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I. J. FERDINAND ET AL

3,479,974

KNOCKDOWN STEEL SHELVING

Filed Aug. 7, 1967

3 Sheets-Sheet 1

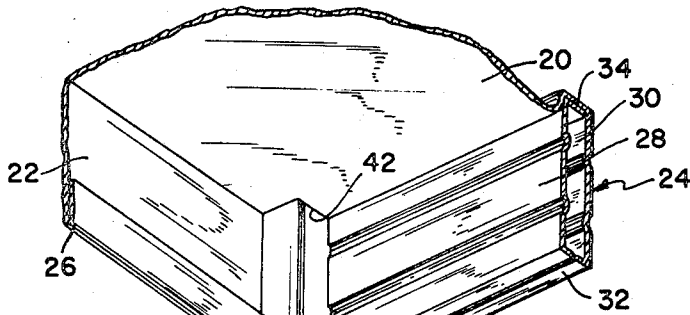


FIG. 1.

FIG. 2.

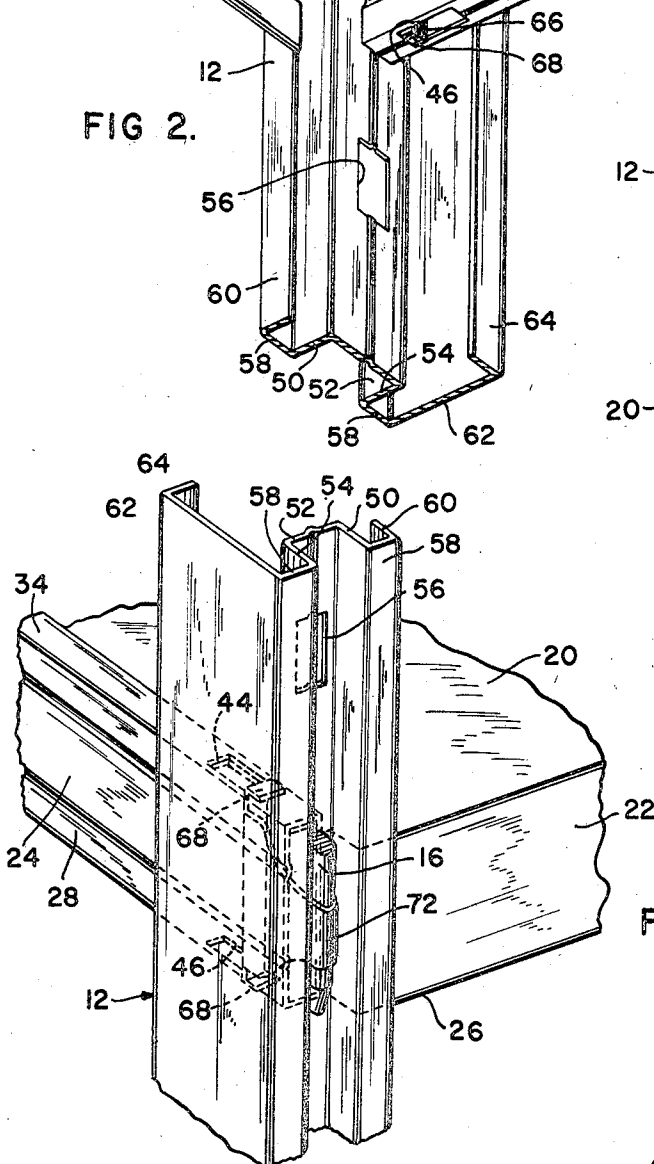
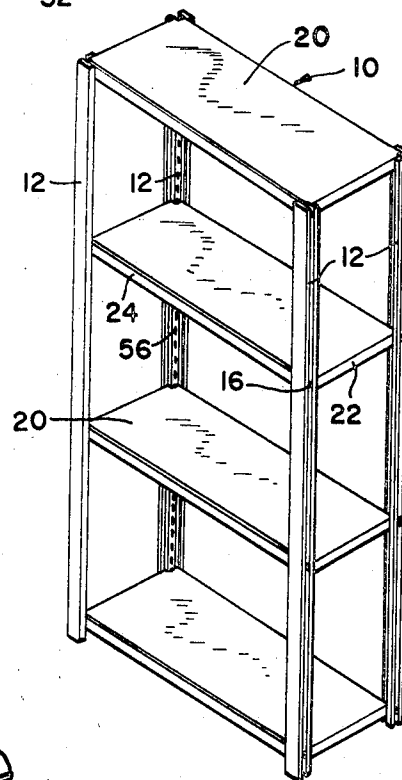


