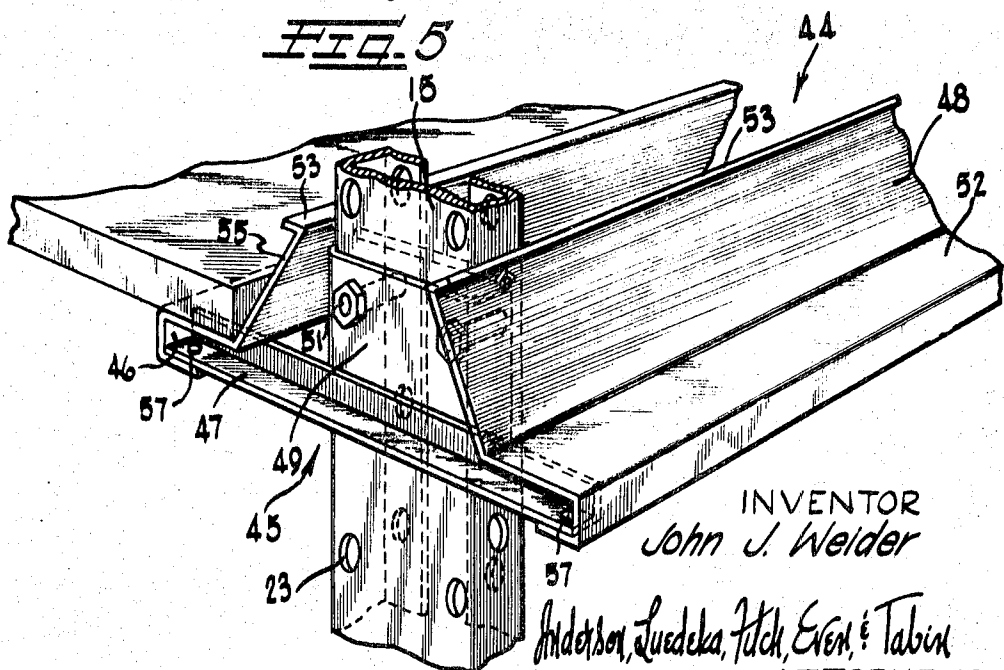


Fig. 5



INVENTOR
John J. Weider

Anderson, Luedeka, Fitch, Evers & Tabin
ATTORNEYS

SELF-ALIGNING RACK STRUCTURE

The present invention relates to storage devices and, more particularly, to a rack structure adapted for vertical stacking and positioning of loads, and to a rack assembly comprising a plurality of such rack structures.

Many different types of storage racks are in current use for storing standard, uniformly shaped items, such as pallets. Such racks are designed to support a wide variety of items and are usually constructed from sets of a relatively few identically shaped members for low cost, convenience and ease of construction.

In the construction of storage racks which are adapted to receive standard shaped load carriers, such as pallets, a load-bearing bed is usually provided upon which a carrier frame may be set and thereby support the items stacked on the carrier. A plurality of horizontal, vertical and cross bracing support members are provided for maintaining a plurality of load-bearing beds in fixed position in an array of storage racks. The load-bearing beds are generally spaced in a vertical dimension a distance such that the space between the carrier and its load and the immediately adjacent load-bearing bed above it is such that the fork of a fork lift truck or similar type of loading or positioning machine may be inserted between support members and place a carrier in position upon the load-support bed.

Materials handling systems are becoming increasing more automated. The material which is to be transported is packaged in or on uniformly shaped carriers and is transported from site to site on the carrier. The carriers are usually adapted to be handled by power equipment such as fork lift trucks, and are also sometimes further adapted to be handled by automatic equipment such as stacker cranes, conveyor belts and chain belts. When it is necessary to store the materials on their containers for various purposes during treatment of the materials, it is desirable that such storage occur in a minimum amount of space. For this reason, vertical arrays of stacks are often used upon which the materials on their carrier may be placed and retrieved when the next processing step is to occur. The carrier is usually positioned between vertical members of an array of stacks.

