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Al-Dabbagh et al.

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[54] **SAFETY CONNECTOR FOR KNOCK-DOWN RACKS**

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[52] **U.S. Cl.** **211/176**, 211/177, 211/182, 248/224, 403/319

[51] **Int. Cl.** **A47f 5/10**

[58] **Field of Search** 211/176, 177, 182, 183; 312/108; 248/223, 224, 220.5; 403/237, 315, 316, 319

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[57] **ABSTRACT**

A knock-down-type storage rack, which includes apertured, upright posts and horizontal cross-beam members in which aligned cross members on opposite sides of the post may be connected to the post through portions of a single aperture. End plates of special shape, attached to the beam portion of the cross member, provide proper abutting cooperation with the post and carry a non-load-bearing safety-lock pin which secures the cross member to one side of the upright post. The safety-pin is spaced from the beam portion so that the pin may be viewed from multiple aisle positions.

3 Claims, 8 Drawing Figures

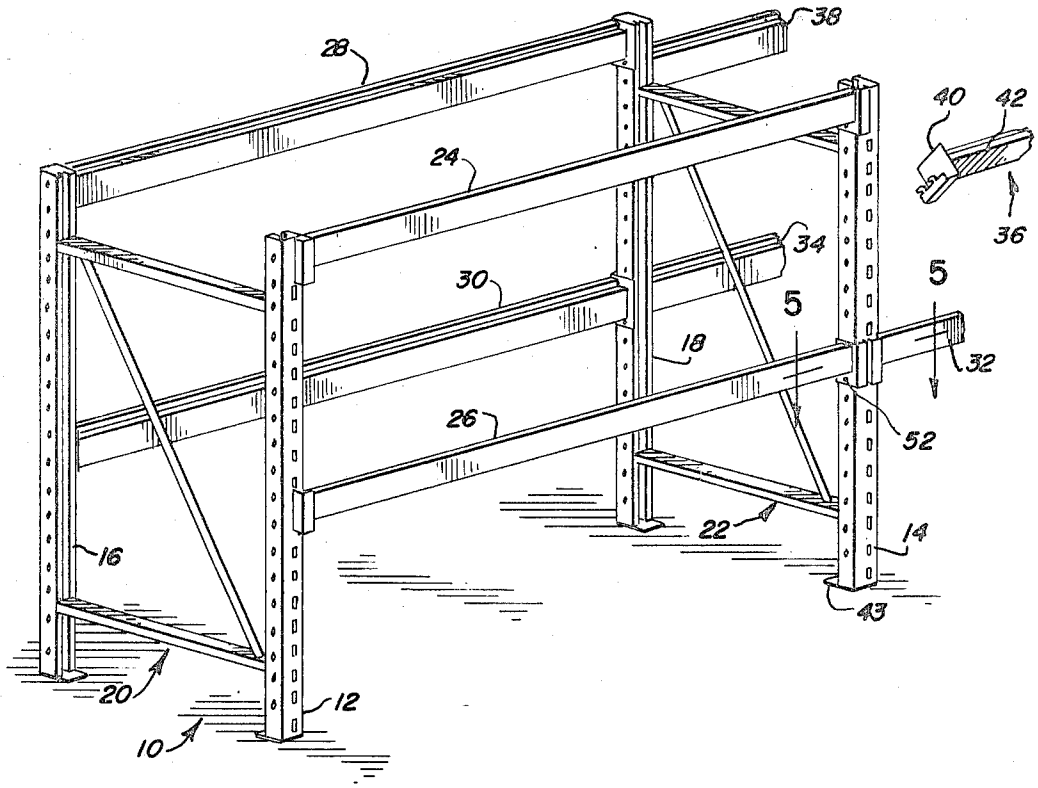
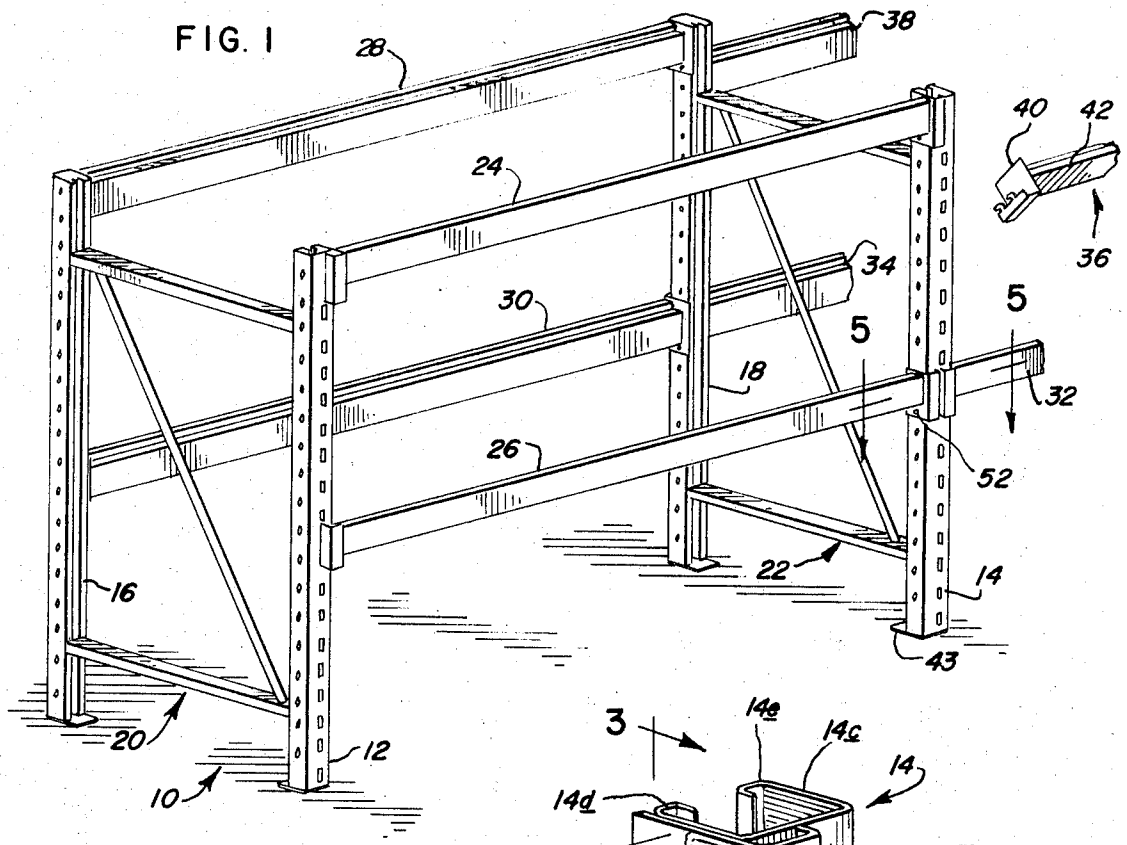


