

[54] **HARDWARE ASSEMBLY FOR CONNECTING PARTS TOGETHER AT RIGHT ANGLES**

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[52] **U.S. Cl.** .....287/20.92 D, 287/20.925, 287/54 C, 312/263, 248/188.1  
[51] **Int. Cl.**.....**F16b 5/06**  
[58] **Field of Search.**..287/20.92 D, 20.92 C, 20.92 R, 287/20.924, 20.925, 20.926, 20.92 Y; 312/263, 111; 248/188, 188.1; 108/156

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**FOREIGN PATENTS OR APPLICATIONS**

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[57] **ABSTRACT**

A clip is fitted partially into specially shaped slots formed in the edge portions of cabinet panels and interconnects the panels in rigid right angular relation to one another as an incident to the tightening of a single clamping bolt. In a second embodiment, the clip also anchors the panels to the floor of the cabinet.

**7 Claims, 13 Drawing Figures**

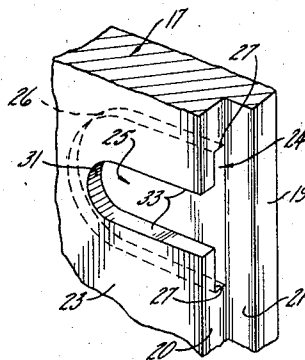


FIG. 1.

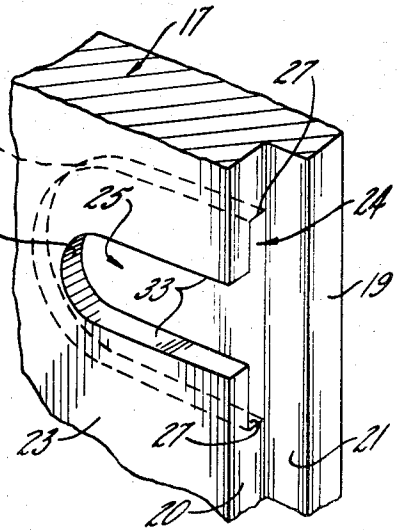
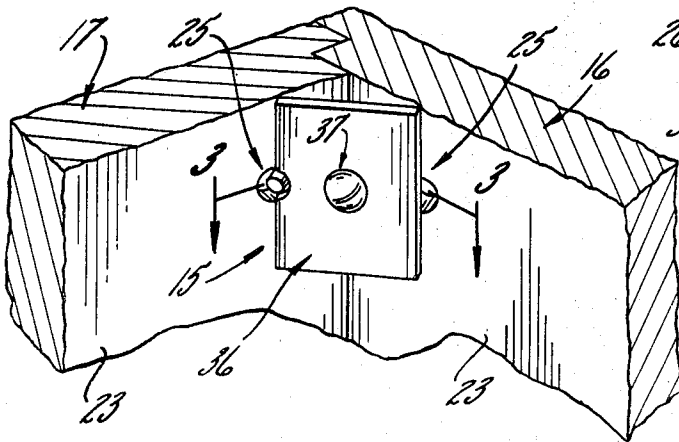


FIG. 4.

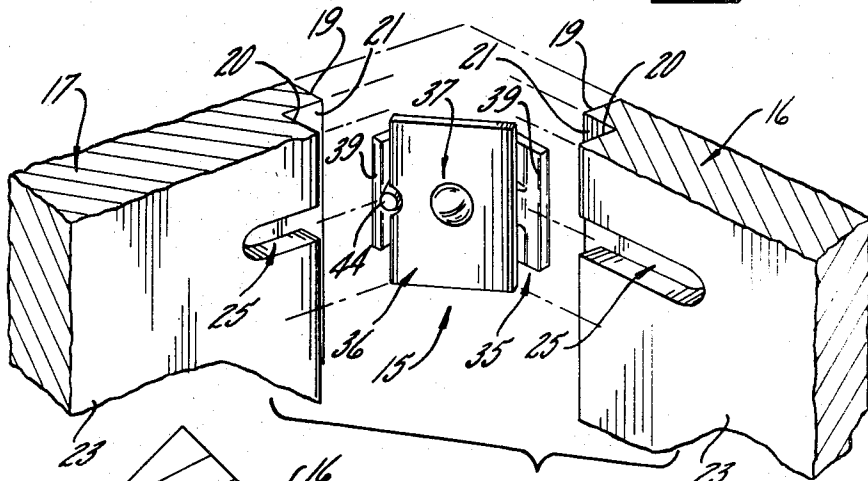


FIG. 2.

