

[54] EXTRUDED SECTION AND STRUCTURES INCORPORATING SUCH SECTION

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[22] Filed: **July 3, 1972**

[21] Appl. No.: **268,923**

Related U.S. Application Data

[63] Continuation-in-part of Ser. No. 192,425, Oct. 26,
1971, abandoned.

[30] Foreign Application Priority Data

Feb. 7, 1972 Canada 134047

[52] U.S. Cl. **52/735, 52/738, 403/231**

[51] Int. Cl. **E04c 3/07, E04b 1/343**

[58] Field of Search **52/730-732,
52/393, 396, 665, 737-739, 735, 235;
49/DIG. 1; 403/230, 231, 242, 263**

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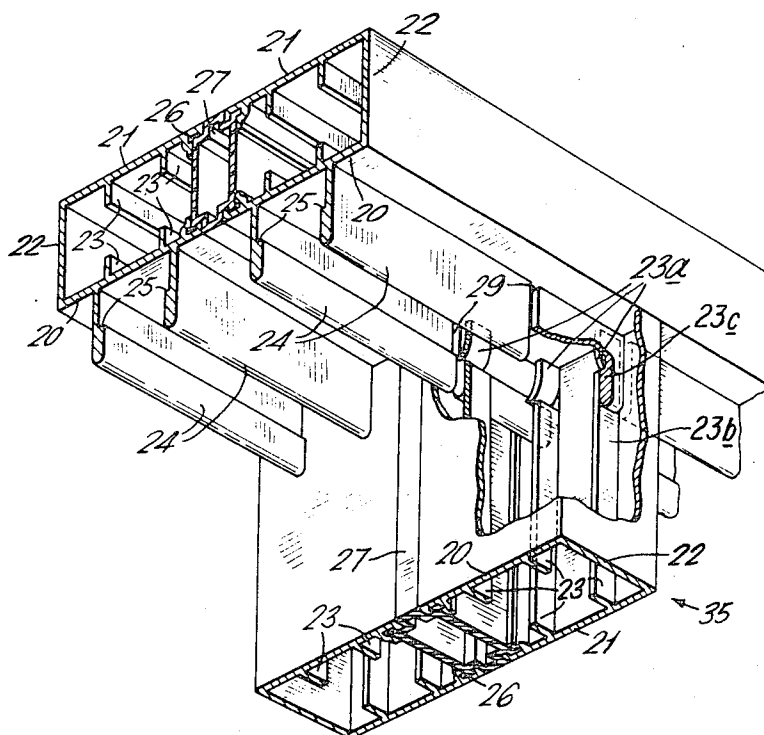
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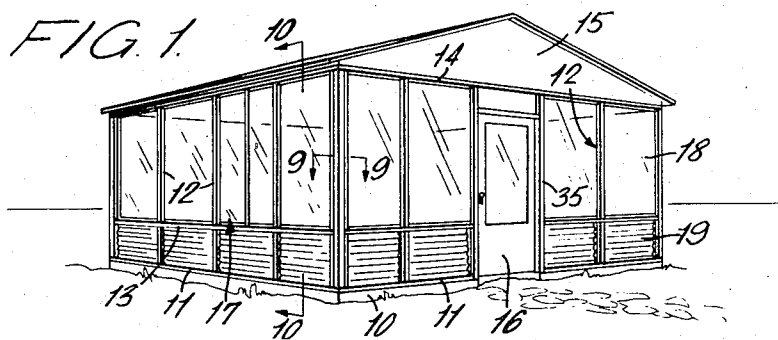
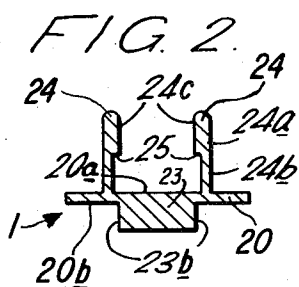
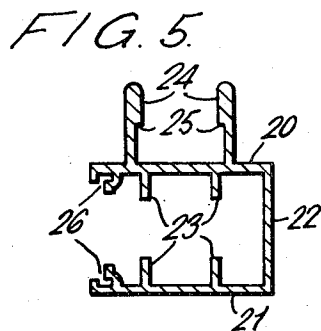
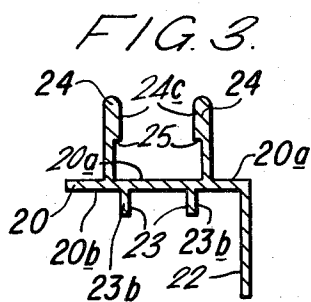
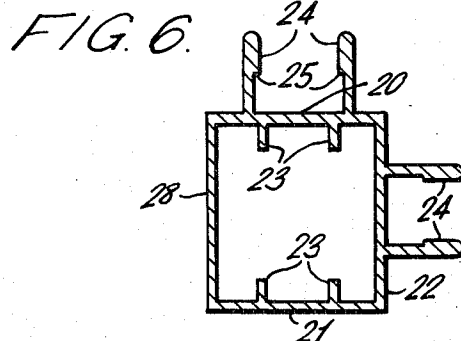
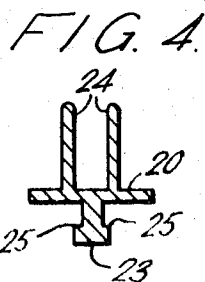
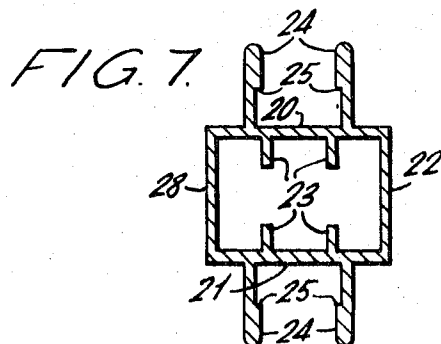
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[57] ABSTRACT

