United States Patent [19]

White

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[54] **SPLICABLE STRUCTURAL MEMBER**

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[21] Appl. No.: **160,519**

Related U.S. Application Data

[63] Continuation of Ser. No. 847,179, Aug. 4, 1969.

[52] **U.S. Cl.** ..... **287/189.36 F**, 52/732

[51] **Int. Cl.** **F16b 7/18**

[58] **Field of Search** ..... 287/189.36 F; 52/726, 730, 732, 633; 211/176, 182; 248/125; 46/16, 23, 27, 28, 29

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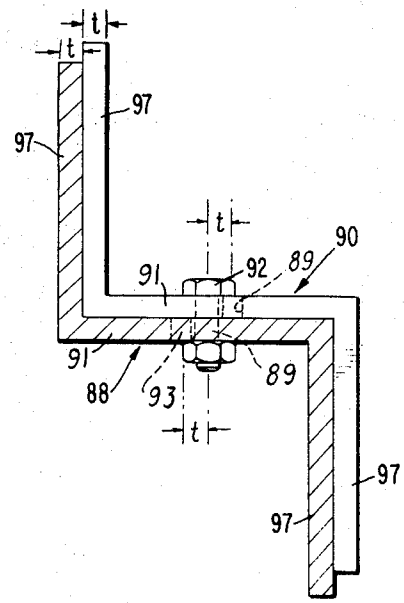
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[57] **ABSTRACT**

A string of nested, overlapping structural members for supporting strand elements by joining successive members lying in parallel planes. All members are provided with a series of holes for receiving fasteners, each series of holes comprising an outer set and an alternate inner set disposed along laterally spaced centerlines such that the inner holes of an upper member are registrable with the outer holes of an underlying member. In this way, any member may be selected for either disposition to obtain the desired relation within a string.

1 Claim, 13 Drawing Figures



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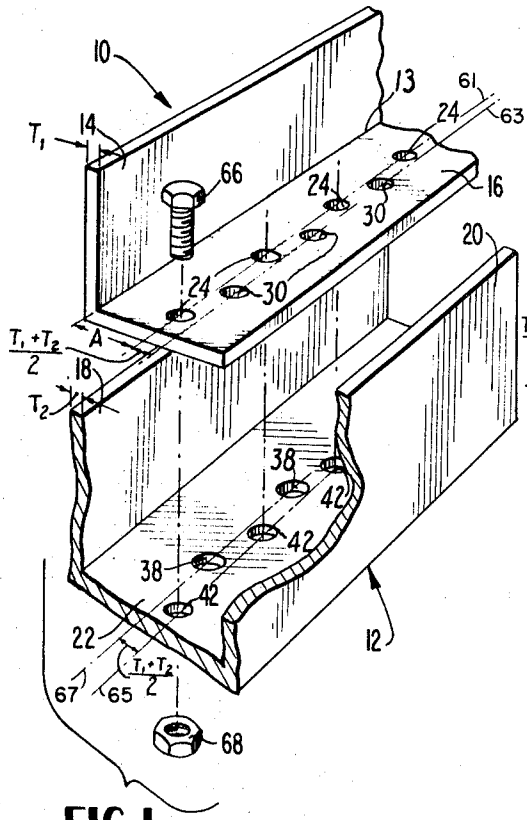


