

July 12, 1960

G. D. PETERSON
WALL CONSTRUCTION

2,944,641

Filed Dec. 6, 1954

5 Sheets-Sheet 1

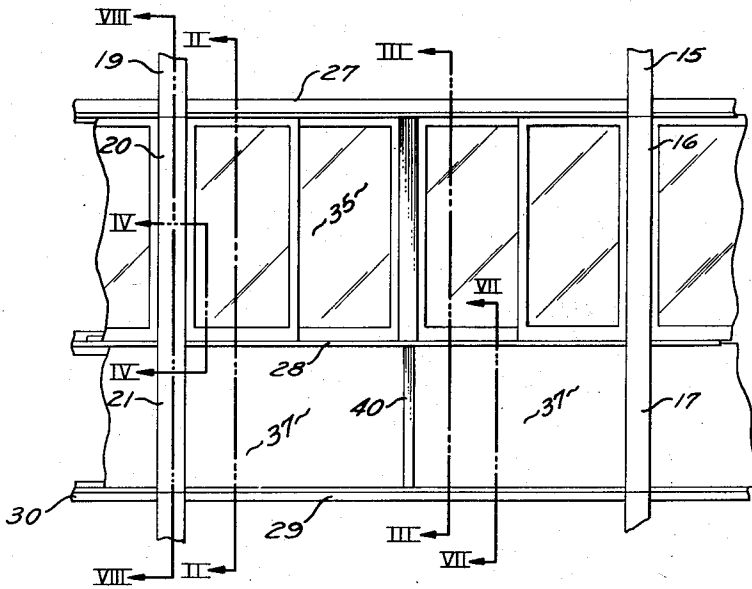


fig. 1

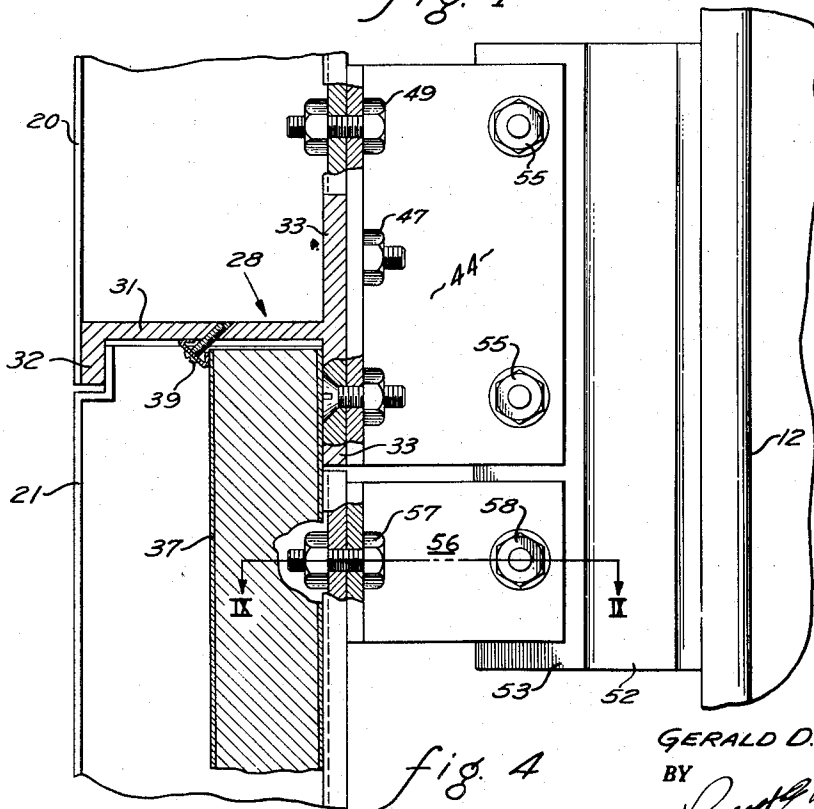


fig. 4

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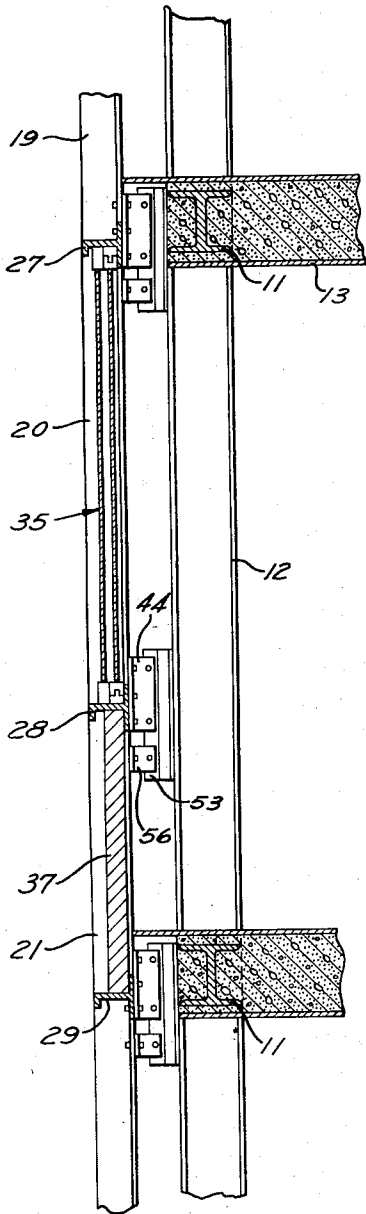