An extruded structural member having a first pair of spaced apart flanges projecting from a face of the member and a second pair of spaced apart flanges projecting from another face of the member. The flanges are dimensioned such that one of the pairs will fit slidably between the other of the pairs on another member of similar configuration when connecting two such members together. Each flange of one of the pairs of flanges has a longitudinally extending ledge thereon, the ledges facing towards the member, and each flange of the other pair of flanges has a tab struck out therefrom and adjacent one end of the member providing an edge extending at an angle with respect to the ledges. In assembling two such members at an angle, the edges on one of the members engage with the ledges on another to hold the two members together in a predetermined angular relationship.

11 Claims, 12 Drawing Figures





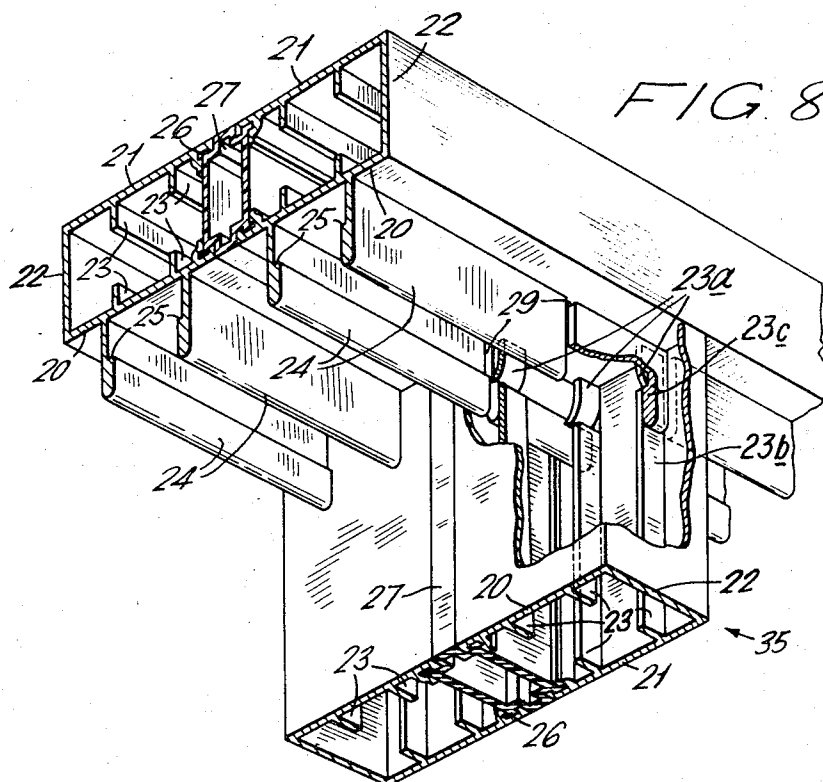
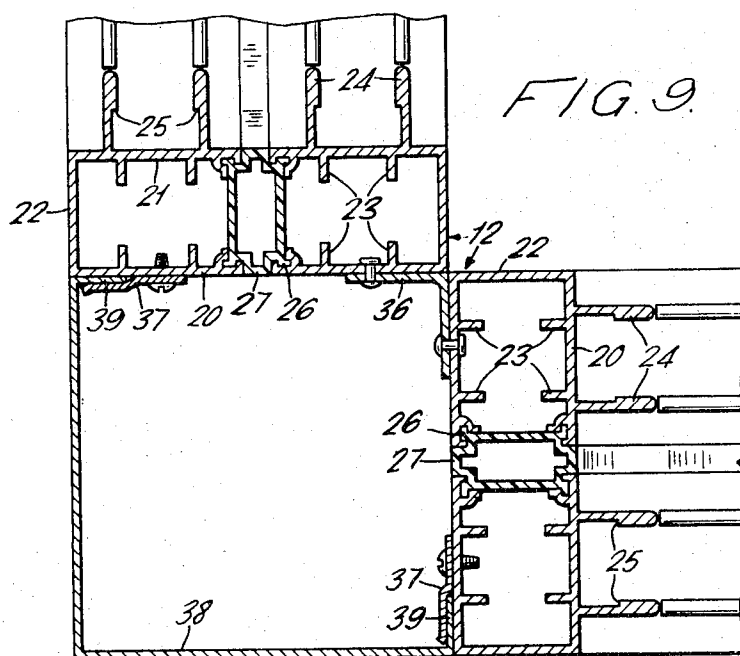


