United States Patent [19]

Salvati et al.

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[54] **SWITCHBOARD FRAMEWORK CORNER TIE**

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[73] Assignee: **Westinghouse Electric Corporation,** Pittsburgh, Pa.

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[21] Appl. No.: **462,485**

Related U.S. Application Data

[63] Continuation of Ser. No. 334,329, Feb. 21, 1973, abandoned.

[52] **U.S. Cl.** ..... **317/121;** 312/257 SK; 220/84; 211/182; 403/363

[51] **Int. Cl.**[2] **H02B 1/02**

[58] **Field of Search** .... 52/288, 475; 287/189, 36 R; 317/117, 120, 121; 220/84; 312/257 R, 265, 140, 257 SK; 403/363; 211/182; 174/129 B, 133 B

[56] **References Cited**

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3,265,419	8/1966	Durnbaugh	312/257 SK
3,353,854	11/1967	Hansen	52/475
3,468,430	9/1969	Lawman	211/182

FOREIGN PATENTS OR APPLICATIONS

961,791	6/1964	United Kingdom	220/84
245,703	7/1963	Australia	317/121

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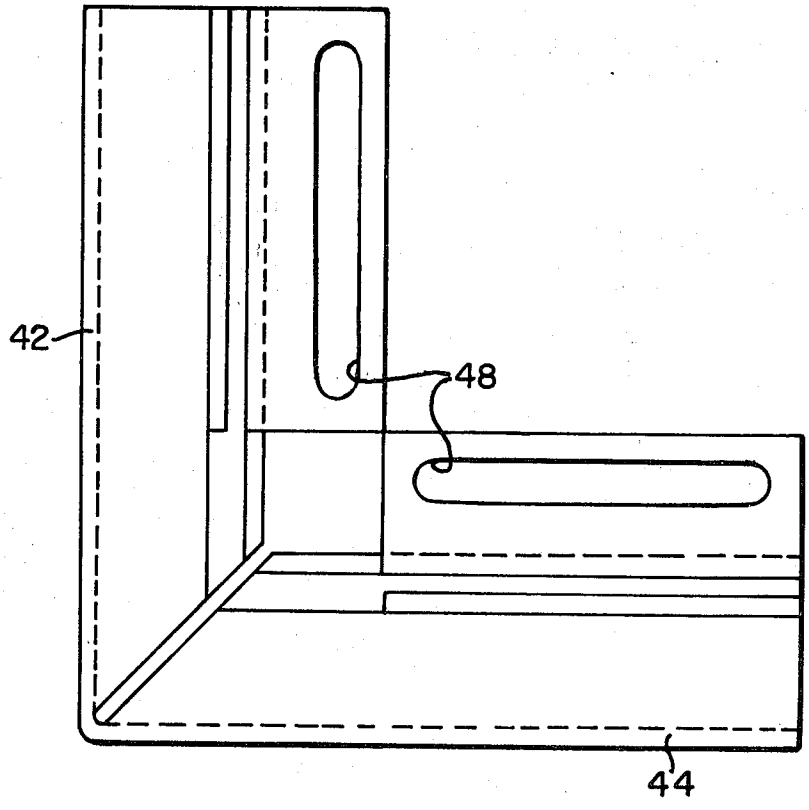
Attorney, Agent, or Firm—H. G. Massung

[57] **ABSTRACT**

A three-phase metal-enclosed switchgear unit or assembly is provided with a single piece or unitary corner tie for supporting three structural members in a mutually perpendicular relationship. Eight corner ties are necessary for each switchgear section. Each corner tie is constructed with three mutually perpendicular leg portions. Each leg portion comprises a generally rectangular member having a longitudinally extending open portion the edges of the open portion extending into outward facing flanges. Structural members can slide onto the corner tie to be held in a mutually perpendicular alignment. Slotted openings are provided in the flanged portions of the corner tie through which multiple openings in the structural members are readily accessible for rigidly securing the corner tie to the perpendicularly disposed structural members.