FIG. 1

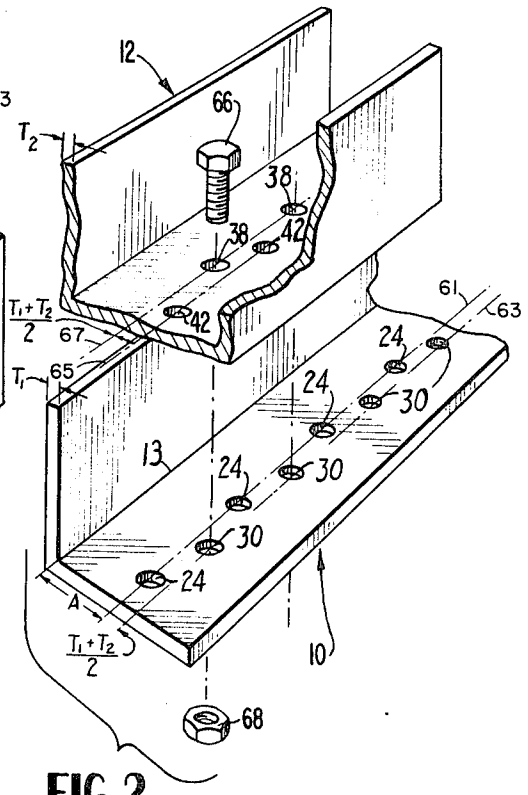


FIG. 2

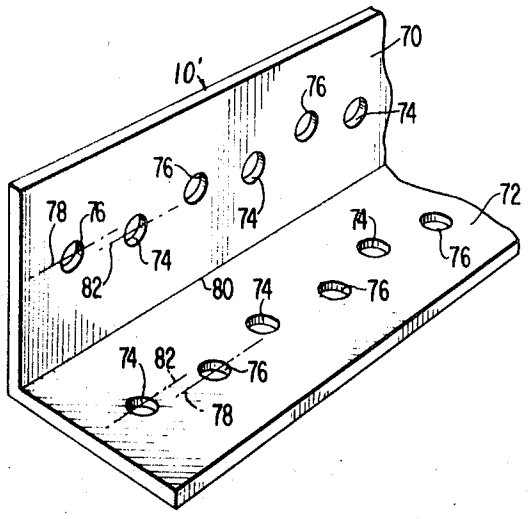


FIG. 3

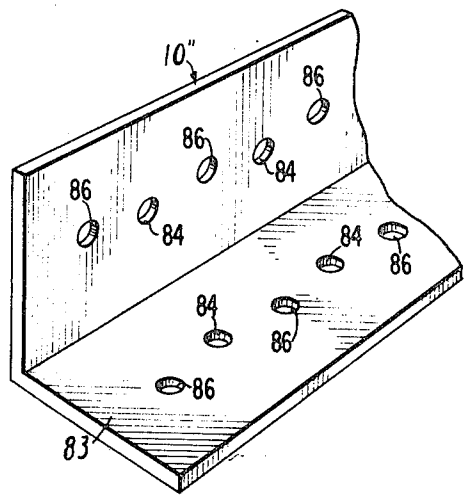


FIG. 4

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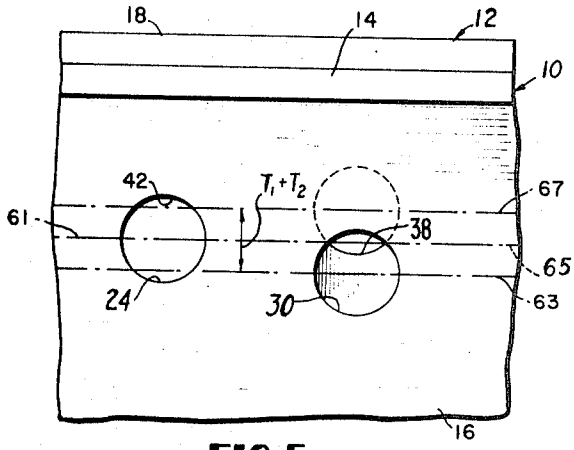


