

[54] CABINET SYSTEMS WITH TENSION RODS AS FRAME MEMBERS

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[51] Int. Cl. **A47b 47/00; A47b 43/00**

[58] Field of Search..... **312/257, 257 SK, 264, 265, 312/108, 111, 140**

References Cited

UNITED STATES PATENTS

2,942,856	6/1960	Woodward et al.....	312/265 UX
3,150,903	9/1964	Chapman et al.....	312/140 X
3,231,321	1/1966	Barney.....	312/265 X
3,250,582	5/1966	Kassmir.....	312/140 X
3,329,473	7/1967	Dickson.....	312/257 R X
3,347,610	10/1967	Pilliod.....	312/140 X
3,360,320	12/1967	Lust.....	312/265 X

3,525,560	8/1970	Gasner et al.....	312/257 R
3,661,434	5/1972	Alster.....	312/257

FOREIGN PATENTS OR APPLICATIONS

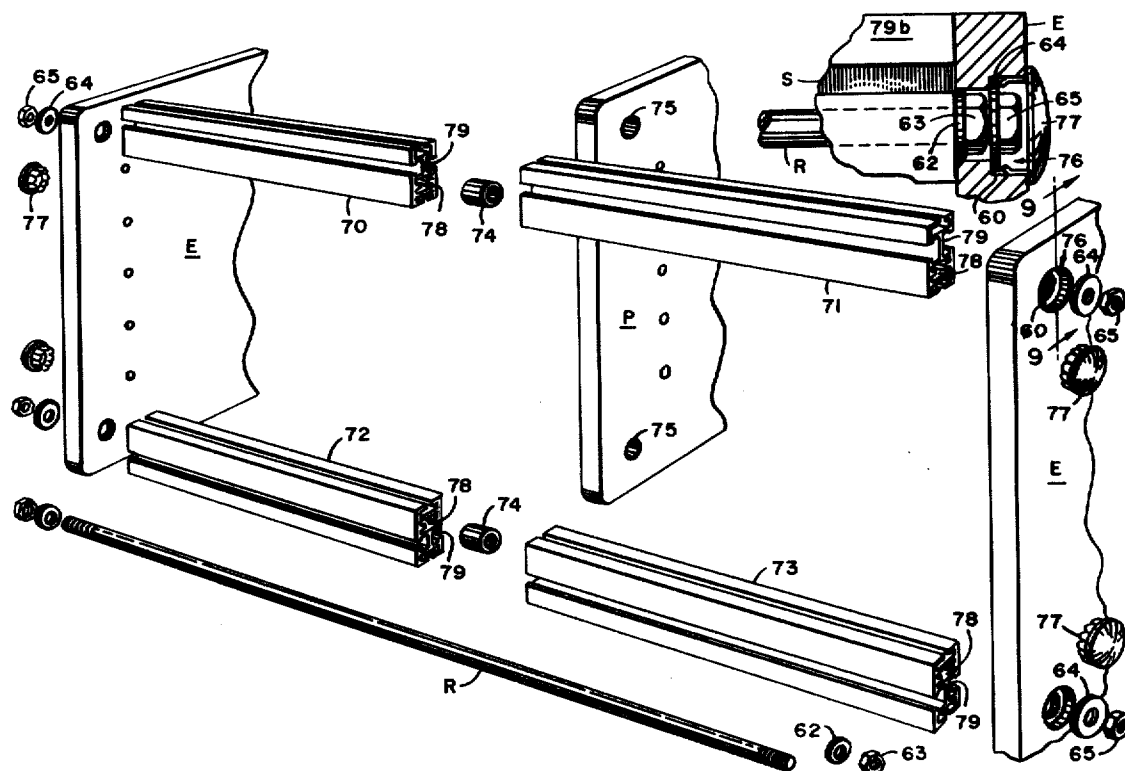
847,757	7/1970	Canada.....	312/265
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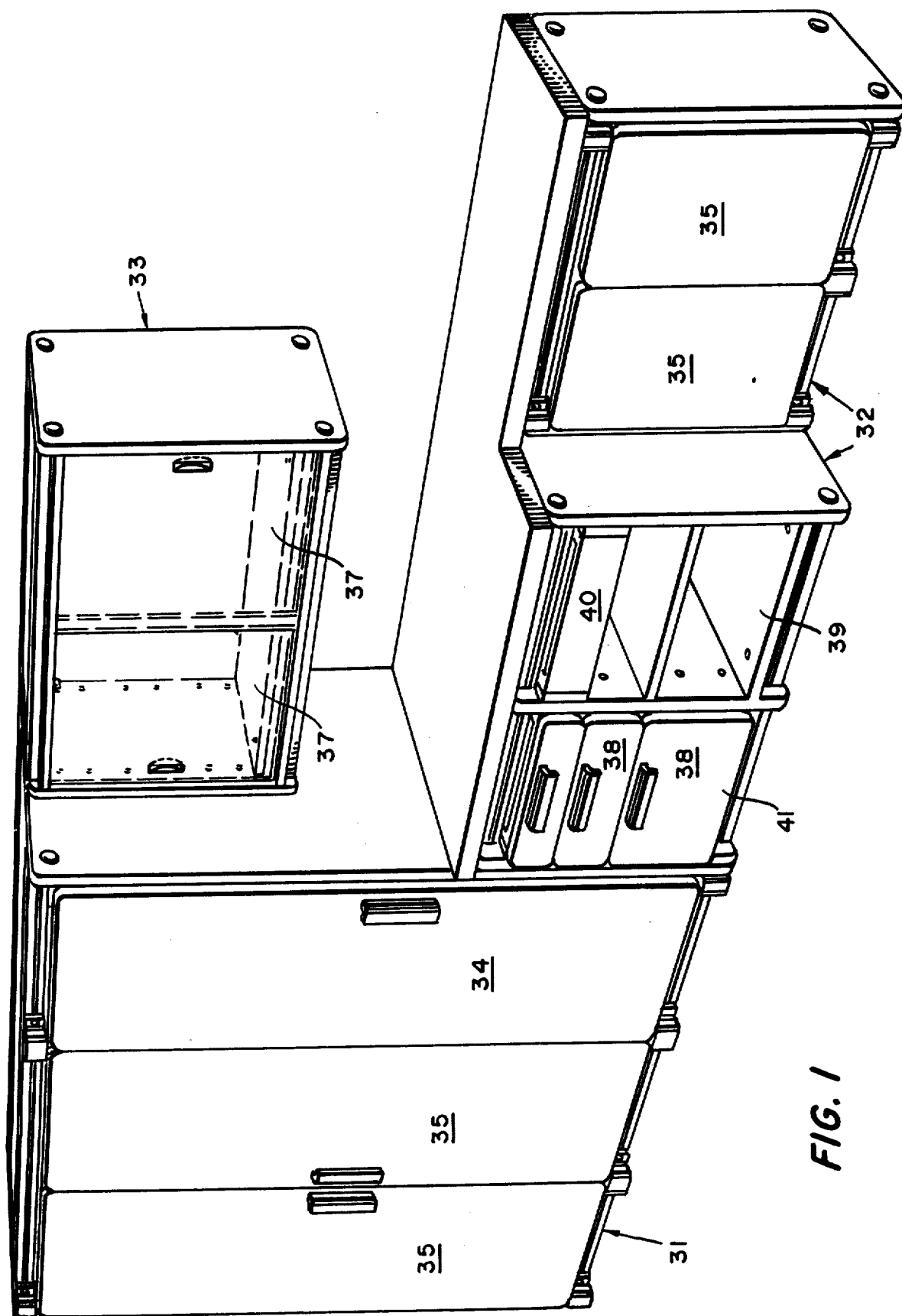
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Attorney, Agent, or Firm—Dawson, Tilton, Fallon & Lungmus

ABSTRACT

[57] A plurality of individual wall cabinets are held together as an integral unit by means of four tension rod/frame assemblies extending transversely through all individual cabinets in the unit. The frame is formed from a metal extrusion which is provided with a longitudinally extending channel or conduit. Individual frame sections or stretcher rails are assembled to separator panels; and their channels are aligned to receive a tension rod. the entire unit is mounted to wall brackets which attach to the rear tension rod/frame assemblies. Door assemblies and other accessories may be mounted to the front tension rod/frame assemblies.

