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Ferdinand et al.

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[54] TWIST CAM LOCK FOR KNOCKDOWN SHELVING

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[51] Int. Cl. **A47b 47/02**

[58] Field of Search..... **108/111, 110, 109, 107, 152, 108/48; 261/148; 5/298, 296**

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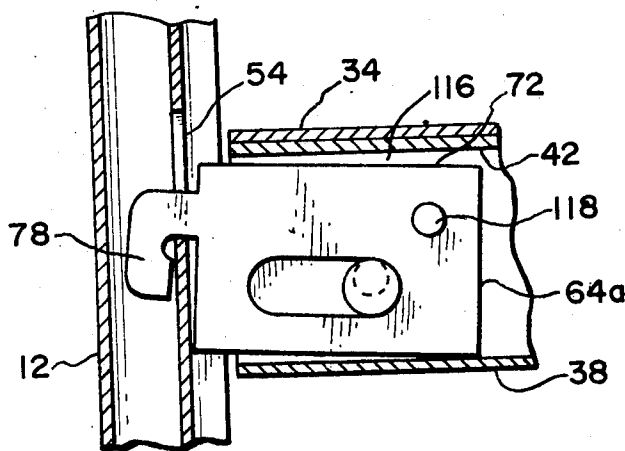
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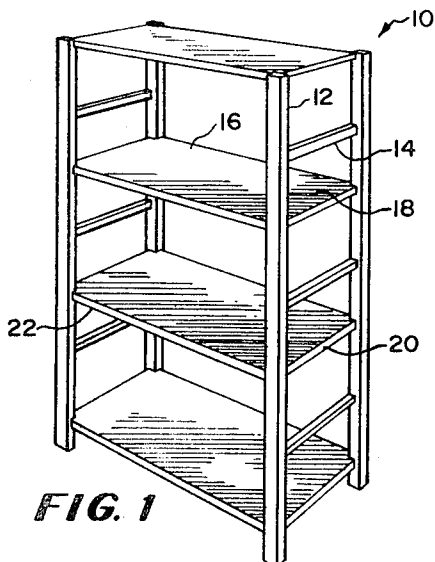
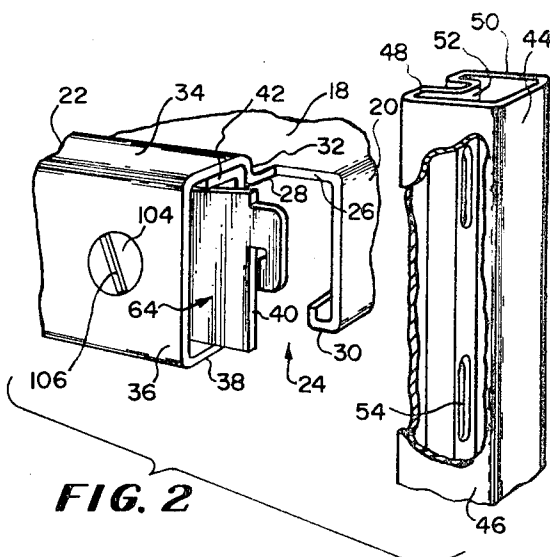