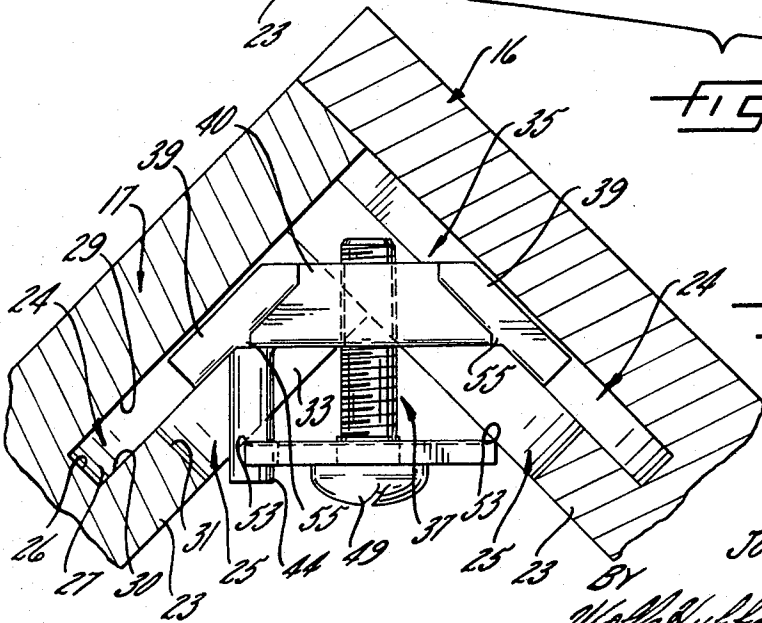


FIG. 3.

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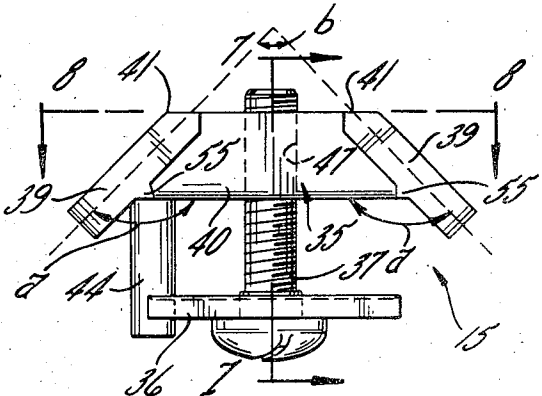
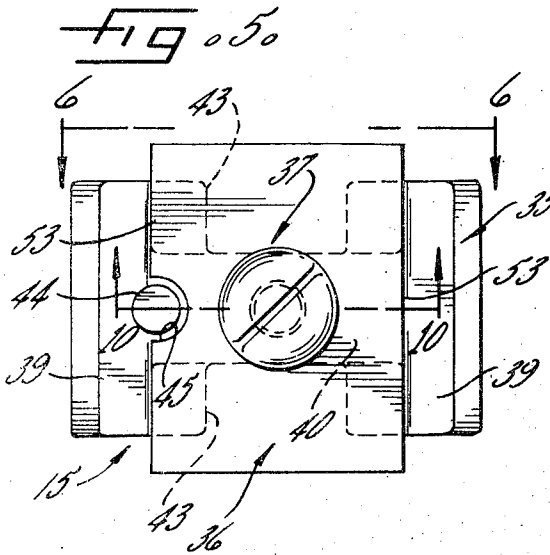