fig. 2

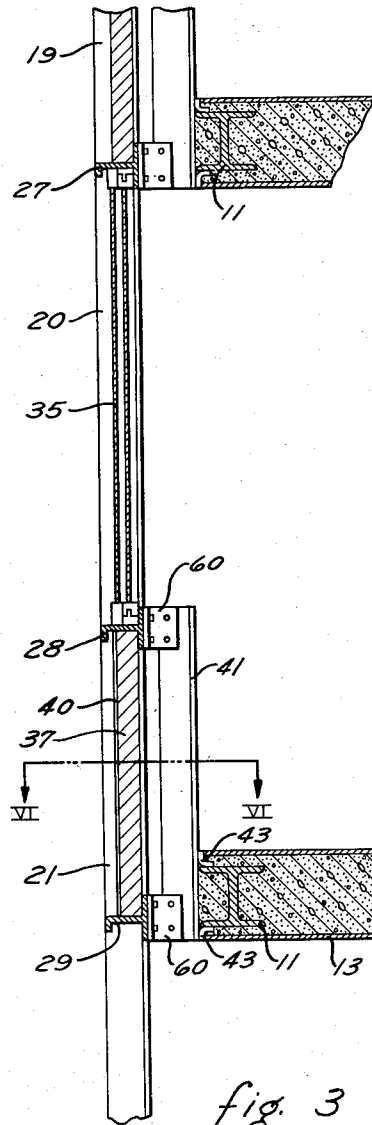


fig. 3

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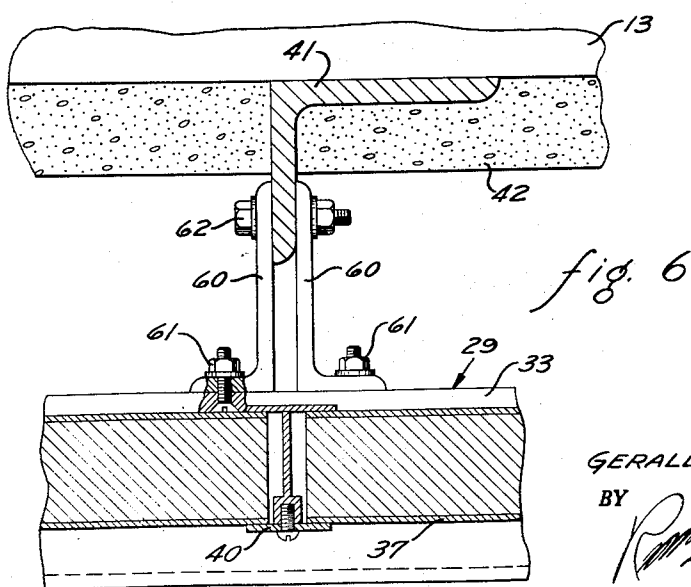
