United States Patent [19]

Begitschke et al.

[11] **3,901,571**

[45] **Aug. 26, 1975**

[54] **INSTRUMENT CABINET**

[75] Inventors: **Donald W. Begitschke,** River Grove; **Warren J. Olsen,** Schaumburg, both of Ill.

[73] Assignee: **Amco Engineering Company,** Chicago, Ill.

[22] Filed: **Feb. 1, 1974**

[21] Appl. No.: **438,576**

[52] **U.S. Cl.** ..... **312/257 R;** 312/263; 312/351

[51] **Int. Cl.**[2] **A47B 77/00;** A47B 47/00

[58] **Field of Search** ..... 312/198, 204, 205, 223, 312/253, 257 R, 257 SK, 263, 351

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Primary Examiner—Casmir A. Nunberg

Attorney, Agent, or Firm—Dominik, Knechtel, Godula & Demeur

[57] **ABSTRACT**

An instrument cabinet is disclosed which has four main channels at its four corners which define vertical columns at the two front edges and two rear edges of the cabinet. Each of the main channels has a generally triangular gusset at each of its ends. Struts are provided for joining the side pairs of main channels, the struts having an L-shaped cross section with undercut T-slots which are utilized for securing the struts to the gussets of the main channels. Cross ties are provided in the front and the rear to define a bezel at each of the front and rear of the cabinet, each of the cross ties also having at least one T-slot for engaging the main channel. In addition, certain of the struts and cross ties are provided with slots and a fulcrum to impart a rattle-free construction to the panels. The interior elements as well as the main channel, strut, and cross ties are all secured within the cabinet by means of slideable fasteners which fit within the T-slots which permits virtually infinite length and width variations of the cabinet as well as interior members.

34 Claims, 22 Drawing Figures

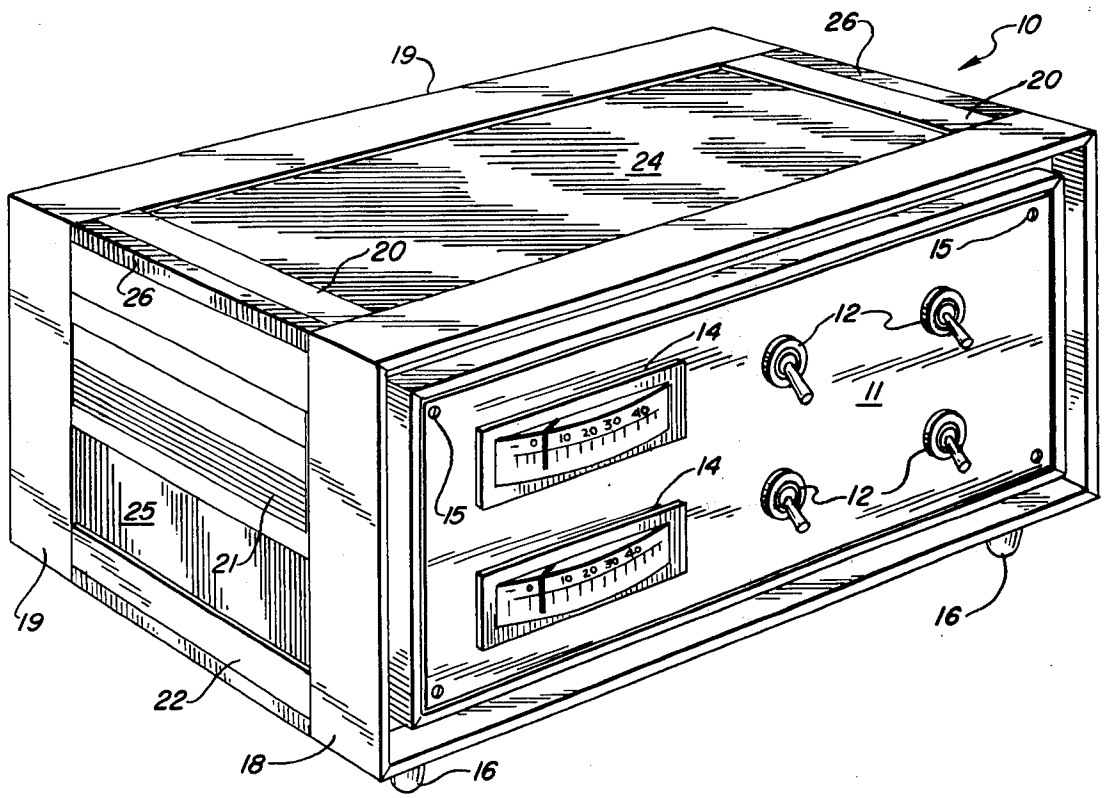
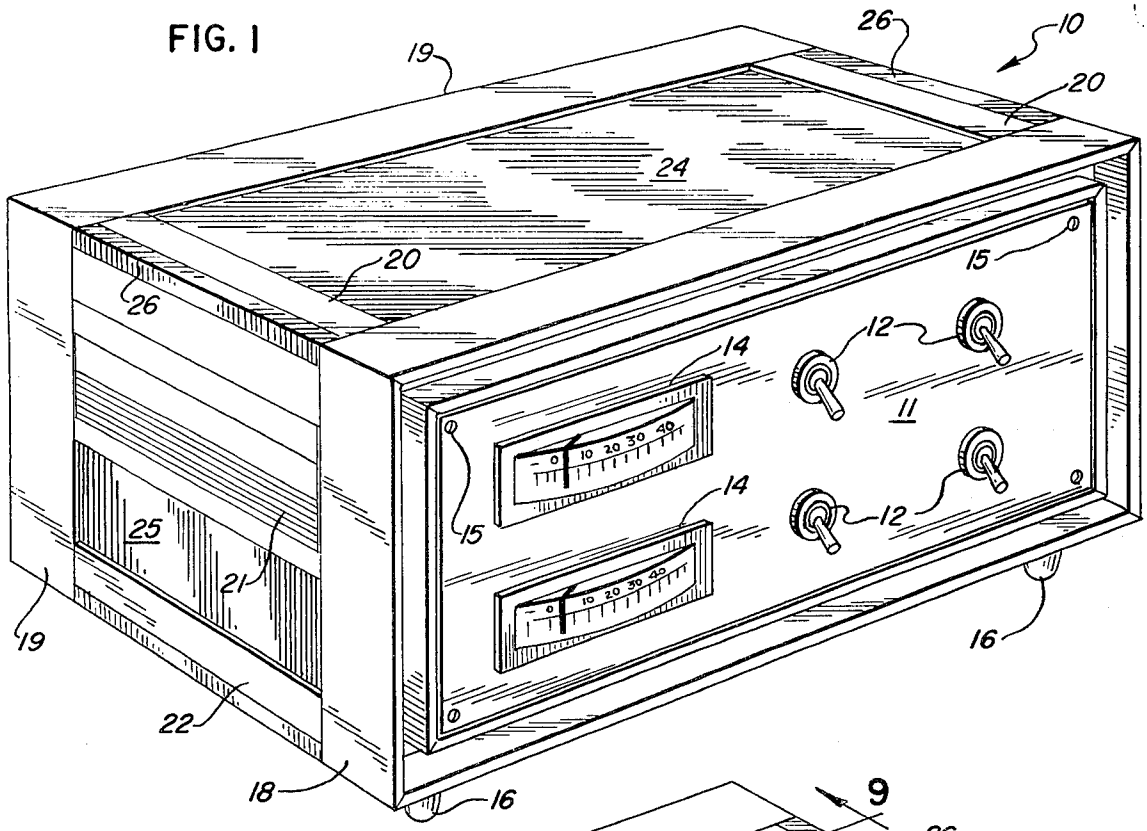