FIG. 6

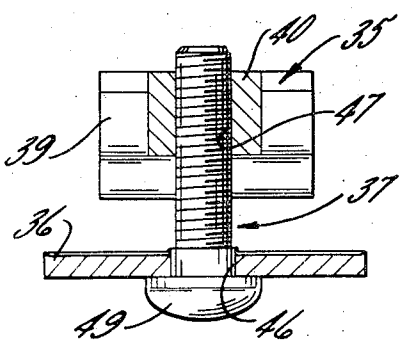


FIG. 7

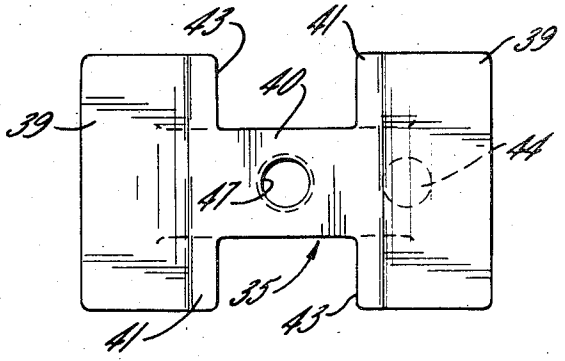


FIG. 8

FIG. 10

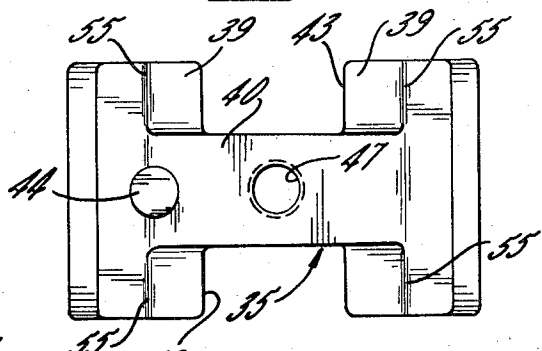
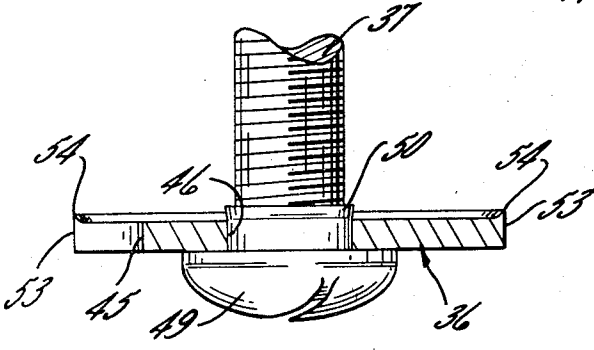