FIG. 10.

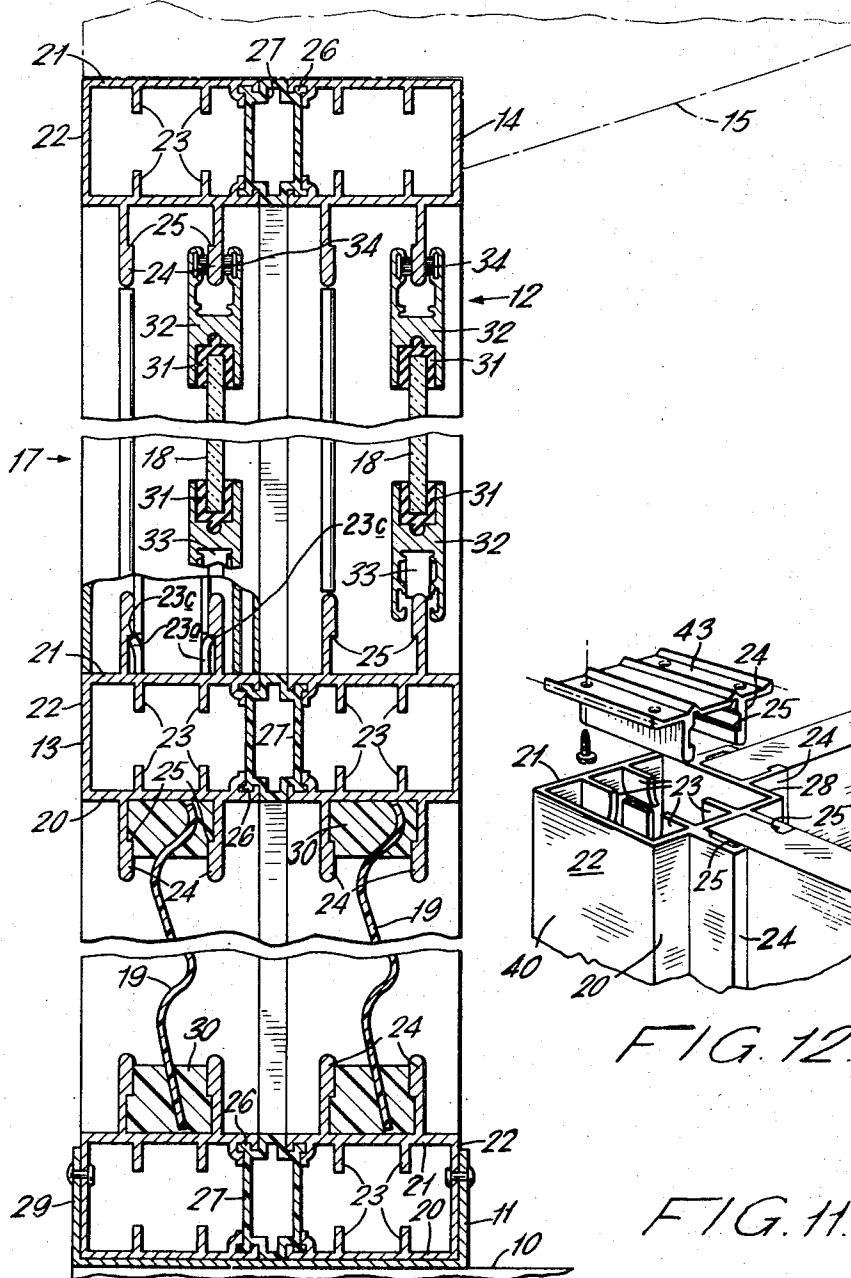
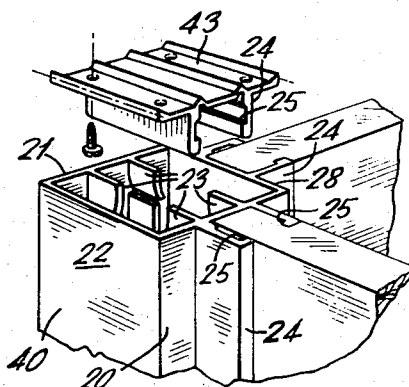
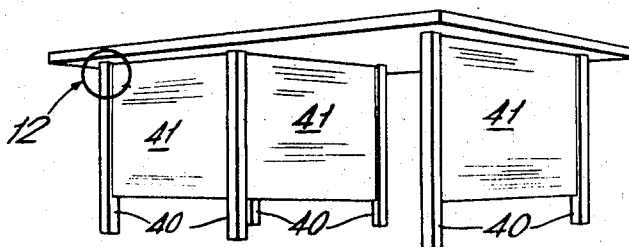