It is apparent that a certain tolerance must be provided in excess of the width of the carrier to permit inserting the carrier between the vertical members of the array. Of course, any excess in tolerance required because of inaccurate positioning of the carrier is wasted. It can also be readily understood that in a vertical array of carriers which is several units high that inaccuracy in positioning the carrier centrally between the vertical members of the array will result in imbalance of loads and in possible malfunctioning of automatic positioning equipment.

It is therefore desirable to provide an array of stacks for receiving carriers for materials which will automatically position the carrier generally centrally between vertical members of the array of stacks.

It is therefore an object of the invention to provide an improved rack assembly.

Another object of the invention is to provide a rack assembly which provides for positioning a material carrier generally centrally between vertical members of the rack.

A further object of the invention is to provide an improved rack for positioning material carriers which are simple of construction and low in cost.

Other objects of the invention will become apparent to those skilled in the art from the following description taken in connection with the accompanying drawings wherein:

FIG. 1 is a perspective view of a rack, partially in section and partially broken away, embodying various features of the invention;

FIG. 2 is a partial front view of the rack assembly of FIG. 1;

FIG. 3 is a fragmentary perspective drawing of a further embodiment of the rack assembly shown in FIG. 1;

FIG. 4 is a schematic diagram of a cross section of the rack assembly of the present invention; and

FIG. 5 is a fragmentary perspective drawing of a still further embodiment of the rack assembly shown in FIG. 1.

Very generally, the rack structure 11 shown in FIG. 1 is designed to support a plurality of material carriers 13, such as an ordinary pallet, thereon in vertically stacked disposition. A plurality of vertical columns 15 and horizontal spacers 17 are joined to provide the skeleton framework of the rack. Bracing members 19 are used for rigidity. Load-support brackets 21 are suitably secured to the columns 15. The load-support brackets 21, as will be described more fully hereinafter, are adapted to support a material carrier 13 and to position the carrier generally centrally between the vertical frame members as the carrier is placed in position for storage.

Now, referring particularly to FIGS. 1 and 2 of the drawings, a rack structure 11 is shown which comprises vertical columns 15 which are spaced apart at the front and rear of the rack to provide the desired spacing between columns to establish the width of the storage unit. Bracing members 19 are affixed between columns in the fore-and-aft planes to provide rigidity to the rack 11.

Pairs of cooperating load-support brackets 21 are spaced vertically along the columns 15. The columns 15 and the load-support brackets 21, in combination, define a vertical array of space units which are adapted to receive material on carriers.

The columns 15 each have two rows of holes 23 vertically spaced along the front face thereof. Another series of vertically spaced holes 24, staggered with respect to the hole 23, extends through the columns perpendicular to the hole 23. The load-support brackets 21 are secured to the columns by means of bolts and nuts 27 and are positioned at the desired height along the columns by selecting the appropriate holes 24. Feet 25 may also be used under each of the columns to more evenly distribute the load of the rack. The horizontal spacers 17 are connected to the columns at the desired location using the structural locks 26 described in detail in U.S. Pat. No. 2,932,368, which locks have a pin that resides in the holes 23.

As best seen in FIG. 2, the load-support brackets, which are bolted to the columns, include strategically proportioned guide plates 29. The guide plates 29 are preferably formed from a single rectangular sheet of metal. Any suitable metal sheet may be used for the guide plate 29, such as carbon steel or stainless steel. The metal sheet is formed by bending the sheet at two places along its length to provide two legs 30 which are at a right angle with respect to each other. The connecting section between the two legs forms the inclined portion of the guide plate 29. The guide plate 29 is affixed to a right-angle L-shaped member 32 to provide the load-support bracket 21. When the load-support bracket 21 is bolted to the columns 15 the connecting section between the two legs of the guide plate 29 provides an inclined length. As a carrier 13 is lowered within the space between the two columns 15, the carrier will contact the guide plate 29 at some position along the inclined length of the guide plate 29. The guide plate then serves to automatically align and position the carrier 13 onto the horizontal supporting portion of the load-support bracket 21.