5 Claims, 7 Drawing Figures



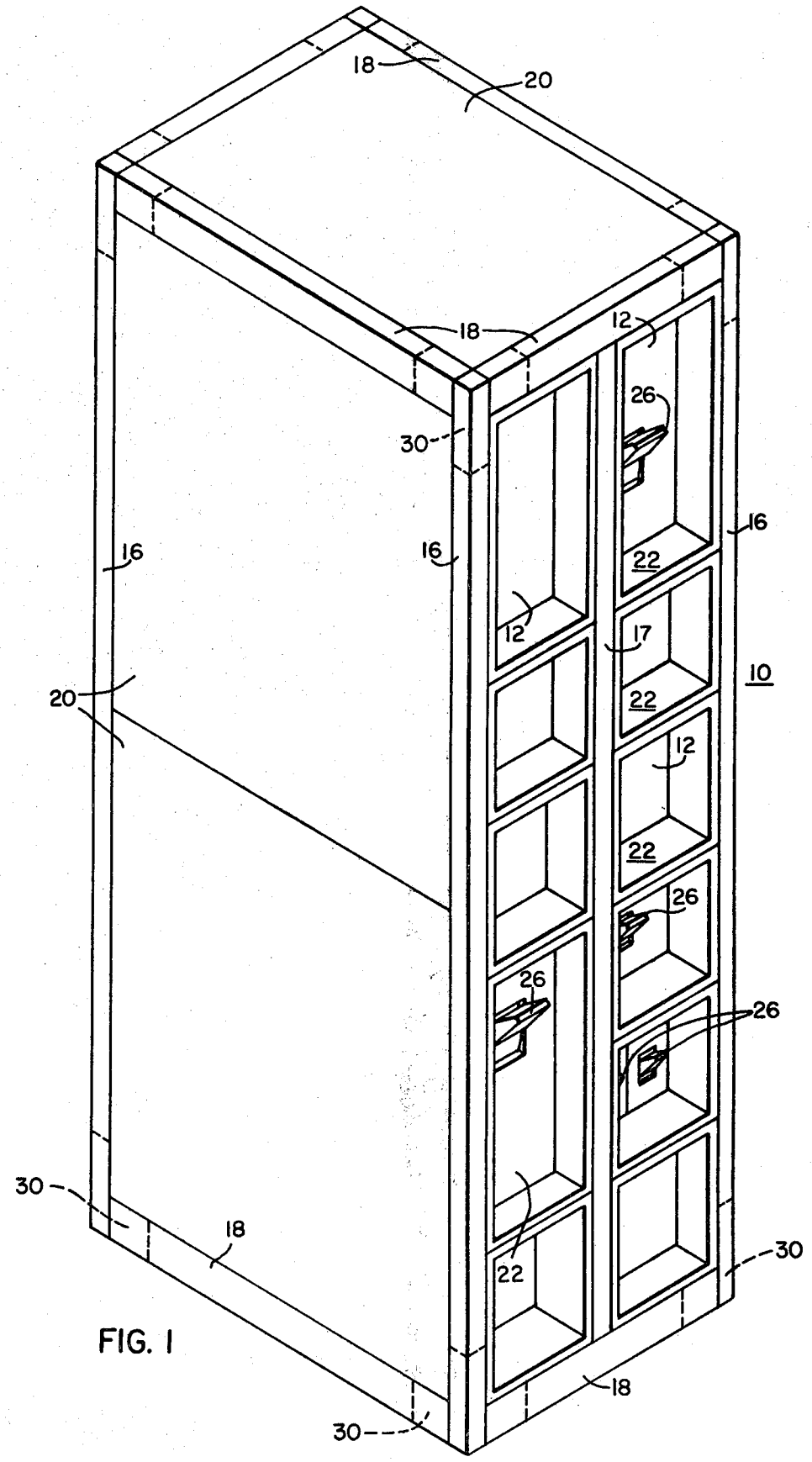

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FIG. 1

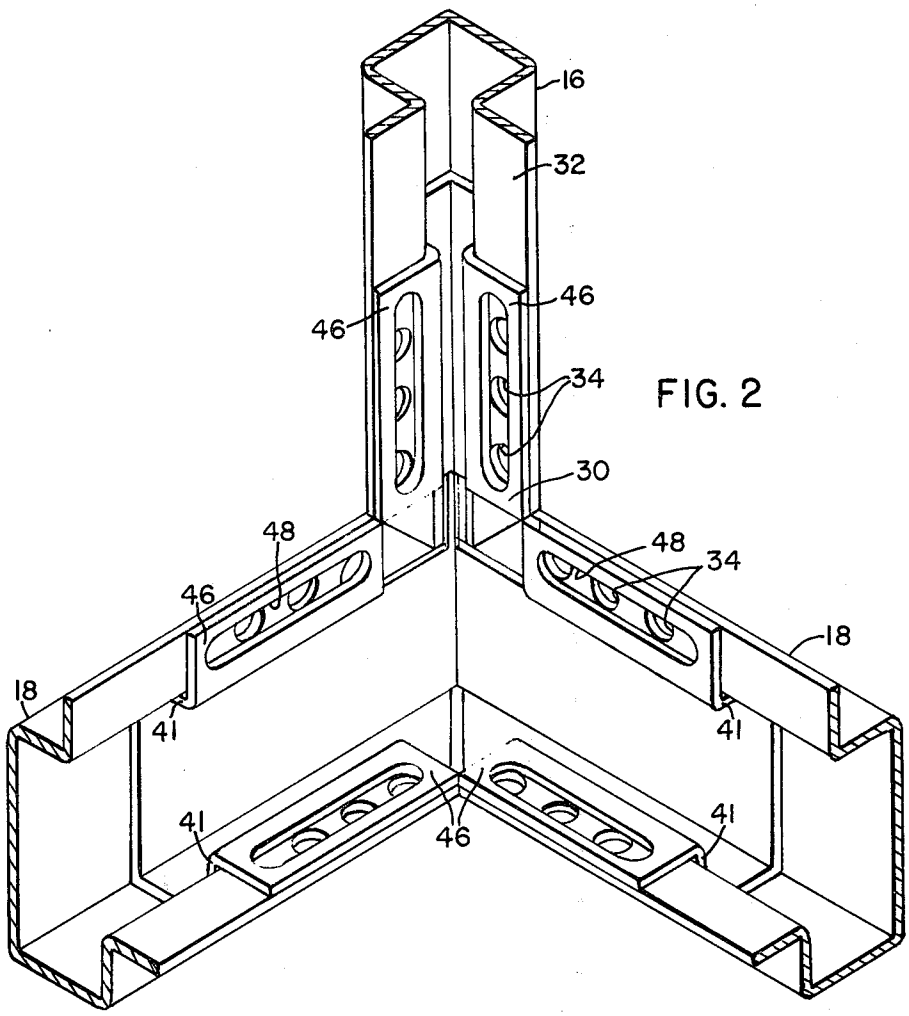

FIG. 2