FIG. 1



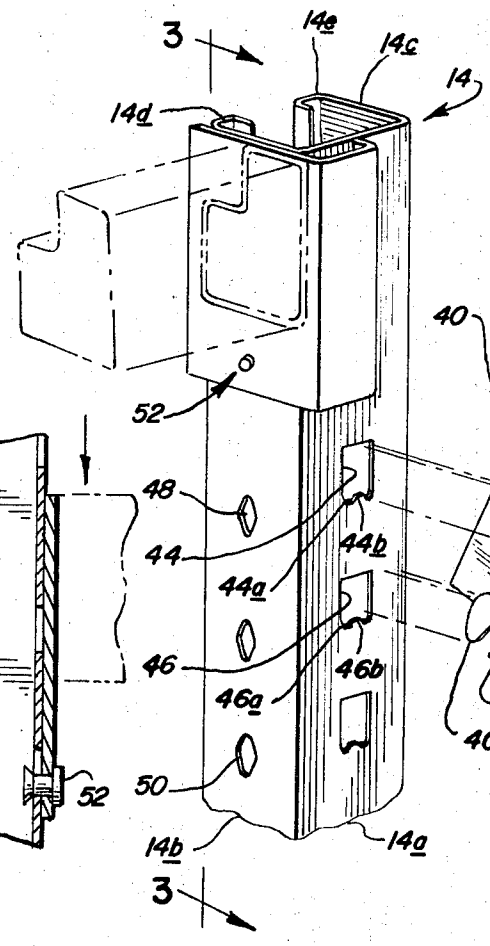


FIG. 2

FIG. 3

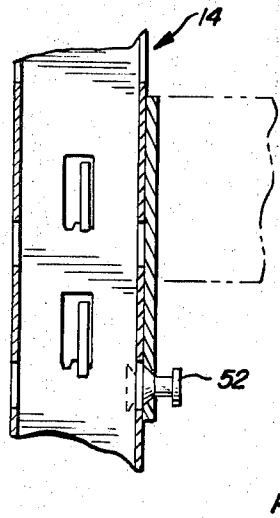


FIG. 4

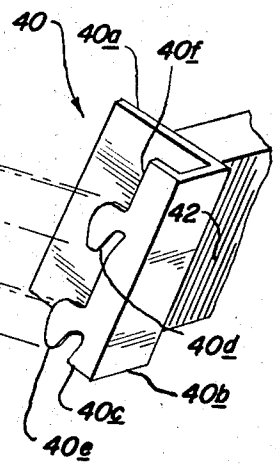


FIG. 5

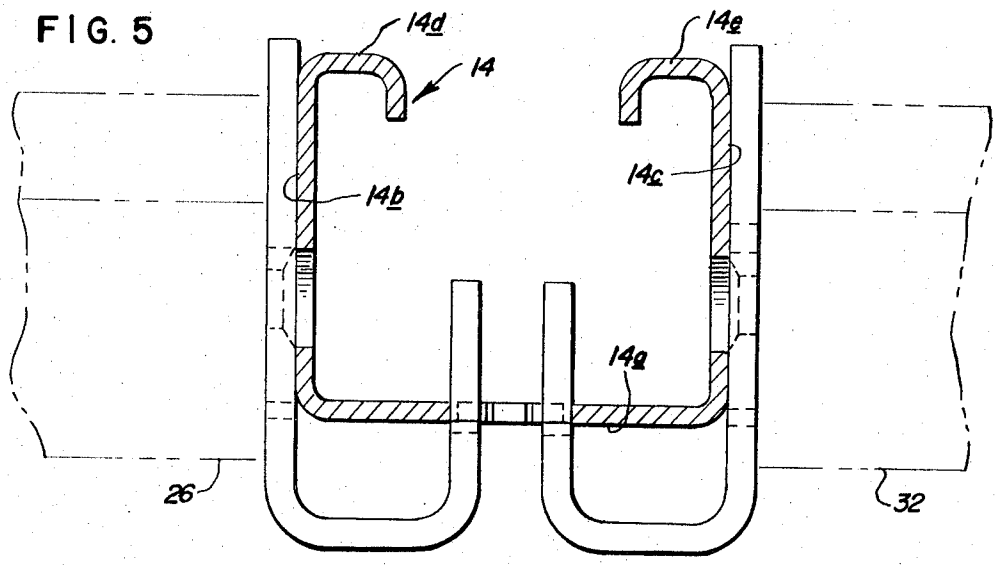


FIG. 6

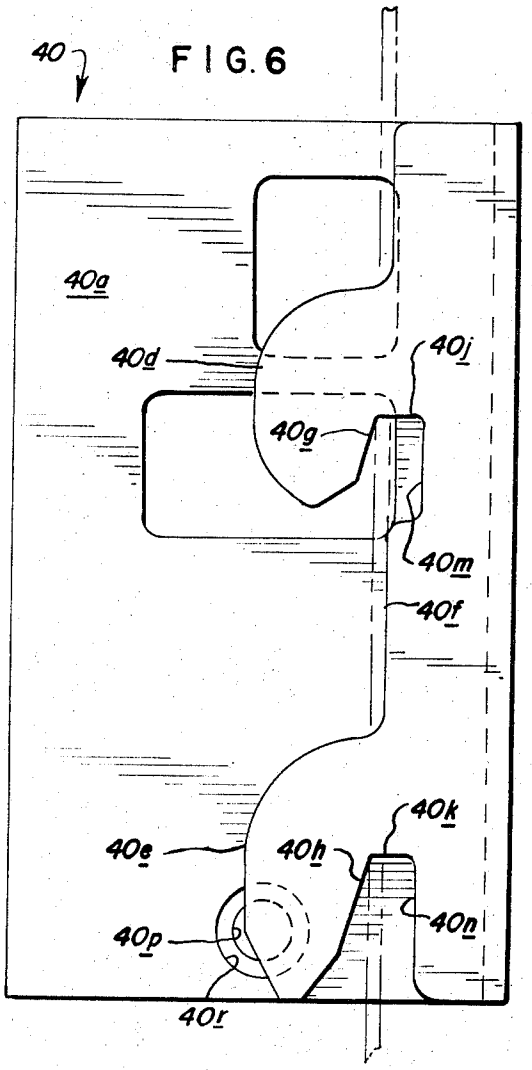


FIG. 7

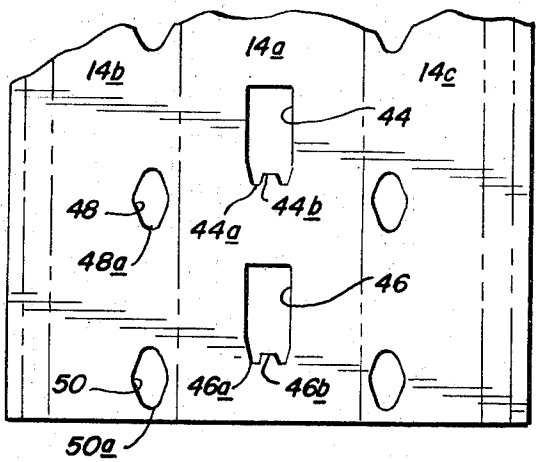
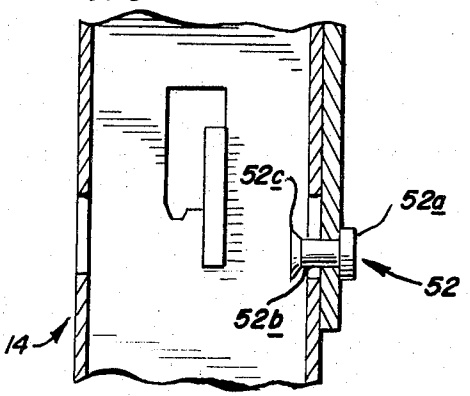


FIG. 8



SAFETY CONNECTOR FOR KNOCK-DOWN RACKS

BACKGROUND OF THE INVENTION

This invention relates to connectors and safety locks for knock-down-type storage racks.

Knock-down storage racks which include apertured, rectangularly shaped upright posts and horizontally disposed, tubular cross members for selective connection and disconnection to the posts, are well known. When assembled, these racks defined tiers of storage bins in which palletized loads can be stored and such racks are usually arranged in rows with aisles therebetween.

It is well known to construct racks wherein the front face of each of the upright posts includes two rows of vertically spaced, key-hole-shaped connector-receiving apertures and in which lug-type connectors are provided on a flanged end-plate mounted at the end of each cross member for locking cooperation with the post apertures.

In order to prevent pivoting of the cross member about its axis and disengagement due to an upward blow as the rack is being loaded and unloaded, as well as to reduce the load of the lug-type connectors, axially slideable, L-shaped latch-bolts are mounted on and within the cross member for movement from either the back side or the front side of the cross member, into and out of latched, load-bearing relationship with apertures in the side of the post. Although these bolts are effective to prevent pivoting, accidental disengagement, and to carry part of the load, it is difficult for an operator to quickly visually determine from a single aisle position, in front of or in back of the rack, whether the latches for both the front and back cross members are secure, since only the latches on either the back or front of the cross members can be viewed. In other words, some of the latches will be blocked from view by the cross member itself.

It is therefore an object of this invention to provide safety means which are positioned so that both the front and back cross member latches can be checked simultaneously from multiple aisle positions.