Since the two legs 30 of the guide plates 29 are at a right angle with respect to each other and they are affixed to a right angle L-shaped member, the sum of the included angles 26 and 28 is 90°. Obviously, the sheet metal from which the guide plate 29 is formed can be provided in sizes which when bent provide an infinite combination of angles 26 and 28 whose sum is 90°. It is preferred, however, that the angle 26 be at least about 60°. At angles of less than about 30° friction between the carrier and the guide plate tends to hinder movement of the carrier relative to the guide plate.

In another embodiment of the invention designed for use with legged carriers, see FIGS. 3 and 4, a load-support bracket 31 is provided with an integral guide plate 33 located outwardly from the column 15. The load-support bracket 31 is in the form of a shallow upwardly open channel having two spaced flanges, with one of the flanges being bent outwardly with respect to the column 15 to provide the guide plate 33.

The load-support bracket 31 may be formed from a single rectangular piece of sheet metal by bending the sheet metal

twice along the lines parallel to the long edge of the rectangle. One of the bends provides the right angle flange 38 while the other provides the outwardly angled flange which provides the guide plate 33. The connecting section between the flanges provides a load-bearing bed 40.

The load-support bracket 31 is mounted on lateral bracket support 35. The lateral bracket support 35 is affixed to the column 15 at desired intervals by suitable means, such as by weld 37. The load-support brackets 31 are placed into position athwart at least two lateral bracket supports 35. The load-support brackets 31 are fixed into position by bolts 39, which span the column 15 and interconnect a pair of load-support brackets 31 so as to prevent lateral movement of the load-support brackets 31. A bracing member 41 is provided to supply additional rigidity to the guide plate 33 of the load-support member. The bracing member 41 is affixed to the lateral bracket support member 35 by suitable means, such as by welding.

As seen in FIG. 3, the outwardly located guide plate 33 is particularly adapted for locating material carriers 43 which have legs or which are runner type pallets.

The dimensional relationship between the width of the carrier 43, the distance between the columns 15, the width of the load-bearing bed 40 of the load-support bracket 31, and the angle and width of the guide plate 33 determine the locating tolerance of the rack structure of the invention. For example, as seen in FIG. 4, the distance between the inside edges of the leg 45 of the carrier 43, shown as dimension y , is preferably somewhat greater than the distance x between the locating corners formed by the junction of the guide plate 33 with the load-bearing bed 40 of the load-support bracket 31. The distance y minus x is then the location error tolerance of the rack structure of the present invention. The distance y minus x may be maintained within the allowed or permissible limits of the particular moving equipment used to carry and position the material carriers.

Other embodiments of the present invention will be readily apparent to one skilled in the art. For example, as seen in FIG. 5, an integral guide plate and load-support bracket 44 is shown which is similar to the system shown in FIG. 1 but designed for use with somewhat heavier loads. The integral guide plate and load-support bracket may be formed from a single rectangular piece of sheet metal as previously described. Four bends are required. The first two bends are right angle bends which provide a J-shaped terminus 46 which engages a lateral bracket support assembly, as will be hereinafter described. The next bend is made at an angle to provide the inclined guide plate surface 48. The connecting section between the guide plate 48 and the J-shaped terminus 46 provides a load-bearing bed 52. A final right angle bend provides a stiffening rib 53 along the upper edge of the guide plate 48. The stiffening rib 53 prevents deformation from contact with misaligned carriers. The lateral bracket support assembly 45 comprises a lateral bracket arm 47 and a mounting member 49. The lateral bracket support arm 47 is fixed to the mounting member 49 by any suitable means, such as welding. The lateral bracket support assembly 45 is then mounted to vertical frame members at the desired height by means of nuts and bolts 51, which may be positioned through the spaced holes 23 in the column 15 as previously described. The lateral bracket support arm 47 engages the J-shaped terminus of the integral guide plate and load-support bracket 43 and is bolted thereto by nuts and bolts 57. Various of the features of the invention are set forth in the following appended claims.