FIG. 1


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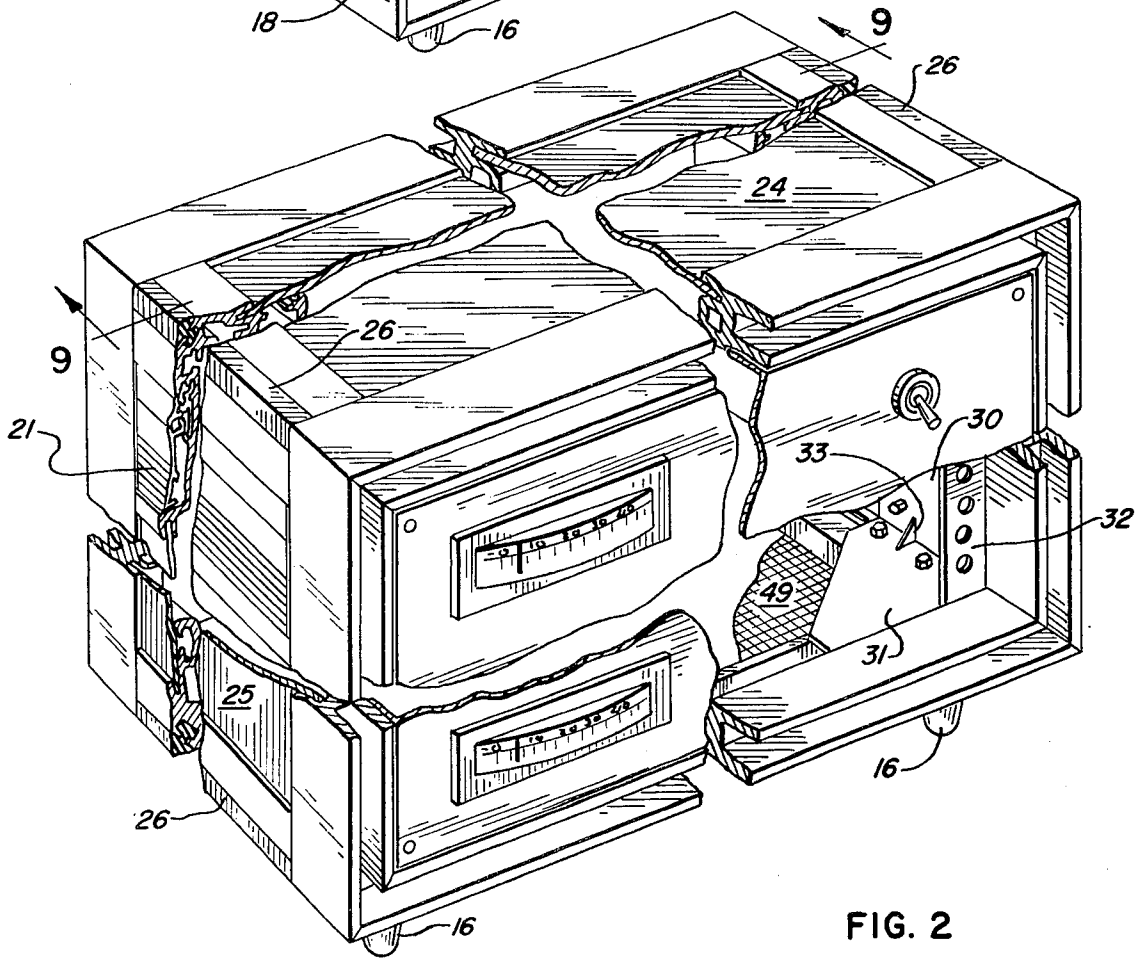