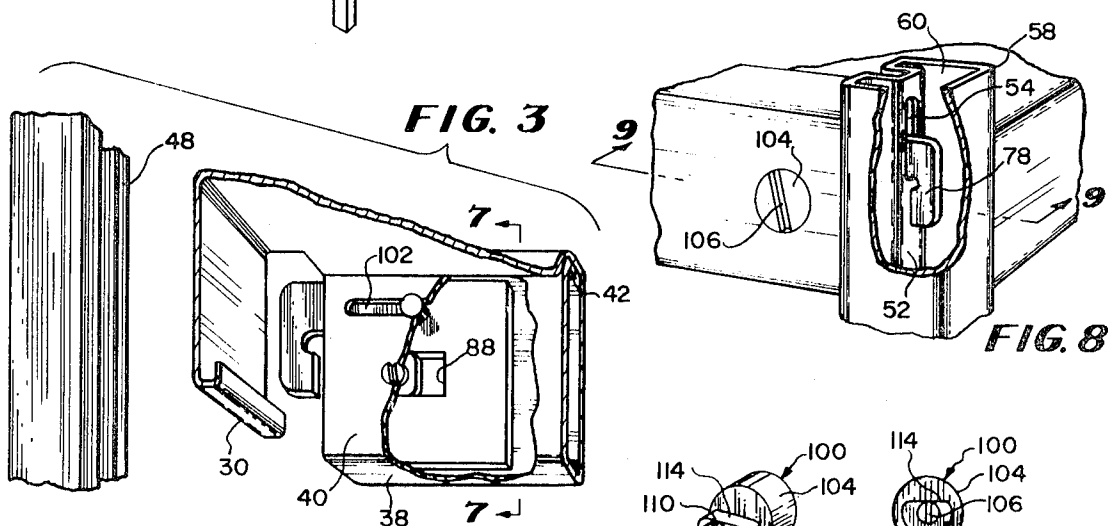
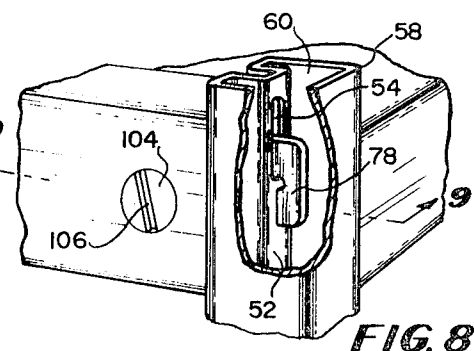
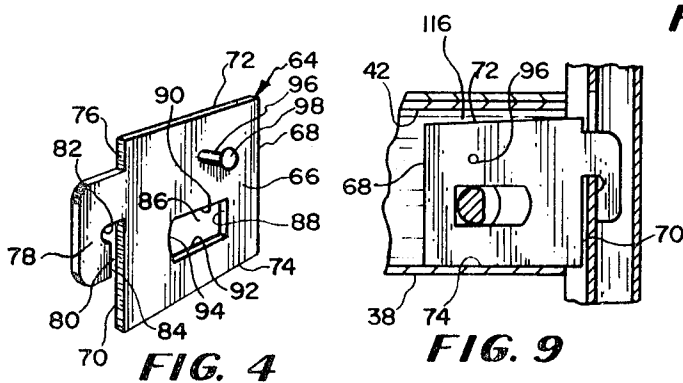
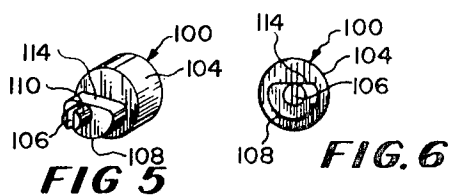
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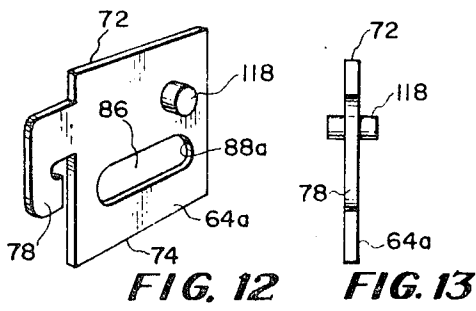
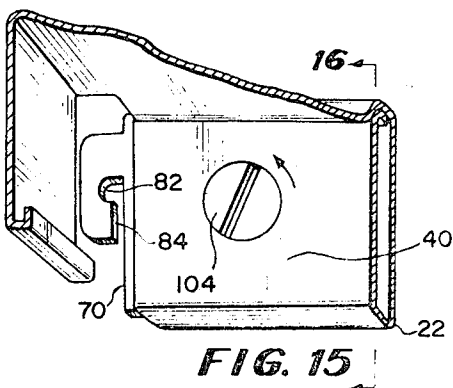
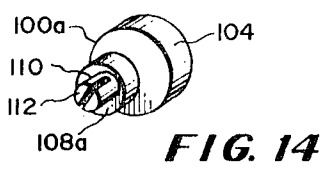
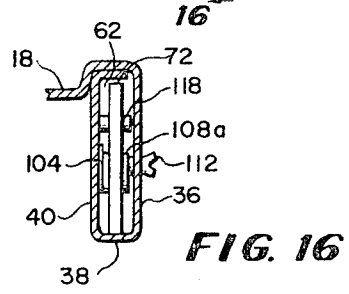
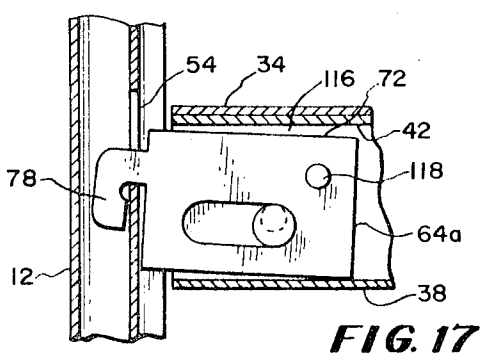
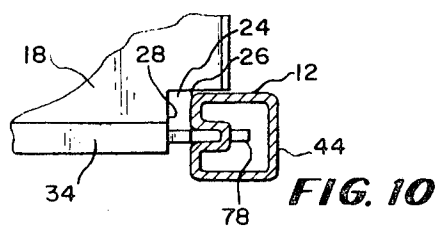
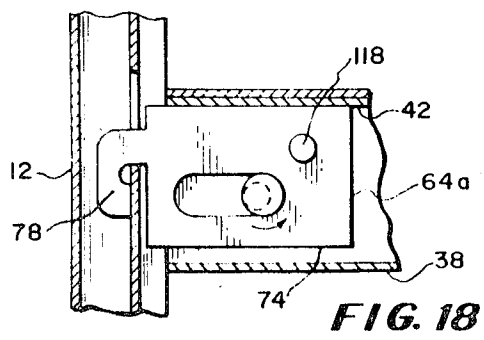
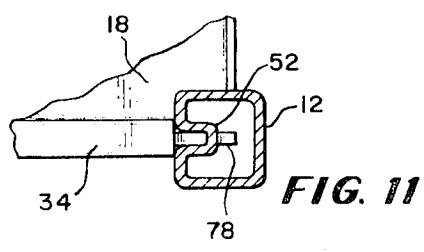
[57] ABSTRACT