3 Claims, 23 Drawing Figures





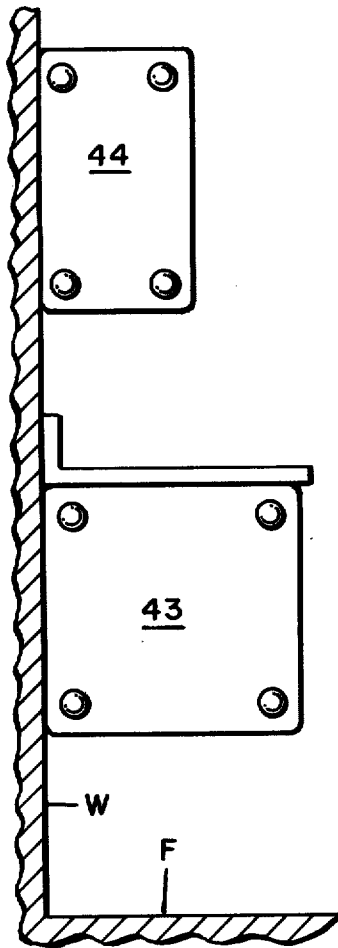


FIG. 2

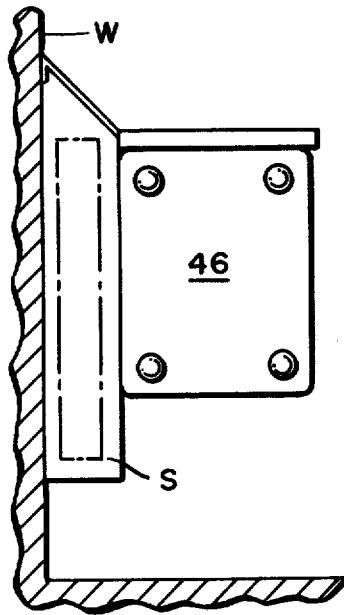


FIG. 3

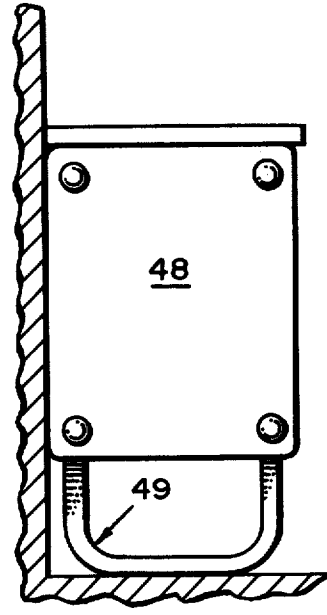


FIG. 4

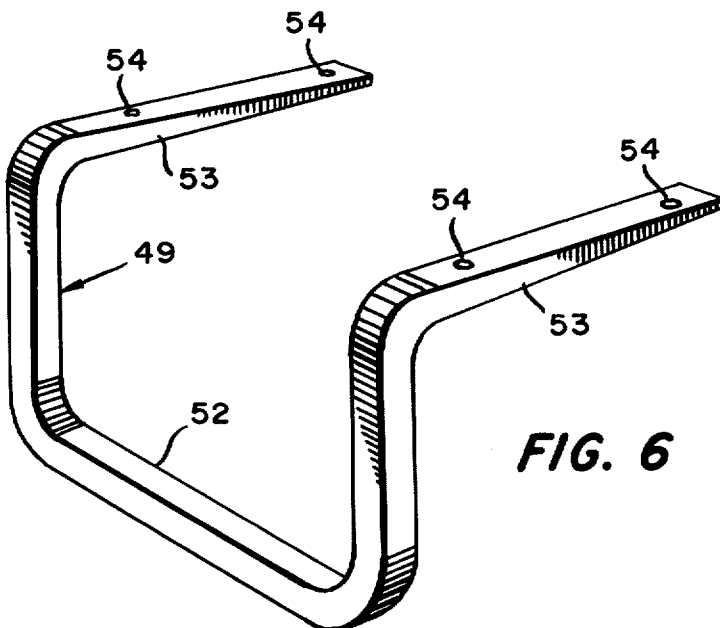


FIG. 6

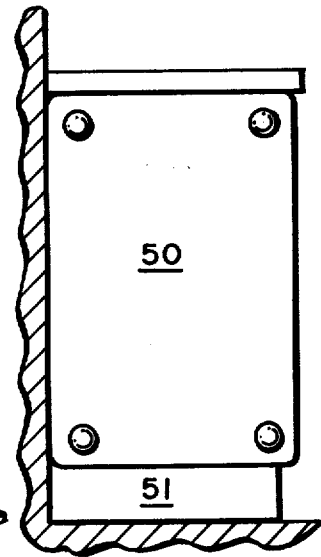


FIG. 5

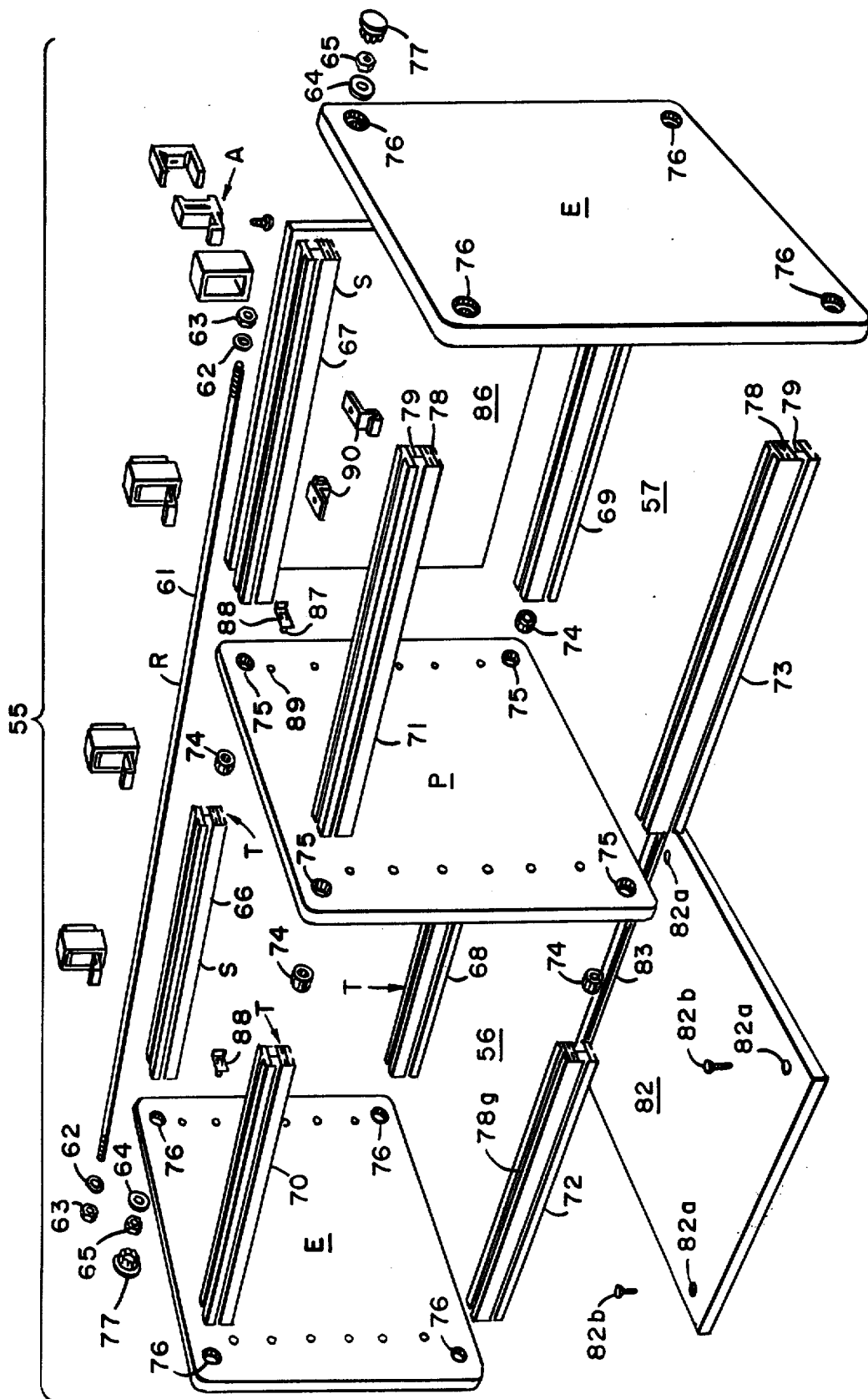
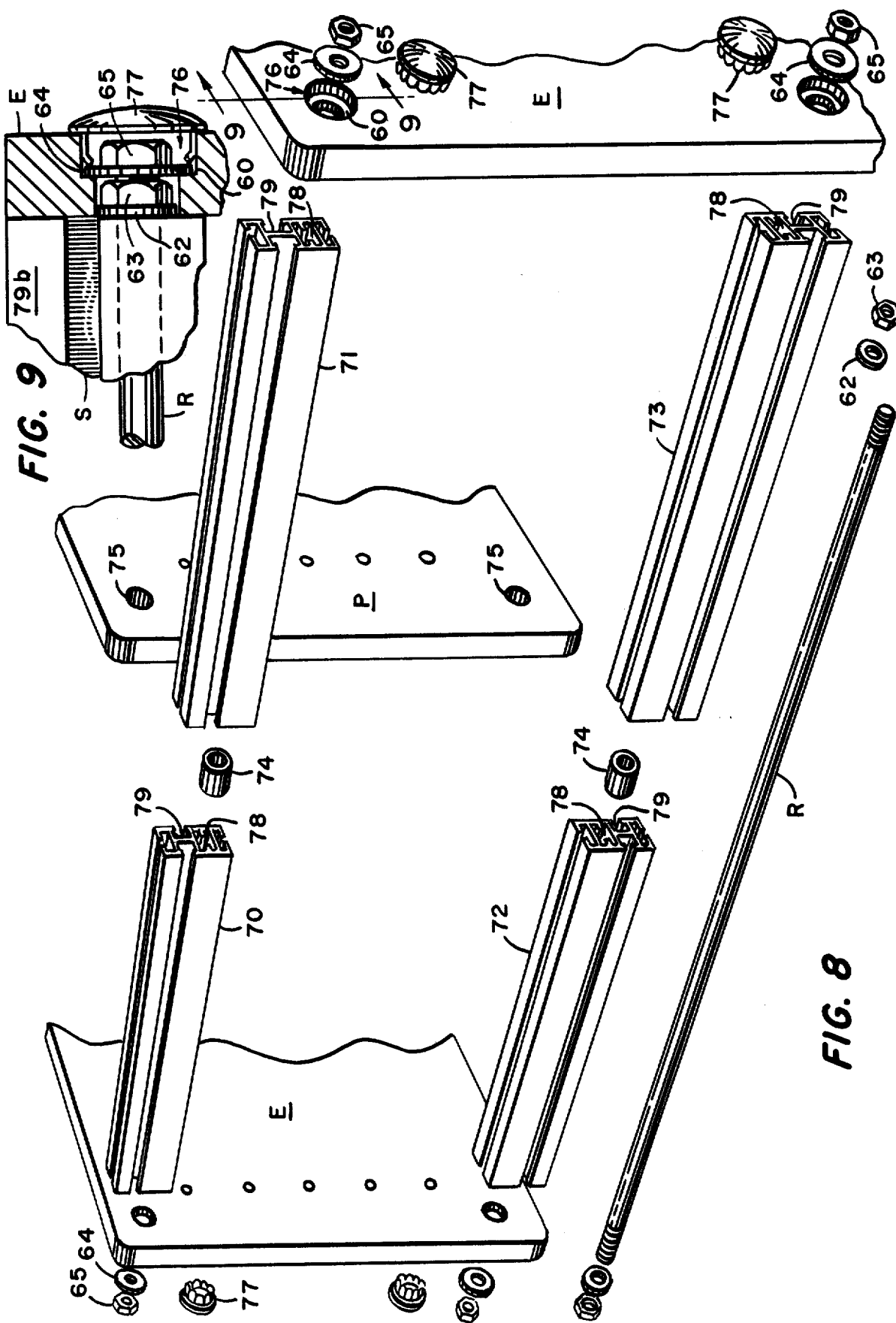