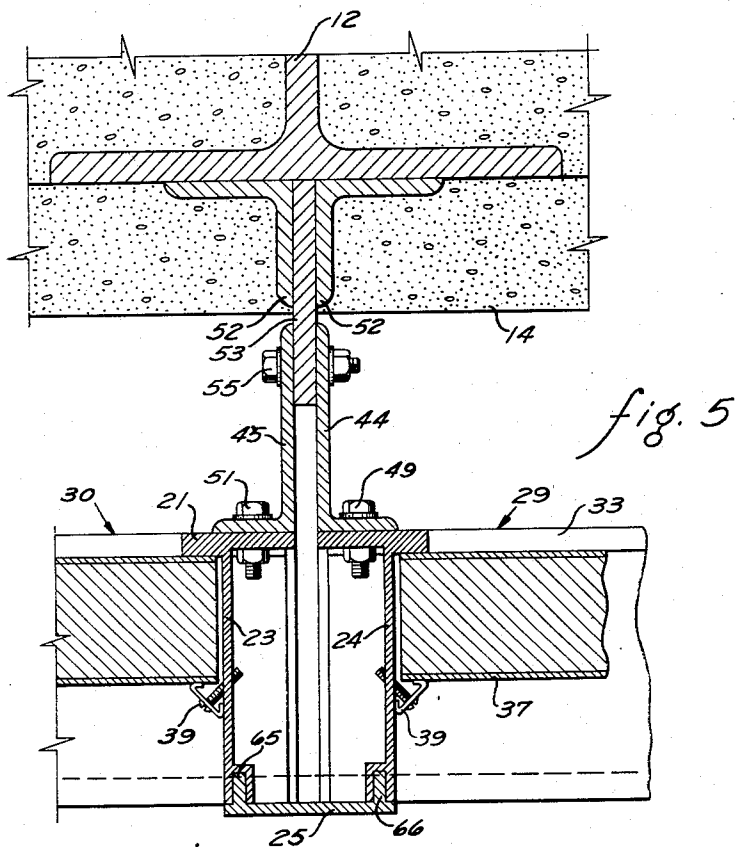
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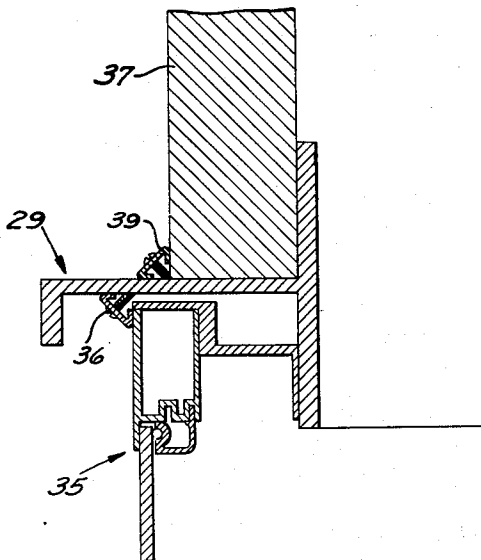
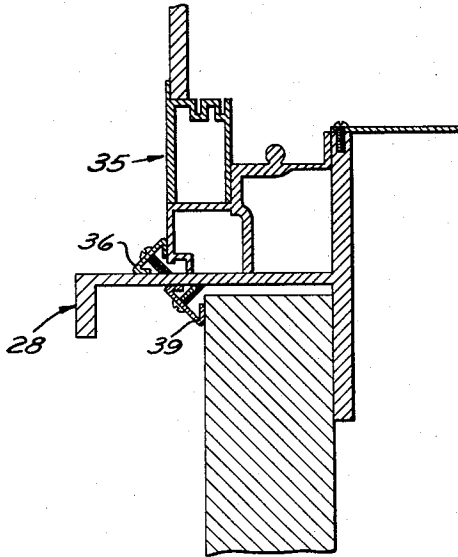