FIG. 9

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FIG. 11

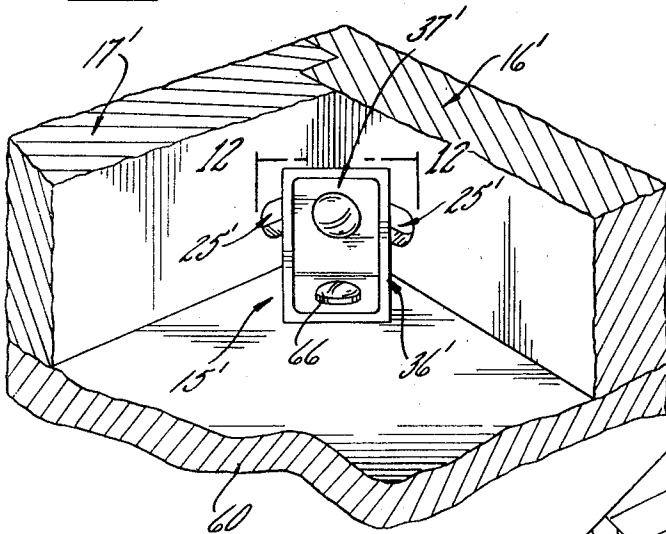


FIG. 12

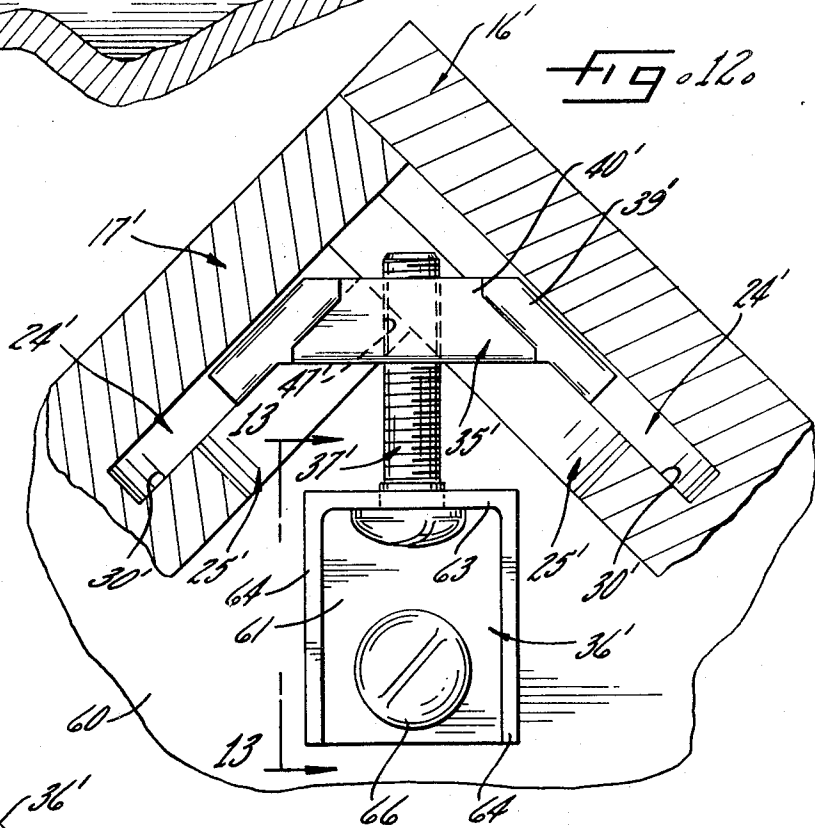
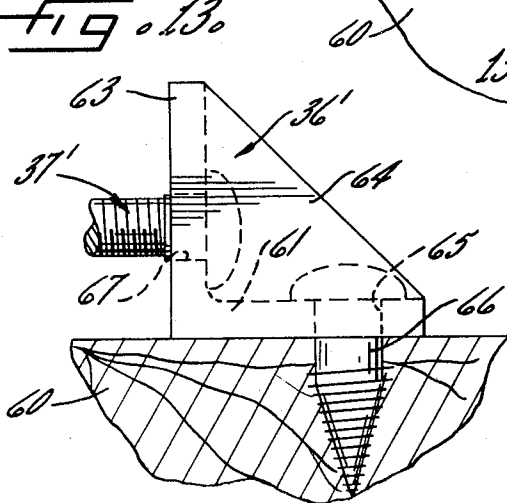


FIG. 13



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## HARDWARE ASSEMBLY FOR CONNECTING PARTS TOGETHER AT RIGHT ANGLES

### BACKGROUND OF THE INVENTION

This invention relates to a hardware assembly for interconnecting two parts and, more particularly, to a hardware assembly which is fitted partially into specially shaped slots in the parts to facilitate quick and easy attachment of the assembly to the parts. An assembly of this general type is disclosed in Dargene U. S. Pat. No. 3,590,419.

### SUMMARY OF THE INVENTION

The primary aim of the present invention is to provide a new and improved hardware assembly of the above character which is particularly suitable for interconnecting slotted parts disposed at right angles to one another and which, at the same time, is effective to interlock the parts in an extremely rigid condition as an incident to the tightening of just a single clamping bolt.