I claim:

1. A stationary storage rack structure adapted for the positioning of loads disposed on carriers using automatic handling equipment, which structure comprises a plurality of spaced-apart vertical columns supported at the lower ends thereof on a floor and arranged in groups of at least four as front and rear pairs of columns, horizontal spacer means extending laterally between said columns to space said respective pairs apart a distance equal to a storage unit having a width larger than the

width of a load carrier, means bracing said columns of different pairs in a fore-and-aft direction, and at least a pair of load-support means extending in a fore-and-aft direction between columns of said front and rear pairs and secured thereto at the same vertical location, each load-support means of said pair extending into said same storage unit between said columns and each said load-support means including a positioning guide surface which depends downward from the column upon which it is supported at an angle between about 30 and 60° to the horizontal and which is adapted to align a load carrier being lowered thereon from above in a generally central position laterally within said storage unit, and each said load-support means also including a plate member that is formed to provide said downwardly sloping guide surface to provide an horizontal load-bearing surface portion which is adjacent said guide surface and disposed laterally inwardly thereof with respect to said storage unit, to provide an adjacent depending vertical portion connected to said horizontal surface portion and to provide an inturned second horizontal portion connected to said depending portion.

2. The storage rack structure in accordance with claim 1 wherein a pair of said load-support means are connected to opposite sides of the same columns at the same location by means of a horizontal support arm, the ends of which are disposed in the regions of said plate member vertically between said horizontal surface portions.

3. A stationary storage rack structure adapted for the positioning of loads disposed on carriers using automatic handling equipment, which structure comprises a plurality of spaced-apart vertical columns supported at the lower ends thereof on a floor and arranged in groups of at least four as front and rear pairs of columns, horizontal spacer means extending laterally between said columns to space said respective pairs apart a distance equal to a storage unit having a width larger than the width of a load carrier, means bracing said columns of different pairs in a fore-and-aft direction, at least a pair of load-support means extending in a fore-and-aft direction between columns of said front and rear pairs and secured thereto at the same vertical location, each load-support means of said pair extending into said same storage unit between said columns and each said load-support means including a positioning guide surface which depends downward from the column upon which it is supported at an angle between about 30 and 60° to the horizontal, each said load-support means including a plate member that extends substantially the entire distance fore-and-aft between front and rear columns and that is formed to provide said angularly-disposed guide surface, said horizontal load-bearing surface portion and a vertical surface portion, and means for connecting said plate members to said columns.

4. The storage rack in accordance with claim 3 wherein said connecting means includes a pair of angle iron pieces, the ends of said plate member being affixed to said angle iron pieces which are connected to said columns.

5. A stationary storage rack structure adapted for the positioning of loads disposed on carriers using automatic handling equipment, which structure comprises a plurality of spaced-apart vertical columns supported at the lower ends thereof on a floor and arranged in groups of at least four as front and rear pairs of columns, horizontal spacer means extending laterally between said columns to space said respective pairs apart a distance equal to a storage unit having a width larger than the width of a load carrier, means bracing said columns of different pairs in a fore-and-aft direction, and at least a pair of load-support means extending in a fore-and-aft direction between columns of said front and rear pairs and secured thereto at the same vertical location, each load-support means of said pair extending into said same storage unit between said columns, and each said load-support means including a positioning guide surface which is disposed at an angle between about 30 and 60° to the horizontal and which is adapted to align a load carrier being lowered thereon from above in a generally central position laterally within said storage unit.

5

and said load-support means including horizontal load-bearing surface portion disposed intermediate said guide surface and said supporting column, both said guide surface and said horizontal surface portion extending continuously fore-and-aft between columns of opposite pairs whereby said storage rack structure is adapted for the storage of legged load carriers, the laterally spaced legs of which are separated a distance slightly greater than the distance between said guide surfaces of said pair of load-support means.

6. A storage rack in accordance with claim 5 wherein said guide surface is provided by one flange of an upwardly open

6

channellike member which is connected to said column by an underlying bracket upon which bracket the horizontal web of said member rests.

7. A storage rack in accordance with claim 5 wherein a pair of said load-support means are connected to opposite sides of one column at the same vertical level, with bolts extending through flanking apertures in the other upstanding flange of each member being used to clamp said channellike members to said column.

15

20

25

30

35

40

45

50

55

60

65

70

75