FIG. 12.

FIG. 11.



EXTRUDED SECTION AND STRUCTURES INCORPORATING SUCH SECTION

This application is a continuation-in-part of U.S. Pat. application S. N. 192,425 filed Oct. 26, 1971, now abandoned.

The present invention relates to extruded sections and structures incorporating extruded sections.

BACKGROUND OF THE INVENTION

The use of extruded metal sections is now common, and well known in many fields in view of the strength, rigidity and weight properties of the same. It has been a constant endeavour in this particular field to provide such sections that are sufficiently versatile to form various structures therefrom easily and quickly, with the minimum of labour. It is accordingly highly desirable to provide an extruded section requiring minimum additional parts to join together securely two or more such sections.

It has previously been known to fasten together extruded sections by means of a connecting part mounted on one or both of the parts to be joined. Such an arrangement, however, necessitates a variety of different connecting parts of different configurations for interconnecting extruded members in various different angular relationships.

It has also been known to provide extruded sections with mating parts which fit together. One difficulty, however, is that the parts to be joined must have different extruded cross-sections.

There has therefore been need for an extruded structural member which will connect rigidly with another structural member of the same cross-section without the use of separate connecting elements.

SUMMARY OF THE INVENTION

It is an object of the present invention to provide an extruded structural member with a novel cross-section.

It is another object of the present invention to provide an extruded structural member with a cross-sectional configuration whereby two members having the same cross-section can readily be interconnected with one another.

It is yet another object of the present invention to provide structures comprising a plurality of extruded structural members, which members all have the same cross-section and fit together with no need for interconnecting parts.

In accordance with one aspect of the present invention, there is provided a structural member constructed for connecting two such members in a predetermined configuration such as a selected angle, and preferably a right angle, to one another, said member comprising:

- a. a pair of first flanges spaced apart from one another and projecting outwardly from one face of said member and extending longitudinally therealong, each of said first flanges having a longitudinally extending first flange face directed towards the other of said flanges;
- b. at least one second flange projecting from another face of said member and extending longitudinally along said member, said at least one second flange having a pair of longitudinally extending second flange faces directed away from one another, the

first flange faces and the second flange faces having respective spacings whereby said second flange fits between the pair of first flanges of another similar structural member in assembling two such structural members; and

- c. first and second cooperating coupling portions located respectively on said first and second flanges, one of said coupling portions comprising two longitudinally extending ledges facing said member at a predetermined distance therefrom, and the other of said coupling portions comprising two edges disposed at a predetermined distance from an end of said structural member and facing away therefrom, said respective first and second coupling portions being directed in opposite directions transverse to the respective first and second flanges for locking interengagement in an assembled position of two such members in said predetermined configuration.