The invention also resides in the unique coaction of the hardware assembly with the slots to rigidly interconnect the parts, in the construction of the assembly to enable quick and easy attachment of the assembly to the parts, and in the particular formation of the assembly to keep the latter anchored tightly to the parts.

These and other objects and advantages of the invention will become more apparent from the following detailed description when taken in conjunction with the accompanying drawings.

### BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a fragmentary perspective view showing two parts interconnected by a new and improved hardware assembly incorporating the novel features of the present invention.

FIG. 2 is an exploded, fragmentary perspective view of the elements shown in FIG. 1.

FIG. 3 is an enlarged fragmentary cross-section taken substantially along the line 3—3 of FIG. 1.

FIG. 4 is a fragmentary perspective view of one of the parts and showing the slots formed therein.

FIG. 5 is an enlarged front elevation of the hardware assembly shown in FIG. 2.

FIG. 6 is a top plan view of the hardware assembly as taken along the line 6—6 of FIG. 5.

FIG. 7 is a cross-section taken substantially along the line 7—7 of FIG. 6.

FIG. 8 is a rear elevation of part of the hardware assembly as taken along the line 8—8 of FIG. 6.

FIG. 9 is a front elevation of part of the hardware assembly shown in FIG. 6.

FIG. 10 is an enlarged view of part of the hardware assembly shown in FIG. 7.

FIG. 11 is a view similar to FIG. 1 but showing a modified hardware assembly incorporating the novel features of the invention.

FIG. 12 is an enlarged fragmentary cross-section taken substantially along the line 12—12 of FIG. 11.

FIG. 13 is a fragmentary side elevation of part of the modified hardware assembly and is taken along the line 13—13 of FIG. 12.

## DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

The present invention is incorporated in a new and improved hardware assembly which may be fitted quickly and easily to two mutually perpendicular parts and then, with a single and very simple manual operation, clamped securely to both parts to lock the latter tightly together in a rigid right angular relationship. For purposes of illustration, the hardware assembly herein is shown as a clip 15 for interconnecting two wooden parts in the form of a side panel 16 and a rear panel 17 of a so-called "knock down" kitchen cabinet which customarily is assembled at its place of use rather than at the plant of the cabinet manufacturer. Two or more vertically spaced clips usually are used to connect the panels, but only a single clip has been illustrated in order to simplify the disclosure.

One edge portion of each of the panels 16 and 17 is formed with a stepped configuration as shown in FIG. 4 and includes an end surface 19 and an offset edge surface 20 both disposed perpendicular to an intermediate surface 21 which parallels the wide inner face surface 23 of the panel. When the panels are assembled, the stepped end portions interfit with one another as shown in FIG. 1 with the end surface 19, the intermediate surface 21 and the edge surface 20 of the rear panel 17 butting against the intermediate surface 21, the edge surface 20 and the face surface 23, respectively, of the side panel 16. Slots 24 and 25 (FIG. 4) are formed in the abutting edge portion of each panel and receive certain parts of the clip 15 when the latter is installed to interconnect the panels.

More specifically, each slot 24 opens out of the edge surface 20 of its respective panel 16, 17 and is defined by a curved closed wall 26 (FIG. 4), by upper and lower end walls 27 and by closely spaced opposing side walls 29 and 30 (FIG. 3) which extend parallel to the face surface 23. Each slot 25 (FIG. 4) is formed in the face surface 23 of the respective panel, extends through part of the side wall 30 into communication with the slot 24, and opens out of the edge surface 20. As shown in FIG. 4, each slot 25 is defined in part by a curved closed wall 31 and by upper and lower edges 33 which extend in the same direction as the end walls 27 of the slot 24 but which are spaced apart a distance less than the spacing between the end walls. Neither the slots 24 nor the slots 25 extend completely through the panels and thus the continuity of the outer faces of the panels is preserved. In addition, when the panels are assembled, the face surface 23 of the side panel 16 conceals the open ends of the slots 24 and 25 in the rear panel 17 and thus the ends of such slots are not visible from the outer side of the side panel.