FIG. 3.

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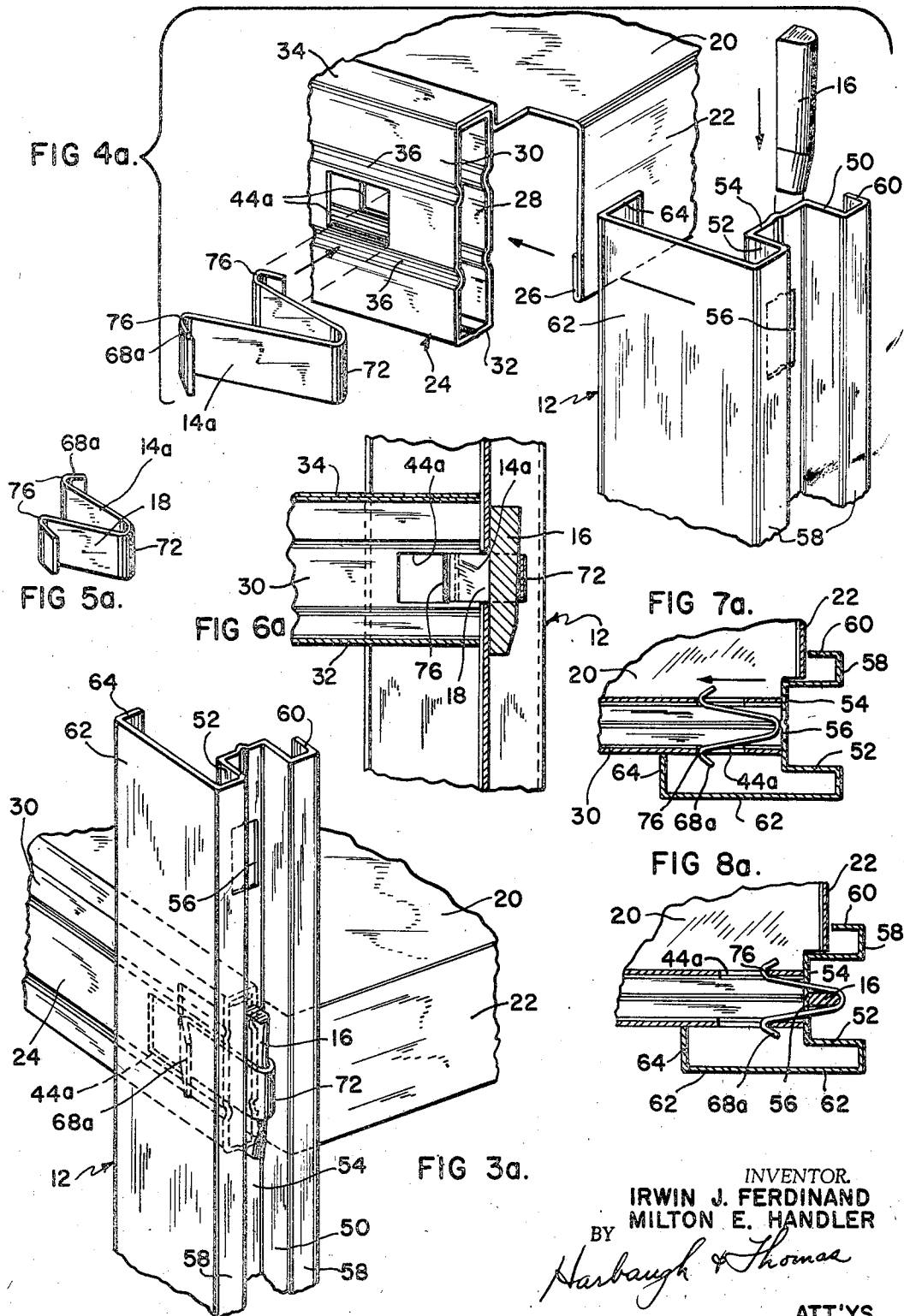
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3 Sheets-Sheet 3