FIG. 5

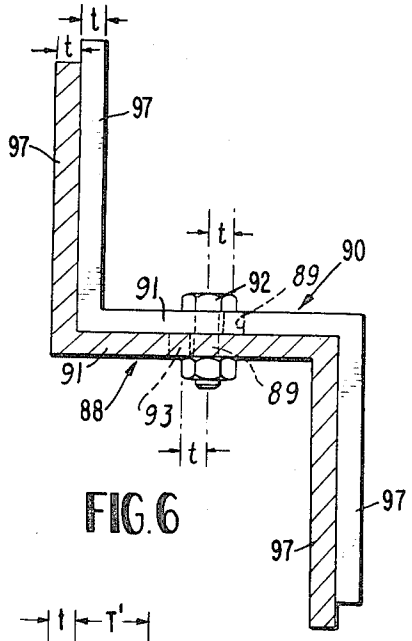


FIG. 6

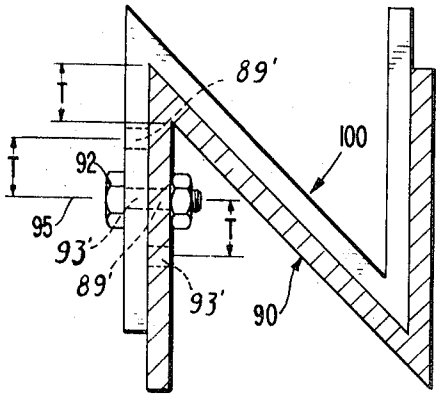


FIG. 7

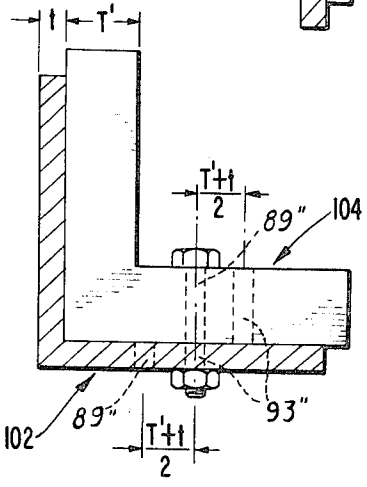


FIG. 8

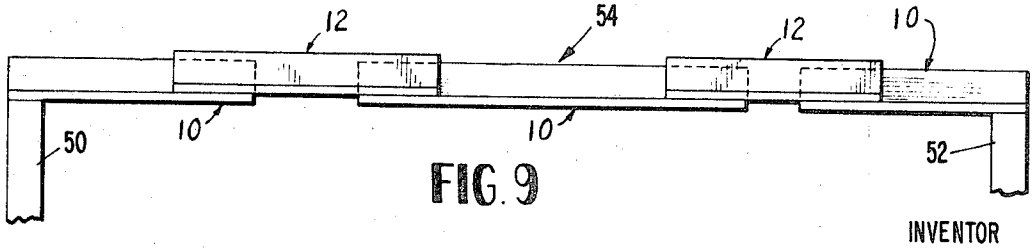


FIG. 9

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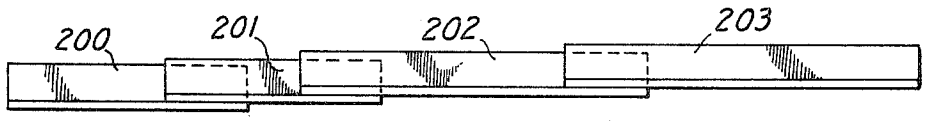