FIG. 7



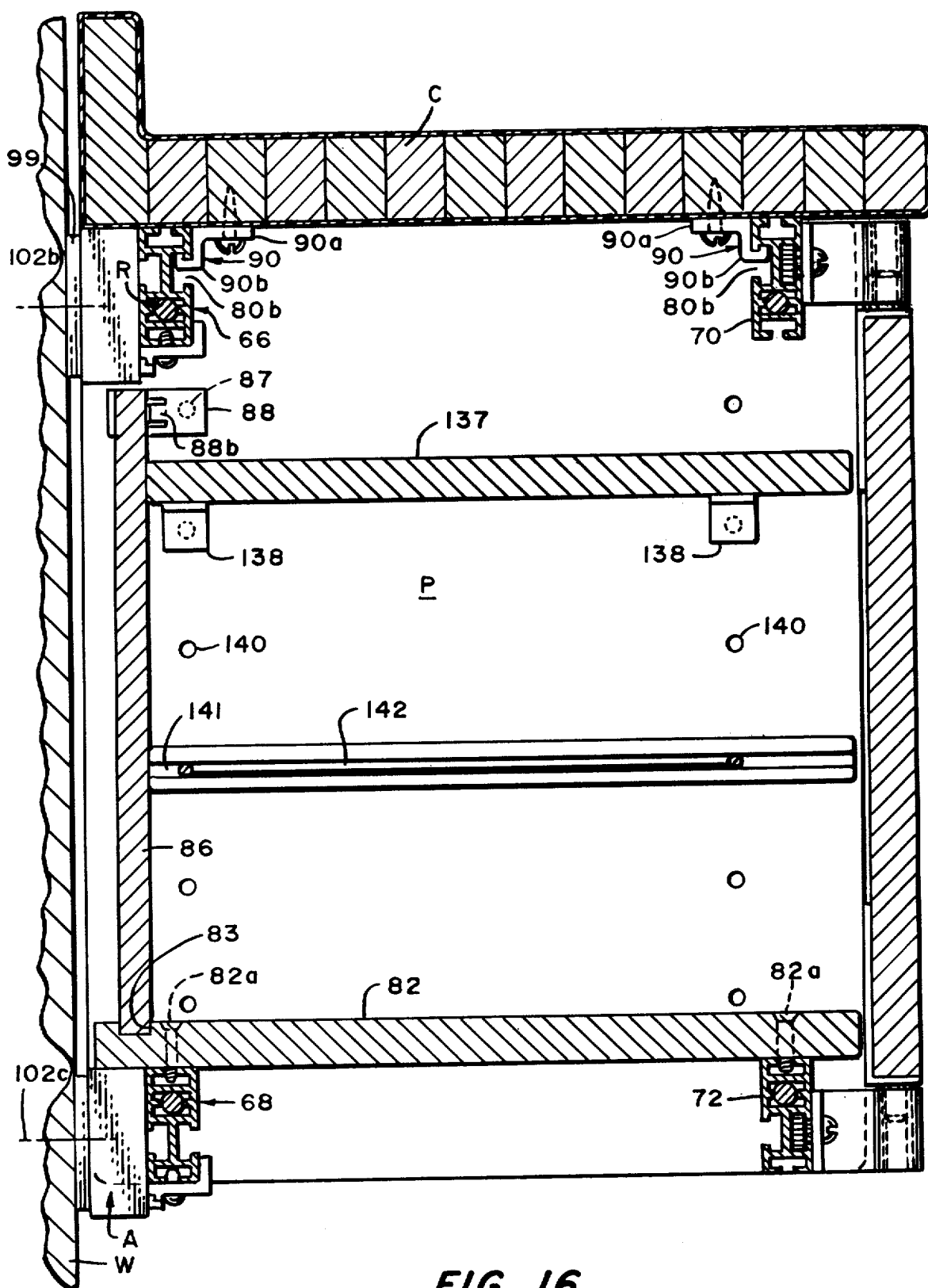


FIG. 16

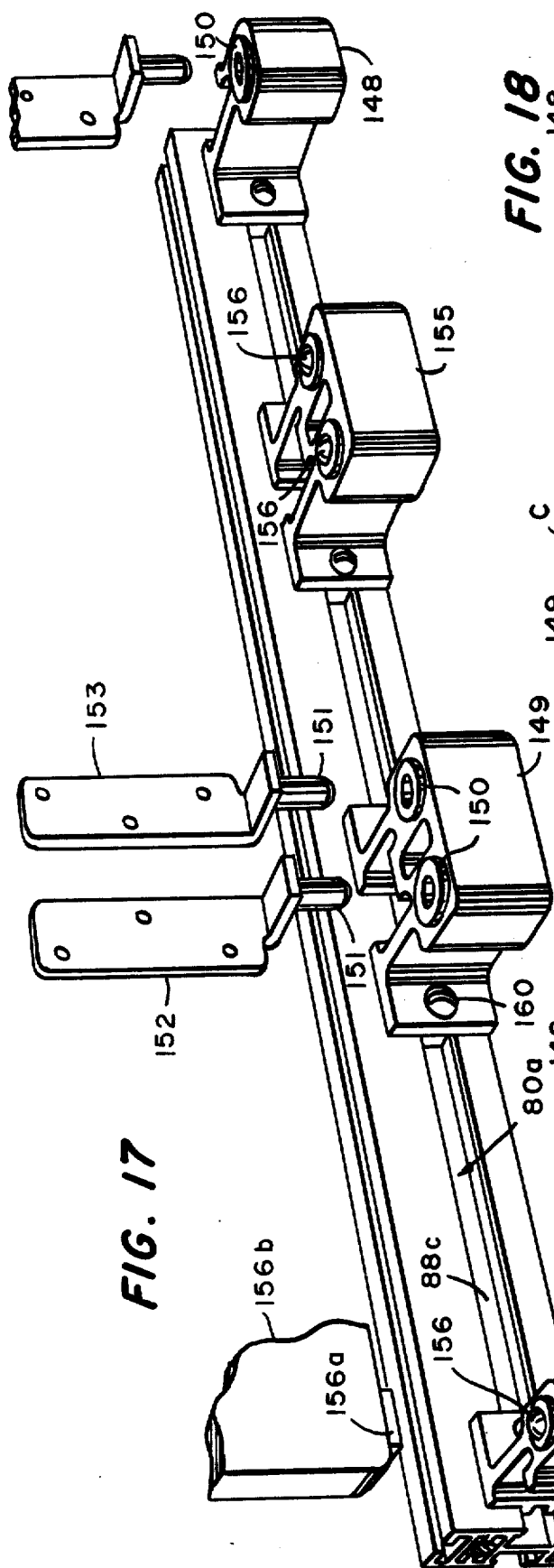


FIG. 17

FIG. 18

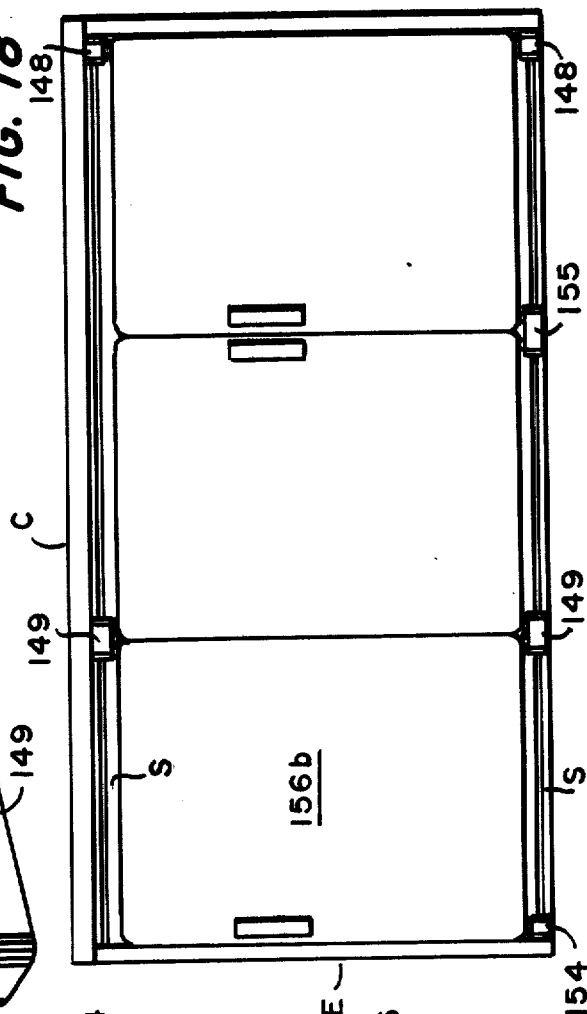
