

May 19, 1970

R. A. OLSEN ET AL

3,512,654

MODULAR CANTILEVER ADJUSTABLE ARM RACK AND JOINT ASSEMBLY

Filed May 9, 1968

2 Sheets-Sheet 1

FIG. 1

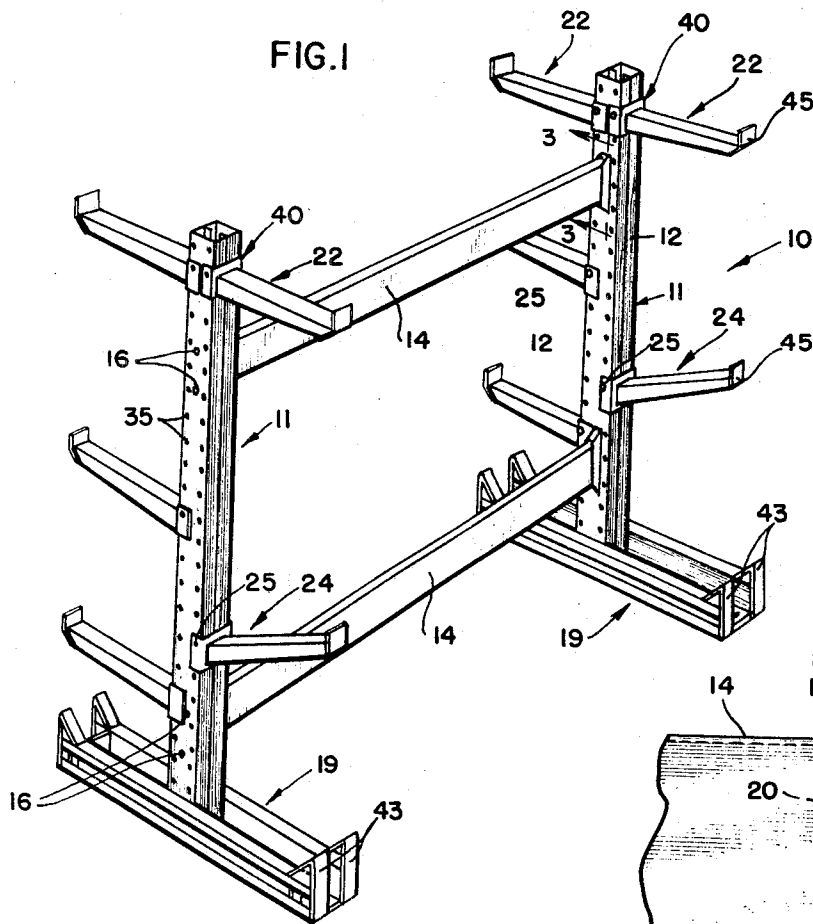


FIG. 3

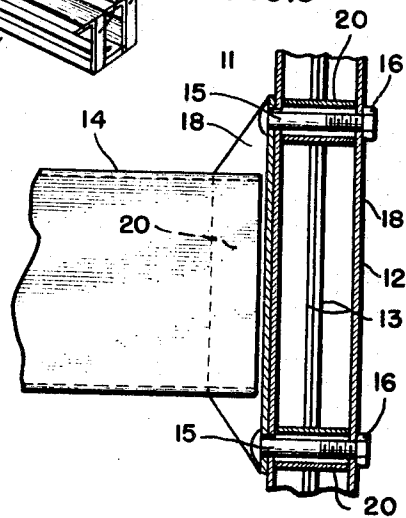