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FIG. 2

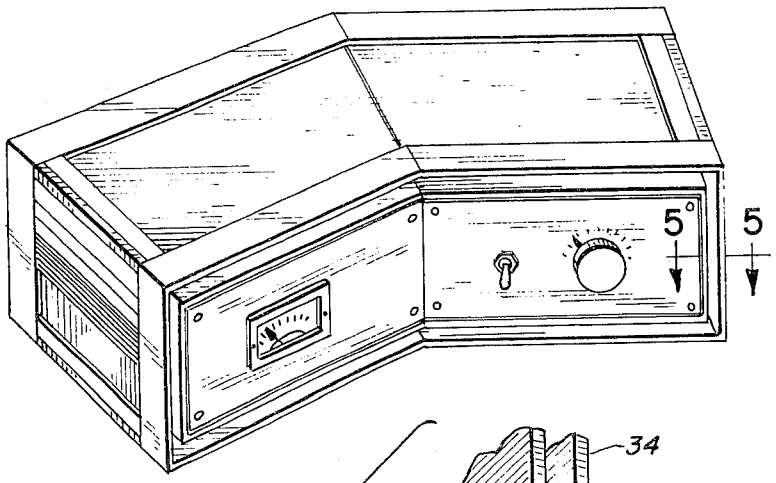


FIG. 3

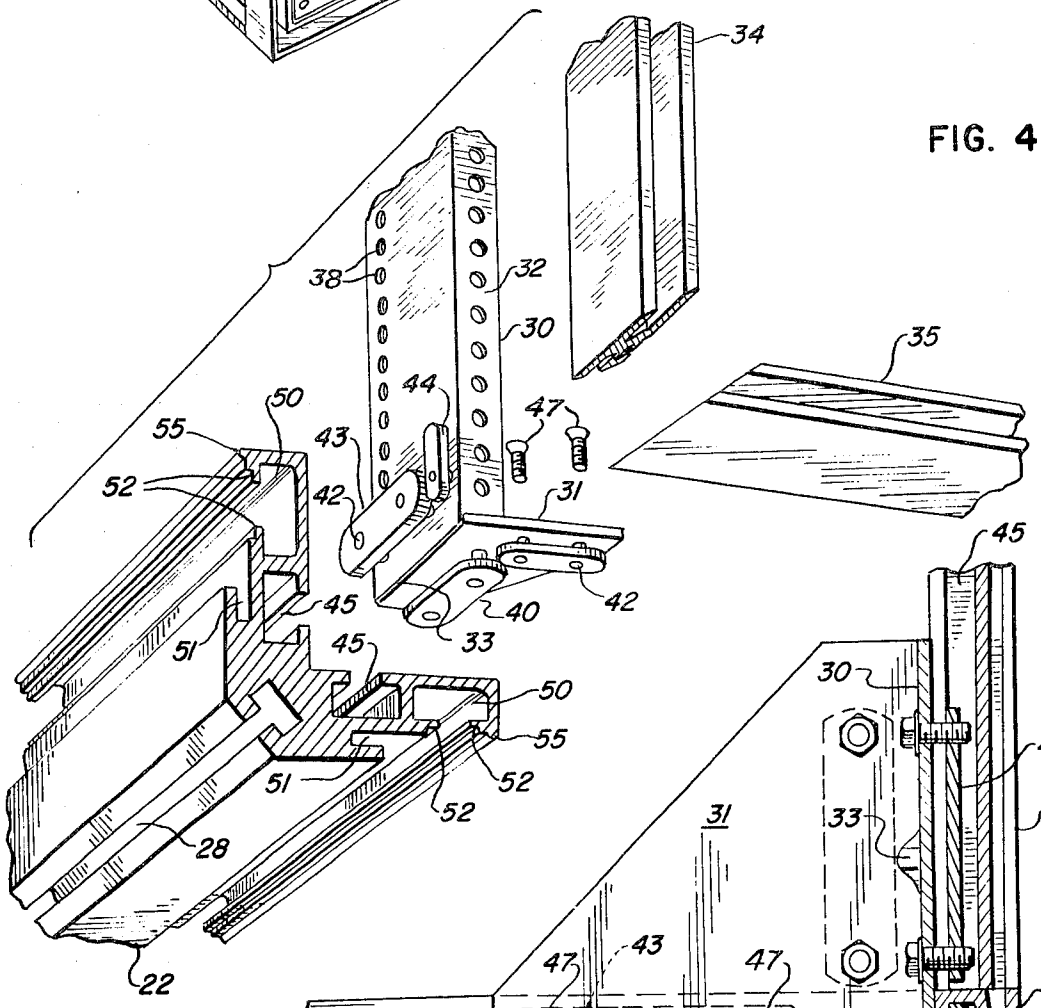


FIG. 4

FIG. 5

FIG. 6

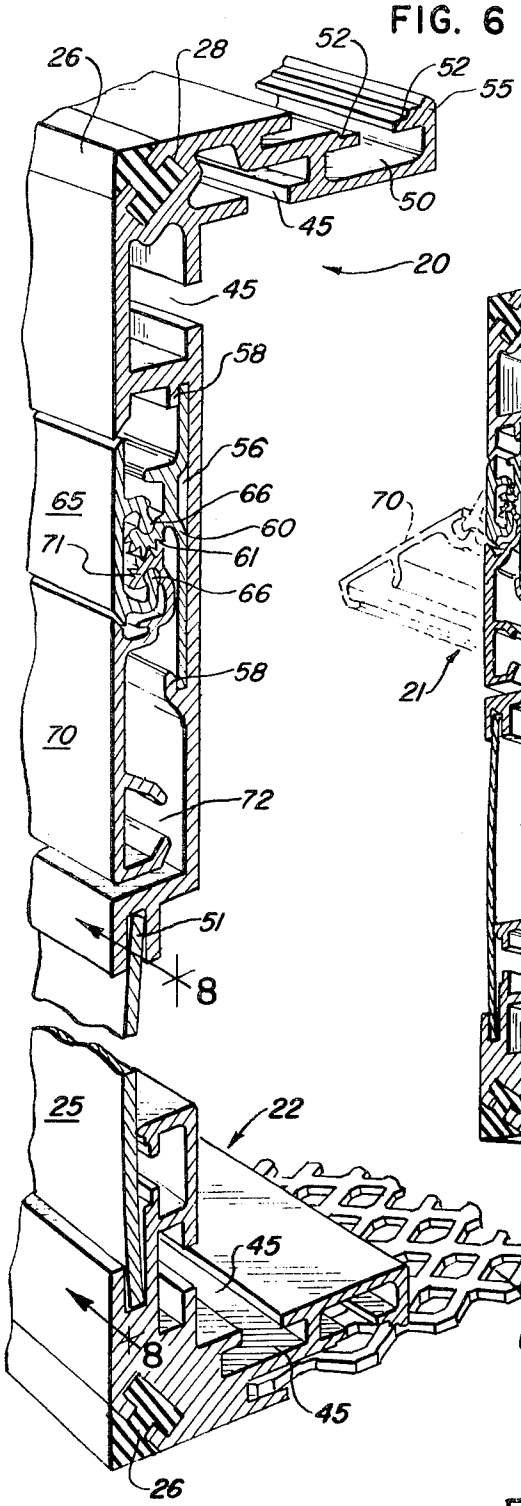


FIG. 7

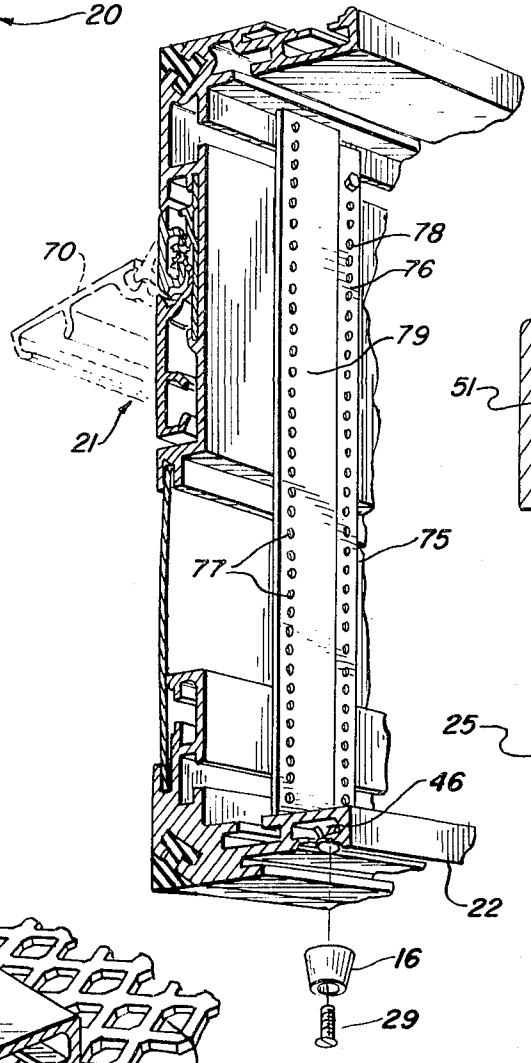


FIG. 8

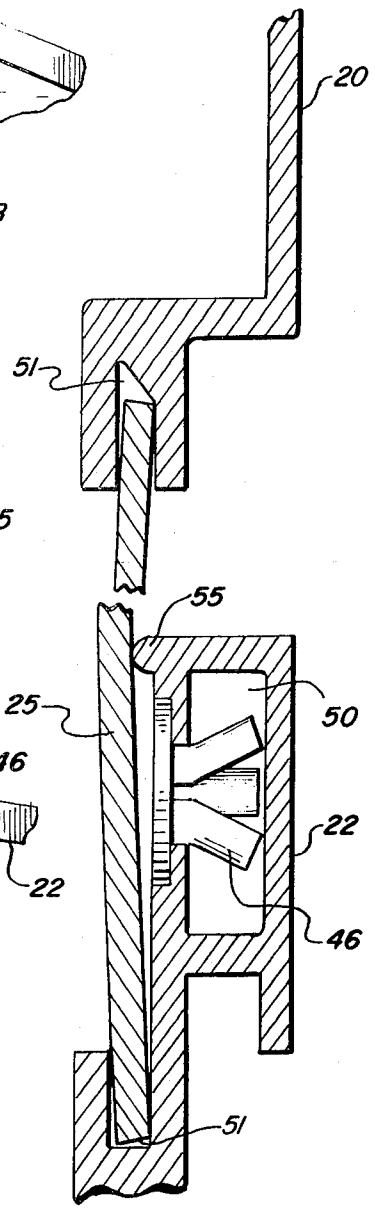


FIG. 9

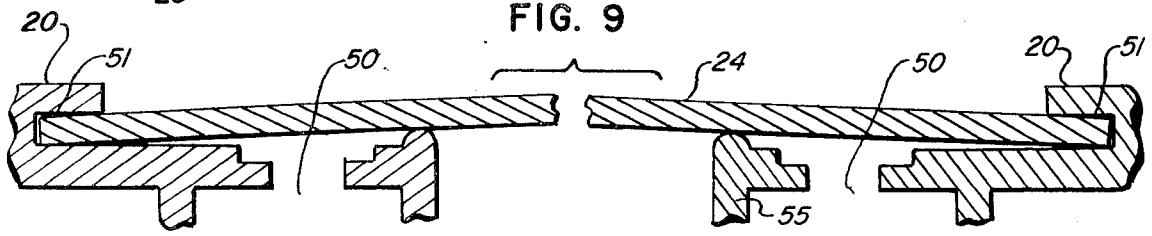
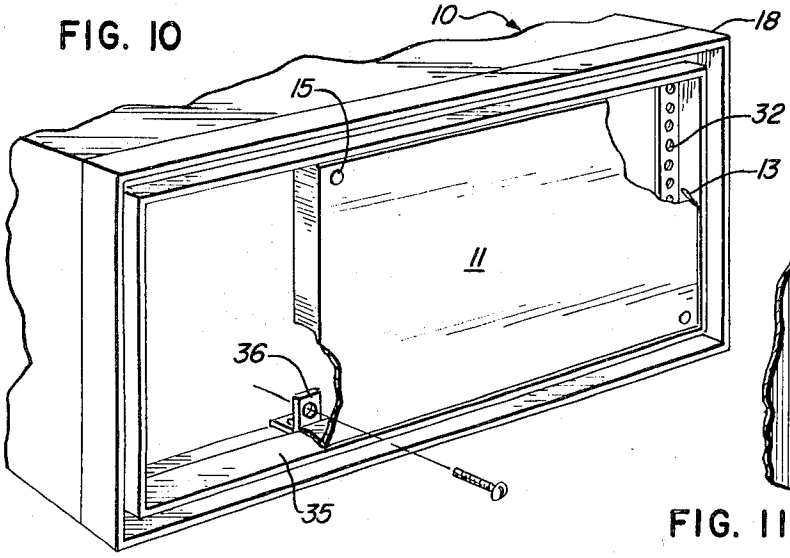