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2

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KNOCKDOWN STEEL SHELVING

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10 Claims

ABSTRACT OF THE DISCLOSURE

Knockdown steel shelving in which cut ends of corner notched shelf flanges are clamped securely against sides of an upright support by wedge activated tension elements manually applied from a position externally of the posts.

Cross-references

Ferdinand et al., 3,276,403, Oct. 4, 1966; Ferdinand et al., 3,265,455, Aug. 9, 1966.

As background it is to be noted that knockdown light weight steel shelving meets a growing demand for economical shelving in the home and the office, the parts being purchased in a small package for ease of shipping and handling, yet are assembled by the purchaser who may be unskilled mechanically. Approximately ninety-eight percent of such shelving is designed for household consumer use and, therefore, ease of assembly is a primary consideration, secondary only to self rigidity and attractiveness when the installation is complete. Shelving constructions which leave little to be desired from appearance and functional points of view have been rejected for lack of ease of assembly and disassembly. Consumers upon occasion have been obliged to return to the seller for assistance in erecting the shelving, and sometimes even the seller has been unable to enlighten the consumer unless previously given instruction by the manufacturer. It follows therefore that the simpler the erection procedure involved in connection with a given design of shelving, the more favorable will be its reception on the competitive market.

The present invention is designed with maximum economics in time and expense to overcome many of the limitations that are attendant upon the construction and use of knockdown steel shelving now on the market for household-consumer use and, toward this end, the invention contemplates the provision of a novel shelving unit which offers readily discerned ease and speed of assembly advantages over many present day shelving units without loss of appearance, safety and rigidity.

Briefly, in carrying out the invention, the shelves are provided with downturned marginal strengthening flanges of determined design ranging from a single thickness flange to compound flanges of plural thickness or full box design, three walls of which are rigidified by the provision of coextensive longitudinally extending ribs therealong. The fourth wall of each box flange preferably incorporates a double thickness of sheet metal. Thus, extreme rigidity is offered in the long direction of the shelves. The corners of the shelves are notched or cut-away to expose the end edges of the thus rigidified box flanges and the exposed cut ends thereof are designed for clamped engagement squarely against the corner posts.

The corner posts are of a three-quarter box design having channel webs bearing against the edges of the double thickness walls of the box flanges to assimilate the full tightening pressure of improved fastening devices so that a direct rigidity is effected between the box flanges and corner posts. With rigidity between the corner posts and the longitudinal box flanges of the shelves, longitudinal rocking of the assembled shelving is eliminated even within high loading limits.

In the inventive concept of the present invention a fastening means is provided, shown essentially in two embodiments, characterized by an intermediate member operating under tension and having at one end two spaced end members with hook-like portions disposed at right angles thereto engaging spaced walls in the multiple wall shelf flange, and at the other end has a bend or loop extending through the channel web of the post to define a slideway to receive a slide wedge within the confines of the post which when rectilinearly tightened draws the end of the shelf flange rigidly against the channel web and secures the parts against disassembly until the wedge is intentionally released.

The invention is further characterized by eliminating the tedium of threading or twisting many threaded parts in erecting the shelving thereby saving assembly and shelf adjustment time.

The invention also contemplates fastening means which operate under tensions which have no rotationally established strains; are self-locking against rotational release; and, are secured quickly in operative position with mere rectilinear movement of parts.