Another type of latch which is used includes a spring-type clip having a locking stud thereon which is mounted to the end-plates of the cross member so that the stud automatically enters a connector-receiving aperture in the upright post to block the movement of the connector out of the aperture until the stud is withdrawn. This arrangement is relatively complex and has the disadvantage that an operator can determine only whether the front cross members are latched, since the latches on the back cross members are blocked from view by the post.

It is another object of this invention to provide simple and inexpensive latches in which the back and front latches can be visually checked from an aisle position.

In many prior art constructions the end connector plate is an L-shaped, angle-type member in which both legs are to fit flush against the front and side faces of the upright post. Both the posts and connector members are fabricated members and as such it is difficult and expensive to provide each with an exact mating shape so that the connector plate always fits snugly against the upright post.

It is thus another object of this invention to provide an improved end-connector plate for positive locking engagement with the upright post of the prior art.

These and other objects will become apparent from the following description and appended claims.

SUMMARY OF THE INVENTION

There is provided by virtue of this invention, a simple and inexpensive safety system, for securing the cross member to the upright post, which is carried on the connector end-plate below the beam portion of the cross member, by which it can be quickly, visually determined from multiple aisle positions whether the safety systems for both the front and back cross members are engaged. The system includes an axially movable, double-headed pin, carried by the end connector plate, which is movable into and out of a lock-pin receiving aperture in the side of the upright post. The pin and receiving apertures are arranged so that the system is substantially non-load-bearing and the aperture is shaped such that the pin will remain therein even if the beam receives an upward jolt as the rack is being loaded or unloaded.

In order to alleviate some of the problems associated with flush-mating of the connector plates and upright posts, improved connector plates are provided in which one side of the plate fits flush against the side face of the post, and the plate is bent so as to form a leg parallel to the side for substantial edge abutment with the post's front face. Along the abutment edge there are provided hooks for engagement with hook-receiving apertures in the front face of the post. These apertures are of the size to receive two hooks in side-by-side relation so that only one row of apertures is necessary for connecting cross members to both sides of the post.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a perspective view of an assembled rack with one cross member positioned for assembly;

FIG. **2** is an enlarged fragmentary perspective view showing one cross member mounted to an upright post and another cross member in position for mounting thereto;

FIG. **3** is a vertical sectional view taken substantially along line **3–3** of FIG. **2** and showing a connector plate and safety lock pin positioned for connection to the upright post;

FIG. **4** is a view similar to FIG. **3**, showing the safety-pin connected to the post;

FIG. **5** is a fragmentary, horizontal sectional view taken substantially along line **5–5** of FIG. **1** and showing the connection of two end-plates to an upright post;

FIG. **6** is a side elevational view of a connector plate;

FIG. **7** is a fragmentary, developed, front view of an upright post, showing the relationship of the hook-receiving apertures and the safety-pin receiving apertures; and

FIG. **8** is a greatly enlarged view similar to FIG. **4**, showing the relationship of the safety-pin and connector when a beam is mounted to an upright post.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to the drawings, there is shown an assembled knock-down storage rack **10**, which includes two front upright posts, **12** and **14**, and two rear upright posts, **16** and **18**. Each front post is connected to an aligned rear post by a front-to-back strut assembly such as **20** or **22**. The front posts **12** and **14** are interconnected by the horizontal cross members, **24** and **26**,

and the rear posts **16** and **18** are interconnected by the cross members **28** and **30.** Cross members **32** and **34** are connected to the upright posts **14** and **18** respectively at positions aligned with the cross members **26** and **30,** while the members **36** and **38** are arranged for connection to the posts below the upper cross members **24** and **28.** With this arrangement tiers of storage bins are defined in columns between the strut assemblies **20** and **22,** and the strut **22** and its companion strut (not shown).