fig. 7

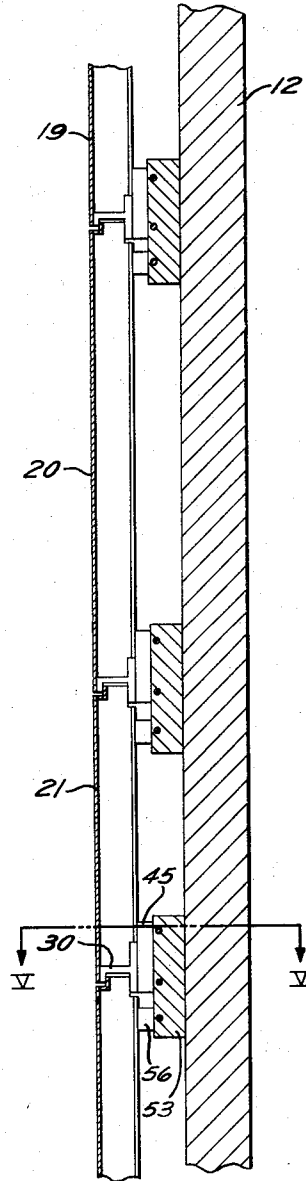
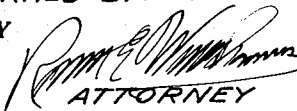


fig. 8

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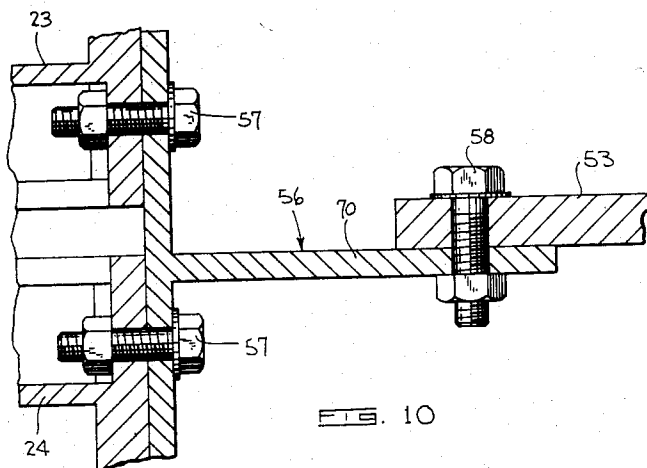
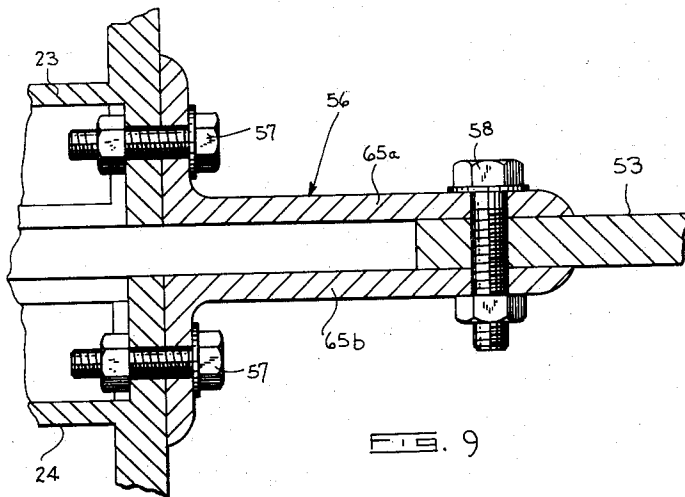
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2,944,641

WALL CONSTRUCTION

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2 Claims. (Cl. 189—34)

This invention relates to building construction and more particularly is directed to an improved device for attaching a facing, or curtain, wall to the structural steel framework of a building.