The provision of a shelving unit and corner fastening means of the character briefly outlined above being the principal object of the invention, it is another object to provide a shelving unit wherein all of the elements associated with the fastening means are substantially concealed from view when the erection procedure has been completed. This object is attained by the provision of a reinforced trim flange on each corner post which overlies and conceals the portions of the various associated ends of the tension members, and by locating the wedge and bent ends of the tension fastening members deep within the channel portions of the corner posts so that they are visible only when seen from an unlikely point of view.

Further objects of the invention contemplate a shelving unit wherein the principal constituent parts thereof are susceptible to conventional high speed rolling, die forming and bending processes and require for their completion no machining operations so that the shelving as a whole may be manufactured at a low cost with work-hardened or tempered metal; a unit which is rugged and durable and which will withstand rough usage and heavy loads; one which may be assembled and disassembled with the aid of only a single household tool, namely, pliers or hammer; one which possesses no sharp edges or corners and which is devoid of abrupt protrusions; one which allows for wide manufacturing tolerances; one which is attractive in its appearance and pleasing in its design; and, one which otherwise is well adapted to perform the services required of it. These and further desirable features characterize the structure and production of embodiments of the present invention.

In the accompanying three sheets of drawings forming a part of this specification, two illustrative embodiments of the invention have been shown in which like reference numerals identify like parts and suffix letters identify corresponding parts.

In the drawings:

FIG. 1 is a front perspective view of a knockdown steel shelving construction embodying the invention.

FIG. 2 is a fragmentary inside or underneath perspective view of the corner region shown in FIG. 1;

FIGS. 3 and 3a are fragmentary perspective views of corner regions of shelving units constructed in accordance with the principles of the present invention;

FIGS. 4 and 4a are fragmentary exploded perspective views illustrating the manner of installation of certain corner fastening means associated with the shelving unit of the invention;

FIGS. 5 and 5a are perspective views of tension members employed in the present invention;

FIGS. 6 and 6a are vertical sectional views taken through the centers of the flanges showing the tensioning relationship as established;

FIGS. 7 and 7a are sectional views taken substantially on the horizontal plane at the level of the tension members showing the embodiments in level adjusting positions preliminary to final engagement.

FIGS. 8 and 8a are sectional views similar to FIGS. 7 and 7a showing the final assembled relationships; and,

FIG. 9 is a vertical sectional view through the box flange shown in FIG. 4 illustrating the method of insertion of the tension member shown in FIG. 5.

Referring further to the drawings and particularly to a typical shelving assembly embodying the invention as shown in FIG. 1, the shelves are identified by the numeral 10, preferably formed from coated sheet metal stock, and are shown secured at their four corners to supporting columns or posts 12. The corner posts 12 and shelves 10 in each shelving unit are functionally identical.

The shelves 10 and corner posts 12 are rigidly secured together in their assembled operative relationship by means of counterpart fastening devices each of which includes a tension member 14 and a securing element in the form of an elongated wedge 16 (FIG. 4). The tension member 14 constitutes a reaction means for assimilating the draw of the wedge which serves to clamp the corner post 12 rigidly to the shelf 10 in a manner that will be further described presently.

As seen in FIGS. 1-4, the shelf 10 is generally of rectangular configuration and it includes a horizontal planar body portion 20 having downturned transversely extending marginal flanges 22 and downwardly and longitudinally extending marginal flanges 24. The transverse flanges 22 may be single thickness flanges but are provided with reentrant reverse bends (FIG. 4) 26 at their lower edges for safety and reinforcing purposes.