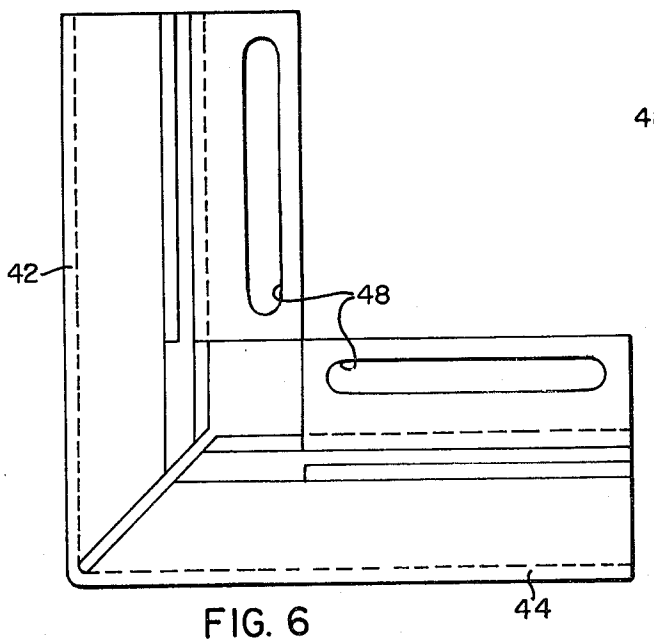

FIG. 6

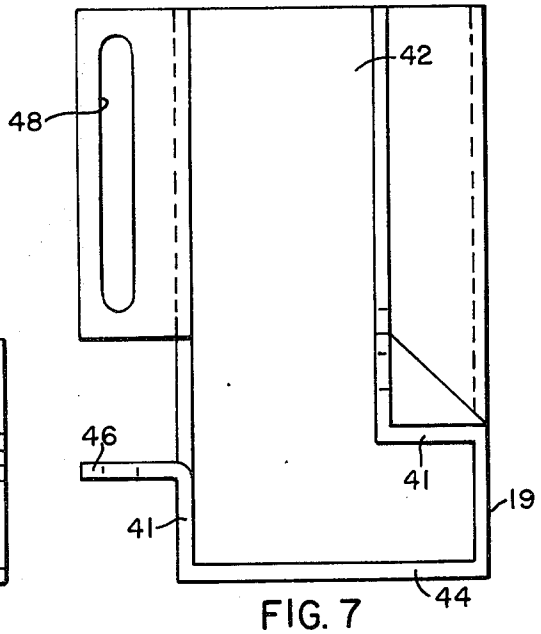

FIG. 7

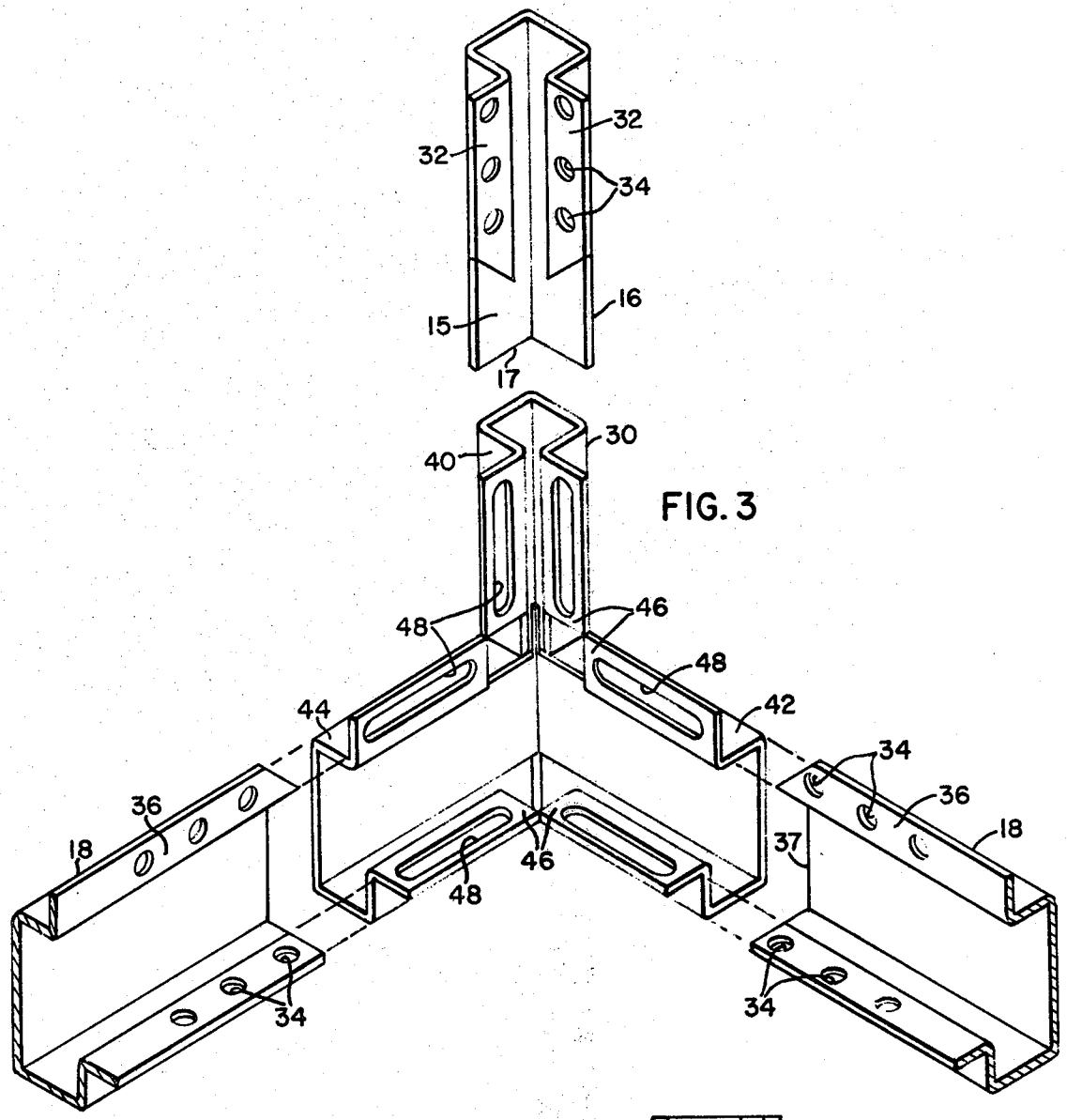

FIG. 3

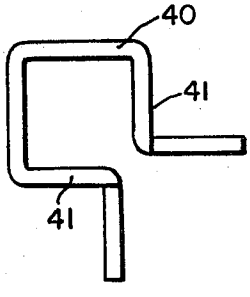

FIG. 4

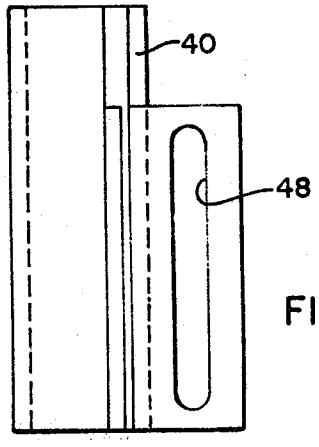

FIG. 5

SWITCHBOARD FRAMEWORK CORNER TIE

This is a continuation of Ser. No. 334,329, filed Feb. 21, 1973, now abandoned.