FIG. 2

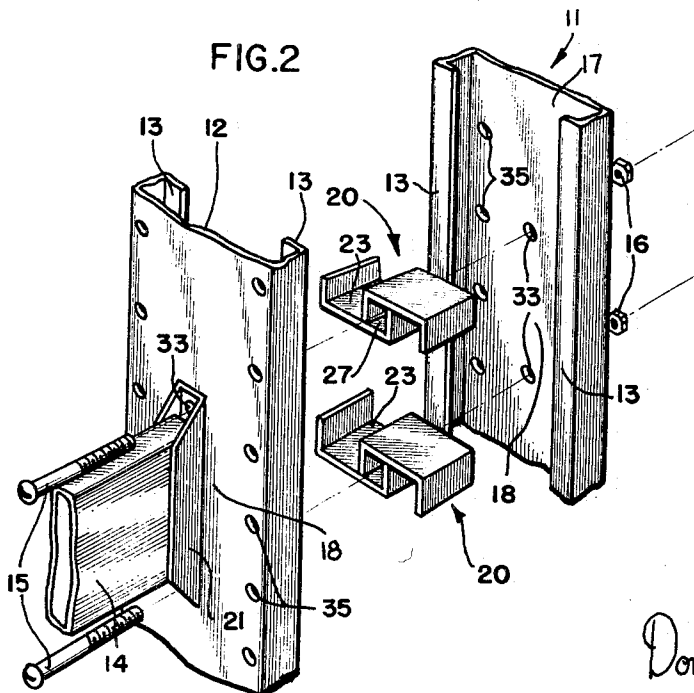


FIG. 4

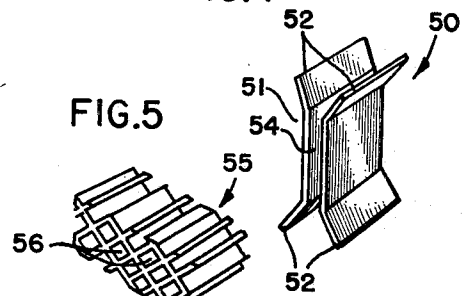
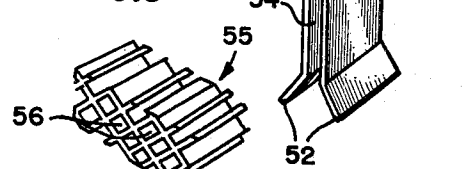


FIG. 5



INVENTORS
ROBERT A. OLSEN
RICHARD S. JAY

Dominick, Knechtel, & Godula
ATTYS.