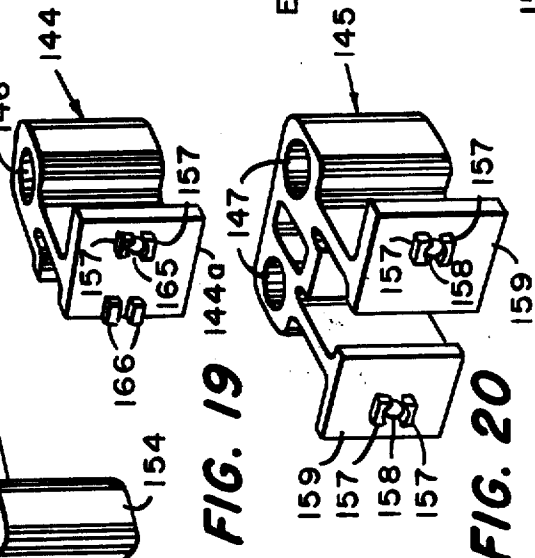
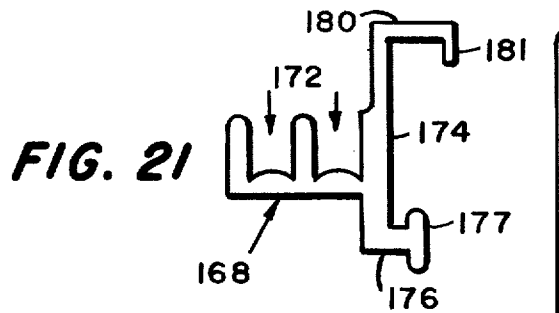
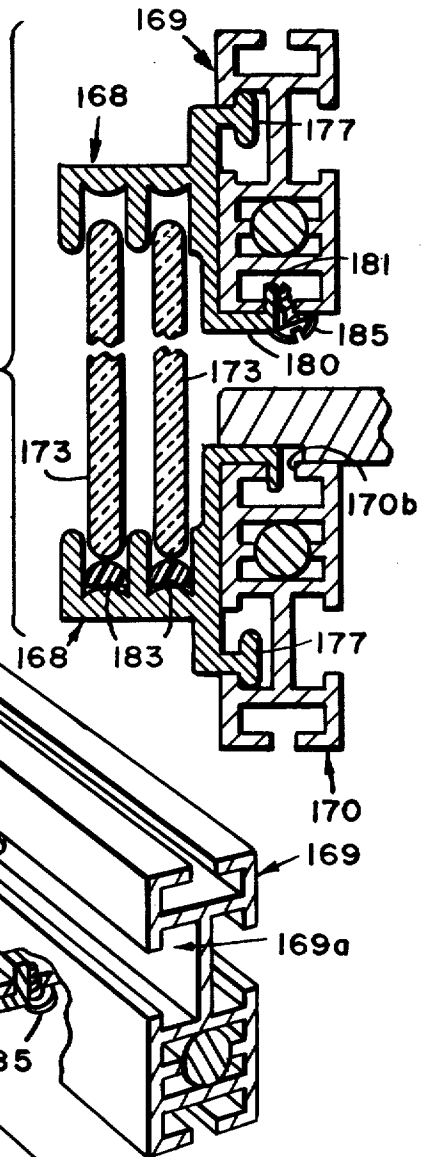
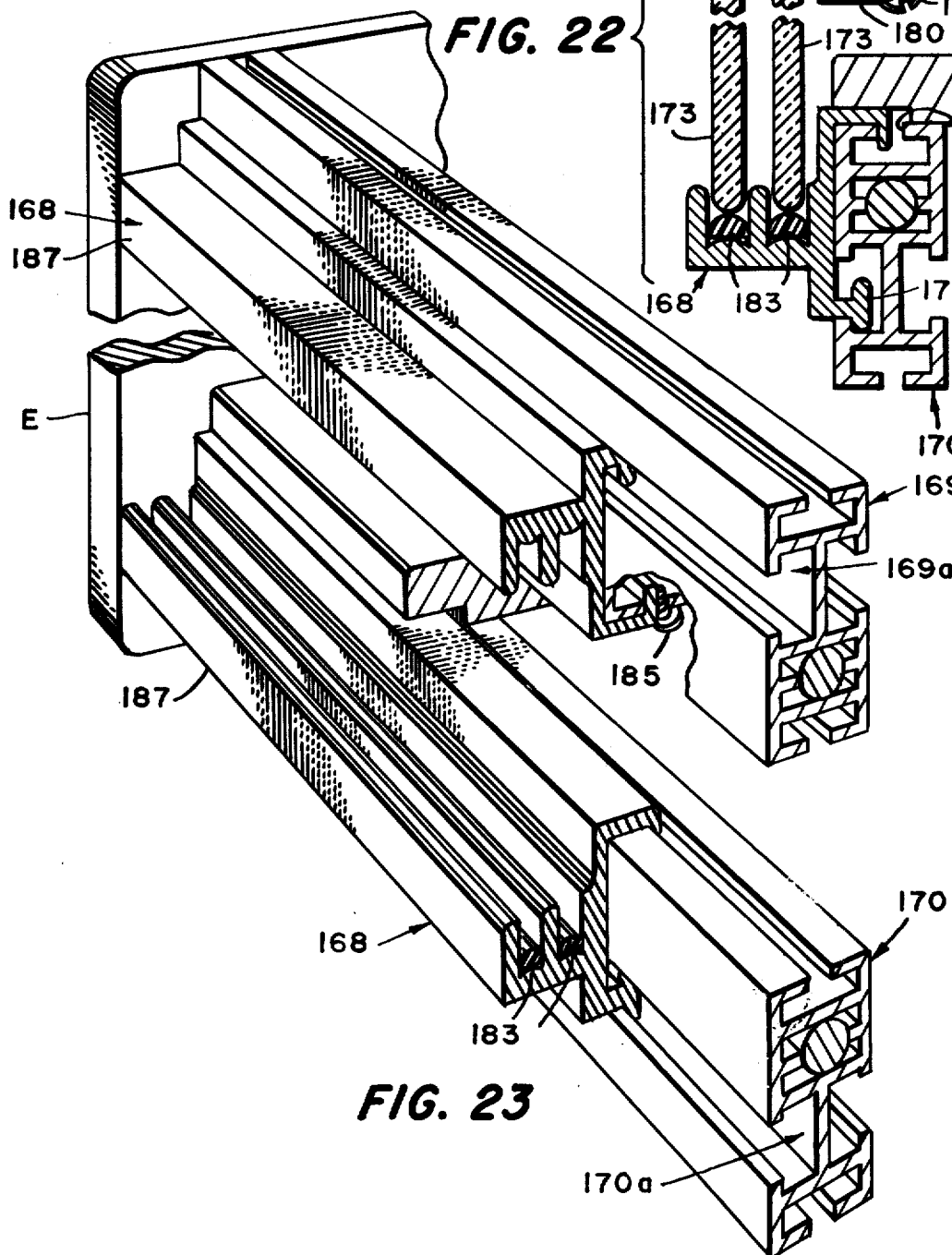