In accordance with another aspect of the present invention, there is provided an extruded structural member comprising:

- a. a longitudinally extending first web;
- b. a first flange means including a pair of first flanges spaced apart from one another and projecting outwardly from one face of said first web and extending longitudinally therealong, each of said first flanges having a longitudinally extending first flange face directed towards the other of said flanges, each of said first flange faces providing a ledge defined by a discontinuity in said first flange face, said ledges facing said first web;
- c. a second flange means including at least one second flange projecting from an opposite face of said web in a direction opposite to that of said first flanges and extending longitudinally along said web, said second flange means providing a pair of longitudinally extending second flange faces directed away from one another, the first flange faces and the second flange faces having respective spacings whereby said second flange means fits between the pair of first flanges of the first flange means of another similar structural member in the assembly of two such structural members; and
- d. a longitudinally extending second web connected to said first web and extending angularly away therefrom.

DESCRIPTION OF THE DRAWINGS

The invention is illustrated by way of example in the accompanying drawings in which:

FIG. 1 is a general perspective view of a complete building structure such as a swimming pool enclosure constructed using extruded structural members in accordance with the present invention;

FIGS. 2-7 are cross-sections of extruded structural members in accordance with the present invention;

FIG. 8 is a perspective view showing the interconnection of two structural elements, each of which is constructed of two extruded structural members in accordance with the present invention;

FIG. 9 is a cross-sectional view on the line 9-9 of FIG. 1;

FIG. 10 is a cross-section along the line 10-10 of FIG. 1;

FIG. 11 is a perspective view of a desk constructed of structural members in accordance with the present invention; and

FIG. 12 is an exploded detail of a corner of the desk shown in FIG. 11.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring to the drawings, there is illustrated in FIG. 1, a structure which can be manufactured simply and economically with a minimum of labour using extruded members in accordance with the present invention and, in this instance, comprises a glazed enclosure for a swimming pool, hot house, cabin or the like. The structure is erected upon a foundation 10 and two which is fastened base members 11, upon which are erected vertical stud members 12 at selected spaced intervals. The stud members are interconnected by sill members 13, and at the top by a plate 14 on which rests a roof structure 15. The structural members of the present invention may be used as the roof rafters if desired. A door 16 and a sliding window 17 are provided. The spaces between the sill members 13 and plate members 14 are glazed with glass panes 18 while the portions between the sill members 13 and the base members 11 are filled with translucent or other wall panels 19.

Referring to FIG. 2, shown therein is a structural member 1 comprising a longitudinally extending web 20 with a first pair of spaced apart flanges 24 projecting from one face 20a of the web 20, at right angles thereto, and a second flange 23 projecting from the opposite face 20b of web 20. Each of flanges 24 has two portions 24a and 24b, with portion 24b extending between web 20 and portion 24a and being of less thickness than portion 24a. At the junction of its portions 24a and 24b, each of the flanges 24 has a ledge 25 facing towards the web 20. As can be seen from the drawings, each of the two parallel outer mating faces 23b of flange 23 lies in substantially the same plane as a respective one of the inner mating faces 24c of the thicker portions 24a of flanges 24. This provides a close sliding fit of flange 23 between the flanges 24 of another, similar structural member in assembling together two such members.

In the embodiment illustrated in FIG. 3, the flange 23 is replaced with two flanges 23 spaced apart from one another so as to be a close fit between flanges 24. There is included a second web 22 connected to an edge of web 20 and projecting perpendicularly away from web 20 to provide a facing for the structural member.

In the embodiment of FIG. 4, the opposite faces of flange 23 are cut away adjacent web 20 to provide two ledges 25 on flange 23 and flanges 24 are of uniform thickness throughout their extent.

The embodiment shown in FIG. 5 includes the structure described with reference to FIG. 3 and further includes a web 21 extending parallel to web 20 and spaced therefrom. Web 22 extends between and, is connected to, respective edges of webs 20 and 21. A pair of spaced apart flanges 23 are provided on web 21 and the flanges 23 of webs 20 and 21 respectively extend in a direction towards one another with each flange 23 on web 20 coplanar with a flange 23 on web 21. Additionally, each of webs 20 and 21 is provided, adjacent its free longitudinal edge, i.e., that edge remote from web 22, with a track structure 26.