BACKGROUND OF THE INVENTION

This invention relates to a corner tie of a type particularly adapted for use on metal enclosed switchgear suitable for relatively low voltage power distribution service. More specifically, this invention relates to a one-piece corner tie suitable for holding three switchgear structural members in predetermined positions.

A metal enclosed switchgear installation usually includes one or more units with each unit consisting of a plurality of sections or cells. The sections are assembled side-by-side to provide a unit or switchgear assembly capable of housing a desired number of circuit breakers or other circuit controlling devices. The maximum number of sections assembled in a unit at the factory is usually determined by the handling and shipping facilities available.

Each switchgear unit comprises a structural framework in a formed sheet metal enclosure. The structural framework must support the considerable weight of conductors and circuit interrupting devices mounted in the switchgear section. The structural framework normally consists of elongated structural members tied or secured together in a generally perpendicular relationship at corner points. A structural member particularly adapted for use in switchgear construction is shown in U.S. Pat. No. 2,167,525 issued July 25, 1939 to R. W. Rosendale. A two piece corner assembly for connecting two or more of this type structural members is shown in U.S. Pat. No. 3,353,854 issued Nov. 21, 1967 to K. M. Hansen. Each of the elongated structural members essentially comprises a generally rectangular tubular member having an open portion in place of one of the longitudinal extending corners, with both edges of the open portion formed into two perpendicular outwardly extending longitudinal flange portions. These structural members are normally connected in a mutual perpendicular alignment with the open portion of each switchgear structural member facing the inside of the switchgear unit. The flange portions thus form recessed surfaces around the opening into the switchgear unit. Formed sheet metal covers having inward facing lip portions can be mounted to these flange portions to provide a flush outer surface.

The switchgear structural members must be tied or secured together at intersecting or meeting corners. It is necessary that where three corner structural members are connected they be held securely in mutually perpendicular alignment. It is desirable that the corner tie be of a simple economic construction and provide a strong and pleasing looking corner with no visible openings. It is also desirable to have a corner tie which can connect, support and align the mutually perpendicular structural members without the use of fastening means or apparatus, until the entire switchgear unit framework is assembled.

SUMMARY OF THE INVENTION

In accordance with the invention, a metal enclosed switchgear unit is provided with main through horizontal bus and vertical section bus conductors or risers having circuit interrupting devices mounted thereto. The circuit breakers are mounted close to the vertical section bus and are recessed from the front of the switchgear section. Formed sheet metal covers are mounted on the sides, back and top of the switchgear unit. Well or pan-shaped covers are mounted at the front of the switchgear unit, and cover the individual circuit interrupting devices. The outer edges of the well-shaped covers are flush with the front of the switchgear unit and the inner surface is approximately flush with the front of the circuit interrupting devices. A cut out is made in the flat inner surface of the well-shaped cover for the circuit breaker operating handle to pass therethrough.

Circuit interrupters, bus conductors and covers are mounted on the main switchgear structural members. The main switchgear structural members comprise generally rectangular members each including a plurality of sidewalls with the sidewalls being spaced from one another at one of the corners to form a longitudinally extending opening and having perpendicular outwardly facing flanges formed at the longitudinally extending opening. A pair of perpendicular flanges extend along the longitudinal axis of the structural member and have mounting holes formed therein. The structural members come together and are held securely in a mutually perpendicular relationship at each corner of the switchgear unit by a one-piece corner tie. Eight corner ties are required for each switchgear unit.

Although the switchgear structure described comprises mutually perpendicular members, it is to be understood that the teachings of the present invention can be applied to structural members positioned in other predetermined locations or orientations. The corner tie comprises three mutually perpendicular legs each of which fits inside a portion of the associated structural members which come together at the corner of the switchgear unit. The vertical structural member is of a generally square tubular construction which includes a plurality of sidewalls with the sidewalls at one corner being spaced from one another to form a longitudinally extending opening between the edges of said sidewalls. Outwardly extending flange portions are formed at the edges of the opening in the vertical structural member. The vertical leg of the switchgear corner tie over which the vertical structural member fits is of the same general cross sectional configuration, but of a generally smaller size so as to fit inside a portion of the vertical structural member. Slots are formed in the flange portions of the vertical leg of the corner tie to facilitate fastening to preformed holes in the flange portions of the vertical structural member.