A known method of constructing buildings is to erect a steel framework and then attach a facing wall or curtain wall thereto. The facing wall hangs in the fashion of a continuous curtain in front of, and from, the structural steel framework. In this type of construction, it is often desirable to use aluminum members as part of the facing wall because of their superior strength, pleasing appearance and ease of maintenance. However, in this type of construction the difference in coefficients of expansion of the steel framework and of the aluminum members makes use of the aluminum members as part of the facing wall difficult because of the problem of providing for the expansion and contraction of the aluminum members. It is likewise a problem to erect such walls cheaply because as heretofore constructed facing walls required a great amount of skilled labor in the attaching thereof.

Accordingly, it is an object of this invention to provide a device for securely attaching a curtain wall to a steel framework.

It is a further object of this invention to provide means for attaching a facing wall to a structural framework which does not require the use of skilled labor.

It is a further object of this invention to provide a device for attaching a facing wall to a framework which permits expansion and contraction of the members of the facing wall with respect to the framework.

Other objects and advantages of this invention will be apparent from a reading of the accompanying specification and an inspection of the drawings.

In the drawings:

Figure 1 is a front view of a facing wall employing the construction of the present invention.

Figure 2 is a cross-section along line II—II of Figure 1 with the concrete surrounding the vertical girder not shown.

Figure 3 is a cross-section along line III—III of Figure 1 with the concrete surrounding the secondary vertical members not shown.

Figure 4 is a cross-section along line IV—IV of Figure 1 with parts partially broken away.

Figure 5 is a cross-section along line V—V of Figure 8.

Figure 6 is a cross-section along line VI—VI of Figure 3 with parts thereof partially broken away.

Figure 7 is a cross-section along line VII—VII of Figure 1 partially broken away.

Figure 8 is a cross-section along line VIII—VIII of Figure 1 with the concrete surrounding the vertical girder not shown.

Figure 9 is a sectional view taken along the line IX—IX of Figure 4.

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Figure 10 is a sectional view similar to Figure 9 showing a modification.

General description

In meeting the objects and purposes set forth above there is provided generally a curtain wall having horizontal and vertical members. In order to accommodate the expansion or contraction of the vertical members with respect to the framework of the building, the top end of each of the vertical members is attached to the framework through a substantially horizontal link which in turn is capable of slight pivotal movement with respect to the member of the framework to which it is attached. Relative expansion or contraction will cause slight pivotal movement of said link and thereby permit vertical movement of the vertical member with respect to the framework. The horizontal member is attached to the framework by means of a bracket which is capable of flexing in a horizontal direction. Expansion or contraction of the horizontal member with respect to the framework causes flexing of the bracket. The bracket is of sufficient flexibility and the link is capable of sufficient pivotal movement that any expansion or contraction of the horizontal or vertical members may be accommodated without injuring the connections between these members and the building framework. The connections between the horizontal and vertical members and the framework are simple so that unskilled labor may be used to effectuate their assembly.

Detailed description

In accordance with the invention, horizontal and vertical girders, 11 and 12, respectively (Figure 2 and others), are connected together by any suitable means to form the framework of the building. Horizontal girders 11 are adapted to support floor structures 13. The vertical girder is encased with concrete, as at 14 (Figure 5) for protection of the girder. A curtain wall is attached to the framework to form the external wall of the building and includes a plurality of vertical members 15, 16, 17, 19, 20, 21 and 22 (Figure 1). As shown in Figure 5, with respect to vertical member 21, each vertical member is formed of three parts 23, 24, and 25. Parts 23 and 24 are mirror images of each other and include a central web, flanges at one end of the web extending at right angles thereto in either direction from the web, the other end of the web being formed with an outwardly facing groove 65. Part 25 is provided to join parts 23 and 24 together and has projecting flanges 66 thereon to fit within the grooves 65 of the webs. The reason for this particular structure will be discussed hereinafter.