The longitudinal flanges 24 may be box flanges, and, as best seen in FIG. 4, each flange includes inside and outside walls 28 and 30, respectively, a bottom wall 32 and preferably a dual thickness top wall 34. The walls 28 and 30 are reinforced by spaced apart reinforcing ribs 36, while the bottom wall 32 is preferably reinforced by a single central rib 38. The upper edge portion of the box flange 24 projects a slight distance above the horizontal plane of the planar body portion 20 of the shelf 12 by reason of a vertical connecting flange wall 40 between the body portion and top wall 34. The flange 40 serves as a further strengthening flange wall and as a marginal restraining means to prevent supported objects from rolling or sliding from the upper surface of the shelf. In the embodiment shown in FIG. 4 the upper wall 34 and bottom wall 32 have apertures 44 and 46, respectively. The four ribs 36 are inwardly rolled ribs while the rib 38 in the bottom wall 32 is an outwardly rolled rib. The four corners of the shelf 12 are notched or cut-away as indicated at 42 (FIG. 4) for reception of selected regions of the corner posts therein.

The details of the corner posts 12 are best illustrated in FIGS. 1, 3, 4 and 4a. Each post is of rolled sheet metal construction, preferably of heavier gauge metal than that of the shelf 10 and comprises a main body portion of essentially a channel-shape cross section which includes side walls 50 and 52 and a connecting web 54. The web is provided with a series of vertically spaced holes 56 therethrough for selective reception of the tension member 16 so that the shelf 10 may be secured to the post 10 at selected elevations therealong. The side wall 50 is provided with a narrow laterally turned trim flange 58 which terminates in a laterally turned edge flange 60. The side wall 52 is provided with a comparatively wide re-entrant trim flange 62 which terminates in a laterally turned flange 64 to bear against the shelf flange 24.

The vertical corner post 12 is adapted to seat within the corner notch 42 with the web 54 of the channel-

shaped body portion opposing and bearing against the adjacent open cut edge of the box flange 24 as best seen in FIGS. 2, 6, 7, and 8. The web 54 is formed with a central coextensive outwardly rolled rib 65 (FIGS. 1 to 6 inclusive) which makes a seat for the web when the post 12 is drawn against the box flange 24.

When the corner post 12 is in its operative position within the notch 42 (FIGS. 1 and 2), the trim flange 58 overlies the outside face of the depending flange 22 while the bearing flange 60 opposes such outside face in close proximity thereto. Similarly, the trim flange 62 overlies the outside wall 30 of the box flange 24 while the bearing flange 64 engages or opposes this wall in close proximity thereto.

In order to fasten the corner post 12 securely to the shelf 10 within the notch 42, as previously mentioned, the fastening device including the tension member 14 and fastening wedge 16 are provided. The tension member 14 projects through and is anchored in the pair of transversely registering slots 44 and 46 (FIGS. 4, 6 and 7) formed in the top and bottom wall 34 and 32, respectively, and is designed as a vertical support of the shelf between the bottom of the hole 56 and top wall 34, and for tensioning engagement by the wedge 16 after tension member 14 is placed through one of the holes 56 (FIGS. 7 and 8) in the channel web 54.

The tension member 14 is of heavy sheet metal construction and, as shown in FIGS. 4 and 5, it is in the form of a stamping having a rectangular flange portion 66 terminating in right angle ears 68 at its ends and a right angle body portion 70 along one side thereof terminating in a narrow end portion reversely bent upon itself to form a hook 72. The spacing between the ears 68 equals the height of the flange 24 so that the flange portion 66 can span the apertures 44 and 46 with the ears 68 located outside of the upper and lower flange walls 34 and 32. The body portion 70 where it joins the flange portion 66 is rounded out as at 74 to terminate a spaced distance therefrom which is slightly greater than the overall thickness of each flange wall 32 and 34 so that as shown in FIG. 6 the tension member 14 can be cocked and slipped into the end of the flange 24 with a rotational movement with one of the ears 68 entering one of the apertures 44 or 46, and going far enough for the other ear to be swung into position as shown in FIG. 7 for movement outwardly to project the hook beyond the end of the flange 24 and through a selected hole 56 when the shelf is brought into assembly position against the post 12. Thereupon, the wedge 16 is inserted in the hook portion and driven tightly into place as shown in FIG. 8 to draw and clamp the end of the flange 24 rigidly against the post web 54.