FIG. 19

FIG. 20



CABINET SYSTEMS WITH TENSION RODS AS FRAME MEMBERS

BACKGROUND AND SUMMARY

The present invention relates to cabinet structures; and more particularly it relates to a method and apparatus for hanging cabinets to a vertical support such as a wall. It has become desirable from the point of view of facilitating maintenance, and particularly cleaning beneath cabinets, to hang cabinet units from a wall. Such cabinet units as are commercially available, however, have to be manufactured almost on a custom basis with the attendant high costs of materials and labor, particularly such labor as is required to assemble, finish and install the cabinets.

The present invention further relates to a system which allows an architect or designer to specify cabinets for a predetermined space or extension from a limited set of modular cabinet widths while providing a customized appearance in the finished product. Heretofore, when an architect desired cabinets to fill a known length or extension, it has been the practice to supply the overall dimensions for the cabinets to a local woodworking shop which would then build the cabinets per instructions, hang the doors, assemble the hardware, and install the cabinet when the building proceeded to the appropriate stage of construction. Such a method does not lend itself to taking advantage of modern techniques of mass production and labor saving.

It has been suggested that individual cabinets be pre-assembled of known widths so that an architect can select from a limited set of cabinet widths to provide a plurality of cabinets, as desired. Such cabinets, however, have also been constructed according to conventional techniques; and although there are some advantages in mass-producing such cabinets (for example, in cutting the stack of panels of like size), nevertheless conventional time-consuming techniques of hardware assembly and cabinet installation are still followed.

The present invention includes a plurality of individual, modular compartments which are held together as an integral unit by four tension rod/frame assemblies which extend through all of the entire cabinet unit. One such assembly is located adjacent each corner of a cabinet when viewed from the side.

The frame is formed from sections of a metal extrusion stretcher rail which includes a longitudinally extending channel or conduit. Individual stretcher rails are assembled to separator panels and end panels. The separator panels divide the total unit into individual compartments. The channels of these individual stretcher rails are aligned to receive a common tension rod, and the rod is tensioned against the rails. Thus, all of the individual stretcher rails of one frame assembly are held in compression by means of a common tension rod; and the stretcher rails, in turn, hold the panels together to form modular, individual cabinets into a solid unit.

The entire unit is mounted to wall brackets which attach to the rear tension rod/frame assemblies. The front door assemblies are mounted to the front tension rod/frame assemblies. Drawer slides may be mounted to the panels within each individual cabinet if it is desired to provide drawers. Bottoms and backs for the cabinets may also optionally be provided.

One of the principal advantages of the present invention is that storage areas may be formed with capacity equal to that of conventional fixed cabinetry, but with fewer parts and less material.

Further, a manufacturer may supply a limited set of modular cabinet widths; and an architect or specifier may fill any desired length within reasonable limits, simply by selecting from the limited set of widths available. Substantial cost savings are available to the manufacturer because all parts may be cut, finished, or machined in stacks. The cabinets may be expanded, as required, due to the modular concept.

Assembly of the cabinets into a unit is also more flexible and economical than with prior art methods. Assembly made of the units may be accomplished either in the distributor's warehouse, prior to shipping to a job site or on site. Further, the units may be partially assembled (for example, by assembling only the end panels and individual cabinet partitions to the tension rod/frame assemblies; and the assembly may be completed on site or even after installation by adding drawers, doors, counter tops, etc.

Installation of the cabinet units is also facilitated. After a horizontal level is established for a unit of cabinets, brackets are mounted to the wall, as needed. It is preferable to provide the wall brackets in pairs, including an upper bracket and a lower bracket which then secure to the upper and lower tension rod/frame assemblies respectively to hang the cabinet unit to the wall in cantilevered fashion. Thus, the cabinets may be mounted at counter-height while leaving an unobstructed space beneath the cabinet unit to facilitate cleaning of the classroom or laboratory in which the unit is mounted. Alternatively, it will be appreciated that the same method may be used to mount cabinet units at head level or over the counter.

The cabinet units may be re-assembled in another location, if desired, or they may be otherwise moved, stored, divided into units of smaller extension, or added to very simply, using the same basic elements. The basic structure may be modified either to add or remove drawers (to create storage cabinets or cupboards) or special inserts may be provided to adapt the cabinets for particular uses.

Other features and advantages of the present invention will be apparent to persons skilled in the art from the following detailed description of a preferred embodiment accompanied by the attached drawing wherein identical reference numerals will refer to like parts in the various views.

THE DRAWING

FIG. 1 is an upper perspective view of a group of various cabinet styles constructed according to the present invention;

FIGS. 2-5 are side elevational views illustrating various types of under-counter cabinets which may be constructed according to the present invention;

FIG. 6 is an upper perspective view of a leg support for the cabinets of FIG. 4;

FIG. 7 is a perspective view of certain elements of a cabinet construction according to the present invention with the various elements in exploded relation;

FIG. 8 is a view similar to FIG. 7 showing only the front elements of the construction;

FIG. 9 is a fragmentary sectional view taken through the sight line 9-9 of FIG. 10;

FIG. 10 is an exploded perspective view of a preferred wall mounting bracket for the inventive cabinet structure;

FIG. 11 is a perspective view with the elements of FIG. 10 in assembled relation;

FIG. 12 is an end view of a stretcher extrusion assembled to a tension rod;

FIG. 13 is a perspective view of a short section of a stretcher extrusion assembled to a tension rod;

FIG. 14 is a side view of a wall mounting bracket assembly in its fully extended position and with a stretcher extrusion and tension rod, shown in section, assembled to it;

FIG. 15 is a view similar to FIG. 14 with the wall mounting bracket assembly in its fully retracted position;

FIG. 16 is a vertical cross section view through a door cabinet construction incorporating the present invention;

FIG. 17 is an upper perspective view of a lower stretcher extrusion showing hinge blocks with door hinges in exploded relation;

FIG. 19 is a perspective view from the stretcher side of a single accessory block;

FIG. 20 is a view similar to FIG. 19 of a double accessory block;

FIG. 21 is an end view of a track for sliding glass doors;

FIG. 22 is a fragmentary cross sectional view of tracks similar to that shown in FIG. 21 mounted to both an upper and a lower stretcher rail; and

FIG. 23 is a fragmentary perspective view of the elements shown in FIG. 22, but without the sliding glass doors.