Knockdown steel shelving is disclosed wherein each corner of a shelf is provided with a slidably mounted hook member that extends into the cut-out corner of the shelf. The hook members are guided within the box flange for retraction to clear an upright support member for level adjustment and for extension to a position for engagement within an opening in an upright support member and then tightened to a retracted position by a cam whereby the shelf corner and support are brought into rigid, weight-supporting relationship. The cam operates within a slot in the hook member and can have one of several locked positions including a position wherein the cam is rotated so that the lobe retracts the hook member into a locked position with a bottom edge of the hook member against the bottom wall of the box flange or with a top edge of the hook member against the top wall of the box flange. In either position, the cam may lock at a side-dead-center position in relation to the other parts. The hook attaching means and cam are essentially concealed, easily installed and adapted for use with various designs of shelves and corner supports. Other embodiments are disclosed.

2 Claims, 18 Drawing Figures







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TWIST CAM LOCK FOR KNOCKDOWN SHELVING

CROSS REFERENCE

This application is related to U. S. Pat. No. 3,438,344.

BACKGROUND OF THE INVENTION

Knockdown steel shelving units are primarily secured and rigidified through the attachment of the shelves to upright support members provided at their corners. These connections must be sufficiently strong to tie the corners of the shelves to the supporting posts so that they can support the weight of objects thereon and also provide that each juncture of shelf corner and support is rigid in all directions and the components are essentially unified.

It is also desirable that these corner connections provide ease of assembly, disassembly and adjustment. Each connection of juncture should be capable of rapid assembly without the use of special tools and each shelf should be independently vertically adjustable without having to loosen the rest of the assembly. It is of great advantage that the fastenings be formed of small, simply fabricated parts to minimize external appearance and also expense of manufacture, shipping and assembly.