FIG. 10

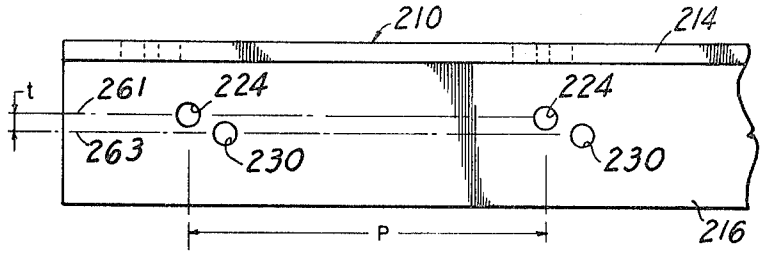


FIG. 11

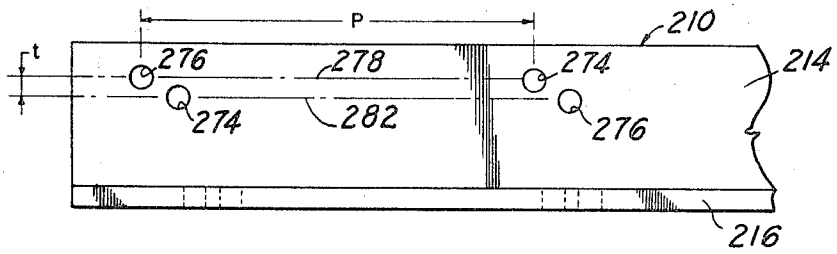


FIG. 12

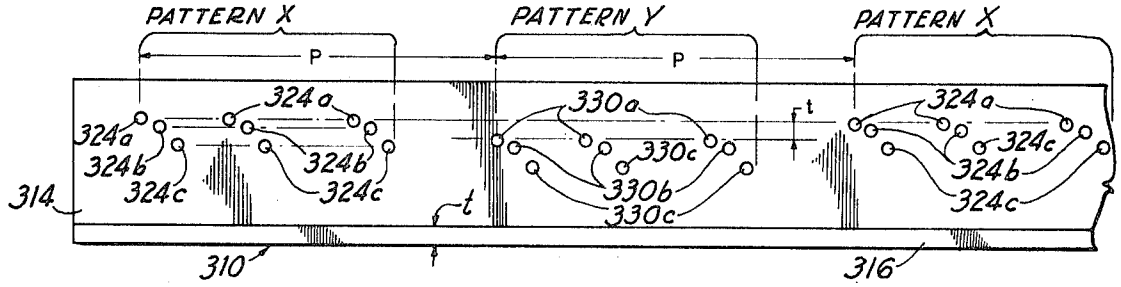


FIG. 13

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SPLICABLE STRUCTURAL MEMBER

This application is a continuation of application Ser. No. 847,179, filed Aug. 4, 1969.

BRIEF SUMMARY OF THE INVENTION

Structural members having angularly related legs for supporting one or a plurality of rigid strand-like members such as cables, electrical conduits, conductors, fluid conduits, tubular hoses, rigid tubes and the like, in which the members may be arranged in a string to provide a generally straight channel or support by virtue of the provision of a series of holes in a leg of each member, each series of holes comprising a first set of holes arranged along a centerline offset from the first centerline by an amount such that the first set of holes of one member are registrable with the second set of holes of another member overlapped therewith, and vice versa.

BRIEF DESCRIPTION OF THE DRAWING FIGURES

FIG. 1 is an exploded perspective view showing one form of the invention;

FIG. 2 is a view similar to FIG. 1 but showing the two structural members of the former figure in reverse relation;

FIG. 3 is a partial perspective view showing another form of the invention;

FIG. 4 is a view similar to FIG. 3 but showing a modification;

FIG. 5 is an enlarged view illustrating the manner of alignment of the holes in a pair of structural members;

FIG. 6 is an end view illustrating a further embodiment of the invention;

FIG. 7 is an end view showing a still further embodiment of the invention;

FIG. 8 is a further view showing another embodiment of the invention; and

FIG. 9 is an elevational view illustrating a string of structural members.

FIG. 10 is an elevational view similar to FIG. 9 but showing the members disposed in lap strake manner.

FIG. 11 is a fragmentary plan view of a modified form of the present invention.

FIG. 12 is a side elevational view of the angle member shown in FIG. 11.

FIG. 13 is a plan view of still another embodiment of the present invention.

DETAILED DESCRIPTION OF THE INVENTION

With reference now more particularly to FIGS. 1 and 2, the reference characters 10 and 12 therein indicate generally a pair of structural members which, in the specific instance shown, are of dissimilar configuration. The member 10 is an angle piece provided with the upstanding leg 14 and a horizontal leg 16 connected together along a common edge 13 and disposed at right angles with respect to each other. Channel member 12 is of a U-shaped configuration, having the upstanding flanges 18 and 20 interconnected by a web 22.

In FIG. 1, the angle member 10 is to be nested within the channel member 12 and in order to secure these parts together in such relation and also in the relationship shown in FIG. 2 wherein the channel member 12 is to be nested within the angle member 10, the leg 16 of the member 10 and the web 22 of the member 12 are

each provided with a series of similarly spaced holes or openings.

Angle member 10 is provided with a first primary set of holes 24 through leg 16 longitudinally spaced from each other along a common centerline 61 parallel to leg 14 and spaced therefrom by a convenient distance A as shown in FIGS. 1 and 2. Angle member 10 is also provided with an second primary set of holes 30 through leg 16 longitudinally spaced from each other along a common centerline 63 parallel to centerline 61 and spaced outwardly from centerline 61 by a distance equal to one-half of the sum of the thickness T_1 of leg 14 of member 10, and the thickness T_2 of flange 18 of channel member 12.