DETAILED DESCRIPTION

In general, the present invention includes a plurality of individual, modular cabinets which are formed by holding separator panels together as an integral unit by means of four tension rod frame assemblies which extend through all of the individual cabinets in the unit. A tension rod/frame assembly is located near each corner of a cabinet, when viewed from the side.

These tension rod/frame assemblies act as framing members, and each assembly includes a stretcher member extruded from metal which provides a longitudinally extending channel or conduit for receiving and holding the tension rods, the stretcher extrusions (or "stretcher rails" as they are sometimes referred to) are cut in sections according to the desired width of each individual cabinet, and the longitudinal channels of each are aligned so that a single tension rod extends through all of the aligned channels, and the rod is tensioned against the aligned stretcher extrusions which are placed in compression. Thus, all of the individual rail sections of a given tension rod/frame assembly are held in compression by means of a common tension rod; and the frame sections, in turn, hold the separator panels and end panels in place to form a solid, integral unit. Metal bushings are located about the tension rod where it extends through a separator panel so that metal-to-metal contact is maintained for all compressive members.

The entire unit is mounted to adjustable wall brackets by attaching the upper and lower rear tension rod/frame assemblies to the wall brackets. Sliding door tracks and other accessories may be mounted to the

upper and lower front tension rod assemblies. Drawers may be provided in the cabinets, and bottoms and backs may also optionally be provided. A counter top is secured to the upper rear and front tension rod assemblies.

The broader aspects of the present invention can perhaps best be understood from FIG. 7 wherein two end panels designated E and an intermediate separator panel P are designed to be held together into a single unit by means of four corner tension rod/frame assemblies T, the parts here being shown in exploded relation. Referring only to the upper rear tension rod/frame assembly, there is a separate section of stretcher rail extrusion S for each of the two compartments, and a common tension rod R extends through the upper rear apertures of each of the end panels E, separator panel P and stretcher extrusions S, holding them in compression by being tensioned to the outboard ends of the stretcher rail sections.

The entire unit is then attached to a wall by adjustable wall bracket assemblies A, provided as needed.

Turning now to FIG. 1, there are shown some typical uses of the present invention for forming cabinets including full height cabinets 31, below-the-counter cabinets 32, or above-the-counter cabinets 33. The cabinets may have single hinged doors as at 34, double hinged doors as at 35, sliding glass doors 37, drawers as at 38, or open front storage, as at 39. The drawers may be of a plain front construction as at 40, or they may be of a more deluxe construction with decorative front panels and pull handles as at 41. Further, the cabinets may be provided in a combination double-hinged door and single-hinged door formed into a single unit, as with the full-height cabinets 31. The number and length of separate cabinet sections that can be strung out side by side with a single tension rod is limited only by practical considerations.

Turning now to FIGS. 2-5, in addition to the variations shown in FIG. 1, the cabinets may be hung directly onto a wall W in cantilever fashion, including the under-the-counter cabinets 43 and over-the-counter cabinets 44 so that the entire floor F is clear. Alternatively, the cabinets may be hung from a permanently installed service module S, for example, as at 46 in FIG. 3, wherein the conduits and wires supplying a laboratory with heat, power, gas, and water may be routed through the service module S. In addition, the cabinets may be free standing as at 48 in FIG. 4 with the bottoms provided with sled base supports 49 for bearing the weight of the cabinets. Another alternative is shown in FIG. 5 wherein the cabinets 50 extend closer to the floor and rest on a closed base 51.

One type of sled base support is shown in perspective in FIG. 6, and it is formed from a single piece of tubing 52 having a square cross section. the tube 52 is formed into a general U-shape, and the upper ends 53 are then formed outwardly and flattened into a chisel shape. Each of the flattened ends 53 is provided with a pair of holes 54 for securing the sled base support 49 to the lower front and rear corner tension rod assemblies with screws, in a manner disclosed in more detail subsequently.

Turning now to FIG. 7, the elements of a cabinet unit 55 with a left compartment 56 and a right compartment 57 are shown. The compartments 56, 57 are defined by the end plates E and the intermediate separation panel P. As mentioned, the panels are held together by the

four tension rod/frame assemblies T. Although there is a separate tension rod R for each assembly, only one is shown, and it is designated 61. Each end of the tension rod 61 is threaded, and it is secured to the outboard end of the associated stretcher extrusion or rail S by means of a washer 62 and jamb nut 63. The rods are secured to the end panels E by a second washer 64 and second jamb nut 65, which is better illustrated in FIG. 9 wherein it can be seen that the washer 64 has a wider diameter than the washer 62, and it engages a shoulder 60 formed in the end panel E.

Returning to FIG. 7, the eight separate stretcher rails are separately lettered, grouped into pairs according to their association with a single tension rod R. Thus, the two upper rear stretcher rails are designated 66 and 67, the lower rear stretcher rails are designated 68 and 69, the upper front stretcher rails are designated 70 and 71, and the lower front stretcher rails are designated 72 and 73. There are four annular bushing spacers 74 which are received in corresponding round holes 75 formed in the corners of the separator panel P. The function of the bushing spacers 74 is to achieve metal-to-metal contact between adjacent stretcher extrusions, and when they are placed in compression as will be described below, the spacer bushings 75 prevent crushing of the separator panel P.

Corresponding aligned corner holes 76 are formed in the end panels E, and these provide the shoulders 60 which have already been discussed and are illustrated in FIG. 9. The end hardware is hidden from sight by means of plug buttons, one of which is shown in FIG. 9 and designated by reference numeral 77. The use of jamb nuts 63, 65 for respectively tensioning the rods R against the stretcher extrusions S and for holding the end panels E against the stretcher extrusions S has been found advantageous because of their thinness, requiring more shallow recesses for the shoulder holes 76, and therefore thinner end panels E may be used.

The structure of the stretcher extrusions is best seen in FIGS. 8, 12 and 13. As indicated, these extrusions are preferably formed by continuous metal extrusion processes such as are known in the art, and they are preferably made of aluminum. They may easily be cut to shape, either in a production area prior to shipping to a site or on the site itself.

The tension rod R is received in a closed channel or conduit 78 which is defined by upper and lower horizontal walls 78a and 78b and upright sidewalls 78c and 78d which extend slightly upwardly beyond the upper horizontal wall 78 and down beyond the lower horizontal wall 78b where they are turned inwardly to form feet or runners 78e and 78f. The inner edges of the feet 78e and 78f are spaced slightly apart to define a continuous slot 78g which is adapted to receive a self-tapping metal screw, such as is shown in FIGS. 14 and 15.

Extending inwardly in opposing relation from the side walls 78c and 78d are spacer ribs 78h and 78j. The spacer ribs 78h and 78j are located midway between the upper and lower wall 78a and 78b, and their innermost opposing edges are spaced apart at a distance slightly greater than the diameter of the tension rod R. Similarly, the upper and lower walls 78a and 78b of the channel 78 are spaced apart at a distance slightly greater than the diameter of the rod R when it is inserted. Thus, when the tension rod R is inserted in the channel 78, there is prevented any substantial movement in any direction of one member relative to the other.

Still referring to the cross sectional shape of the stretcher extrusion S, the lower wall 78b and the lower portions of the side walls 78c and 78d, together with the inwardly projecting feet 78e and 78f form a lower longitudinal slot 78k which may receive square nuts, permitting the nuts to be adjusted to any desired positions along the entire length of the extrusion. The length of one side of a square nut intended to be held in the slot 78k is only slightly less than the width of the slot so that once it is inserted into the slot, the square nut cannot be turned. Thus, in attaching accessories or cabinet members to the stretcher extrusion S at the bottom, either machine threaded screws or sheet metal screws may be used.

Extending upwardly from the center of the upper horizontal wall 78a is a vertical web 79, at the top of which there is formed a third horizontal wall 79a. Upper side wall portions 79b and 79c are formed at the outboard edges of the third horizontal wall 79a, and upper inwardly extending feet 79d and 79e are formed respectively at the top edges of the upper side wall portions 79b and 79c so as to define an upper longitudinal square nut channel 79f and an upper screw slot 79g.

The lower side wall portions 78c and 78d extend slightly upwardly beyond the first or central horizontal wall 78a as at 78m and 78n in FIG. 12, and the lower portions of the upper side walls 79b and 79c extend downwardly a corresponding distance below the third horizontal wall 79a, as at 79h and 79j. Thus, the structure provides a third and a fourth longitudinal square nut channel 80a and 80b respectively, each having an associated screw slot 80c and 80d respectively which is wider than the corresponding screw slots 78g and 79g for the square nut channels 78k and 79f respectively.