Prior art devices have generally utilized complicated corner connectors bolted to the support members for rigidity. A more rapid and efficient device is disclosed in U. S. Pat. No. 3,438,344, comprising a concealed lever operated cam connector that serves to draw the support member firmly against the shelving to form a rigid support. The device in one embodiment uses the horizontal tensioning action endwise of the shelves for anti-end sway purposes and direct vertical support and moderate side sway for the shelf at the corner connector due essentially to the frictional abutment of the shelf flange against the corner support member. Also, although the lever is concealed, it may be inadvertently loosened disturbing the integrity of the unit.

SUMMARY OF THE INVENTION

The present invention improves the solution for these and other related problems and provides a corner fastening device for a system of knockdown steel shelving that is simple in construction, easily and rapidly assembled and disassembled with readily seen but inconspicuous elements that are not easily actuated without a tool that is readily at hand if desired. It also provides for easy vertical adjustability within the shelving system without disturbing the rest of the unit and serves as a weight supporting base for a shelf as well as providing rigidity of assembly and protection against sway.

A planar sliding member is provided, in accordance with this invention, with a hook shaped protuberance at one end and a slot in the body portion whose major axis is horizontal and intersects the end of the hook. The sliding member is secured within the box flange of a shelf by a single camming device inserted through the slot and rotatively supported in concentric apertures through the walls of the box flange. One end of the camming device is slotted to accommodate a screw driver. The central portion of the camming device is longitudinally displaced relative to the ends and rests in and engages the slot and preferably projects snugly into a narrow channeled corner post with substantial resulting rigidity and beam-like support for the clamping effort.

The hook member upon being drawn tight secures within an aperture provided in a wall of a corner support member and clamps by engagement centrally behind an unbroken area of the post wall that is spaced from the hook receiving opening. Thereby the support area is remote from the edges of the opening. Turning the camming device draws the cut-out corner of the flange against the wall of the support member and presses the sliding member into abutment with either the top or bottom side wall of the flange for added vertical support. The parts are designed for ease of manufacture, using a reduced number of parts and operates without binding. Furthermore, the cam need only be turned about $\frac{1}{4}$ turn from lock to unlock positions.

These and other advantages of the present invention will become apparent when considered in conjunction with the accompanying drawings.

DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view of a knockdown steel shelving unit embodying the present invention;

FIG. 2 is a fragmentary exploded view of the cut-out corner of a shelf with the hook member within the box flange and showing the slotted wall of a support member to be engaged thereby;

FIG. 3 is a fragmentary exploded view of the under side of the shelf corner and support of FIG. 1;

FIG. 4 is a perspective view of one form of hook device in this invention;

FIG. 5 is a perspective view of one form of cam member used in accordance with this invention;

FIG. 6 is an end plan view of the cam member of FIG. 5;

FIG. 7 is a cross-sectional view taken along the lines 7-7 of FIG. 3 of the box flange to show the lateral relationship of the parts;

FIG. 8 is a fragmentary perspective view of the shelf and corner support of FIGS. 1 and 3 in assembled condition;

FIG. 9 is a cross sectional view taken along the lines 9-9 of FIG. 8 showing the hook member in its locked position;

FIG. 10 is a fragmentary top view of the juncture of a shelf corner and a corner support showing the lock member in engagement with the slot of the support before the cam is turned to the locked position;

FIG. 11 is a fragmentary view of the parts shown in FIG. 10 with the cam in locked position;

FIG. 12 is a perspective view of a modified form of lock member;

FIG. 13 is an end plan view of the modified lock member shown in FIG. 12;

FIG. 14 is a perspective view of a modified cam member for use with the lock member of FIGS. 12 and 13;

FIG. 15 is a fragmentary view of the underside of a cut-out corner of a shelf with the lock member of FIG. 12 and the cam member of FIG. 14 mounted therein;

FIG. 16 is a cross-sectional view taken along the lines 16-16 of FIG. 15;

FIG. 17 is a partial cross-sectional view of a corner support and the box flange of a shelf member with the hook member of FIG. 12 engaging the slotted wall before the cam member is turned to the locked position;

FIG. 18 is a view of the parts shown in FIG. 17 with the cam member rotated to the locked position.