Channel member 12 is provided with a first secondary set of holes 42 through web 22 longitudinally spaced along a common centerline 65 parallel to flange 18 so that when angle member 10 is nesting within channel member 12 so that the outside surface leg 14 is contiguous with the inside surface of flange 18, the holes 24 in leg 16 are registrable with holes 42 in web 22 and centerline 61 is in vertical alignment with centerline 65. Channel member 12 is also provided with a second secondary set of holes 38 through web 22 longitudinally spaced along a common centerline 67 parallel to centerline 65 and spaced inwardly toward flange 18 therefrom by a distance equal to one-half the sum of the thickness T_1 of leg 14 of member 10 and the thickness T_2 of flange 18 of member 12. Thus, when channel member 12 is nesting in angle member 10 as seen in FIG. 2, the holes 38 in member 12 are registrable with holes 30 in member 10 and centerline 67 overlies centerline 63. The longitudinal spacing between holes 24 along centerline 61 or the holes 30 along centerline 63, or the holes 38 along centerline 67, or the holes 42 along centerline 65 may be varied as desired as long as the relative transverse spacing between the centerlines 61, 63, 65, and 67, remain the same as set forth hereinabove.

A partial top plan view of members 10 and 11 is shown in FIG. 5 with the members nested as shown in FIG. 1. It will be noted that centerline 61 overlies centerline 65 so that holes 24 and 42 are registrable with each other. It will also be noted that holes 30 and 38 are in misalignment with each other and centerlines 63 and 67 are laterally spaced from each other by a distance equal to the sum of thickness T_1 of leg 14, and thickness T_2 of flange 18. From the above, it will be seen that if thickness T_1 equals thickness T_2 then the lateral distance between centerlines 61 and 63 is equal to T_1 or T_2 and likewise for the lateral distance between centerline 65 and 67.

The purpose of this relationship is to allow the structural members 10 and 12 to be disposed as desired to produce an arrangement such as is shown in FIG. 9. FIG. 9 diagrammatically illustrates the provision of a support assembly to support strand-like elements stretching between two supports 50 and 52, the support assembly being indicated generally by the reference character 54. Support assembly 54 comprises a string of structural members 10, 12, constructed in accordance with the present invention which present substantially level or flat surface extending between supports 50 and 52, for receiving the strand-like elements. The string of structural members 10, 12, show three members 10, within which are nested members 12 in alternate overlapping relationship as shown until the

string is of a desired length to stretch between the two supports **50** and **52** as desired. Without the relationship of the staggered holes **24, 30, 38,** and **42** shown in FIGS. **1** and **2,** for example, the structural members **10, 12,** could not be overlapped and nested with each other.

It is therefore seen that fasteners, such as the bolt **66** and nut **68** shown in FIGS. **1** and **2,** may be received through the registered set of holes, such as a hole **24** and a hole **42** in FIG. **1,** or a hole **38** and a hole **30** in FIG. **2,** to secure the members **10** and **12** together to form the string **54,** as is shown in FIG. **9.** It is also to be understood that overlapped or nested members **10, 12** may be extended or retracted in increments equal to the spacing between adjacent longitudinally aligned holes in a set.

FIG. **3** shows a modified structural member **10'** which may take the form of angle irons having right angularly disposed legs **70** and **72** each having an inner set of holes **74** in each leg **70, 72,** and an outer set of holes **76** in each leg **70, 72.** The outer sets of openings **76** are disposed along centerlines **78** spaced from the line of intersection **80** between the inner faces of the two legs **70** and **72** by a fixed and predetermined amount whereas the centerlines **82** of the inner sets of holes **74** are laterally spaced inwardly therefrom by an amount equal, in this case, to the thickness of each leg **70** or **72.** Thus, two or more members constructed as is shown in FIG. **3** may be overlapped either way with respect to each other while still achieving alignments of the holes **74, 76** thereof. The member **10'** which is nested within the other will always be arranged such that its inner set of holes **74** are alignable or registrable with the outer set of holes **76** of the other member **10'** within which it is nested. In FIG. **3** it will be noted that the sets of holes are arranged such that the inner set of holes **74** of one leg is laterally aligned with the outer set of holes **76** of the other leg. When two members **10'** are positioned with respect to each other so that holes **74** of the inside member **10'** are in registry with holes **76** in the outside member **10',** then appropriate fasteners may be positioned in the registered holes **74** and **76** in each leg **70** and **72** to lock the members **10'** together. Since holes **74** in the leg **70** are longitudinally spaced from the holes **74** in the other leg **72,** the fasteners positioned in the registered holes **74** and **76** will be staggered longitudinally from each other in the legs **70** and **72.**