FIG. 10



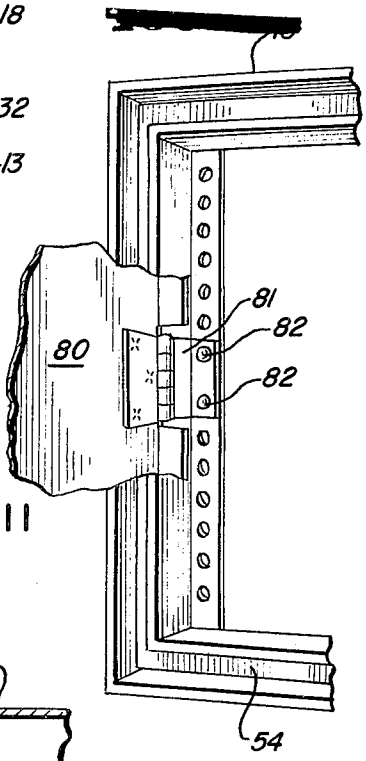


FIG. 11

FIG. 14

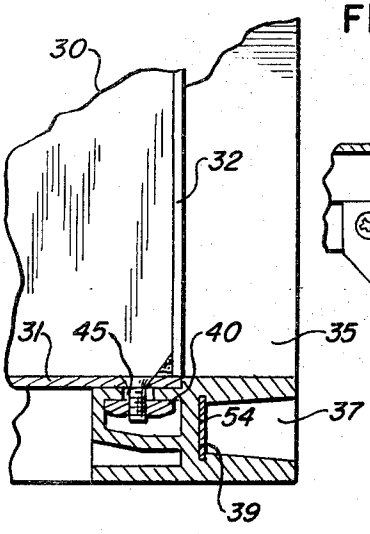


FIG. 13

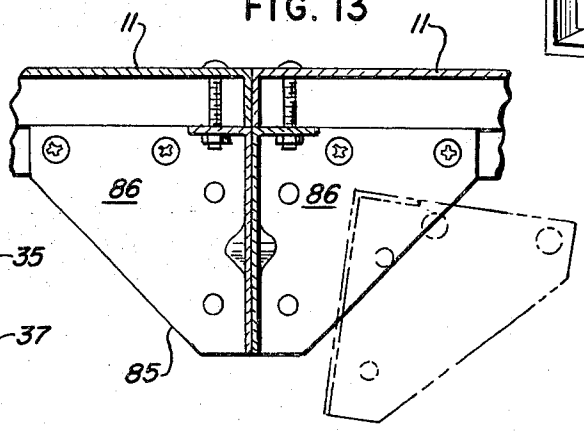
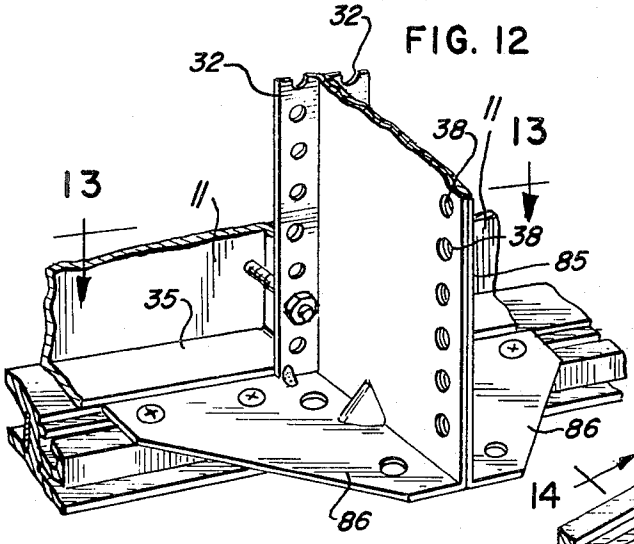