May 19, 1970

R. A. OLSEN ET AL

3,512,654

MODULAR CANTILEVER ADJUSTABLE ARM RACK AND JOINT ASSEMBLY

Filed May 9, 1968

2 Sheets-Sheet 2

FIG. 6

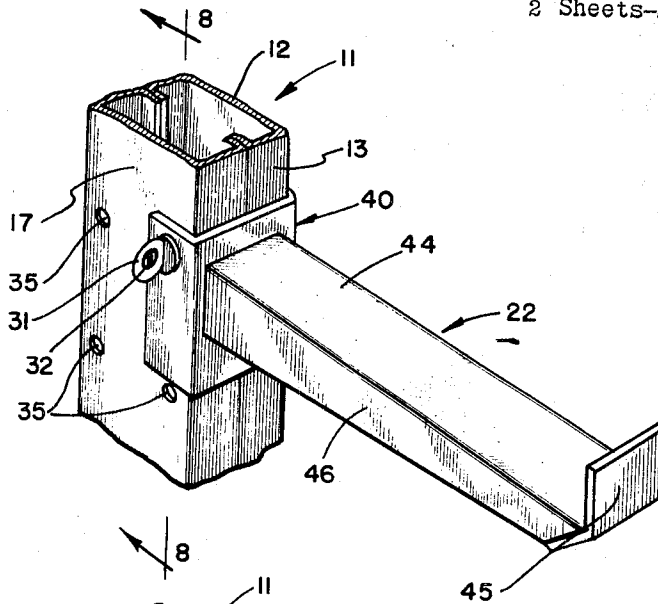


FIG. 7

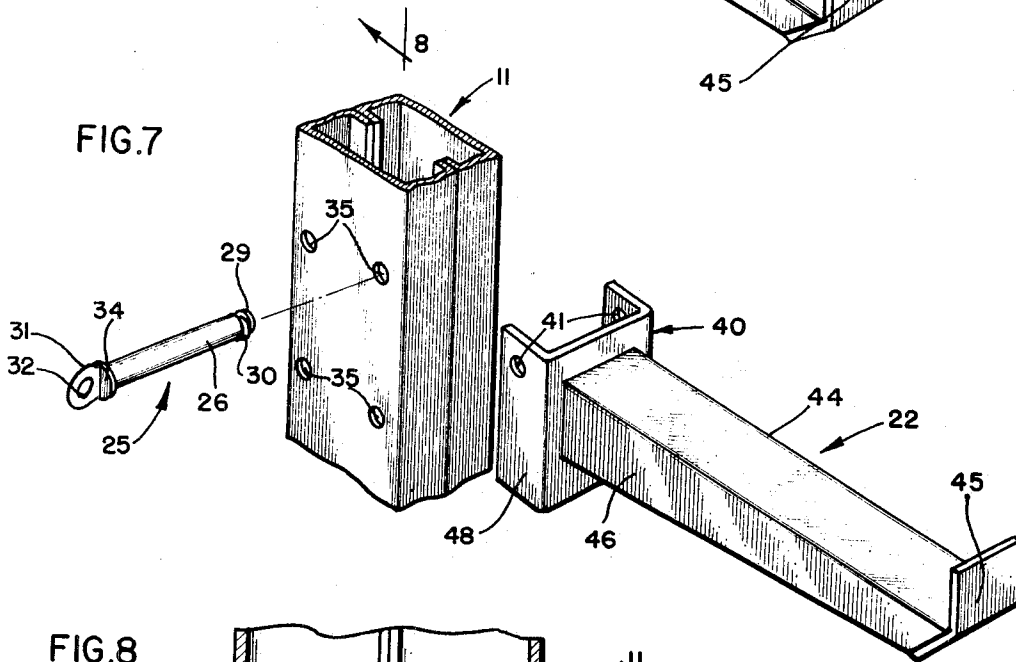


FIG. 8

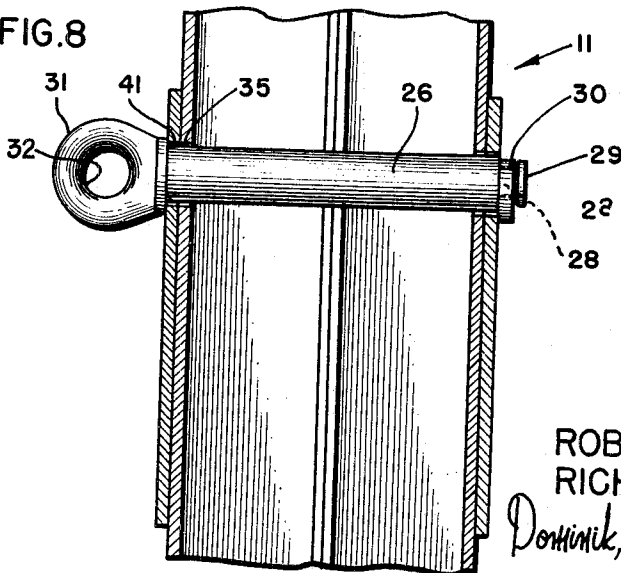
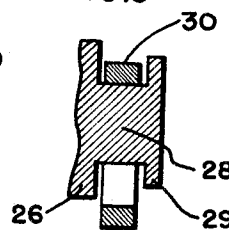


FIG. 9



INVENTORS
ROBERT A. OLSEN
RICHARD S. JAY
Dominik, Knechtel, & Godula
ATTYS.