Returning now to FIGS. 7 and 8, the upper stretcher extrusions 66, 67, 70 and 71 are shown in the positions illustrated in FIGS. 12 through 15--that is, the vertical web 78 is located above the tension rod channel 78; whereas for the lower stretcher extrusions 68, 69, 72 and 73, the relationship is reversed with the central vertical web 79 located beneath the tension rod channel 78.

For the structure illustrated, bottom panels, one of which is shown and designated 82 rest on the lower stretcher extrusions 68, 72 and 69, 73 respectively. The panels are provided with a pair of forward holes 82a for receiving sheet metal screws 82b which are received in the sheet metal screw slot 78g of the lower forward stretcher extrusion or rail 72. Corresponding holes and screws may be used to secure the rear portion of the bottom panel 82 to the rear stretcher rail 68 in a similar manner.

When it is desired to use a back panel, a transverse groove 83 is formed in the upper surface of a bottom panel 82 parallel to and adjacent the rear edge for receiving and holding the bottom edge of a rear panel, one of which is shown at 86 for the compartment 57. The top of the back panel 86 is secured to the end panel E and the separator panel P by means of retaining clips, as seen in FIG. 16. The retaining clips 88 are provided with stub shafts 87 for being received into shelf holes 89 formed in the panels E and P. As best seen in FIG. 16, each of the retaining clips 88 includes rear support flange 88a and a forward for engaging the rear of the panel 86, and a wire spring member 88b which engages the forward edge of the panel 86 to hold it in place.

Brackets **90** are also included for mounting counter tops or cabinet tops to the upper rear stretcher rails **66**, **67**.

As best seen in FIG. 16, the brackets **90** include a base flange **90a** for resting against the lower surface of the counter top **C**, and a lower hook portion designated **90b** which fits into the square nut channels **80a** or **80b** and clamping about the associated downwardly projecting portion **79h** or **79j** of the upper side wall members **79b** or **79c** respectively of the extruded stretcher rails **S**. The cabinet top is not shown in FIG. 7, and doors, drawers and shelves are omitted as well.

Turning now to FIG. 8, there is shown the front portions of the end panels **E** as well as the front portion of the separator panel **P**, and the four front stretcher rails **70**, **71**, **72** and **73**. When assembled, the bushings **74** fit into the round holes **75** on the upper and lower front corners of the separator panel **P**, and the bushings have an axial length equal to the width of the panel **P** so that the inboard ends of the associated pairs of stretcher rails **70**, **71** and **72**, **73** engage and bear against the bushings rather than the panel **P**.

It will be observed that the two upper stretcher rails **70**, **71** are located such that the vertical web **79** is above the tension rod channel **78**; where this relationship is transposed for the lower stretcher rails **72**, **73**, are already mentioned. Since the tension rod channels are offset relative to the center of the stretcher rails, this permits greater bulk and contact with the inner surface of the end panels **E** above the upper shoulder hole **76** and beneath the lower shoulder hole, as indicated in FIG. 9 for an upper stretcher rail, thereby providing greater rigidity to the assembled unit.

In assembling the panels to the tension rod assemblies, the bushings **74** are placed in the hole **75** and the tension rod channels **78** are then aligned with the smaller diameter portions of the shoulder holes **76** as the tension rods **R** are slipped through the holes, the channel **78** and the bushings **74**. The innermost flat washers and jamb nuts **62**, **63** are then tightened on the threaded end portions of the tension rod **R**, inducing tension into the rod while compressing the stretcher rails **S** and intermediate bushings **74**.

Next, the outer flat washer **64** is placed over the threaded end portion of the tension rod, and the outermost jamb nut **65** secures the end panel **E** to the assembly. The end panel **E** is held between the flat washer **64** and the outboard end of the associated stretcher rail. Turning now to FIGS. 10 and 11, the wall mounting bracket assembly **A** is seen to include three separable elements: a wall mounting bracket generally designated **99**, a hanging bracket **100**, and a sleeve **101**. The bracket **99** includes a back portion **99a** and upper and lower outwardly extending portions **99b** and **99c**. The back portion **99a** is adapted to abut a wall to which it is desired to mount the cabinets, and it includes a vertically elongated slot, **102**, which permits vertical adjustment of the bracket assembly relative to a wall screw **102a**, as seen in FIG. 14 and 15 wherein the bracket assembly **A** is adjusted respectively in its lowermost and uppermost position relative to the mounting stud **102a**. The central portion of the back **99a** of the wall bracket **99** is thickened as at **99d** for greater strength in mounting. The undersurface of the upper portion **99b** of the wall bracket **99** is provided with a plurality of transverse longitudinal teeth or keys **103**, and the upper sur-

face of the lower portion **99c** is similarly provided with teeth **104**.

Turning now to the hanging bracket **100**, it includes upper and lower flanges **105** and **106** which are respectively provided with an upper set of teeth **105a** and a lower set of teeth **106a** for meshing respectively with the sets of teeth **103**, **104** on the wall bracket **99**. The teeth can only be intermeshed by placing the hanging bracket **100** alongside the wall bracket **99**, aligning the teeth on one with the intermediate grooves on the other, and then sliding the hanging bracket transversely. That is to say, as seen in FIGS. 14 and 15, when the hanging bracket and wall bracket are intermeshed and aligned, the hanging bracket cannot be moved in a direction transverse to the plane of the wall to which it is attached. The function of the intermeshing teeth is to permit discrete, rather small adjustments in the positioning of the hanging portion of the bracket relative to the wall so as to compensate for any dips or curves in the wall from a truly planar surface. The hanging bracket **100** is shown in FIG. 14 in its outermost adjusted position, and in FIG. 15 in its innermost adjusted position.

The flanges **105**, **106** are connected by means of two vertical webs **107a** and **107b**, and the lower flange **106** extends forwardly as at **106c** where it is thence formed upwardly to provide a lip **106d**.

The sleeve **100** is a simple box-shape having top and bottom walls **101a** and **101b** and first and second side walls **101c** and **101d** formed into an integral unit which fits over the wall bracket **99** and holds the hanging bracket **100** in assembled relation therewith--that is, it prevents lateral sliding of the hanging bracket **100**. The entire hanging bracket assembly is seen in FIG. 11 with the three principal elements in assembled relation. It will be observed that the extension **106c** of the flange **106** provides a land **106e** which is apertured at **106f** for supporting a stretcher rail **S** (FIGS. 14 and 15). A self-tapping sheet metal screw **108** holds the stretcher rail in place by extending through the aperture **106f** and being threaded into the lower longitudinal screw slot of the stretcher rail. The bracket assembly **A** is disclosed and claimed in copending, co-owned application of Leif Blodde, entitled "Adjustable Bracket Assembly for Hanging Cabinets to Walls," Ser. No. 324,873, filed Jan. 18, 1973.

Turning now to FIG. 16, the steps in assembling a cabinet to the wall **W** will be discussed. Vertical height measurements are made to locate the wall mounting studs at upper locations **102b** and lower locations **102c** as at many places along the wall as are required for supporting the intended cabinet. One of the wall mounting bracket assemblies **A**, described above, is placed at each of these stud locations. The wall mounting brackets **99** are attached to the wall at each location with the studs **102a**, as described in connection with FIG. 14, for example, but the tightening is only temporary at this stage. The rear spacer bushings **74** (FIG. 7) are assembled in the openings **75** of the separator panel **T**, and the separator panel is slid in position between the upper and lower rear stretcher rails **66**, **68**. The tension rods **R** are then placed through the tension rod channels **78** and the associated bushing spacers **74**. Adjacent stretcher rails are pushed together, and the inner flat washers **62** and jamb nuts **63** are assembled and tightened securely to form a solid metal-to-metal frame unit centered on the tension rod. Enough tension is applied

to hold the separator panels in place by virtue of the portion of the stretcher rail that extends beyond the bushing to form a shoulder which engages the panel from each side. The applied tension is also sufficient to cause the rail to bite into the bushing, and this in combination with the compressive force on the rail, prevents rotation of the stretcher rail on the tension rod.

The front bushing spacers 74 are then placed in the corresponding apertures 75 at the front of the partition panel P. The upper and lower stretcher rail 70, 72 as well as any adjacent stretcher rails are assembled to the front tension rods R on either side of the separator panel P, after any necessary square nuts have been slipped into the proper slot, as will be made clear subsequently. The insertion of square nuts and the like will depend upon the type of cabinet required—that is, whether it has swinging doors, sliding doors, drawers, or are simply opened. The smaller or inner flat washers 62 and jamb nuts are then assembled to the outer threaded portions of the front tension rods and tightened so that the entire front assembly is centered on the tension rods.