FIG. 12



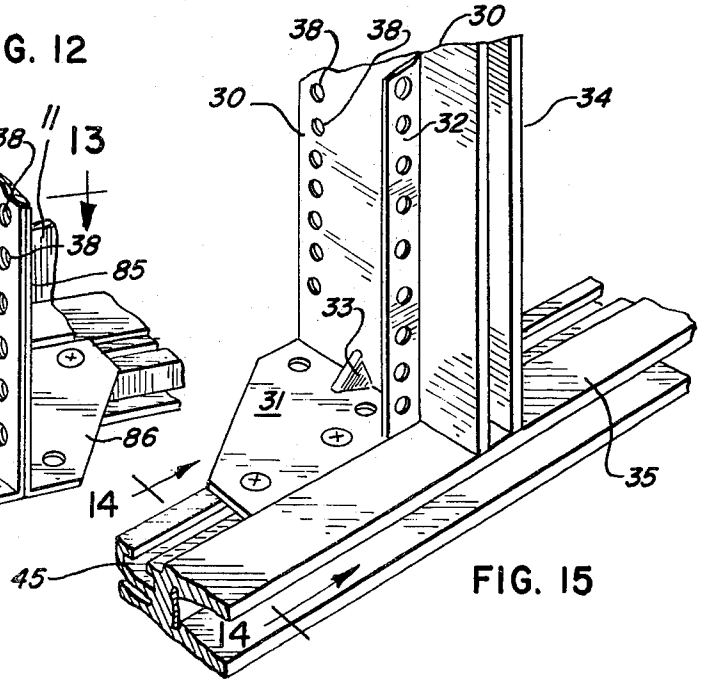


FIG. 15

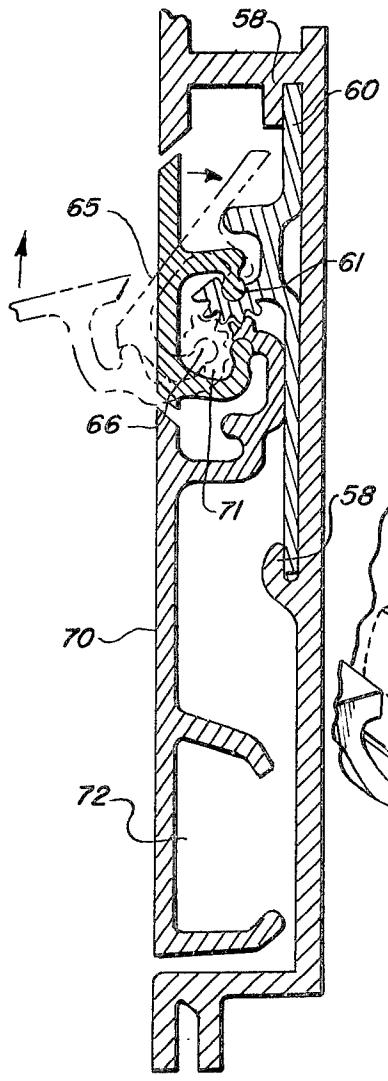


FIG. 16

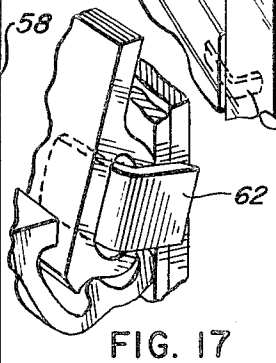


FIG. 17

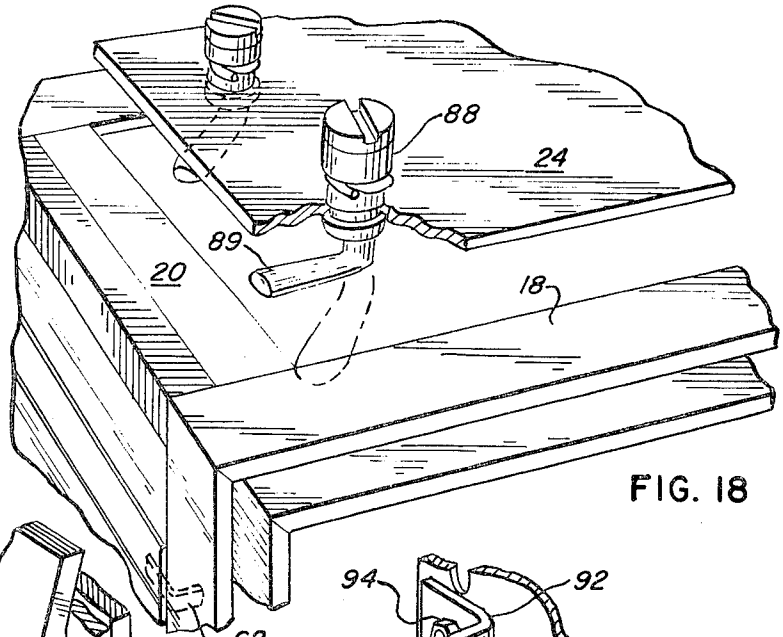


FIG. 18

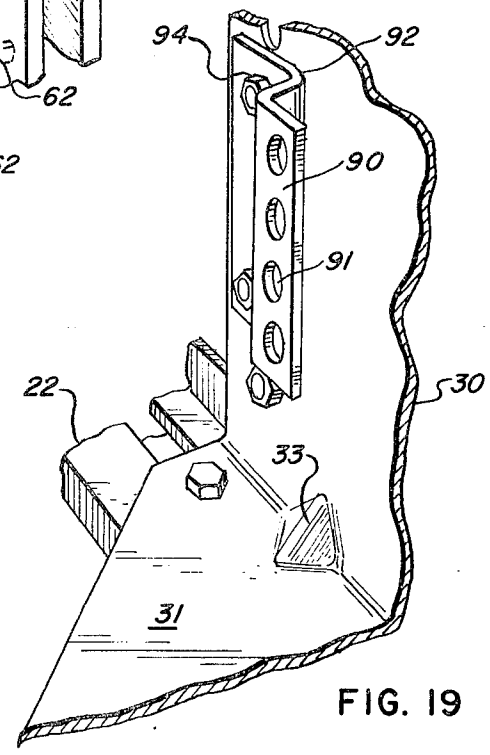


FIG. 19

FIG. 20

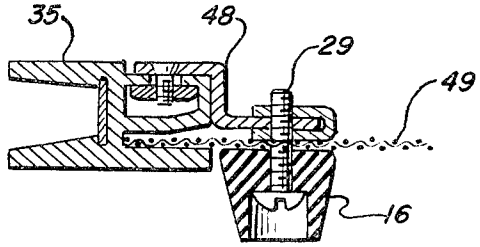


FIG. 21

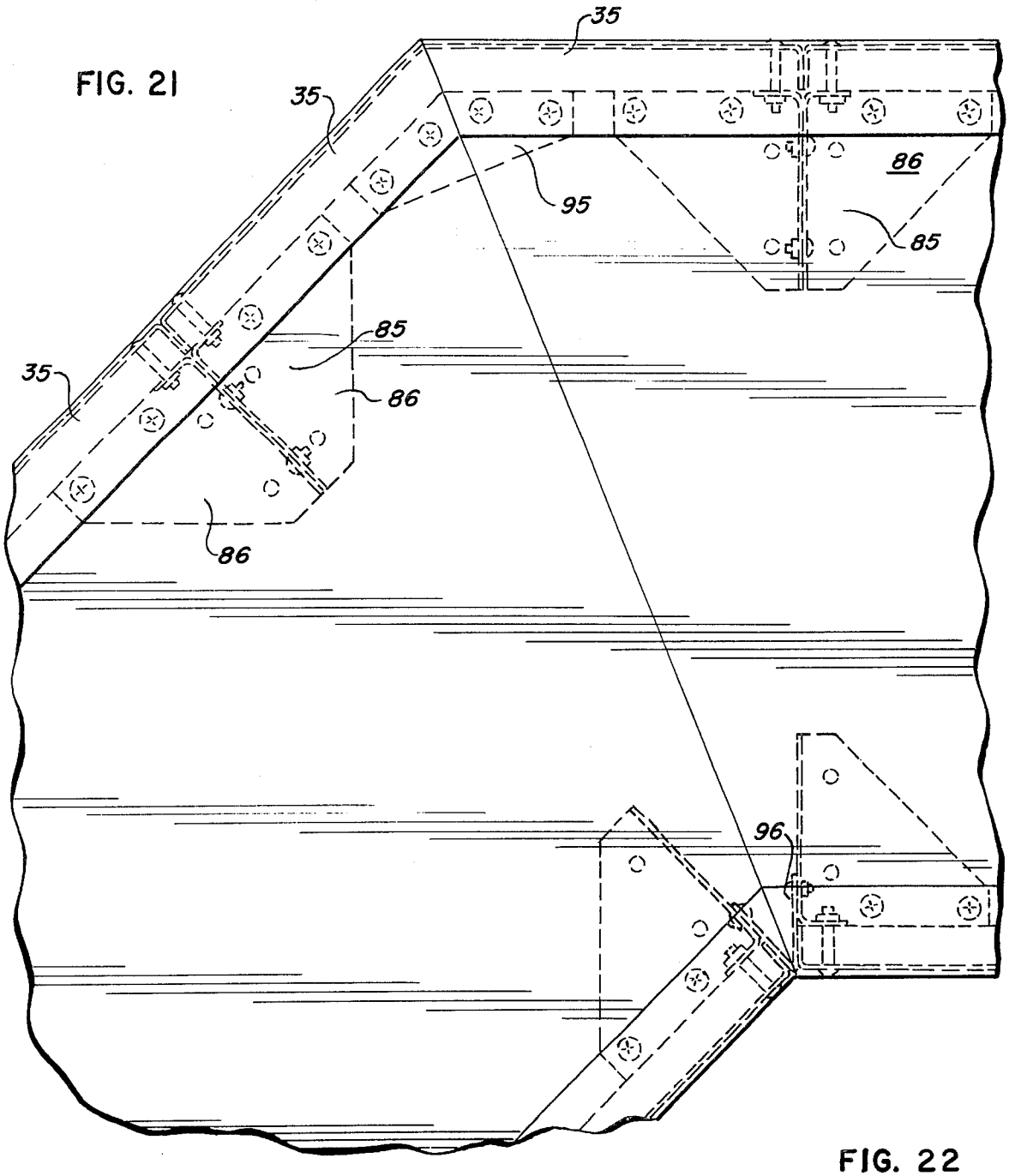
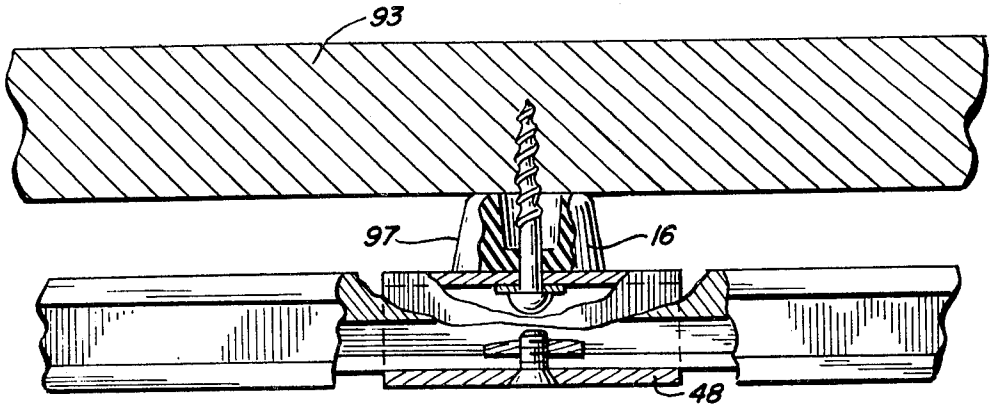


FIG. 22



INSTRUMENT CABINET

BACKGROUND

1. Field of Invention

The present invention relates to modular instrument cabinets, which may be assembled for housing various instruments or groups of instruments. The subject matter is generally found in Patent Office Class 312, sub-class 257, although sub-class 263 and others contain related art.

2. The Prior Art

The prior art is exemplified by issued United States patents owned by applicant's assignee. Exemplary of such an instrument cabinet is U.S. Pat. No. 3,012,835. Exemplary of larger cabinets utilized for major installations are U.S. Pat. Nos. 2,991,140 and 3,034,844. Exemplary modular-type constructions which can be adapted to a wide variety of sizes are U.S. Pat. Nos. 3,087,768 and 3,272,582.

Most of the cabinets such as the instrument cabinet shown in U.S. Pat. No. 3,012,835 require extensive tooling, and shaping and forming of the interior parts as well as jigging for welding. While the cabinets all possess excellent construction features, and utility in the field, they are dictated in size by a standardized **19** inch modular opening, a standard in the electronics industry. Where instrument cabinets are employed, the discipline regarding the **19** inch panel opening is honored in the breech, and wide varieties of sizes and configurations may be required. In addition, with instrument cabinets which are intended for use as a console, it is often desirable to mount several together with pie-shaped corners to define a semi-circular presentation to a controller.

Where such variations in height, width, and depth are required it becomes quite expensive to tool for a whole host of sizes, and yet a good market exists for a sturdy cabinet which is readily adaptable to an almost infinite variation in interior sizes, and with means for accommodating a wide variety of interior fastening elements and support.

SUMMARY

The invention is directed to a construction of a modular instrument cabinet which is essentially self-jigging for purposes of construction, and can be assembled to an almost infinite variety of heights, widths, depths, and interior support elements. The construction is built around four main channels which define vertical columns at the two front edges and the two rear edges of the cabinet. Each of the main channels terminates in a gusset at each end, and the main channels are joined from front to rear by struts, each of the struts being characterized by an angle-type configuration with two legs of mutually perpendicular construction. Inverted T-slots having an undercut portion are provided, at least one in each leg of the struts, and means for mounting the gussets to the main channel include slideable members which slide within the T-slots and thereafter may be secured to the main channel. Cross ties are provided to define a front and rear bezel for the cabinet, and each of the cross ties has at least one T-slot with an undercut for engaging the main channel adjacent gussets. Optionally, slots may be provided in certain ones of the struts and cross ties having a fulcrum at the outer edge which provide for a bending engagement at the edges of panels which form the closure in a substantially rattle-free nesting configuration. Furthermore, the cross tie members may have deep channels with an undercut bottom permitting the insertion of decorative strips. The main channels are ideally formed from a single piece of material with the gusset bent at the end at substantially right angles of the main channel.

As indicated in the Summary above, it is one of the principal objects of the present invention to provide an infinitely variable dimensioned self-jigging instrument cabinet construction. In achieving this objective, advantages such as the provision of standard catalog sizes; length, width, and diameter variations from the standard sizes; and the capability of including special pie-shaped corners are enjoyed by a construction built in accordance with the present invention.

In addition, a further object of the present invention is to permit subject instrument cabinet to be made with the standard **19** inch front opening module, although variations can be accommodated. Furthermore, a pre-stressing of the panel sheet material is another objective to thereby provide a substantially rattle-proof mounting of the panel closure.

A further object of the present invention is to provide a bumper rail on all four edges of the side member running substantially the entire length of the cabinet which cushions the same against handling.

Still another object of the present invention is to provide a handle construction running along the side of the instrument cabinet which, because of its length, permits a person lifting the same to concentrate the lifting element at the substantial center of balance thereby rendering handling of the cabinet easier.

Still another more detailed object of the present invention is to provide an instrument cabinet construction with the features set forth above which is susceptible of fabrication with extrusions and formed sheet members, thereby avoiding breakable castings, as well as the tooling cost for such castings. With such a construction, the further objective of being able to assemble the cabinet without drilling, and only cutting various elements to length, is achieved which includes significant economies in both assembly time as well as tooling.

DESCRIPTION OF DRAWINGS

Further objects and advantages of the present invention will become apparent as the following description of an illustrative embodiment proceeds, taken in conjunction with the accompanying drawings in which:

FIG. **1** is a front perspective view of a typical instrument cabinet illustrative of the present invention, and illustrative of the front presentation in the front panel thereof.

FIG. **2** is a partially broken, partially exploded, view of the same cabinet as shown in FIG. **1**, illustrating the crosssectional configuration of the various structural elements and their interrelationship.