The front-to-back and side-to-side structural cross members are of a generally rectangular tubular construction with an opening, in place of one of the longitudinal corners of the structural members, formed thereon. Outwardly extending flanged portions are formed longitudinally along the edges of the opening in the front-to-back and the side-to-side structural cross members. All horizontal structural cross members have the same cross-sectional configuration. The corner tie member has two horizontal generally perpendicular extending legs to which the vertical leg, extending perpendicular to horizontal legs, is secured or attached. Each of the horizontal legs of the corner tie is of the same general configuration or shape as the horizontal structural cross members, but of a slightly smaller size, so as to fit internally of a portion of the horizontal structural members. Elongated slots are formed in the flanged portions of the horizontal legs of the corner tie member to facilitate attachment or fastening to the as-

sociated horizontal structural members. The corner tie is of a one-piece or unitary construction and fits inside the end portion of each of the structural members which are brought together or assembled to form a corner of the switchgear section.

A three legged corner tie has six flanged portions. Each flanged portion of the corner tie extends from a side of the rectangular or square legs which the tie member includes. The depth of the side from which each of these flanged portions extends can be slightly greater than the depth of the side of the associated structural member with which it is flush side so that when the corner tie is secured to the structural members and the flanged members of the corner tie are pulled into engagement with the flanged portion of the structural member, the legs of the corner tie give slightly and a slightly resilient or lockwash washer effect between the corner tie and the structural support member is obtained or results. The corner tie fits inside three structural members brought together at each corner, and any slight separation or misalignment between the structural members during assembly is closed by the corner tie member. That is, if the end of the horizontal structural member does not align perfectly with the vertical structural member and a slight opening is left therebetween, a portion of the corner tie member is in position behind the structural members to close this opening. This helps provide an essentially dead front construction with no openings through the framework into the body or interior of the switchgear unit.

The disclosed corner ties provide a simple one-piece construction which facilitates assembly of the switchgear unit. The corner tie positions the horizontal cross members and the vertical corner posts during assembly, and supports these parts of the framework during assembly without the use of mounting hardware. After the switchgear structural framework is assembled, mounting hardware can be used to securely fasten the corner tie members to the horizontal and vertical structural members. The flange portions of the corner tie members are provided with slotted openings therein so that a plurality of bolts or self-tapping screws can secure each flange portion of the corner tie to the associated flange portion of the structural support members. The corner tie member provides for a structurally strong corner and a totally stable switchboard framework construction.

The slotted openings in the corner tie flange portions and the location of the corner tie behind any openings between structural members allows easy assembly of the structural framework without exact positioning of the structural members. Slight misalignment or positioning of the structural members are compensated for by the corner tie construction and do not affect the appearance or strength of the switchboard framework.

BRIEF DESCRIPTION OF THE DRAWINGS

For a better understanding of the invention, reference may be had to the preferred embodiment exemplary of the invention shown in the accompanying drawings, in which:

FIG. **1** is a perspective view of a double-section switchgear unit utilizing the teachings of the present invention;

FIG. **2** is a perspective view of a portion of the switchgear unit shown in FIG. **1,** showing the corner tie member in place;

FIG. **3** is an exploded perspective view of the corner tie and structural member shown in FIG. **2;**

FIG. **4** is a top view of the vertical legs of the corner tie member shown in FIG. **3;**

FIG. **5** is a bottom view of the vertical legs shown in FIG. **4;**

FIG. **6** is a top view of the horizontal legs of the corner tie; and

FIG. **7** is a side view of that portion of the corner tie shown in FIG. **6.**

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring now to the drawings, and to FIG. **1** in particular, there is shown a switchgear unit **10** comprising two generally rectangular upstanding sections or cells **12** disposed in side-by-side relationship. Additional sections **12** may be added as desired. Generally, each switchgear unit **10** comprises a plurality of vertical structural members **16** and horizontal structural cross members **18** which are assembled to form the main switchgear framework. Formed cover sheets **20** are added to the top back and sides of the framework to partially enclose the switchgear unit **10.** The front portion of each switchgear **12** is vertically divided into a plurality of small enclosures **22** for various circuit breakers and circuit controlling apparatus. These enclosures **22** are vertically stacked or disposed one above the other up to the height of the switchboard section **12.** As can be seen in FIG. **1,** when molded case circuit breakers are mounted in the switchgear section **12,** the front of the circuit breaker is set back or spaced from the front of the switchgear section **12.** Circuit breaker operating handles **26** of the molded case circuit breakers are also recessed or spaced from the front of the switchgear section **12.** Covers, which are attached to the front of the switchboard section **12,** form a part of the front face of switchgear unit **10.** Circuit breaker operating handles **26** project through openings formed in front covers. As just mentioned, the breakers handles **26** are set back from the front of switchboard unit **10** and are partially protected from material or personnel moving across or in front of the switchboard unit **10.**