THE PREFERRED EMBODIMENT

Referring now to FIG. 1, a unit or module of shelving 10 is shown comprising vertical corner posts or supports 12, cross members or braces 14 and the shelves 16 which can be easily located and relocated vertically along the corner supports 12 without special tools. The flat portion 18 of the shelf 16 is preferably rectangular in shape and provided peripherally with depending end flanges 20 and the box side flanges 22 at the edges thereof. A knurled kerf-headed screw (not shown), usable in two ways, may be used to secure the cross braces 14 between a pair of supports 12. The flanges 20 and 22 depend at right angles from the plane shelf portion 18. Since all corner constructions under consideration are similar in the shelving, the following description of one corner relates to the other corners thereof.

As best seen in FIGS. 2 and 3, the flanges 20 and 22 terminate short of the corner of the shelf and define the cut-out corner 24 indicated by the edges 26 and 28, which are generally straight, normal to each other and extend through the flanges. The cut-out corners 24 are provided at each corner of each of the shelves 16, and are adapted to engage against and conform with the inner side planar walls of the supports 12 to form a snug fit thereagainst. The edges 26 and 28 can be notched or otherwise contoured to fit the contours

of the inner walls of the supports as desired and the structure shown is merely illustrative of the general arrangements of shelf corner-to-support contact that can be used. The cut-out corner 24 exposes the illustrative structure of the flanges 20 and 22. The flange 20 can be a simple planar wall with or without a bottom rolled edge or be provided with the widened and squared rolled flanged edge 30, the terminus of which is in the plane of the edge 26. The flange 22 is machine-rolled to form the small inner top edge wall 32, the raised top wall 34, the outer side wall 36, the bottom wall 38 and the inside wall 40. This structure forms a box flange known in the art. As is the practice, to add to the rigidity of the structure, the inner side wall 40 is turned outwardly to form the inside top wall 42 which is flush against the inner surfaces of both the edge wall 32 and the top wall 34. The combination of the cross members 14 and the front and rear raised edges 32 of the box flanges provide means to retain articles on the shelves during normal usage.

FIGS. 2 and 3 and also FIG. 8 show the details of the structure of one form of support members 12 for each corner of the module to include the outer walls 44 and 46 and the inner walls 48 and 50. The inner wall 48 can be planar or preferably provided with the longitudinal squared inwardly offset, narrow channel 52, and either structure will be provided with a series of vertically spaced slots 54. In order to provide various combinations of shelf heights or spacings between the adjacent shelves and a choice of the number of shelves to be used to form a module, the slots 54 are spaced from each other at distances less than the minimum usable distance that would normally be used in assembling the shelves with the supports. This spacing, that is, the distance between the bottom of one slot and top of another can be as little as one inch or as much as two inches as long as it is greater than the vertical depth of the flanges 20 and 22, which are preferably the same depth for all of the shelves used in a particular module. Other spacings for the slots can be used.

The outer walls 44 and 46 can be contoured or vertically channeled for beauty or strength, as desired. Since the supports 12 are rolled from a single sheet of metal, like the shelves 16 there will be a seam or hair line opening along the corner edge 58 that can be welded if desired. The supports 12 are box or square channel shaped in cross section and the walls are spaced so that an elongated opening or space 60 (FIG. 8) is defined within the support. The topmost and lowermost slots 54 in the series can be equally spaced from the respective ends of the supports so that the supports can be used end-for-end or interchangeably.

The opening 62 (see FIG. 7) formed by the box flange 22 at each corner or each end of those flanges forms a housing for the hook or latch member 64. The hook member 64 (see FIG. 4) comprises a flat metal body 66 of generally rectangular shape defined by the rear edge 68, the front edge 70 and the top and bottom edges 72 and 74. As shown in FIG. 9 the top and bottom edges, in one embodiment, are not parallel, e.g., the edge 68 is shorter than the edge 70. The front edge 70 has the top portion 76 forming a shoulder and carries the hook 78 extending coplanar with the body 66 and defining the opening or slot 80 and the rounded or notched top portion 82. The inner face 84 of the hook is a flat edge substantially parallel with the edge 70.