FIG. **3** is a perspective view of a pair of illustrative instrument cabinets fitted together with a pie-shaped type intersection.

FIG. **4** is an enlarged partially sectioned, exploded view of the interrelationship between the main channel and a lower strut.

FIG. **5** is an enlarged transverse sectional view through one of the main channels at a corner of the cabinet looking downwardly generally as shown in section line **5—5** of FIG. **3**.

FIG. 6 is an enlarged perspective transverse sectional view taken generally along the broken section taken at the left hand portion of FIG. 2 from substantially the same vantage point but enlarged for purposes of illustrating detail.

FIG. 7 is a transverse sectional view taken from substantially the same portion of the cabinet as FIG. 6, but reversed to show the interior portion of the cabinet, and illustrating in particular, in phantom lines, the raised configuration of the handle and also showing the accessory mounting flange.

FIG. 8 is an enlarged, partially broken view illustrating the rattle-free mounting of the side panel taken generally along section lines 8—8 of FIG. 6.

FIG. 9 is a further enlarged transverse sectional view, partially broken, showing the rattle-free mounting of the top panel, and taken generally along section line 9—9 of FIG. 2.

FIG. 10 is a partially broken front view of the cabinet illustrating how the front panel is mounted to the instrument cabinet.

FIG. 11 is an enlarged partially broken perspective view taken toward the left-hand side of the cabinet shown in FIG. 10 illustrating how a door may be hinged to the mounting flange of the main channel.

FIG. 12 is an enlarged broken perspective view taken from an interior portion of the instrument cabinet showing a back-to-back panel separator mounting.

FIG. 13 is a transverse sectional partially diagrammatic view looking downwardly at the back-to-back mounted panel separators of FIG. 12 and taken along section line 13—13 of FIG. 12.

FIG. 14 is an enlarged transverse sectional view of the cross tie taken along section line 14—14 of FIG. 15.

FIG. 15 is a broken perspective view of the back-to-back main channels taken from the front portion of FIG. 12 and also showing the vertical member in place.

FIG. 16 is an enlarged transverse section taken generally along the upper portion of the handle member as shown in FIG. 6.

FIG. 17 is a broken perspective of the end of the handle illustrating how the same is secured in place by means of a spacer.

FIG. 18 is an exploded partially diagrammatic view of the upper portion of the cabinet illustrating how a top panel may be removably secured in place.

FIG. 19 is an enlarged broken perspective view of the main channel illustrating particularly an accessory mounting bracket and how the same is secured to the main channel.

FIG. 20 is an enlarged partially broken transverse sectional view of the cross tie illustrating how a resilient foot may be mounted to the cross tie.

FIG. 21 is an enlarged view showing in phantom lines the construction of the intersection of two cabinets when a pie-shaped intersection such as that illustrated in FIG. 3 is involved.

FIG. 22 is an enlarged partially sectioned broken view of a cross tie illustrating how substantially the same mounting as employed with the resilient foot can be employed to secure the instrument cabinet to a horizontal surface such as a ceiling, crossbeam, or the like.

DESCRIPTION OF THE PREFERRED EMBODIMENT

An illustrative cabinet **10**, is shown in FIG. 1 of the drawings, where it will be seen that a front panel **11** includes typical switches **12**, and indicators **14**. The nature of the instrument cabinet **10**, or other competitive prior art type devices, is to house various electronic elements for purposes of control and/or monitoring and thus the invention is independent of the type and organization of switches **12** or indicators **14** such as shown on the front panel **11**. Indeed, the invention is directed to a modular form of cabinet **10** which accommodate a wide variety of switches, indicators, and other control elements without a requirement that the designer develop his instrumentation to a specific rigid dimensional formula for the size of the cabinet.

Further as noted in FIG. 1, the front panel **11** is mounted to the cabinet **10** by means of mounting bolts **15**. To secure the cabinet **10** from shock, four resilient feet **16** may be optionally secured to the underside of the cabinet **10**.

In basic outline, the panel **11** of the front portion of the instrument cabinet **10** is surrounded by and defined by a front bezel **18**, and at the rear by a rear bezel **19**. The front and rear bezel **18, 19** are joined by means of opposed upper struts **20**, and lower struts **22**. Shown in this configuration is a retractable handle **21** which may be raised, as shown in FIGS. 7 and 16 for purposes of carrying the instrument cabinet **10** at its natural balance point.

The cabinet, and more particularly its exterior structural elements, are enclosed not only by the front panel **11**, but by a top panel **24**, and side panels **25**. To assist additionally in connection with carrying, and cushioning from shock, it will be observed that strut trim **26** is provided in all four of the struts at the outer edge to absorb shock and bumping when the instrument cabinet is transported from place to place. In addition to the elements just described as enclosing the cabinet **10**, it will observed in FIG. 2 that a bottom grid of either a perforated or a expanded metal-type material may enclose the lower portion to protect against damage, and to provide for supplemental ventilation of the electronic components housed within the instrument cabinet **10**.

The configuration particularly of the lower strut **22** and its relationship to the main channel **30** is shown in FIG. 4. There it will be seen that the lower strut **22** has a pair of legs intersecting substantially perpendicularly and, at the outer vertex, provision is made for a trim T-slot **28** in which the trim **26** is inserted. T-slots **45** are provided in the interior portion of each of the legs of the lower strut **22**, and positioned in substantially flanking relationship to the intersection of the two legs. To be further noted in FIG. 4 is the general configuration of the main channel **30** which has a substantially triangularly shaped gusset **31** at each end, the lower end only being shown in FIG. 4. A mounting flange **32** intersects at substantially a **90** degree angle with the body portion of the main channel **30**, and a modified wedge form **33** is provided at the intersection between the gusset **31** and the main channel **30** for purposes of increasing the strength at the intersection. The front bezel **18** is defined by a vertical member **34** and a cross tie **35** also as shown in their exploded and corner mitered relationship each to the other and each to the lower strut **22**. As seen in FIG. 5, the vertical member **34** is provided with a decor slot **37** having an undercut at its base for the removable snap-in mounting of a decor retainer strip **39**. A similar decor slot **37** is provided in the cross tie members **35** to the end that the front of the

front bezel 18 may be provided selectively with varying colors in the decor slot.

The means whereby the main channel 30 is secured to the upper strut 20 and lower strut 22 is illustrated in exemplary fashion in FIG. 4 with regard to the lower strut 22. Clamps 40 generally in the form of a plate 41 with a pair of threaded holes 42 are provided of such a configuration so that they will slidingly fit in the T-slots 45. An exemplary double clamp 43 is shown with two threaded holes 42, and also a single clamp 44 with a single threaded hole 42. The clamps 40 then secure the relevant members together by means of screws, usually flat-headed 47 which pass through pre-selected holes in the end gussets 31 or the body portion of the main channel 30 as illustrated, and upon tightening screws 47, the clamp plates 41 engage the inner portion of the T-slots 45 and slideably but thereafter securedly hold the parts together. At this point it will be appreciated that irrespective of the length of the lower strut 22, the channel 30 as illustrated may be fitted alongs its length. This advantage flows from the use of the particular configuration of the main channel 30, its associated gusset 31, and the arrangement of the T-slots 45 in the lower gusset 22. The relationship between the upper strut 20 and its respective main channel 30 is a substantial mirror image of that shown in FIG. 4 and described above.

The attachment of the gusset 31 to the cross tie 35 is best illustrated in FIG. 5 where it will be seen that a double clamp 43 (shown in phantom lines) is provided in the T-slot 45 of the cross tie 35, and the gusset 31 is secured in position by means of tightening screw 47. On the side portion, however, the back of the vertical channel 30 is secured by means of the double clamp 43, again, in the T-slot 45 defined in the vertical leg of the lower strut 22. In the instance of the double clamp 43 as shown, bolts are employed rather than screws to secure the clamp 40 in position. Also to be noted is the vertical member 34, and how it is secured by means of a single clamp 44 through the main channel 30 by means of a mounting bolt as just described, interiorly of the vertical member T-slot 45. The lower leg of the lower strut 22 is provided with a panel T-slot 50 which may be employed to clampingly engage the bottom grid 49. The perforated grid 49 is secured at its ends in the captivating slot 51 provided in the lower strut cross sectional configuration as described. In addition, a retainer notch 52 for use of a fastener also is provided, the notches 52 flanking the opening to the panel T-slot 50. Also to be observed is the stressing fulcrum 55 which will be described in greater detail in connection with FIGS. 8 and 9. To also be noted in FIG. 4, is the substantial mirror image of the T-slot 50 at the extremity of both legs, and also the captivating slots 51 and related structural elements, thus rendering the lower strut 22 useful in connection with either a flat imperforate panel member such as side panel 25, or the bottom grid 49 as described.