Each track structure comprises two spaced apart flanges 26a and 26b, projecting from the respective one of webs 20 and 21 in a direction towards the other of webs 20 and 21. Flange 26a is of substantially flat configuration and flange 26b has two offset portions, so as to define a substantially L-shaped longitudinally extending track therebetween.

The embodiment illustrated in FIG. 6 is similar to the embodiment described with reference to FIG. 5 but with tracks 26 replaced by a web 28 extending between webs 20 and 21, thus defining a hollow member of rectangular cross-section. As will be seen from FIG. 6, the flanges 23 on webs 20 and 21 extend inwardly of the hollow member and flanges 24 on web 20 extend outwardly thereof. There is additionally provided a second pair of flanges 24 extending outwardly from web 22, substantially perpendicular to the flanges 24 of web 20.

The embodiment shown in FIG. 7 is similar to that shown in FIG. 6 with the second pair of flanges 24 being provided on web 21 rather than web 22.

Referring to FIG. 8 there is shown two parallel structural members of the type shown in FIG. 5. The two members have their open sides facing towards one another and are interconnected by an extruded thermally insulating member 27 which may be made of rubber or suitable plastic. The member 27 has two longitudinally extending spaced webs 27a, each having portions of L-shaped cross-sectional configuration at its respective opposite edges. The L-shaped portions are each dimensioned to slide within the L-shaped track 26. The two webs 27a are interconnected by two webs 27b, each of which has an offset portion centrally thereof, the offset is dimensioned such that the central portions of the webs 27b lie coplanar with respective ones of the webs 20 and 21 when webs 27a are engaged in tracks 26. In assembly, two members as shown, member 27 is slid into the tracks 26 of the two members, and thereby joins the same in side-by-side parallel relation. The connector member 27, being of thermally insulating material, provides a barrier reducing the transmission of heat from one member to another in installations, for example, building walls, where the two members are exposed respectively to the outside atmosphere and a heated inside atmosphere inside the building. Alternatively, a non-thermally insulated structure of similar configuration can be provided by having a structure wherein the members are permanently connected, eliminating the connector 27 and tracks 26.

Also in FIG. 8 an assembly of two members designated generally by the letter A and a further assembly of two members designated generally by the letter B are shown connected at right angles to one another.

To prepare the members for interconnection at right angles to one another requires basically three operations, namely:

- forming slots in flanges 24 of one member;
- removing portions of flanges 24 in the other member to be connected thereto; and
- striking out tabs from flanges 23 in the abovementioned other member.

The members in assembly A each have two slots 29 cut in each of their flanges 24, each of the slots 29 having a width slightly greater than the thickness of one of the webs 20 and 21, the two slots 29 in each flange 24 being spaced along the respective flange 24 a distance substantially the same as the distance between the webs

20 and 21 of member B. Each slot 29 in one of flanges 24 extends coplanar with a corresponding slot 29 in the other of flanges 24. With this arrangement, the webs 20 and 21 of a member in assembly B can fit within two corresponding slots 29, one in each of the flanges 24 of a member in assembly A.

Each member of assembly B is prepared for connection to a respective one of the members of assembly A by removing portions of flanges 24 at the end adjacent the end of assembly B to be joined to assembly A and a tab 23a is formed in each of its flanges 23. Each tab 23a is struck out of and extends outwardly from the plane of its respective flange 23 and provides an edge 23c spaced from the end of assembly B a distance equal to the spacing of ledges 25 from the webs 20 of the members of assembly A. To interconnect the assemblies A and B each of the webs 20 and 21 of each member of assembly B is inserted into a respective pair of corresponding slots 29 in the flanges 24 of a respective one of the members of assembly A, with flanges 23 of each member of assembly B fitting between flanges 24 of a respective one of the members of assembly A. The members are then pushed together. Engagement of tabs 23a with flanges 24 displaces the tabs into the planes of flanges 23 until complete engagement is achieved, whereupon tabs 23a resume their normal positions wherein their edges engage with ledges 25 of flanges 24 to lock the two members A and B in assembled relation. The tabs 23a and ledges 25 therefore define respective coupling means on the respective flanges 23 and 24.

It will be apparent that the coupling means do not necessarily have to be as shown in FIG. 8. The function of the coupling means could equally well be provided by other forms of deformation or projection in flanges 23 and 24. In one embodiment, tabs 23a are replaced by a plurality of serrations on the outer faces of flanges 23. In this case it is also preferred to replace ledges 25 with a plurality of longitudinally extending serrations engageable by the serrations on flanges 23. With an arrangement of this nature, an assembled structure may be readily dismantled by merely pulling the parts away from one another.