The clip 15 is formed by three basic components, namely, an H-shaped member 35 (FIGS. 3 and 5) which is sized to fit in an upright position within the pairs of slots 24 and 25, a retainer plate 36 which extends diagonally across the corner between the face surfaces 23 of the panels 16 and 17, and a clamping bolt 37 which is operable when tightened to draw the H-shaped member and the retainer plate toward one another and into clamping engagement with portions of the panels to rigidly interconnect the panels in the desired right angle relationship. In this particular instance, the H-shaped member 35 is a die casting and is

defined by two vertical legs 39 (FIG. 8) and by a horizontal bridge 40 formed integrally with and spanning the legs midway between the upper and lower ends thereof. The legs 39 are sized to fit within the slots 24 and thus the vertical length of the legs is somewhat less than the vertical spacing between the upper and lower end walls 27 of the slots so as to establish vertical clearance between the end walls and the upper and lower ends of the legs. The length of the legs is, however, considerably greater than the vertical spacing between the upper and lower edges 33 of the slots 25 so that the legs will be retained in the slots 24 and prevented from moving inwardly into and through the slots 25. The bridge 40 is received within the slots 25 (see FIG. 3) and its vertical dimension (i.e., the distance between the upper and lower sides of the bridge) is less than the vertical spacing between the upper and lower edges 33 of the slots 25.

Importantly, the legs 39 project inwardly from the inner side of the bridge 40 and flare or diverge away from one another as they progress from the outer side toward the inner side of the bridge. The legs are located in vertical planes which herein are inclined relative to the inner side of the horizontal bridge at angles  $a$  (FIG. 6) of  $135^\circ$  and which intersect one another outwardly of the bridge with the angle  $b$  of intersection between the planes being  $90^\circ$ . The outer edges of the legs are beveled as indicated at 41 in FIG. 6 and lie flush with the flat outer surface of the bridge.

Herein, the retainer plate 36 (FIG. 5) is a flat rectangular steel stamping and is located in a vertical plane spaced inwardly from and disposed parallel to the inner side of the bridge 40. The plate is centered both vertically and horizontally with respect to the H-shaped member 35 and is oriented with its minor dimension or width extending horizontally, the width of the plate being approximately equal to the width of the inner side of the bridge. The plate is sufficiently long to project slightly above and below the upper and lower ends of the legs 39 and, in effect, covers or blocks the upper and lower U-shaped openings 43 defined between the legs and the upper and lower sides of the bridge 40. The angular orientation of the plate relative to the H-shaped member is maintained substantially the same at all times by a cylindrical finger 44 (FIG. 6) formed integrally with and projecting inwardly from one end of the inner side of the bridge 40 and fitted into a semi-circular recess or notch 45 (FIG. 5) formed in the adjacent edge of the plate 36. Accordingly, the surfaces of the notch and the finger are engageable with one another to limit turning of the plate and to keep the plate oriented with its major dimension extending substantially vertically.

In order to connect the H-shaped member 35 and the retainer plate 36, the clamping bolt 37 extends through an unthreaded hole 46 (FIG. 7) formed in the center of the plate and is threaded into a horizontally extending hole 47 formed in the center of the bridge 40. The head 49 of the bolt is disposed adjacent the inner side of the plate and thus, when the bolt is tightened, the plate is drawn toward the bridge to reduce the spacing between the two. Advantageously, the plate 36 is captivated against the head 49 of the bolt 37 and is restricted from sliding along the bolt toward the bridge 40 so as to prevent the spacing between the plate and the bridge

from being changed except by turning the bolt. For this purpose, an enlarged captivating collar 50 (FIG. 10) is formed around the shank of the bolt adjacent the outer side of the plate and traps the plate against the head 49.

The collar is formed during manufacture of the clip 15 by deforming the bolt shank with a suitable die after the bolt first has been inserted through the hole 46 in the plate 36.