Each of the upright posts and each of the cross members are substantially identical so that the description as to one is applicable to all. The cross member **36** has an end-plate, such as **40,** welded to each end of the tubular beam section **42.** The connector plate is a channel-shaped, stamped metal member having a long leg **40***a* which is welded on one side to the tubular section; a front section **40***b* which is bent at right angles to the long leg; and a short leg **40***c* which is bent rearwardly and generally parallel to the long leg **40***a*. A plurality of vertically spaced, downwardly open connector hooks **40***d* and **40***e* are provided along the vertical abutment edge **40***f* of the short leg **40***c* for cooperation with the upright post **14.** The plate **40** is shaped so that the distance between the inner surface of leg **40***a* and the outer surface of leg **40***c* is less than one-half the width of the front of the upright post **14.**

The upright post **14** is an elongated, channel-shaped, metal member of almost any cross-section and which may have a foot **43** welded at the bottom end. In the specific example shown the post includes a front face **14***a* having a centered, vertically extending row of spaced, hook-receiving apertures, such as **44** and **46.** Each of the apertures has a lower support edge, such as **44***a* and **46***a* , at the center of which there is provided an upstanding centering rib, such as **44***b* and **46***b* . The vertical sides of the aperture adjacent the support edges are tapered inwardly toward the upstanding rib so as to urge the hooks of the connector plate toward the center of the post and hold the long leg of the plate flush against the side of the upright post. The upstanding ribs divide the apertures into two vertical portions, one for receiving hooks from connector plates on each side of the post.

In addition to the front face the upright post includes two side faces **14***b* and **14***c* which extend rearwardly from the front face and terminate in inwardly-directed rolled-type edges **14***d* and **14***e*. Each side of the upright post includes a plurality of vertically spaced and vertically-elongated safety-pin-receiving apertures, such as **48** and **50.** Each of the apertures has narrow upper and lower ends which taper outwardly so as to form a wide-mouthed middle section. The lower edges of the receiving apertures, such as **48***a* and **50***a* , are spaced below the lower support edges **44***a* and **46***a* of the hook-receiving apertures.

Each connector hook-receiving aperture is of a height sufficient to receive the connector hook and has a width greater than twice the width of a hook so as to accommodate two hooks in side-by-side relation. Each hook extends forwardly of the abutment edge and has an upwardly tapering, cam-like inner edge, such as **40***g* and **40***h*, which terminates forwardly of the abutment edge **40***f* in a support land, such as **40***j* or **40***k*, each of which is adapted to engage an aperture support edge. The junction of the land and its respective tapered edge is spaced forwardly of the abutment edge by a distance approximating the thickness of the front face so as to insure tight engagement of the abutment edge against the front face. Immediately forward of the hooks there are provided recesses, such as **40***m* and **40***n*. The lowermost recess, **40***n*, aids in connecting and disconnecting the hooks from the posts.

A safety lock pin **52** is carried on the long leg **40***a* of the connector plate in an aperture **40***p* which has a beveled or countersunk portion **40***r* surrounding the edge of the aperture. The aperture **40***p* is spaced below the beam portion **42** of the cross-member **360** and is positioned below the land **40***k* of the lower hook **40***e* so that the distance between the land **40***k* and the lowers edge of the aperture **40***p* is less than the vertical spacing on the upright post between the hook-receiving apertures' support edge **46***a* and the lower edge **50***a* of a lower pin-receiving aperture. Such spacing prevents the lock pin **52** from contacting the cross-member in load-bearing relation when it is secured to the upright post. Moreover, by positioning the aperture below the beam the pin is visible from both front and back aisle positions.

The pin **52** is a double-headed member having an outer buttonlike head **52***a* for engagement with the outer surface of the leg **401**; an elongated intermediate shank portion **52***b* which extends through and slideably cooperates with the aperture **40***p*; and an inner tapered head **52***c* shaped for mating engagement with the bevel **40***r* so that its end will fit flush with the inner abutment surface of leg **40***a*.

As the rack is being assembled the connector hooks are fitted into their apertures, and before the hooks are seated and while the pin **542** is **52** the wide portion of the aperture **50,** the pin is pushed inwardly so as to extend the beveled head **52***c* through the aperture and into the post. When the connector hook is seated on the support edge such as **44***a* or **46***a* the pin shank **52***b* is spaced above the lower edge of the pin-receiving aperture so as to be non-load bearing,, and the inner head **52***c* is positioned behind the lower tapered section of the aperture so that it cannot be retracted until the cross-member is raised.