The members will usually be formed of relatively soft extruded material, such as aluminum or a suitable plastic, and in many applications it will be possible to cut and deform the flanges 23 to provide tabs 23a at the construction site just prior to assembly, a tool (not shown) being provided for this purpose which is manually operable to exert sufficient cutting force to displace the tabs 23a out of the planes of flanges 23. Although FIG. 8 illustrates the structural members as disposed at right angles to one another, it will also be apparent that they can be disposed at any other angle transverse to one another, the mating faces being cut at the appropriate angles, as will the slots 29 in flanges 24 of one of the members into which the other member fits.

Particular reference is now made to FIGS. 1, 9 and 10 to show the manner in which the structural member can be employed. It will be seen from FIG. 10 that the base member 11 comprises two members in accordance with FIG. 5 connected together by thermally insulating member 27 and fitted into a channel 29, which channel is in turn fastened directly to the foundation 10. The sill members 13 and the stud members 12 each comprise the cross-section described with reference to

FIG. 7 and have two pairs of flanges 23 and two pairs of flanges 24 extending from the respective webs 20 and 21 thereof. Each of wall panels 19 has its edges embedded in a respective strip of compressible material 30, these strips being pressed into the spaces between respective pairs of flanges 24, where they are retained by retaining edges 25.

It will be seen from the upper part of FIG. 10 that flanges 24 can also serve as tracks for the mounting thereon of sliding windows constituted by a glass sheet or sheets 18. Each sheet has its edges embedded in strips of resilient material 31, which are in turn engaged in corresponding recesses in a member 32 of special particular section. The member 32 engaged on the lower edge of the glass sheet 18 is provided with suitable bearing members 33 on the top edge of a flange 24 with low sliding friction between them, while the member engaged on the upper edge of the glass is provided with strips of bearing sealing material 34 which engage the side walls of the corresponding flange 24. The structure shown in FIG. 10 is effectively a four track window unit wherein each flange 24 could be provided with a sliding window and/or screen combination. The vertical edges of the window pane 18 are preferably provided with members similar to member 32 on the top edge of the pane for engagement with the respective flanges 24 of studs 12.

In a further embodiment, glass panes can be mounted in a similar manner to the mounting of panels 19, with bearing members replacing the compressible material 30 if so desired. To facilitate installation in such instances one flange 24 on one member may have a greater dimension than the other, as measured from the web.

For use as a thermally insulated fixed pane window, one of the flanges 24 of each of the members may be provided with an additional ledge 25 extending oppositely to those shown in FIG. 10 and towards the other member whereby a strip of material such as strip 30 may be held under the additional ledges 25 and over the thermally insulating element 27 so that a thermal pane may be installed coplanar with the thermally insulating element 27.

It will be understood that for special uses the flanges 24 of a member may be omitted, the member therefore having a completely smooth exterior side, and being particularly suited for use, for example, as a door frame in which a door unit 16 (see FIG. 1) is mounted.

FIG. 9 shows one way in which a corner junction may be formed, wherein two adjacent studs 12 of the same crosssection as the floor and top plate members are joined at their abutting corners by means of a vertical angle member 36. Other vertical recess holding members 37 are fastened to the flat faces of the vertical studs and provided with respective vertical slots in which generally L-shaped corner member 38 has returned edge portions 39 engaged and retained. It will be seen therefore that the assembly of such corners is a very quick and simple operation.

FIGS. 11 and 12 show the application of a structural member in accordance with the present invention to the construction of a desk, wherein six vertical members 40 are used with interconnecting panels 41. A desk top 42 is fastened across the top of all the vertical members by means of top plates 43 provided with flanges 24 that cooperate with flanges 23 of the vertical members. Each wall panel is push-fit into the space be-

tween the flanges 24 and can be pre-cut to slide vertically therein so as to be retained therein by the ledges 25. The tabs 23a are preformed to retain the top plate 43 when it is inserted therein.

The corner member 40 illustrated in FIG. 12 has general purpose application and it will be seen that the cross-section of this corner member 40 is that described with respect to FIG. 6.

Although in most of the embodiments illustrated flanges 23 are disposed internally of the structural members with flanges 24 disposed externally thereof, other embodiments are envisaged which reverse this arrangement.