FIG. **4** shows a modified member **10''** from that shown in FIG. **3.** Member **10''** has legs **81** and **83** corresponding to legs **70** and **72** in FIG. **3.** Each leg **81** and **83** has an inner set of holes **84** corresponding to the holes **74** in member **10'** and an outer set of holes **86** corresponding to holes **76** in member **10'.** The holes **84** in leg **81** of member **10''** are, however, laterally aligned with holes **84** in leg **83.** Likewise holes **86** in leg **81** are laterally aligned with holes **86** in leg **83.** Thus when using two members **10''** so that holes **84** of the inner member **10''** are in registry with holes **86** of the outer member **10'',** the fasteners inserted through the registered holes in leg **81** will be in lateral alignment with the fasteners inserted through the registered holes in the leg **83.**

FIG. **6** shows a further embodiment wherein the two structural members indicated generally by the reference characters **88** and **90** are of ㄱ-shaped configuration, and each with a central web **91** and oppositely extending flanges **97** along each edge thereof at right angles thereto. The flanges **97** have the same thickness *t* as indicated and the webs **91** each have a first set of holes **89** aligned along a common longitudinally extending centerline parallel to flanges **97** and a second set of holes **93** aligned along a common longitudinally extending centerline parallel to the centerline of holes **89** and spaced therefrom the distance t. Holes **89** correspond to holes **76** in FIG. **3,** and holes **93** correspond to holes **74** in FIG. **3** so that holes **89** in member **88** are registrable with holes **93** in member **90** when member **90** is nested in member **88.** Likewise holes **89** in member **90** are registrable with holes **93** in member **88** when member **88** is nested in member **90.** The holes **93** in member **90** are shown in registration with holes **89** in member **88** in FIG. **6** and a fastener **92** is passed therethrough.

In FIG. **7,** a modified Z-shape configuration as compared with FIG. **6** is shown, the two members being indicated by the reference characters **98** and **100.** However, in contrast to FIG. **6** wherein the holes **89** and **93** are offset by the thickness t of the flanges **97** of the members **88** and **90,** the offset in FIG. **7** between holes **89'** and **93'** is equal to the distance T shown therein which represents the lateral offset between the lines of the intersection of the nested faces, substantially as shown.

In the configuration shown in FIG. **8,** wherein the two members **102** and **104** are of different thickness dimensions T' and t' as shown, the offsets between the centerlines of the inner and outer sets of holes **89''** and **93''** will be equal to one half of the sum of $t' + T'$ as indicated.

In FIG. **10,** it will be seen that, if desired, the structural members may be arranged in lapstrake manner. Specifically, assuming that the left hand of a member, in FIG. **10,** which is identified by numeral **200,** were considered the proximal end and its other end the distal end, each of the structural members **200, 201, 202,** and **203,** would have its distal end overlapping the proximal end of the left adjacent structural member. In other words, the proximal end of structural element **201** would overlap the distal end of structural element **200,** etc. The overlapping would be sufficient, of course, to align the registering holes so that they could receive a fastening member (not shown).

In FIGS. **11** and **12,** the structural element, denoted by numeral **210** includes angularly related leg portions **214** and **216.** A pattern of two holes **224** and **230** is established at spaced intervals along the length of leg portion of flange **216.** The pitch P of each pattern is, of course, different from the longitudinal distance between adjacent holes **224** and **230** within the pattern. In like manner, the holes **274** and **276** are established. These holes **274** and **276,** preferably, but not necessarily, have the same pitch P as the holes **224,** and **230.** The lateral spacing t of centerline **261** from centerline **263** of such holes is, as in the preceding embodiments, equal to the thickness of the leg portion **214.** Also, the lateral distance between centerline **278** and **282** is equal to t, i.e., the thickness of leg member **216.** It will be noted that the pitch P or the longitudinal distance between holes **224, 230, 274,** and **276,** may be varied in any desired manner without departing from the inventive concept.