The body 66 has the opening or slot 86 therein defined by the rectilinearly arranged rear edge 88, and the top and bottom edges 90 and 92 with the front edge 94 being arcuate. The longitudinal axis of the slot 86 lies substantially parallel with the bottom edge 74 and the edges 90 and 92 are substantially parallel with each other. The slot 86 lies substantially equidistant from the edges 68 and 70, with the edge 90 being substantially coincident with the central longitudinal axis of the body 66, which axis passes through or just under the notch 82. The hook member 64 is provided with a pin 96 having the rounded head 98 that is press-fitted into a suitable bore drilled into the body 66, the latter being made of fairly heavy metal stock, e.g., $\frac{1}{8}$ to $\frac{1}{10}$ inch in thickness.

Referring to FIG. 7 it is seen that the hook member 64 fits within the opening 62 of the box flange 22 and is held by means of the pin 96 and the cam member 100. For this purpose the inner wall 40 of the box flange is provided with the slot 102 (see FIG. 3) through which the pin 96 extends while the cam member 100 extends through a suitable bore hole in the outer wall 36, through the slot 86 and into a second aligned bore in the wall 40. It is apparent that this assembly is accomplished by first placing the hook member 64 in the opening 62 with the hook member 64 extending into the cut-out corner 24 and then inserting the pin 96 into the slot 102 and driving it into the bore hole of the body 66 as these parts are held in alignment. The pin 96 can be used to move the hook member back to clear the post for adjusting shelf level and forward in the box flange when the shelf is being attached to a corner support.

The cam member 100 (see FIGS. 5 and 6) has the flat round head 104, bearing the slot 106 to receive the tip of a screw driver, at one end, the cam 108 at its intermediate portion and the integral end-slotted pin 110 at the inner end. The cam member 100 is likewise inserted through the bore in the wall 36, through the slot 86 of the hook member 64 and into the bore of the wall 40 where the end 110 is peened or flared as indicated at 112. The cam member 100 is thus rotatably mounted through the walls of the box flange and affixed so that it cannot be removed during normal usage. The pin 96 is long enough to extend a suitable distance through the wall 40 so that it can be engaged by the fingers to move the hook member 64 to an extended position, as shown in FIG. 2, within the limits of the slots.

The slot 102 is located above and substantially parallel to the larger slot 86 and can be longer than the limits of reciprocation allowed by the cam 108 operating within the slot 86, depending upon its radial position. The cam surface 108 of the cam member 100 is substantially concentric with the common axis of the pin 110 and the head 104 which latter members are also concentric. The cam surface 108 is preferably at least as wide as, if not wider than, the thickness of the hook member 64 so that a good bearing and sliding surface is provided within the slot 86. The cam surface 108 is discontinuous and has the flat or truncated surface 114 on one side. The diameter of the cam surface 108 is slightly less than the vertical distance between the edges 90 and 92 of the slot 86 and also the slot 102 is slightly larger than the diameter of the pin 96 so that the respective slots and pins move easily in respect to each other without binding. Also, the curvature of the cam surface 108 is substantially the same as that of the curved edge 94 of the slot 86, while the truncated surface 114 can abut against the squared edge 88, depending on the rotative position of the cam member 100. Thus, by finger pressure on the inside of the box flange against the head 98 the hook member 64 can be moved back to the position shown in FIG. 3 with the cam surface 108 engaging the round edge 94 or extended to the position of FIG. 2 with the flat surface 104 against the rounded square end 88. In this latter position the shelf and hook member are in readiness to engage a corner support 12 as indicated in sequence by reference to FIGS. 2, 8 and 9.