In the tightened position, the rounded edges 74 engage the inner faces of the upper and lower flange walls 34 and 32 to provide a weight supporting relationship for the shelf flanges in addition to the clamping relation that provides rigidity against side sway of the shelving.

Whenever it is desired to relocate a shelf at a different level in assembled shelving, the wedges for that shelf are pushed upwardly. The apertures 44 and 46 are long enough to accommodate withdrawal of the hook 72 from the hole 56 as shown in FIG. 7 whereupon the shelf is moved to its new level and the wedging relationship reestablished as already described in original assembly.

In the embodiment shown in FIGS. 3a to 8a inclusive, like numerals referring to like parts, the tension member 14a is formed from flat strip stock of spring steel and then tempered. It comprises a central portion folded back upon itself to form two diverging arms 18 connected by a bight portion 72 having approximately the radius of the working edge portion of the wedge 16. The free ends of the arms 18 are oppositely bent outwardly and back upon themselves to provide hook-like ears 68a that provide sharp angle bight corners 76.

In this embodiment the registering slots 44a in opposite walls of the flange 24 are disposed in the side walls be-

5

tween the ribs 36 to receive the ears 68a as shown in FIGS. 7a and 8a and the bight portion 72 is received through a selected hole 56 in the corner post to receive the wedge 16 therethrough.

In assembling this embodiment, the tension member 14a is finger gripped on opposite sides of its arms 18 and squeezed to bring the bights 76 closer together to clear the side walls 28 and 30 of the shelf flange 24 whereupon they are inserted into the end of the flange 24 between the ribs 36. The finger squeeze is released and the bight 72 is pressed inwardly until both ears 68a snap outwardly through the apertures 44a as shown in FIG. 7a where they are held at all times by the resiliency of the tension member at the bight portion 72a.

Thereafter, the shelf is brought into registration with a selected hole 56 in the web 54 of the post 12 and the ear 68a through the inner aperture 44a is pushed forward to move the bight 72 through the hole 56 to receive the wedge 16 as shown in FIG. 8a.

It is desirable to have the ears of both embodiments just as vertically wide as possible at their bights but preferably no wider than the distance between ribs 36 in each flange side wall. The vertical height of the hook 72 or bight 72 is desirably no greater than it need safely be to carry the tension load imposed by the wedges 16 and side sway strains, it being desirable to retain for strength as much stock as is reasonably possible in the posts 12.

It will be observed that both tension devices described can be used at any shelf corner without mental hesitation or orientation, either side up. No mistakes are incurred, nor need be remedied, when inserting them in place, and the wedges in both instances can be tightened by squeezing with pliers or with a hammer tapping. Furthermore, they are also self-tightening by gravity if loose.

Having thus described the invention and the embodiments thereof, it will be observed how the various objects and results are attained and how identical parts can be used for both embodiments in using a rectilinear sliding wedge to rigidify shelving with minimum time, effort and tools. Accordingly, the invention is not to be limited to the exact arrangement of parts shown in the accompanying drawings or described in this specification as various changes in the details of construction may be resorted to without departing from the spirit of the invention. For example, whereas no cross bracing for the shelving has been illustrated herein and none is considered necessary, such can be used if desired by the customer as where the slenderness ratio of the shelving columns, as with one unit on another, is deemed to require it.

Additionally, while the terms "longitudinal" and "transverse" in the above description refer to the long and short dimensions respectively of the shelf 12, obviously the box flange 24 may extend marginally along the short dimension of the shelf if desired so well as all four sides.