1

2

3,512,654

MODULAR CANTILEVER ADJUSTABLE ARM RACK AND JOINT ASSEMBLY

Robert A. Olsen, Palatine, and Richard S. Jay, Evanston,
Ill., assignors to Jarke Corporation, Chicago, Ill., a
corporation of Illinois

Filed May 9, 1968, Ser. No. 727,779

Int. Cl. A47f 5/10

U.S. Cl. 211—176

7 Claims

ABSTRACT OF THE DISCLOSURE

A modular cantilever adjustable arm rack and joint assembly is disclosed in which a compression joint is employed in the diaphragm area defined on the vertical column where the horizontal brace members are secured to the vertical column. Additionally, a safety pin of one piece construction is disclosed which can be employed to secure the cantilever arms to the vertical columns in registering holes in the brace for the arms and along the vertical columns.

The present invention relates to a modular cantilever adjustable arm rack and joint assembly, and more particularly to the means for adjustably and removably securing the arms in a plurality of locations on the vertical column. In addition, the invention contemplates the stiffening of the diaphragm area defined at the point where the horizontal brace is secured to the vertical column, and the cantilever arms are also secured to the column.

Storage racks of the prior art such as disclosed in U.S. Pat. 3,164,255 are exemplary of the art. In these structures, it will be noted that diagonal bracing is employed between the vertical columns at the interior portion in order to provide for squaring in combination with the spacing of the vertical columns by the horizontal brace.

Additionally, the prior art structures conventionally employ bolts with safety pins, fixed interlocking structures, and the like, to secure the arms to the vertical columns. When two parts are employed, if one is lost the other is ineffective. When projections or specific interlocking structures are provided, additional inventory problems arise at the manufacturing level as well as with the customer.

In view of the foregoing, it is a general object of the present invention to provide a cantilever adjustable arm rack and joint assembly in which a single self-retaining pin may be employed to removably secure the cantilever arms at a wide variety of locations on the vertical column.

A related object looks to the reinforcing of the diaphragm area defined at the connection between the horizontal brace and the vertical column in such a manner that oil-canning action in thinner structural members is avoided, and safety of connection as well as universal distribution of stresses is provided at the joint irrespective of the location of the horizontal brace or the member securing the cantilever arm to the vertical column.

Still another and important object of the present invention looks to the provision of a structure of a minimized number of modular elements for a cantilever adjustable arm rack and joint assembly which permits a wide variety of sizes to be inventoried in a highly prefabricated condition, and then assembled according to customer's order and specification with a minimized amount of subsequent assembly and delay time in shipment.

Further objects and advantages of the present invention will become apparent as the following description of an illustrative embodiment proceeds, taken in conjunction with the attached drawings in which:

FIG. 1 is a perspective view illustrating a modular cantilever adjustable arm rack and joint assembly to develop the present invention showing the adjustable arms which are horizontal as well as those with inclined load face.

FIG. 2 is an enlarged partially broken exploded perspective view of the joint where the horizontal brace is secured to the vertical column.

FIG. 3 is a partially elevational view taken through the center line of the tension bolts shown in FIG. 2 further illustrating the detail between the horizontal brace and the vertical column shown in FIG. 2, taken along section line 3—3 of FIG. 1.

FIG. 4 is a perspective view illustrating an alternative embodiment of the compression brace.

FIG. 5 is a perspective view showing a further alternative of the embodiment of a honeycomb compression brace.

FIG. 6 is a partially broken perspective view illustrating the assembled relationship of the horizontal cantilever arm and the vertical column.

FIG. 7 is an exploded perspective view of the structure shown in FIG. 6 illustrating the assembled relationship of the arm pin, arm, and vertical column.

FIG. 8 is a sectional view through the vertical column taken along section line 8—8 of FIG. 6.

FIG. 9 is an enlarged longitudinal sectional view of the arm locking pin encircled in dotted lines in FIG. 8 at the right hand upper portion thereof.