The main frame of the switchgear unit **10** is constructed from vertical corner posts or structural members **16** and cross members or horizontal structural members **18** which are connected together at each corner of the switchgear unit **10.** A corner tie member **30** connects vertical post **16** to two cross members at each corner of the switchgear unit **10.** Eight corner ties **30** are required for each switchgear unit **10.**

Referring now to FIG. **2,** there is shown a more detailed view of tie member **30** with the vertical corner post **16** and the cross members **18** in place. Vertical corner post **16** is formed as a generally square or rectangular member having a plurality of sidewalls with the sidewalls being spaced from one another at one corner to form a longitudinally extending opening between the edges of the adjacent sidewalls. The outwardly extending flange portions **32** of structural member **16** project perpendicularly away from the edges of the sidewalls at the opening thus formed. The flange portions **32** extend longitudinally along the vertical corner post **16.** The flange portions **32** extend almost the length of the vertical corner post **16** but terminate a short distance from both ends of vertical post **16.** A two-sided angle portion **15** of the vertical post **16** extends beyond the ends of

flange portions 32. Vertical post 16 is fit onto corner tie 30 so that the end 17 of vertical post 16 is approximately flush with the bottom 19 (FIG. 7) of the corner tie 30. Vertical corner post 16 has a plurality of openings 34 formed at the ends of flange 32 to facilitate attachment or fastening to corner tie 30.

Cross members 18 are of a generally rectangular tubular construction with a portion which would contain one of the corners being open, with outward facing flanges 36 formed at the opening. Flanges 36 run or extend parallel to the longitudinal axis of cross members 18 for approximately the entire length. Openings 34 are formed near the end of flanges 36 to facilitate attachment to tie member 30. A portion of cross member 18 is fit onto corner tie 30 so that the end 37 of cross member 18 is flush with the edge of the angle portion 15 of vertical corner post 16.

Corner tie member 30 has three mutually perpendicular legs 40, 42 and 44. Vertical leg 40 has the same general cross-sectional configuration or shape as vertical corner post 16 but with suitable dimensions so that corner post 16 can slide easily over vertical leg 40, as can best be seen in FIG. 2. Horizontal legs 42 and 44 are formed from one piece, as shown in FIGS. 6 and 7, and are perpendicular to each other and to vertical leg 40. Horizontal legs 42 and 44 are of the same general cross-sectional shape as cross members 18, but of a somewhat smaller size so that a portion of cross members 18 can fit easily over legs 42 and 44, as shown in FIG. 2. Vertical leg 40 is welded or otherwise permanently attached to horizontal legs 42 and 44 in a mutually perpendicular relationship. Flanges 46 are formed at the edges of the openings of legs 40, 42 and 44 of corner ties 30. Elongated slotted openings 48 are formed in flanges 46. As shown in FIG. 2, a plurality of openings 34 formed in vertical corner post 16 and cross members 18 are easily accessible through the slots 48 in corner tie 30. More than one fastener can pass through each slot 48 to securely hold structural members 16 and 18 in proper alignment. The portions of vertical corner post 16 and cross members 18 which slide onto corner tie 30 are securely fastened to corner tie 30. The three-legged corner tie 30 is of a one-piece or unitary construction and helps to properly position the structural members 16 and 18 of the switchgear framework. Each cross member 18 and corner post 16 will slide over one of the legs 40, 42 or 44 of the corner tie 30 and when in proper position can be bolted to the corner tie 30. The entire structural framework can be constructed or assembled before fastening structural members 16 and 18 to corner tie 30, since the corner tie 30 construction will position and hold structural members 16 and 18 until bolted in position. Alternately, structural member 16 or 18 can be secured to corner tie 30 as soon as they are into slide position. Bolts or self-tapping screws can be used to fasten to flanges 46 of corner tie 30 to the flanges 32 or 36 of structural members 16 or 18, respectively. After assembly, the corner ties 30 cannot be seen from externally of the switchgear unit 10. If there is any slight opening left between the ends of structural member 18 and the angle-shaped portion 15 of structural member 16, it will be closed by a portion of corner tie 30.