What is claimed is:

1. In an adjustable knockdown sheet metal shelving unit, in combination, an elongated upright corner post comprising

a main body portion of channel shape cross section including a web portion having a series of vertically spaced holes therethrough,

a generally rectangular horizontally disposed shelf having a shelf portion and a depending rectangular flange having two opposing walls and extending along at least one longitudinal edge thereof supporting the shelf portion at said edge,

reinforcement means extending along a transverse edge thereof, supporting the shelf portion adjacent to the transverse edge,

said shelf, depending flange and reinforcement means being cut away at a corner region of the shelf to receive the corner post with the web portion bearing against the cut away rim edge of the adjacent rectangular flange with engagements spaced from the

6

hole and with one said flange of the corner post opposing the adjacent end edge of the reinforcement means,

a tension means having a first portion interengaging said opposing walls of said rectangular flange against relative axial movement and another portion extending through one of said holes in said web portion to define a slideway therebeyond,

and tapering wedge means received in said slideway and disposed rectilinearly slidable between said web portion and said slideway to extend substantially the height of the flange and draw and support the web portion of the corner post rigidly against said adjacent rim edge of the rectangular flange.

2. The combination called for in claim 1 in which said two opposing walls have apertures therethrough, and said first portion of the tension means comprises laterally extending terminal elements extending through said apertures in said opposing walls and engaging the sides of the apertures that are adjacent to the post.

3. The combination called for in claim 1 in which said opposing walls have apertures spaced vertically and, said first portion of the tension means comprises a cross member disposed within the flange and terminally extending through said apertures as moved into position from within the flange.

4. The combination called for in claim 3 in which ears located terminally on said cross member engage the outer edge surfaces of said opposing walls, at the apertures, and are movable in said apertures between positions wherein said other portion is retracted from said hole for moving the shelf vertically and said other portion is advanced through said hole to receive said wedge means for securing said web portion rigidly against the end of said rim edge of the rectangular flange.

5. The combination called for in claim 1 in which said first portion of the tension means comprises a flange portion terminating in right angle ears and, said other portion comprises a right angle body portion on said flange portion terminating in a narrow portion reversely bent to form a hook defining said slideway.

6. The combination called for in claim 1 in which said opposing walls are vertically spaced with axially aligned apertures therethrough and in which

said first portion comprises a cross-head portion terminating in right angle ears spaced to be received outside of the opposing walls, and

said second portion comprises a body portion rounded out to be cocked and inserted into said rectangular flange and rotated in a vertical plane to locate one ear in one aperture and swing the other ear into the other aperture in a retracted position from which it is advanced towards the post to overlap and engage the opposed walls and terminally extend through said hole to receive the wedge means.

7. The combination called for in claim 1 in which the opposing walls are spaced horizontally with opposing apertures therethrough and

said tension means comprises an elongated element of spring metal folded back upon itself to form said other portion and to provide a bight slideway element and two diverging arms oppositely bent outwardly and back upon themselves to form the portion comprising ears extending through and beyond said apertures.

8. The combination called for in claim 2 in which said opposing walls have vertically spaced longitudinally extending ribs bordering the upper and lower edges of said apertures.

9. The combination called for in claim 8 in which said terminal elements are of the same width as the vertical height of said apertures.

7

10. In a metal shelving unit, in combination, an elongated upright corner post comprising:

a main body portion of channel shape cross section including

a web portion having a series of vertically spaced holes therethrough, 5

a generally rectangular horizontally disposed shelf having a shelf portion and a depending flange extending along at least one longitudinal edge thereof supporting the shelf portion at said edge, 10

reinforcement means extending along a transverse edge thereof, supporting the shelf portion adjacent to the transverse edge, 15

said shelf, depending flange and reinforcement means being cut away at a corner region of the shelf to receive the corner post with the web portion bearing against the cutaway edge of the flange and with one side flange of the corner post opposing the adjacent end edge of the reinforcement means, 20

tension means having a first portion interengaging said flange against relative axial movement and another

8

portion extending through one of said holes in said web portion to define a slideway therebeyond, and tapering wedge means disposed rectilinearly slidable on said web portion and extending substantially the height of the flange in said slideway to draw and support the web portion of the corner post rigidity against said edge of the flange.

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U.S. Cl. X.R.

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