Usually, the clip 15 is shipped by the manufacturer as a unitary assembly, that is, with the bolt 37 threaded into the hole 47 in the bridge 40 and holding the plate 36 connected to the bridge. In addition, the clip is shipped with the bolt threaded only part way through the hole so that the horizontal spacing from the plate to the inner side of the bridge and the inner edges of the legs 39 is comparatively great. The clip also is installed as a unitary assembly and, to install the clip and interconnect the panels 16 and 17, the clip is first slipped horizontally toward the edge surface 20 of, for example, the rear panel 17 to insert one of the legs 39 into the slot 24 and to slip the bridge 40 into the slot 25 from the open ends of the slots thereby to position the bridge and the one leg as shown in FIG. 3. It will be noted that insertion of the leg 39 and the bridge 40 into the slots 24 and 25 is possible by virtue of the horizontal spacing from the plate 36 to the leg and the bridge being greater than the thickness of the side wall 30 of the slot 24 so that, in effect, a sufficiently wide gap exists between the plate and the leg to receive and accommodate the side wall of the slot during insertion. As a result of the captivating collar 50 preventing the plate 36 from sliding on the bolt 37, the width of the gap is maintained automatically and thus the installer need not pull the plate away from the leg and the bridge preparatory to inserting the latter into the slots.

After the bridge 40 and one of the legs 39 have been slipped into the slots 24 and 25 of the rear panel 17, the side panel 16 is moved edgewise and rearwardly toward the rear panel so that, in effect, the bridge 40 and the other leg 39 move into the slots 24 and 25 in the side panel through the open ends of the slots. With the panels thus abutting one another at right angles, the bolt 37 then is simply tightened with a screwdriver to draw the outer vertical side edges 53 (FIGS. 3 and 10) of the retainer plate 36 into clamping engagement with the face surfaces 23 of the panels and to draw the legs 39 inwardly into clamping engagement with the adjacent surfaces of the inner side walls 30 of the slots 24. The side walls 30 thus become tightly clamped between the legs and the plate, and the panels thus are held together rigidly at right angles to one another.

With the clip 15 installed, the plate 36 diagonally spans the internal corner between the panels 16 and 17 with the outer vertical side edges 53 of the plate engaging the face surfaces 23. The plate thus acts as a corner brace and prevents the panels from buckling or collapsing toward one another to an angle of less than  $90^\circ$ . Because of the finger 44, the angular orientation of the plate with respect to the panels is maintained during installation of the clip and thus the installer need not manually turn the plate to locate the vertical side edges 53 in engagement with the face surfaces 23 and, in addition, need not hold the plate against turning when the bolt is tightened. Preferably, the outer vertically extending corners 54 (FIG. 10) of the vertical side edges

53 are left sharp (i.e., the corners are not rounded off) during manufacture of the plate and thus the sharp corners dig into the wood panels to help lock the plate in tight engagement with the panels.

The bridge 40 also extends diagonally across the internal corner between the panels 16 and 17 but is located within the slots 25 with the finger 44 projecting inwardly through one of the slots 25. Because of the particular angular relationship between the legs 39 and the bridge 40, the inner sides of the legs parallel the outer faces of the inner walls 30 of the slots 24 as shown in FIG. 3 and thus engage the walls face-to-face when clamped against the walls by the bolt 37. As a result of such engagement, the panels are prevented from spreading away from one another and increasing their included angle to more than 90°.

To promote tight clamping of the legs 39 to the side walls 30 of the slots 24, each leg is formed with a pair of inwardly projecting spurs 55 (FIGS. 3 and 9) which extend vertically from the upper and lower ends of the leg to the upper and lower sides of the bridge 40. The spurs 55 are of generally V-shaped cross-section as shown in FIG. 3 and form rather sharp protrusions which bite into and interlock with the wooden material of the side walls 30 to help prevent lateral shifting of the legs after the latter have been clamped. Preferably, the spurs on each leg are spaced laterally or horizontally from the spurs on the other leg by a distance equal to the horizontal spacing between the vertical side edges 53 of the plate 36 (i.e., by a distance equal to the width of the plate) in order to prevent the legs from fulcruming about the spurs when the side edges 53 are drawn into clamping engagement with the face surfaces 23. In other words, the forces applied by the side edges are in line with the spurs to avoid rocking of the legs about the spurs.