The general assembly of the modular cantilever adjustable arm rack and joint 10 is disclosed perspective in FIG. 1. It will be seen that the rack 10 comprises a pair of vertical columns 11 which are fabricated from a pair of column channels 12. A pair of horizontal braces 14 are positioned and secured to the vertical column 12 by means of a tension bolt 15 and nut 16. A base 19 is fixedly secured in perpendicular relationship to each of the vertical columns, the bases 19 being shown in parallel relationship to each other. A plurality of cantilever arms 22, 24 are secured to the vertical columns 11 by a self-retaining shear pin 25 in a manner which will be disclosed in greater detail hereinafter. Here it will be appreciated that the cantilever arms 22, 24 can be randomly secured to either side of vertical columns 11, and that a horizontal cantilever arm 22 or an inclined cantilever arm 24 may be employed and utilize both sides of the rack assembly. Notably missing from this construction, are any cross braces, tension tie rods, and the like between the horizontal braces 14 which permits additional flexibility and storing anywhere on the rack assembly 10.

In order to eliminate the necessity for employing such tie rods, opposed channels 12 are employed to construct the rack assembly 10 with vertical columns 11 which are light in weight, economical to manufacturer, and flexible in operation assembly. Particular attention is drawn to the area where horizontal brace 14 is secured to the vertical columns 11 shown in FIGS. 2 and 3. There it will be seen that a diaphragm area 18 (shown by cross-hatching) is defined upon a column face 17 which lies between the column flanges 13. As the horizontal brace 14 is secured to the column channels 12 by means of tension bolts 15 and secured by nuts 16, the varying load forces applied to the column 11, whether transferred by the horizontal brace 14 or the cantilever arms 22, 24, create a complexity of stresses in the diaphragm area. To accommodate these stresses and eliminate any oil canning effect, a compression brace 20 is provided for positioning between the column faces 17 and yet permitting passage of the tension bolt 15. As shown in FIG. 2, the compression brace 20 is fabricated from two interlocking channel sections 23, thereby providing a bolt throughway

3

27 in alignment with bolt holes 33 in the column faces 17 and connector brace 21.

As the tension bolt 15 is secured by the tension nuts 16, the connector brace 21 which is connected to the channel horizontal brace 14, secures the horizontal brace 14 to the vertical column 11. The diaphragm area 18 defined in the column face 17 is thereby compressively loaded across its cross-section by means of the compression brace 20, and torsion, bending, and compressive loads transmitted from either the cantilever arms 22, 24 or the horizontal brace 14 are distributed uniformly over the diaphragm area 18. Particularly, as shown in FIG. 3, it will be seen that bolt 15 passes substantially through the horizontal geometric center of the compression brace 20. The diaphragm area 18 is generally bounded by the orientation of the bolt 15 and the intermediate portion of the column channels 12.

As shown in FIG. 4, an alternative compression brace may be employed which includes a pair of opposed flat channel 51 with flared ends 52. One lateral edge of the alternative compression brace 50 is tack-welded in column face 17 in the same manner as the compression brace shown and described in connection with FIGS. 2 and 3. Bolt clearance 54 is provided between opposed faces of the flat channel 51 of the alternative compression brace. Still another embodiment of a honeycomb compression brace 55 is disclosed in FIG. 5. There it will be seen that the honeycomb member has a plurality of bolt holes 56 which can accommodate the tension bolt 15. The lateral edges of the honeycomb 55 are secured to the column faces in the same manner as described with regard to the alternate opposed channel compression brace 51 and the compression brace 20 as disclosed in the principal embodiment.