I claim:

1. An extruded structural member including an elongated structural element with two longitudinally extending side faces directed away from one another, a pair of spaced apart longitudinally extending first flanges integral with said element and projecting from one of the side faces thereof and a pair of spaced apart longitudinally extending second flanges integral with said element and projecting from the other side face thereof, with said first flanges having inner mating faces spaced apart a first predetermined distance and said second flanges having outer mating faces spaced apart by said first predetermined distance such that the second flanges of one such member will fit slidably between the first flanges of another such member and with each flange of one of said pairs of flanges having a ledge in its mating face, the ledges extending the length of the flange facing towards the adjacent side face of the member and spaced therefrom a second predetermined distance throughout the length of the flange, each flange of the other pair of flanges having a resilient projection integral therewith, projecting from its mating face, each such projection having a free edge spaced from an end of the structural element by said second predetermined distance, facing away from said end and extending across the associated mating faces in a direction transversely to said side faces of said structural element so that in assembling two such structural members with said end of one abutting against said one side face of the other, the edges of the resilient projections of the one will engage under the ledges of the other to hold the two members together at a predetermined angular relationship.

2. The structural member of claim 1 wherein said ledges are formed in said inner mating faces of said first flanges, and said projections project from the outer mating faces of the second flanges.

3. The structural member of claim 2 wherein said structural element is of hollow rectangular cross-section and includes a first web having said two side faces and a diametrically opposed second web, said first flanges projecting from the outwardly directed one of said side faces of said first web and the second flanges projecting from the inwardly directed one of said side faces of said first web, said member further including a pair of spaced apart longitudinally extending third flanges integral with said structural element projecting inwardly from said second web, each said third flange being aligned with a respective one of said second flanges and a resilient projection integral therewith, projecting from a mating face thereof, the projections having free edges spaced from said end of the structural element by said second predetermined distance, facing away from said end and extending across

the associated mating faces in a direction transversely to said side faces of said structural element, said member also including a pair of spaced apart longitudinally extending fourth flanges projecting outwardly from said second web, said fourth flanges having the same configuration as and being aligned with said first flanges.

4. The structural member of claim 2 wherein said structural element is of hollow rectangular cross-section and includes a first web having said two side faces, a diametrically opposed second web and a third web connecting said first and second webs, the first flanges projecting from the outwardly directed one of said side faces of said first web and the second flanges projecting from the inwardly facing one of said side faces of said first web, said member further including a pair of spaced apart longitudinally extending third flanges projecting inwardly from said second web, each said third flange being aligned with a respective one of said second flanges and a resilient projection integral therewith and projecting from an outer mating face thereof, the projections having free edges spaced from said end of the structural element by said second predetermined distance, facing away from said end and extending across the associated mating faces in a direction transversely to said side faces of said structural element, said member also including a pair of spaced apart longitudinally extending fourth flanges projecting outwardly from said third web and being substantially the same as said first flanges.

5. The structural member of claim 2 wherein said structural element is substantially L-shaped in cross-section including a first web having said two side faces and a second web integral with said first web and extending angularly away therefrom.

6. The structural member of claim 2 wherein said projections comprise deformed portions of said second flanges.

7. The structural member of claim 6 wherein said deformed portions are resiliently displaceable tabs.

8. The structural member of claim 2 wherein said structural element is substantially U-shaped in cross-section and wherein one leg of said U is a first web having said two opposed side faces, the second flanges projecting inwardly of the U from said first web and the first flanges projecting outwardly of the U from the first web, the other leg of said U comprising a second web having integral therewith a pair of spaced apart longitudinally extending third flanges projecting inwardly of said U from said second web, each said third flange being aligned with a respective one of the second flanges and having a resilient projection integral therewith, projecting from an outer mating face thereof, the projections having free edges spaced from said end of the structural element by said second predetermined distance, facing away from said end and extending across the associated mating faces in a direction transversely to said side faces of said structural element.

9. The structural member of claim 8 including a pair of spaced apart longitudinally extending fourth flanges integral with said structural element and projecting outwardly of said U from said second web, said fourth flanges having the same configuration as and being aligned with said first flanges.

10. The structural member of claim 8 wherein the free ends of the legs of said U are each provided with a substantially L-shaped longitudinally extending track structure.

11. The structural member of claim 9 wherein the free ends of the legs of said U are each provided with a substantially L-shaped longitudinally extending track structure.