The lower strut 22 has just been described principally in connection with FIG. 4 of the drawings. For a further understanding of the end of the cabinet, reference will now be made to FIG. 6 which includes the lower strut 22 along with the upper strut and the handle 21 which, with the side panel 25, completes the end construction of the cabinet 10. At the upper portion of FIG. 6 it will be observed that the upper strut 20 includes T-slots 45 in much the same manner as the lower strut 22. The upper strut 20 is also provided with a trim T-slot 28 for the upper strut trim 26. Below the lower T-slot 45, provision is made for a hinge mount track 56 which slidably engages, by means of the undercut rails 58, a hinge mounting leaf 60. The hinge mounting leaf 60 includes a gear segment 61, which coacts with offset beads 66 of the gear hinge clamp 65. A leaf grip 70 having gear segment 71 and a spacer grip element 72 coacts with the gear segment 61 of the hinge mounting leaf 60. In operation, as shown particularly in FIG. 7, the leaf grip 70 of the handle 21 is elevated, and the fingers may grasp the spacer grip 72, so that in effect the handle 21 runs the entire depth of the cabinet 10, and thus the person lifting can hold it at a point where a natural balance prevails. The handle 21 is therefore an integral part of the cabinet by means of being a portion of the upper strut 20. It will be further appreciated where the handle 21 is not desired, the upper strut 20 can be a substantial identical member with the lower strut 22. Also to be observed is the captivating slot 51 at the lower extremity of the upper strut 20 for engaging the side panel 25 as described.

The engagement of the side panel 25 with the upper strut 20 and lower strut 22 is best illustrated diagrammatically in FIG. 8. There it will be seen that the upper captivating slot 51 at the lower extremity of the upper strut 20 engages one edge of the side panel 25. The lower edge of the side panel 25 is engaged by the captivating slot 51 of the lower strut 22. To be noted is the configuration of the stressing fulcrum 55 which prestresses and deforms slightly the lower portion of the side panel 25 as the same is cocked about the stressing fulcrum 55 and its related edge nesting in the captivating slot 51. Similarly, the top panel 24 is secured in place by the opposed upper struts 20 as illustrated in FIG. 9. There it will be seen that the opposed captivating slot 51 both are preceded by stressing fulcrums 55 which bend at both edges of the top panel 24. To be further noted in FIG. 7 is the means whereby the resilient foot 16 is secured to the lower strut 22 by means of a foot bolt 29 which may be secured in the panel T-slot 50 of the lower strut 22. Also to be noted in FIG. 7 is the provision of an accessory mounting angle 75 which has a strut mounting flange 76, a plurality of holes in the offset strut mounting flange 78, and an accessory mounting flange 79 with a plurality of mounting holes 77. The mounting holes 77 on modular spacing up and down the entire accessory mounting flange 79 permit interior elements to be secured at numerous locations, and because the accessory mounting flange 79 is offset from the adjacent upper strut and lower strut by the strut mounting flange 76, ready access to secure the members by means of conventional threaded engaging elements may be had.

The mounting of the front panel 11 is shown in FIG. 10 where it will be seen that the panel 11 has panel flanges 13 which may be reversely bent, and provided with holes for matching up with the holes in the mounting flange 32 interiorly of the front bezel 18 of the cabinet 10. Alternatively, it will be seen that the flange 13 at the left-hand portion of the front panel 11 butts directly against a panel mount angle 36 which is secured to the T-slot 45 in the lower cross tie 35. As shown in FIG. 11 is a further modification of a mounting of the front panel 11, where it will be seen that a panel door 80 may be secured by means of a panel door hinge 81,

and its associated hinge bolts **82** to the mounting flange **32** interiorly of the front bezel **18.**

Beginning with FIG. **12,** there is shown a means whereby a pair of main channels **30** may be secured together in back-to-back relationship, with opposed gussets **86** rather than single gussets **31** as normally experienced with a single vertical channel **30.** This panel separation channel **85** thus defined by two vertical columns **30** positioned back to back can be utilized where a relatively long instrument cabinet **10** is desired, and interior mid-support is desirable which will present a pair of mounting flanges **32** at the forward portion. FIG. **15** further illustrates how, with a single main channel **30,** the gusset **31** is secured at its lower portion to the T-slot **45** of the lower cross tie **35.** Also shown is the utilization of a vertical member **34** with the lower cross tie **35,** should an extension of the cabinet be desired in a pie-shaped configuration such as shown in FIG. **21.** In this instance, the lower cross tie **35** as well as the upper cross tie may be extended, to a false corner. Nonetheless, still existent at the edge of the front panel **11** (not shown in FIG. **15**) are the existing mounting flange **32** with its associated mounting holes, and the accessory mounting holes **38** of the main channel **30** to complete further mounting of members desired. For example, in FIG. **13** it will be seen that a pair of panels **11** are secured in edge abutting relationship at the forward portion of the panel separating channel **85** which is defined by the configuration of a pair of main channels **30** in back-to-back relationship.

While the handle **21** has been described in detail in connection with FIGS. **6** and **7,** it will be observed that the leaf grip **70** and its associated gear segments **71** are shown in enlarged detail on FIG. **16.** The captivating relationship between the undercut rails **58** and the hinge mounting leaf **60** are clearly shown. To be noted is the relative position of the gear hinge clamp **65** when the leaf grip **70** is fully lifted, thereby terminating the extent to which the leaf grip **70** may be lifted. FIG. **17** illustrates the spacer **62** which may be inserted into the interior portion of the gear hinge clamp **65,** and in FIG. **18,** the relationship between the spacer **62** and the front bezel **18** is shown.

Further shown in FIG. **18** is a means whereby the top panel **24** may be made removeably secured to the cabinet by means of a top panel clamp **88** having a locking dog **89** at its lower portion. The locking dogs **89** engage the underneath portion of the interior leg of the upper strut **20.**

Shown in FIG. **19** is an additional bracket **90** which is a modified z shape in cross section including a plurality of accessory holes **71** and a channel flange **92** which will receive various channel bolts **94** to secure the same to the vertical portion of the main channel **30.** The accessory mounting bracket **90** as shown in FIG. **18** is ancillary to the function of the accessory mounting angle **75** shown in FIG. **7.**

Further to be noted particularly in FIG. **20** is the means whereby the resilient foot **16** is mounted to the bottom grid **49** and adjacent to the mounting foot **48** of the cross tie **35.** The foot mount **48** that reversely bends and is secured at one end by a mounting bolt to the cross tie **35,** and at the other end by a C-clamp threadedly engaged with the foot bolt **29.** A further example of the resilient mounting foot **16,** and its inverted configuration, appears in FIG. **22** where it will be seen that the same technique for mounting can be used to secure the same to a ceiling **93** or beam member so that the instrument cabinet **10** can be mounted from the top rather than supported on the bottom. The same construction employing a substantially identical foot mount and mounting bolt **29** is utilized, but in this instance in connection with the upper cross tie **35** rather than the lower cross tie **35.**

One aspect of the invention discussed in connection with the description of the panel separation channels **85,** and their associated gussets **86** relate to the pie-shaped construction as shown in the cabinet in FIG. **3,** but more specifically in detail in FIG. **21.** There it will be seen that the cross ties **35** which might normally terminate, are extended by means of the panel separation channel **85** to a beveled corner, which can be beveled at any particular angle. At the beveled corner, the pie tie gusset **95** secures the adjacent cross tie members **35.** At the front portion of the cabinet **10,** the conventional main channels **30** are employed, with the front panels **11** in butt-to-butt relationship. Additionally, however, an apex filler **96** is employed interiorly of the backs of the adjacent main channels **30,** thereby securing the adjacent main channels **30** in their corner-to-corner abutting relationship.

While the bulk of the description insofar as the securing members are concerned has been directed to the employment of clamps **40** in the T-slots **45,** it will be appreciated that expanded anchors **46** such as shown in FIG. **7** may be employed with the resilient mounting feet **16** and other elements, including the securing of the bottom grid **49** to the lower strut **22.** The top mount **97** as shown in FIG. **22** may also use an expanding anchor **46** if the mounting is to be reversed from the configuration shown in FIG. **22.**

In review it will be seen that an instrument cabinet has been disclosed and described which relies for its rigidity as well as self-jigging assembly configuration upon, as illustrated, four main channels **30** having substantially triangular figured gussets **31** at both ends. These gussets **31** and main channel **30** are tied in by means of a plurality of clamps into undercut T-slots provided in upper struts **20** and lower struts **22** which are secured to opposed pairs of the main channels **30,** the opposed pairs being tied together by means of cross ties **35** and vertical members **34** to not only secure the unit, but to also define a front bezel **18** and rear bezel **19.** Because of the clamping relationship, the struts, cross ties, and vertical members as well as the main channels may be made to a wide variety of lengths, widths, and depths thereby, without extensive tooling modification, affording a wide variety of dimensional proportions of the instrument cabinet **10.** Indeed, the only extensive tooling required is that for the struts, vertical members, and cross ties which are preferably formed of aluminum extrusions. The main channel **30,** as noted, can be punched with modular punches defining the holes, and break forming to define the mounting flange **32** as well as the gusset **31.** The panel members, including the top panel **24** and side panels **25** can be cut to shape, and variations in size are readily accommodated by the stress forming of the same in the captivating slots **51** of the various structural members. Various accessory mounting elements can be provided for positioning interiorly of the cabinet **10** since a quantity T-slots **45** are available at sturdy mounting points interiorly of the cabinet **10.**

Although particular embodiments of the invention have been shown and described in full here, there is no intention to thereby limit the invention to the details of such embodiments. On the contrary, the invention is to cover all modifications, alternatives, embodiments, usages and equivalents of a instrument cabinet as fall within the spirit and scope of the invention, specification and the appended claims.