Significantly intertwined with the point assembly and elimination of oil canning in the diaphragm area 18, is the mounting assembly for the horizontal arms 22, 24 as illustrated in FIGS. 6 through 9, inclusive. As shown particularly in FIG. 6, it will be seen that the horizontal cantilever arm 22 comprises an arm beam 42 with a load stop 45 at its far end. Depending from the load face 44 of the arm beam 42 are a pair of parallel flanges 46. At the support end of the arm beam 42, the same is secured to a brace 40 which has channel-shaped cross-section proportioned to slidably engage the vertical column 11. Pin holes 41 (see FIG. 7) are provided in the brace 40 to receive the arm self-retaining shear pin 25 particularly as illustrated in FIG. 7. It will be observed that a plurality of mounting holes 35 are provided in the face 17 of the channels 12 which make up the vertical column 11 to receive the horizontal arm 22 at a plurality of positions up and down the vertical column 11. When the cantilever arms 22, 24 are positioned adjacent the diaphragm area 18 on the column channels 12, it will be appreciated that a wide variety of stresses are applied to the vertical column 11. The single arm self-retaining shear pin 25, therefore, translates a portion of these forces to the vertical column 11 as the same engages the pin holes 41 in the flanges 48 of the cantilever arm brace 40. An additional operating advantage of the present construction is achieved by providing a single arm self-retaining shear pin 25 which can be quickly manipulated by the operator to position the cantilever arms 22, 24 to the vertical column 11. Particularly, as shown in FIG. 7, it will be seen that the arm self-retaining shear pin 25 includes a pin shank 26 and a loosely fitting retaining ring 30 at one end portion thereof. At the other end portion a grip 31 is provided, shown in this instance having a grip eye 32 and a grip eye collar 34 proportioned to abut the column face 17 adjacent the arm pin mounting holes 35 in the vertical column 11.

Referring now to FIG. 9, it will be seen that the loosely fitting retaining ring 30 surrounds a stub shaft portion 28 at the end of the pin shank 26 remote from the grip 31. A collar 29 is formed at the far end of the pin shank 26,

4

and preferably a split ring 30 is employed and positioned around the stub shaft 28 in such a manner that metallic interference prevents the retaining ring 30 from sliding over the collar 29. The outer diameter of the retaining ring 30 approximates that of the pin shank 26 or is slightly less than the pin shank 26 so that the retaining ring can pass through the mounting holes 35 in the column face 17 as well as the arm pin holes 41 in the brace flange 48.

In operation the user positions the cantilever arm 22 up or down the vertical column 11 until the flange bolt holes 41 and the column bolt holes 35 are aligned. Thereafter, with one hand, the operator grasps the pin 25 by means of the grip 31 and jiggles the same until the retaining ring 30 aligns itself with the exterior portion of the shank 26. Then the arm self-retaining shear pin 25 is trust transversely across the vertical column 11 into the position shown at FIG. 8. The pin is additionally passed through the far bolt holes 35, 41, this being accomplished by jiggling the same. A loose tolerance is provided at both pairs of bolt holes to insure the easy passage of the pin 25.

After the shank 26 has passed transversely through the vertical column 11 until the grip eye collar 34 abuts the flange 48 of the cantilever arm mounting brace 40, the ring 30 drops into the position resting atop the stub shaft 28 as shown in FIG. 9. To remove the arm self-retaining shear pin 25, the operator must first center the retaining ring 30 coaxially with the pin shank 26, and thereafter withdraw the pin. After the pin has been withdrawn from one pair of bolt holes 35, 41, the operator can position his shoulder underneath the arm beam 42, or hold the same in one arm, and thereafter manipulate the arm self-retaining shear pin 25 out of the other side.

Most importantly, by employing an arm self-retaining shear pin 25 with a retaining ring 30 such as illustrated and described above, only one piece is required in order to safely and securely positionably engage the cantilever arms 22, 24 with the vertical columns 11. The pins 25 can be employed with either the horizontal cantilever arms 22 or the inclined cantilever arms 24. No safety pins, extra bolts, or other parts are required to safely secure the arms 22, 24 to the vertical columns 11 apart from the single arm self-retaining shear pin 25.