The curtain wall also includes a plurality of horizontal members 27, 28, 29 and 30 (Figure 1). Each of the horizontal members has a horizontal web portion 31 (Figure 4), a downwardly extending flange 32 on the exterior portion of the web and a pair of vertically extending flanges 33 on the interior portion of the web. The ends of each horizontal member are formed with upstanding flanges 34 (Figure 5) to prevent water from flowing over the edges into the vertical members. Each of the horizontal members supports a window unit 35, preferably of the type having horizontally movable sash although it is to be understood that any suitable window unit may be used without departing from the scope of this invention. Connectors 36 (Figure 7) are provided to position the windows on the horizontal members. The horizontal members are also adapted to support wall units 37 formed of masonry, aluminum or other suitable material. Connectors 39 are provided on the horizontal and vertical members to locate the wall units 37 in place.

Midway between the vertical members and below the window units, secondary vertical members 40 (Figures

1 and 3) are provided to give additional support to the window units. Flange structure 41 is attached to the secondary vertical member 40 and is in turn connected to the horizontal girder 11 by a suitable connecting means 43. Flange structure 41 is encased by concrete, as at 42 (Figure 6). This structure furnishes support for the window units against horizontal wind pressure.

At the point where the members of the facing wall are attached to the framework, vertical members 21 and 22 are positioned above and below the adjacent ends of the horizontal member 29 and the horizontal member 30 (Figure 8). The interior wall of each of the vertical members is cut away so that it mates with the flange 33 of the horizontal members. One end of each of the horizontal members is connected to an angle member 44 (Figure 4) by means of bolts 47. The adjacent end of another horizontal member is connected to angle member 45 by similar bolts. As shown in Figure 5 with respect to vertical member 21, part 24 of the vertical members is connected to angle member 44 by bolt 49. Part 23 of the vertical member 21 is connected to angle member 45 by bolt 51. As shown in Figure 5, the vertical girder 12 has a plate 53 attached thereto by means of angle members 52. Plate 53 is in turn connected to the flanges 44 and 45 by a plurality of bolts 55. A sufficient number of bolts 55 are provided to prevent any vertical movement of this end of the vertical member with respect to the vertical girder.

The leg of each of angle members 44 and 45 which respectively engage plate 53 is of sufficient length that it is capable of flexing in a horizontal direction. A clearance is provided between the adjacent ends of horizontal members, for example, members 29 and 30, as appearing in Figure 5, so that there may be relative movement therebetween in a direction toward and away from each other. Expansion or contraction of the horizontal members will cause the adjacent ends thereof to move toward or away from each other and this in turn will cause flexing of the angle members 44 and 45. It will be seen that parts 23 and 24 of the vertical member will also flex since they are rigidly affixed to the angle members. It will be appreciated, therefore, that it is desirable to make the vertical members in the three-part construction set forth above so that it will be possible for the parts 23 and 24 to flex with respect to each other. However, the invention is not limited to the details of the particular three piece structure of the vertical member illustrated.

As illustrated in Figure 4 with respect to member 21, each of the top ends of the vertical members is connected to a suitable connecting plate 56, which may be either a pair of angles 65a, 65b (Figure 9) or a T-shaped connecting clip 70 (Figure 10), and the plate 56 is in turn mounted on the plate 53. Bolts 57 attach the plate 56 to the parts 23 and 24 of the vertical member. Connecting plate 56 is connected to plate 53 by a single bolt 58. The single bolt 58 is provided and is so mounted that connecting plate 56 is capable of slight pivotal movement about the axis of bolt 58 and thereby a limited vertical motion is permitted to the vertical member 21. A suitable clearance is provided between the top end of each vertical member and the horizontal members adjacent thereto so that there will be no binding of parts when such pivotal movement occurs. Thus, expansion or contraction of the vertical member will cause pivotal movement of the connecting means 56 with respect to the vertical girder 12 and the vertical member will be enabled to move vertically sufficiently to accommodate the expansion or contraction movement.