What is claimed is:

1. A cabinet comprising, in combination,
four main channels defining vertical columns at the two front edges and the two rear edges of the cabinet,
each of said main channels terminating in a gusset perpendicular to each end,
struts for joining from front to rear opposed pairs of channels,
each of said struts having an angle type configuration with two legs, the legs being perpendicular to each other,
T-slots having an undercut portion in each of the legs of the struts, and flanking the junction of the two legs,
clamping means for mounting the gusset portions of the main channel to each of said struts, one portion of said means slideably engageable with each of said T-slots,
and cross ties defining a front and rear bezel for said cabinet,
each of said cross ties having at least one T-slot for engaging the main channel adjacent gussets, whereby the cabinet is self-jigging for purposes of assembly by securing the struts and cross tie members to their respective main channels and its opposed end gussets.

2. In the cabinet of claim **1** above,
panels enclosing the areas between respective ones of the cross ties and struts,
slots in ones of said struts and cross ties,
one of said slots having a fulcrum at its outer edge, whereby sheets of material forming panels may be mounted interiorly of said slots, the fulcrum serving to deformingly engage and pre-stress the same into a rattle-free nesting engagement with the respective slots and struts and cross ties.

3. In the cabinet of claim **1** above,
each of said cross tie members having a deep channel in its outwardly facing portion,
each of said channels terminating in an undercut botton,
whereby decorative strips may be inserted in the base of said cross tie channels to customize the cabinet as to design.

4. In the cabinet of claim **1,**
each of said main channels having an offset mounting flange,
a plurality of holes in said mounting flange, whereby panels and other accessories may be secured to the front portion of the main channel for completing the open portion of the front bezel of the cabinet.

5. In the cabinet of claim **1,**
each of said main channels and gusset being formed of a single piece of material, with the gusset bent at substantially right angles to the main channel,
and a mounting flange at the front of the portion of each such main channel having a plurality of holes for mounting a variety of interior structures and exterior panels.

6. In the cabinet of claim **1,**
vertical members between the cross tie ends,
each of said vertical members having a cross sectional configuration substantially the same as the cross tie members.

7. In the cabinet of claim **1,**
an accessory mount being a vertical elongate member, the same being characterized by an offset strut mounting flange, said strut mounting flange having a plurality of holes at its opposed end portions to the T-slots of the adjacent strut,
and a plurality of holes on the main body of the accessory mount for mounting various accessories at pre-selected locations.

8. In the cabinet of claim **4,**
each of said main channels and gusset being formed of a single piece of material, with the gusset bent at substantially right angles to the main channel,
and a mounting flange at the front of the portion of each such main channel having a plurality of holes for mounting a variety of interior structures and exterior panels.

9. In the cabinet of claim **2,**
each of said main channels having an offset mounting flange,
a plurality of holes in said mounting flange, whereby panels and other accessories may be secured to the front portion of the main channel for completing the open portion of the front bezel of the cabinet.

10. In the cabinet of claim **5,**
vertical members between the cross tie ends,
each of said vertical members having a cross sectional configuration substantially the same as the cross tie members.

11. A cabinet comprising, in combination
a front bezel having top and bottom cross ties and a pair of opposed vertical members,
a rear bezel having top and bottom cross ties and a pair of opposed vertical members,
upper and lower struts joining the front and rear bezels at the four corners with the bezels,
each strut, cross tie, and vertical member having an undercut T-slot disposed interiorly of the cabinet,
and a plurality of clamps adjustably positioned in ones of the T-slots permitting structural and accessory members to be adjustably secured in place.

12. In the cabinet of claim **11,**
main channels having opposed end gussets,
each gusset having mounting means to secure the same to adjacent strut and cross tie members.

13. In the cabinet of claim **11** above,
panels enclosing the areas between respective ones of the cross ties and struts,
slots in ones of said struts and cross ties,
one of said slots having a fulcrum at its outer edge, whereby sheets of material forming panels may be mounted interiorly of said slots, the fulcrum serving to deformingly engage and pre-stress the same into a rattle-free nesting engagement with the respective slots and struts and cross ties.

14. In the cabinet of claim **11** above,
each of said cross tie members having a deep channel in its outwardly facing portion,
each of said channels terminating in an undercut bottom,

whereby decorative strips may be inserted in the base of said cross tie channels to customize the cabinet as to design.

15. In the cabinet of claim **12,**
each of said main channels having an offset mounting flange,
a plurality of holes in said mounting flange,
whereby panels and other accessories may be secured to the front portion of the main channel for completing the open portion of the front bezel of the cabinet.

16. In the cabinet of claim **12,**
each of said main channels and gusset being formed of a single piece of material, with the gusset bent at substantially right angles to the main channel,
and a mounting flange at the front of the portion of each such main channel having a plurality of holes for mounting a variety of interior structures and exterior panels.

17. In the cabinet of claim **15,**
each of said main channels and gusset being formed of a single piece of material, with the gusset bent at substantially right angles to the main channel,
and a mounting flange at the front of the portion of each such main channel having a plurality of holes for mounting a variety of interior structures and exterior panels.

18. In the cabinet of claim **11,**
vertical members between the cross tie ends,
each of said vertical members having a cross sectional configuration substantially the same as the cross tie members.

19. In the cabinet of claim **11,**
an accessory mount being a vertical elongate member, the same being characterized by an offset strut mounting flange, said strut mounting flange having a plurality of holes at its opposed end portions to the T-slots of the adjacent strut,
and a plurality of holes on the main body of the accessory mount for mounting various accessories at pre-selected locations.

20. In the cabinet of claim **12** above,
panels enclosing the areas between respective ones of the cross ties and struts,
slots in ones of said struts and cross ties,
one of said slots having a fulcrum at its outer edge, whereby sheets of material forming panels may be mounted interiorly of said slots, the fulcrum serving to deformingly engage and pre-stress the same into a rattle-free nesting engagement with the respective slots and struts and cross ties.

21. A cabinet comprising in combination,
four main channels,
each channel having a gusset at each end thereof extending substantially perpendicularly to the channel,
four struts each having an L-shaped cross section defining two perpendicular legs,
each leg having an undercut T-slot
clamp means securing each strut end to a main channel end slidable in the T-slots,
and cross tie members joining parallel main channels not jointed by the struts.

22. In the cabinet of claim **21**
each of said struts being an extrusion of uniform cross section.

23. In the cabinet of claim **21**
each of said cross ties being an extrusion of uniform cross section.

24. In the cabinet of claim **21**
each main channel being a sheet metal stamping,
each gusset end being integral with the main channel and bent perpendicular thereto.

25. In the cabinet of claim **21**
each main channel having a parallel mounting flange perpendicular therewith.

26. In the cabinet of claim **21**
a plurality of uniformly spaced mounting holes in said mounting flange.

27. In the cabinet of claim **21**
a plurality of uniformly spaced mounting holes along an edge of said channel remote from said mounting flange.

28. In the cabinet of claim **21**
a pair of opposed gear hinge lifting handles formed beneath the upper opposed struts and running substantially the length of said upper struts,
whereby lifting points may be adjusted to the center of balance of the cabinet.

29. In the cabinet of claim **21,**
an undercut slot along the intersecting vertex of the legs of the strut,
and a resilient member proportioned for a sliding fit in said slot,
whereby the cabinet is cushioned along its strut edges.

30. In the cabinet of claim **22,**
an undercut slot along the intersecting vertex of the legs of the strut,
and a resilient member proportioned for a sliding fit in said slot,
whereby the cabinet is cushioned along its strut edges.

31. In the cabinet of claim **1,**
a wedge form in the bend line between the gusset and main channels,
whereby the angular relationship between the gusset and main channel is reinforced.

32. In the cabinet of claim **8,**
a wedge form in the bend line between the gusset and main channels,
whereby the angular relationship between the gusset and main channel is reinforced.

33. In the cabinet of claim **21,**
a wedge form in the bend line between the gusset and main channels,
whereby the angular relationship between the gusset and main channel is reinforced.

34. In the cabinet of claim **24,**
a wedge form in the bend line between the gusset and main channels,
whereby the angular relationship between the gusset and main channel is reinforced.

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