Returning now to FIG. 1, it will be seen in review that a plurality of load supporting areas are defined by the horizontal adjustable arms 22, 24 terminating at load stops 45. In addition, load stops 43 are provided on the horizontal base 19 to maximize the storage area provided on both sides of the vertical columns 11. The parallel horizontal beams 14 remain uncluttered by cross bases therebetween, maximizing the flexibility of load carrying provided by the cantilever arms 22, 24. The arms are randomly positionable at any location defined by the bolt holes 35 in the channels 12 of the vertical columns 11. The single arm self-retaining shear pin 25 secures the arms 22, 24, irrespective of the joint area between the horizontal beam 14 and the vertical columns 11 at any position desired by the user.

Although particular embodiments of the invention have been shown and described in full here, there is no intention to thereby limit the invention to the details of such embodiments. On the contrary, the intention is to cover all modifications, alternative embodiments, usages and equivalents of a modular cantilever adjustable arm rack and joint assembly as fall within the spirit and scope of the invention, specification and the appended claims.

What is claimed is:

1. A modular cantilever adjustable arm rack and joint assembly comprising, in combination, a pair of vertical columns, said vertical columns being formed from channel-like members having opposed webs, horizontal brace members for attachment between the vertical columns,

5

tension members for securing the horizontal brace members to the vertical columns, a diaphragm area defined on said vertical column where the horizontal brace members are secured thereto by means of the tension members, a plurality of compression elements transverse between the channel-like members of the vertical columns, said compression elements being proportioned and oriented to flank the tension member between the channel members thereby distributing the torsional, compression, and bending forces applied to the faces of the vertical column across the face of the vertical column in the diaphragm area to insure against oil-canning action within the diaphragm area on the flat faces; and a plurality of cantilever arms removably secured to the vertical columns, said arms being adjustably positionable at space stations along the length of the vertical column including the diaphragm area thereby permitting the erection of a rack which avoids cross-braces between the horizontal brace members.

2. In the assembly of claim 1, arm locking pins for securing the arms to the vertical columns, said arms terminating in channel-like mounting braces proportioned to slideably engage the vertical columns, and registering hole means in the vertical columns and mounting braces to receive the locking pins.

3. In the assembly of claim 1, said compression elements comprising offset channel members.

4. In the assembly of claim 1, said compression elements comprising a honeycomb.

5. In combination with the modular cantilever adjustable arm rack and joint assembly of claim 1, a cantilever arm retaining pin for securing a plurality of parallel members having aligned apertures therein for receiving the same; said pin comprising a shank portion, circular in cross-section; a stub shaft at one end thereof; a retaining ring proportioned and oriented to loosely fit on the stub shaft, said proportions permitting the retaining ring to offsettingly overlap the extended cross-sectional

6

area of the shank portion when in the horizontal configuration, retaining collar means at the end of the stub shaft securing the retaining ring from dislodgment, and gripping means at the opposite end of the retaining body pin for guiding the same and threading the pin body through the plurality of apertures in the aforesaid parallel members to be lockingly engaged.

6. In the assembly of claim 5, said gripping means having at least one dimension larger than the hole with which it cooperates.

7. In the assembly of claim 5, said gripping means comprising eye means terminating in a collar at the opposite end of the shank portion from the retaining ring.

References Cited

UNITED STATES PATENTS

1,140,036	5/1915	Hella	85—7
2,056,078	9/1936	Slater	248—243
2,941,775	6/1960	Arnit	248—243
3,040,905	6/1962	Gingher et al.	211—183
496,465	5/1893	White	52—731
2,776,080	1/1957	Hopfeld	52—690
3,127,020	3/1964	Bibb	211—176
3,190,410	6/1965	Molstad	52—731
3,212,648	10/1965	Baker	211—176
3,346,124	10/1967	Sobel	211—148

FOREIGN PATENTS

185,948	6/1956	Austria.
30,875	8/1965	Germany.
560,482	4/1957	Italy.

U.S. Cl. X.R.

248—243; 85—7

MARION PARSONS, JR., Primary Examiner