In the event that, as loaded pallets are being placed in or removed from the rack by a fork lift, the beam should receive an upwardly directed blow, the connector hooks would move upwardly in their apertures and the safety pin **52** would move upwardly past the wide center portion and into the tapered upper portion of the pin-receiving aperture while still keeping the head **52***c* inside the post and thereby preventing disconnection of the cross-member from the post.

As the pin **52** moves vertically in the aperture the beveled portion of the head **52***c* acts as a cam member and urges the pin into locking relationship with the post.

It will be appreciated that numerous changes and modifications can be made to the embodiments herein without departing from the spirit and scope of this invention.

What is claimed and desired to be secured States Letters Patent of the United State is:

1. In a knock-down storage rack which includes apertured, upright posts of generally rectangular cross-section and beam members having ends constructed and adapted for selective connection and disconnection to the posts to provide the storage rack construction, the improvement comprising, in combination, the

post providing a front face and a side face transverse to each other, and each provided with a series of spaced apertures, the apertures in the front face each being vertically elongated and having a lower support edge, each end construction of the beam being in the form of a unitary plate shaped to provide a side-engaging portion adapted for attachment to the cross-beam on one surface thereof and substantial surface abutment against a side face of the post by the other surface thereof, and a hooking flange spaced from but substantially parallel to the side-engaging portion, the side-engaging portion being of greater dimension than the end of a beam and providing an exposed section located outwardly of the beam, safety pin means carried on the exposed section of the side-engaging portion and having a locking head adapted for entry into one of the series of apertures in the post's side when the beam is properly positioned on the post, the hooking flange having an elongated edge for bracing abutment with the face of the post and a plurality of hooks extending outwardly of said bracing edge adapted for entry into a plurality of apertures in the post's front face for simultaneous supporting engagement with the support edges of the apertures, the connector hooks and said pin being positioned on said plate such that when said hooks are seated in the hook-receiving apertures and said pin is positioned in said pin-receiving aperture, said pin is in spaced non-load-bearing relation with the edges of said pin-receiving aperture, said pin-receiving aperture being elongated and having a widened portion through which said locking head of the pin is extendable and said aperture having narrower upper and lower portions behind which the head of said pin is positionable, and the side-engaging portion of said plate being recessed so as to receive the locking head of said pin therein.

2. A rack as in claim **1** wherein each of said apertures in said front face includes an upstanding rib positioned substantially centrally along said support edge for dividing said aperture into two hook-receiving portions so that said aperture can simultaneously receive hooks from cross-members on opposite sides of said post.

3. In a knock-down storage rack which includes apertured, front and back upright posts of generally rectangular cross-section and beam members having ends constructed and adapted for selective connection and disconnection to the posts to provide the storage rack construction, the improvement comprising, in combination, each post providing a front face and a side face transverse to each other, and each provided with a series of spaced apertures, the apertures in the front face each being vertically elongated and having a lower support edge, the end construction of each beam secured to front and back posts being in the form of a unitary plate shaped to provide a side-engaging portion adapted for attachment to the cross-beam on one surface thereof and substantial surface abutment against a side face of the post by the other surface thereof, a hooking flange with a plurality of hooks thereon for entry into a plurality of apertures in the post's front face spaced from but substantially parallel to the side-engaging portion, the side-engaging portion being of greater dimension than the end of a beam and providing an exposed section located below the beam, and safety pin means carried on the exposed section of the side-engaging portion below said beam and adapted for entry into one of the series of apertures in the post's side when the beam is properly positioned on the post, the arrangement of safety pin means below the beam permitting visual inspection of all safety pin means for both front and back post-supported beams from a single aisle position, the safety pin means including a locking head for entry into the series of apertures in the post's side, said series of apertures being elongated and having a widened portion through which the locking head of the pin is extendable, said apertures each having narrower upper and lower portions behind which the head of the pin is positionable, and the side-engaging portion of the plate being recessed so as to receive the locking head of the pin therein when the safety pin means are withdrawn.

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