Thus to assemble a shelf within previously positioned uprights, the shelf is held with the corners at the slots 54, representing the desired height or spacing, the hook member 100 at each corner 24 is moved out and the hook 78 passed into the slot and moved down so that the slot 80 engages fully upon the edge of the wall 52 and finally the head 104 is turned counter-clockwise so that the cam 108 pulls the hook member 100 into the locked position of FIG. 9 at each corner. Release of the shelf is accomplished by reversing this procedure. In the locked position of the hook member 100 the top edge 72 can be spaced from the wall 42 of the box flange as indicated at 116, with the bottom edge 74 against the bottom wall 38. FIGS. 10 and 11 show how the cut-out corner 24, defined by the edges 26 and 28 is drawn flush against the corner support 12.

In the alternate structures shown in FIGS. 12-18 the shelf and support members are the same but the hook member 64a is modified in that the edges 72 and 74 are essentially parallel, the cross pin 118 is provided as a guide member and the modified cam member 100a has a circular off-center cam 108a and operates from the inside of the box flange 22, in other words has the slotted head 104 on the inside of the corner. The slot 86 in the hook member is also modified in that the back edge 88a is rounded.

FIG. 13 shows that the guide pin 118 extends from both sides of the hook member 64a and in FIG. 16 the cross pin is shown in guiding position within the space 62 of the box flange. Similarly, the cam member 100a assumes a reverse position with the slotted head 104 rotatably mounted within a suitable bore in the flange wall 40. The circular cam 108a fits within the slot 86 much the same as the cam 108 and it acts as a thrust bearing against the inside surface of the wall 36 in one direction while the spread or peened end 112 prevents the cam member from coming out. By turning the cam head 104 in the direction of the arrow (counter-clockwise) the cam 108a rotates about 90° from the position shown in FIG. 17 to the position, turned side-dead-center, of FIG. 18 to pull the hook 78 to the right and secure the corner mounting. In so doing the hook member 64a raises so that its top edge 72 is flush against the inner surface of the wall 42, as shown in FIG. 18, and the space 116 closes. In this position the hook member 64a is rigidly locked and pulled back to the limits of the cam 108a.

It is apparent that a number of modifications in the structures can be made without departing from their essential functions. The size of the parts can be varied as well as their respective dimensions in relation to one another as long as the hook member is held so that it can reciprocate and respond to the rotation of the cam member 64 and pull the support and shelf corner into rigid, weight-support abutment.

What is claimed is:

1. In a knockdown shelving construction comprising an upright support member having an aperture through a wall portion thereof;

a shelf having a horizontal portion and a depending box flange member having spaced vertical side walls and transverse top and bottom walls terminally abutting said wall portion at one end of said flange with horizontal

coaxial apertures in said side walls of said box flange spaced from said abutting end;

a fastening device interconnecting said shelf and support members including a cam member having axially spaced circular portions rotatably journaled in said coaxial apertures in said side walls and an eccentric camming portion intermediate said circular portions between said side walls;

a hook means having a generally flat body portion in spaced relation within the walls of said box flange and having an elongated slot extending longitudinally thereof;

said hook means having portions of its top and bottom edges normally spaced from the transverse walls of said box flange in the unlocked position;

a bottom opening slot defining a hook member at one end of said flat body portion;

said hook member having an inwardly facing flat edge portion and being receivable through said aperture;

the elongated slot of said hook means being pivotally engaged upon the eccentric camming portion of said cam member and having a rear edge engageable therewith to move said hook means axially of said box flange and a top edge engageable therewith to raise said hook means;

said bottom opening slot receiving the lower edge of said wall portion bordering said aperture in weight supported relationship thereon; and

one of said circular portions of said cam member having a tool engageable contour for rotating said cam member whereby said eccentric camming portion reciprocates said hook means from said unlocked position to a locked position wherein said flat edge of said hook member engages said wall portion below said aperture and pivots to draw said flange endwise tightly in abutting relationship against said support member in a locked position with an edge of said hook means wedged against a transverse wall of said box flange.

2. The combination called for in claim 1 in which:

said rear edge of said slot in said hook means is a curved edge engaged by said camming portion and the locked position of said cam member occurs with said camming portion mated within said curved edge, and said hook means is raised with its top edge contiguous with the top transverse wall of said box flange in the locked position.

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