It is also frequently necessary that the strand-like elements supported in the structural members be attached

thereto by known fasteners and clamps which require fastening holes through the structural members. In order to prevent these fastening holes from being blocked when the structural members are overlapped, these fastening holes must be arranged in a pattern with respect to the sets of holes provided in the structural members used to fasten the structural members together. FIG. **13** shows such an arrangement for an angle member **310** having a leg **314.** Two patterns X and Y of holes are provided in leg **314.** The holes in pattern X are referenced **324***a*, **324***b*, and **324***c*, and the holes in pattern Y are referenced **330***a*, **330***b*, and **330***c*. Holes **330***a* and **324***a* correspond to holes **30** and **24** in member **10** and are arranged along centerlines spaced laterally apart by the distance t which is the thickness of leg **316.** Holes **324***b* and **324***c* are fastening holes and can be arranged with respect to hole **324***a* in any desired manner. The particular arrangement selected, however, must remain the same in each repeated pattern X. Likewise, holes **330***b* and **330***c* have a fixed relationship with each hole **330** *a* in each pattern Y corresponding to the relationship between holes **324***b* and **324***c* and hole **324***a*. Specifically, pattern X is repeated 3 times, then pattern Y repeated 3 times, and then pattern X repeated 3 more times. It will be noted that the number of times patterns X and Y are repeated between alternations or the spacing between each pattern can be varied as desired as long as the relationship in each pattern is unchanged and the lateral spacing *t* between holes **324***a* and **330***a* is unchanged and still have holes **324***a*, **324***b* and **324***c* of one member in registry with holes **330***a*, **330***b*, and **330***c* respectively of the other member to make a support assembly. It is therefore seen, if desired, a group or pattern of holes may replace a single hole depicted in FIGS. **1** – **4** for example.

From the foregoing description and, particularly with reference to FIGS. **1** and **2,** it will be understood that by the provision of the registering holes, such as holes **24** and **42** in FIG. **1,** or holes **30** and **38** in FIG. **2,** a cylindrical bolt, such as bolt **66** provided with a bearing surface of approximately 360° for the shank may be placed through such holes. Furthermore the inner surface of the head of bolt **66** and the inner surface of the nut **68** are provided with 360° of peripheral bearing surface on the structural members **10** and **12** for clamping the structural members **10** and **12** together.

What is claimed is:

1. An assembly of structural members comprising at least a pair of members each having adjacent leg portions disposed in angular relation,

said leg portions of each member presenting intersecting inner faces and one member being nestable within the other member and vice versa whereby the outer face of one leg of said one member is in contiguous relation to the inner face of a leg of the other member,

at least the one leg of said one member and the underlying leg of the other member being provided with a series of longitudinally spaced holes comprised of a first set of holes and an alternate second like set of holes, the holes of the first set in each member being identical in size and shape with those of the second set in the other member, the two sets of holes being spaced along centerlines parallel to said other face of the corresponding member and which centerlines are spaced laterally by an amount such that the first set of holes of said one member are registrable with and superposed with respect to the second set of holes of said other member when said one member is nested within said other member and the second set of holes of said one member is registrable with and superposed with respect to the first set of holes of said other member when said other member is nested within said one member.

2. A preformed member for use in the construction of structural framework comprising: a predetermined shaped structural member, said member having first and second portions angularly oriented relative to each other, each of said portions including inner and outer surfaces with the planes of said inner surfaces intersecting at a first line and with the planes of said outer surfaces intersecting at a second line, there being provided at least two openings defined in at least one of said portions, and one of said openings being located a predetermined distance measured from one of said intersection lines and said other opening being located a distance from said other intersection line equal to said predetermined distance, whereby said preformed member can be operatively connected in longitudinally aligned relationship to a similar preformed member by overlapping said surface portions in nested relationship and to an extent to selectively align said one opening of said preformed member with said other opening of said similar member when said similar member is nested within said preformed member and to align said other opening of said preformed member with said one opening of said similar member when said preformed member is nested in said similar member, each of said angularly oriented portions being provided with at least two openings with each of said openings being detailed in location a measured distance from said intersecting lines respectively; said two openings in each of said angularly oriented portions being longitudinally spaced along said angular portions with said openings in each of said angular portions being in transverse aligned relationship, and said transversely aligned opening being equally spaced relative to said intersecting lines.