The end panels E of FIG. 7 and 8 are then placed on the ends of the tension rods and secured with the outer flat washers 64 and jamb nuts 65. After the end nuts 65 are securely tightened with the stretcher rails in their proper disposition, as shown in FIG. 16, the frame is leveled by adjusting the wall brackets 99 relative to the mounting studs 102a by means of the slots 102, and the wall brackets are then secured. Any adjustment between the wall bracket 99 and the hanging bracket 100 is made so that all of the lands 106e of the wall bracket assemblies are aligned. The sheet metal screws 108 are then secured to the screw slots in the stretcher rails, thereby securing the stretcher rails to the hanging wall bracket assemblies. The plug buttons 77 are inserted into the shoulder holes 76 to hide the end jamb nuts.

Next, the counter top C may be added by laying it on top of the frame and securing it by means of the brackets 90, as already discussed.

The bottom panels 82 may then be assembled by placing them on the lower stretcher rails with the groove 83 located toward the rear, as shown. The screws 82b then secure the bottom panel 82 to the associated lower front and rear stretcher rails 68, 72. One back panel retaining clip 88 is then placed in a suitable shelf hole in the separator panel P, preferably at the top, and the back panel 86 is inserted by first inserting the lower edge into the groove 83 and then rotating the top portion backwardly until it snaps over the spring retainers 88b and is held by the back flange 88a.

As seen in FIG. 16, the shelving may be either of two types, including the conventional rectangular shelf 137 resting on shelf support brackets 138 placed in a horizontally aligned pair of shelf holes 140 formed in the separator panel P. Alternatively, the shelves may have longitudinal side grooves 141 formed in their side edges for sliding onto shelf guide rods as at 142, the ends of which are turned outwardly and pressed into appropriate shelf support holes 140 which are, again, horizontally aligned.

If it is desired to use swinging front doors to close the cabinets, the assembly of such doors is best understood in connection with FIGS. 17 through 20. A single hole extrusion 144 is shown in FIG. 19, and a double hole extrusion 145 is shown in FIG. 20. These extrusions may be used either as hinge blocks or as door stop

blocks, depending upon the type of insert placed into the respective bores 146, 147. When used as hinge blocks, they are shown in FIG. 17 as a single hinge block 148 and a double hinge block 149. In this case, nylon bushings 150 are inserted into the bores to form a bearing surface and prevent metal-to-metal contact with pins 151 of right-hand or left-hand hinge plates 152, 153 respectively. When used as a door stop, a single bullet-type catch 156 is inserted into the bore of the single extrusion block 154 in FIG. 17; alternatively, two bullet types catches 156 may be inserted into the double bore into the double block, as at 155. As illustrated at the upper left-hand corner of FIG. 17, the bullet-type catch 156 is adapted to engage and releasably hold an associated catch plate 156a located at the lower corner of a swinging door 156b.

The mounting of the hinge blocks or stop blocks is best illustrated in FIG. 20 where two small projections 157 are mounted respectively above and below clearance apertures 158 located on each of two mounting pads 159 and extending rearwardly thereof. The periphery of a pair of projections 157 is rectangular, and the height of a pair is such as to just fit into one of the lateral slits 88c leading into an associated square nut slot 80a (FIG. 17). The blocks are then secured by means of machine screws 160 received in appropriate square nuts located in the nut channel 80a.

Turning now to FIG. 19, similar projections 157 are formed on a mounting pad 144a for the single mounting block 144, and they are located above and below respectively a clearance aperture 165. An additional set of projections 166 are located in a horizontally aligned, but offset position to prevent the block from twisting around the screw when the weight of the door is added.

As seen in FIG. 18, which is a frontal view of a typical door cabinet, it can be seen that identical single hinge blocks 148 and double hinge blocks 149 may be used on the upper stretcher rail S as well as on the lower stretcher rail, with the appropriate inserts placed in the bottom of the bores. There need not be complementary upper door stop blocks.

Turning now to FIGS. 21–23, there is illustrated the attachment of tracks for sliding glass doors. A track extrusion is generally designated by reference numeral 168 in FIG. 21 wherein it is shown from the end. The same extrusion may be used either as an upper track when it is assembled to an upper stretcher rail as at 169 in FIG. 23, or as a lower track when it is assembled to a lower track rail 170 in FIG. 23.

The track extrusion is shown in FIG. 21 for attachment to a lower stretcher rail, and it also is a metal extrusion having a forward cantilever portion in the shape of a W, defining two laterally spaced longitudinal grooves 172, each receiving and slidably supporting an associated plate of glass or plastic 173. To one side of the grooved portion, there is a vertical leg 174 which continues downwardly and is turned inwardly as at 176, having its distal end formed into upper and lower ridges to provide a locking tab 177 which fits into and couples with one of the outwardly facing lateral nut channels on an associated stretcher rail, such as are shown at 169a and 170a respectively for the stretcher rails 169 and 170 in FIG. 23. The opposite portion of the leg 174 is formed inwardly as at 180 and downwardly as at 181 to provide a hook which couples into the longitudinal screw slot located on the stretcher rail nearest the ten-

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sion rod channel. As seen in FIG. 22, the upper track hooks into the lower screw slot 169b; whereas the lower track hooks into the upper screw slot 170b of the lower stretcher rail 170.

The grooves in the bottom track 169 is FIGS. 22 and 23 are provided with a strip of half-round plastic designated 183 on which the glass panels rest and slide to present grating. Further, the strips 183 partially fill the grooves 172 which are somewhat deeper than are needed for the bottom position. The extra depth is used, however, when the tracks are placed in the upper position so that the panels may be removed by lifting upwardly and swinging the bottom out of the lower grooves.

When the track extrusion 168 is used in the upper position, it is inverted; however, since the upper stretcher rail 169 is also inverted relative to the position of the lower stretcher rail 170, the connection of the upper track extrusion to its associated stretcher rail is identical except that it is held in place with sheet metal screws 185. Typically, three such screws will be applied to a 40 in. length of extrusion.

As best seen in FIG. 23, the end panel E extends beyond the extrusion rails 169, 170; and the outermost front face of each of the extrusions 168, designated 187, are flush with the front edge of the panel E. Similarly, the separator panels (not shown in FIG. 23) will have their front edges flush with the faces 187 of the track extrusions 186.

Having thus described in detail a preferred embodiment of the present invention, persons skilled in the art will be able to modify certain of the structure which has been illustrated and to substitute equivalent elements for those disclosed while continuing to practice the principle of the invention; and it is, therefore, intended that all such modifications and substitutions be covered as they are embraced within the spirit and scope of the appended claims.

I claim:

1. A cabinet unit having a plurality of compartments comprising: a plurality of tension rod/frame assemblies, one such assembly located in each corner of said unit and extending transversely across the width thereof, each assembly including a metal stretcher channel forming a conduit extending the width of each com-

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partment, all of said conduits for each assembly being horizontally aligned, each assembly further including a continuous metal rod received in said aligned conduits, each of said stretcher channels comprising an elongated metal member having a plurality of interconnected thin metal walls including a first horizontal wall, a second horizontal wall spaced beneath said first horizontal wall, and first and second vertical wall means integral with said first and second horizontal walls to define said conduit receiving an associated tension rod; each conduit being larger in area than the cross section of a rod received therein and each stretcher including spacer means within said conduit for holding said stretcher channel against lateral movement relative to a rod on which it is assembled; a separator panel separating each adjacent pair of compartments and interposed between all four pairs of adjacent channels; a pair of exterior side panels, each of said separator and exterior panels defining corner holes aligned with the conduit of an associated tension rod/frame assembly; end fastener means holding the ends of each continuous rod in tension against the outboard ends of said aligned stretcher channels, said stretcher channels being dimensioned to extend beyond said associated corner holes of said separator panels and providing end portions biting into the separator panels engaged thereby and holding an associated separator panel in vertical alignment while resisting twisting of said channels; a door assembly including upper and lower hinge means secured respectively to the stretcher channels associated with said upper and lower front tension rod/frame assemblies; a door hingedly connected to said hinge means; and a bottom panel for each compartment carried by the lower rear and front tension rod/frame assemblies.

2. The structure of claim 1 further comprising second fastener means securing said end panels to said tension rod/frame assemblies outboard of said first-named fastener means.

3. The structure of claim 1 further comprising wall fastener means for securing said cabinet unit to a wall by securing to the upper rear tension rod/frame assembly.

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