In one embodiment of the invention, the sides 41 of corner tie 30 to which flanges 46 are attached can be made slightly longer or larger in size than the corresponding side of corner post 16 or cross members 18 so that when corner post 16 and cross members 18 are positioned on corner tie 30, flanged portions 46 are slightly separated from openings 34. Thus, when corner tie 30 is fastened to structural member 16 or 18, there must be some slight deformation of the part 30 and this will keep some pressure on the fastening devices to help assure that the fasteners do not work loose during shipping or use of the switchgear unit 10.

Using the one-piece corner tie 30, assembly of the switchgear 10 framework is relatively simple. The corner tie 30 assures that structural members 16 and 18 are in proper mutually perpendicular alignment and the slotted flanges 46 allow the corner to be formed without extreme accuracy which would be required to line up to prepunched holes. A plurality of fasteners can be used in each slot 48 to securely hold corner tie 30 to structural members 16 and 18. The one-piece corner tie 30 supports the framework and facilitates assembly. Corner tie 30 also provides a structurally strong corner and a totally stable framework construction.

What we claim is:

1. A metal-enclosed switchgear framework comprising:

a plurality of elongated structural support members, each of said support members having a longitudinally extending opening therethrough from one end to the other and a first pair of non-connected and spaced flanges disposed perpendicular to each other and extending away from the longitudinally extending opening,

a plurality of single piece corner ties, each of said corner ties comprising at least three leg portions extending outwardly from a common central portion; each of the leg portions fitting snugly inside and retained within the longitudinal openings extending through the associated structural support members and including a second pair of non-connected and spaced flanges disposed perpendicular to each other and extending outward from and outside of the longitudinally extending opening in the associated structural support member parallel to portions of said first pair of flanges;

fastening means connecting said first pair of flanges to said second pair of flanges;

said plurality of single piece corner ties supporting said structural support members and restricting movement of each of said structural support members to a single direction generally away from said corner tie along the longitudinal axis of said structural support member;

said plurality of structural support members being assembled with said plurality of corner ties and defining a polyhedron shaped framework with the end portions of each of said plurality of structural support members disposed around a portion of one of the legs of the associated corner ties; and

each of said structural support members fastened at the opposite ends to the leg portions of a pair of said plurality of corner ties.

2. A metal-enclosed switchgear framework, as claimed in claim 1, wherein: said plurality of elongated structural support members comprise, cross members having a generally rectangular tubular configuration and including a plurality of sidewalls with the sidewalls at one of the corners being spaced from one another to form a longitudinally extending opening, each of said cross members having outwardly facing perpendicular flanges extending longitudinally along the edge of the opening, and vertical corner post members each having

a generally square tubular shape and including a plurality of side walls with the sidewalls at one of the corners being spaced from one another to form a longitudinally extending opening having outward facing perpendicular flanges formed at the edges of the opening; each of said corner ties comprising three mutually perpendicular legs with two of the mutually perpendicular legs having a slightly smaller rectangular tubular shape with the same general cross-sectional configuration as said cross member and the third mutually perpendicular leg having a slightly smaller size with the same general cross-sectional configuration as said vertical post member; and said plurality of elongated structural support members and said corner ties being assembled so as to form a generally rectangular parallelepiped framework.

3. A metal-enclosed switchgear framework as claimed in claim **1** wherein:

each of said plurality of elongated structural support members comprises a generally U-shaped tubular member including a plurality of sidewalls and having a longitudinally extending opening at one of the corners between the adjacent sidewalls with outwardly facing flanges formed at each edge of the longitudinal opening and extending longitudinally of said structural support member; and

each of said corner ties comprising three mutually perpendicular leg portions, each having a longitudinal opening with outwardly facing flanges formed at the edges of the opening and extending along the leg portion and wherein the outwardly facing flanges of each of said corner ties does not extend beyond the outer edge of the outwardly facing flanges formed on said plurality of structural support members.

4. A metal-enclosed switchgear framework as claimed in claim **3,** wherein:

the flanged portions of said elongated structural support members have a plurality of openings formed adjacent to the opposite ends thereof;

the flanged portions of said corner ties have an elongated slotted opening formed therein so that when a leg portion of said corner tie is disposed in the longitudinal opening extending through said structural support member, at least a portion of the holes formed in the flanged portion of said structural support member are substantially aligned with the slot formed in the leg portion of said corner tie member; and a plurality of fasteners are disposed to connect the flanged portions of said corner tie to the flanged portions of said structural support member.

5. A metal-enclosed switchgear framework as claimed in claim **3** wherein each leg of said corner tie has substantially the same shape as the associated structural support member within which the leg portion of said corner tie is disposed.

* * * * *