From the foregoing, it will be apparent that the present invention brings to the art a new and improved clip 15 which, while being of extremely simple construction, is effective to rigidly interconnect the panels 16 and 17 upon the tightening of the single bolt 37. Because the legs 39 and the bridge 40 are received in the slots 24 and 25 with vertical clearance, the panels may be shifted vertically relative to one another as permitted by the clearance and adjusted to the proper vertical positions after the clip has been fitted to the panels and before the bolt is tightened. The slots 24 and 25 also receive the legs and bridge with lateral clearance to enable such lateral adjustment of the clip as may be necessary to center the clip in the corner between the panels before the clip is clamped to the panels.

A modified clip 15' possessing most of the advantages of the clip 15 is shown in FIGS. 11 to 13 in which elements corresponding to those of the first embodiment are indicated by the same but primed reference numerals. The clip 15' is used to interlock the side and rear panels 16' and 17' and, at the same time, to anchor the panels to another part such as a floor panel 60 extending perpendicular to side and rear panels.

As shown, the clip 15' includes an H-shaped member 35' which is identical to the member 35 and which fits in an identical manner into pairs of slots 24' and 25' corresponding to the slots 24 and 25. In this instance,

however, the retainer 36' comprises a generally L-shaped floor anchor whose horizontal and vertical arms 61 and 63 are braced by integral side webs 64. A hole 65 (FIG. 13) is formed through the horizontal arm 61 and receives a fastener in the form of a wood screw 66 for securing the anchor 36' to the floor panel 60 adjacent the corner between the side and rear panels 16' and 17', the anchor being fastened in place before the side panels are erected and after the H-shaped member 35' has been fitted into the slots in the panels, a captivated bolt 37' extending through a hole 67 in the vertical arm 63 and threaded into a hole 47' in the bridge 40' is tightened and draws the legs 39' of the H-shaped member 35' into clamping engagement with the inner side walls 30' of the slots 24' to interconnect the side and rear panels 16 and 17 and also to secure those panels to the floor panel 60.

I claim:

1. A hardware assembly comprising a generally H-shaped member having two legs and having a bridge formed integrally with and spanning said legs, said legs projecting inwardly from one side of said bridge and flaring away from one another, a retainer spaced inwardly from and facing said one side of said bridge, a finger formed integrally with and projecting inwardly from said member, a recess formed in said retainer and receiving said finger, said finger coacting with the edges of said recess to limit turning of said retainer and to maintain the retainer in a substantially fixed angular position relative to said member, and a bolt extending from said retainer and threaded into a hole in said bridge and operable when turned to change the spacing between the retainer and the bridge.

2. A hardware assembly as defined in claim 1 in which said retainer is sized to block at least part of the inner side of each opening defined between said legs and said bridge.

3. A hardware assembly as defined in claim 1 in which the included angle between each leg and said one side of said bridge is approximately 135°.

4. A hardware assembly as defined in claim 1 further including a hole in said retainer and aligned with the hole in said bridge, said bolt extending rotatably through the hole in said retainer and having a head disposed adjacent the inner side of said retainer, and means integral with said bolt and captivating said retainer against said head to restrict the retainer from sliding along said bolt and thereby prevent the spacing between said retainer and said bridge from being changed except by turning said bolt.

5. A hardware assembly as defined in claim 1 in which said retainer is a plate, and a sharp-edged corner extending around the side of said plate facing said bridge.

6. A hardware assembly as defined in claim 1 further including a spur extending along and projecting inwardly from the inner side of each leg.

7. A hardware assembly as defined in claim 6 in which said retainer is a plate having opposite side edges extending in the same general direction as said spurs, the spacing between said spurs being substantially equal to the spacing between said side edges.

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