3. A preformed structural member as defined in claim **2** wherein said transversely aligned opening of one angular portion is located a predetermined measured distance from one of said intersection lines and wherein said other transversely aligned opening is located an equal measured distance from said other intersecting line.

4. A preformed member for use in the construction of structural framework comprising: a predetermined shaped structural member, said member having first and second portions angularly oriented relative to each other, each of said portions including inner and outer surfaces with the planes of said inner surfaces intersecting at a first line and with the planes of said outer surfaces intersecting at a second line, there being provided at least two openings defined in at least one of said portions, and wherein one of said openings is located a predetermined distance measured from one of said intersection lines and said other opening is located a distance from said other intersection line equal to said predetermined distance, whereby said preformed member can be operatively connected in longitudinally aligned relationship to a similar preformed member by overlapping said surface portions in nested relationship to an extent to selectively align said one opening of said

preformed member with said other opening of said similar member when said similar member is nested within said preformed member and to align said other opening of said preformed member with said one opening of said similar member when said preformed member is nested in said similar member, said angularly oriented member being provided with at least two patterns of longitudinally spaced openings, each pattern of longitudinally spaced openings including a series of openings with the openings of each pattern detailed in a measured location from said intersecting lines and said series of openings in said second pattern being transversely spaced relative to the openings of said first pattern.

5. A preformed member for use in the construction of structural framework comprising: a predetermined shaped structural member said member having first and second portions angularly oriented relative to each other, each of said portions including inner and outer surfaces with the planes of said inner surfaces intersecting at a first line and with the planes of said outer surfaces intersecting at a second line there being provided at least two longitudinally spaced openings defined in at least one of said portions, each of said openings having a central axis and being symmetrical in shape with respect to said axis, one of said openings being located a predetermined distance from one of said intersection lines and the other said openings being located a distance from said other intersection line equal to said predetermined distance, whereby said preformed member can be operatively connected in longitudinally aligned relationship to a similar preformed member by overlapping said surface portions in nested relationship to an extent to selectively align said one opening of said preformed member with said other opening of said similar member when said similar member is nested within said preformed member and to align said other opening of said preformed member with said one opening of said similar member when said preformed member is nested in said similar member.

6. A preformed member as in claim **5** wherein said openings are circular in shape.

7. In a preformed member as described in claim **5** further characterized in that each of said angular oriented portions is provided with at least two openings, with each of said openings being detailed in location a measured distance from said intersecting lines, respectively.

8. In a preformed member as described in claim **5** further characterized in that at least one of said angular oriented portions is provided with at least two patterns of openings, with each pattern of said opening including a series of longitudinally spaced openings, with each opening of said pattern detailed in location said measured distance from one of said intersecting lines and wherein said series of openings of said second pattern is longitudinally spaced relative to said first pattern along said angular oriented portion and with each opening of said second pattern detailed in a measured distance from said intersecting line, corresponding to the measured distances of said first pattern.

9. An improved structural framework comprising:

a. a series of preformed structural members, each of said members having first and second portions angularly oriented relative to each other, each of said portions including inner and outer surfaces with the planes of said inner surfaces intersecting at a first line and with the planes of said outer surfaces intersecting at a second line, there being provided at least two longitudinally spaced openings defined in one of said portions, each of said openings having a central axis and being symmetrical with respect to said axis, one of said openings being located a predetermined distance from one of said intersection lines and the other opening being located a distance from said other intersection line equal to said predetermined distance, and

b. means connecting said series of preformed structural members in nested and longitudinally aligned relationship said preformed members being selectively connectable with the inner surface of a first preformed member nested in juxtaposition with the outer surface of a second preformed member and with the outer surface of said second preformed member nested in juxtaposition with the inner surface of a third preformed member, and wherein said connecting means extends through aligned openings in said nested preformed members.

10. A structural framework as in claim **9** wherein said openings are circular in shape.

* * * * *