Connections between the horizontal and vertical members of the curtain wall and the framework of the building similar to those described above in reference to horizontal members 29 and 30 and vertical members 20 and 21, are provided wherever two horizontal and two vertical members meet.

Referring to Figure 6, angles 60 are connected as by bolts 61 to the horizontal members 29. The angle members 60 are in turn connected by bolts 62 to flange structure 41 and thereby to the horizontal girder 11.

It is seen, therefore, that a construction which is capable of accommodating horizontal and vertical expansion of the facing wall with respect to the framework has been provided. The construction is so simple that the parts can be readily prefabricated at the factory and unskilled labor can be utilized to effect the necessary simple connections needed.

Although the above mentioned drawings and description apply to one particular, preferred embodiment of my invention, it is not my intention, implied or otherwise, to eliminate other variations or modifications which do not depart from the scope of the invention unless specifically stated to the contrary in the hereinafter appended claims.

I claim:

1. A structure for attaching a plurality of structural members to the framework of a building comprising, in combination: an elongated framework member; first and second axially aligned structural members substantially parallel with the longitudinal axis of said framework member; third and fourth axially aligned structural members extending transversely to the longitudinal axis of said framework member, said four structural members having surfaces lying in a common plane spaced from, and parallel with, said framework member; a pair of angle members, each of said angle members having a first leg substantially parallel with said common plane and a second leg extending transversely to said common plane toward said framework member; first connecting means rigidly connecting the first leg of one of said angle members to said first structural member and said third structural member adjacent the proximate ends thereof; second connecting means rigidly connecting the first leg of the other of said angle members to said first structural member and said fourth structural member adjacent the proximate ends thereof; means rigidly connecting the second legs of said angle members to said framework member adjacent the ends of said second legs closest to said framework member, said second legs being of sufficient length between the point of connection thereof to said framework member and said common plane to be capable of flexing in a direction parallel with the longitudinal axis of said third and fourth structural members; a bracket fixedly secured to the end of said second structural member adjacent the other structural members, said bracket extending transversely to the longitudinal axis of said second structural member toward said framework member; means connecting said bracket to said framework member for pivotal movement with respect thereto in the direction of the longitudinal axis of said framework member.

2. A structure for attaching a plurality of aluminum members to the steel framework of a building, comprising: a vertically extending steel framework member; two vertically extending and two horizontally extending aluminum members; said horizontal aluminum members each including a horizontal web having upwardly and downwardly extending flanges at its inner end; said vertical aluminum members each including two horizontally spaced sections, each section including a vertically extending web having sidewardly extending flanges at its inner end, the inner portions of said sections being capable of flexing sidewardly with respect to each other; a strip connecting the outer end of said vertically extending webs, the adjacent ends of said two horizontal aluminum members being spaced a slight distance from each other to allow for expansion thereof and being received between the adjacent ends of said vertical aluminum members with the flanges on said horizontal and said vertical aluminum members being aligned and coplanar;

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a structure connecting said two horizontal and one of said vertical members to said vertical steel member including a pair of spaced angle members, said angle members each having a first vertical leg parallel with a corresponding leg on the other angle member and a second sidewardly extending leg extending away from the corresponding leg on said other angle member, said first legs of said angle members being of sufficient length to permit sideward flexing thereof, said second legs of said angle members each respectively abutting against and rigidly connected to the sidewardly extending flanges on one section of said one vertical aluminum member; said second legs of said angle members also respectively abutting against and rigidly connected to the upwardly and downwardly extending flanges on one of said two horizontal aluminum members; means rigidly connecting the inner ends of said first legs to said vertical steel member; a further angle member connecting the other of said vertical aluminum members to said vertical steel member, said further angle member including a vertical

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leg; a horizontal bolt connecting said vertical leg to said steel member so that said further angle member may pivot about a horizontal axis; said further angle having a pair of sidewardly extending flanges abutting against the sidewardly extending flanges on the other of said vertical aluminum members and means rigidly connecting the sidewardly extending flanges of said further angle member to the sidewardly extending flanges on the other of said vertical aluminum members.

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