

Feb. 15, 1966

J. R. O'DONNELL

3,235,039

CURTAIN WALL SUPPORT SYSTEM

Filed July 30, 1962

4 Sheets-Sheet 1

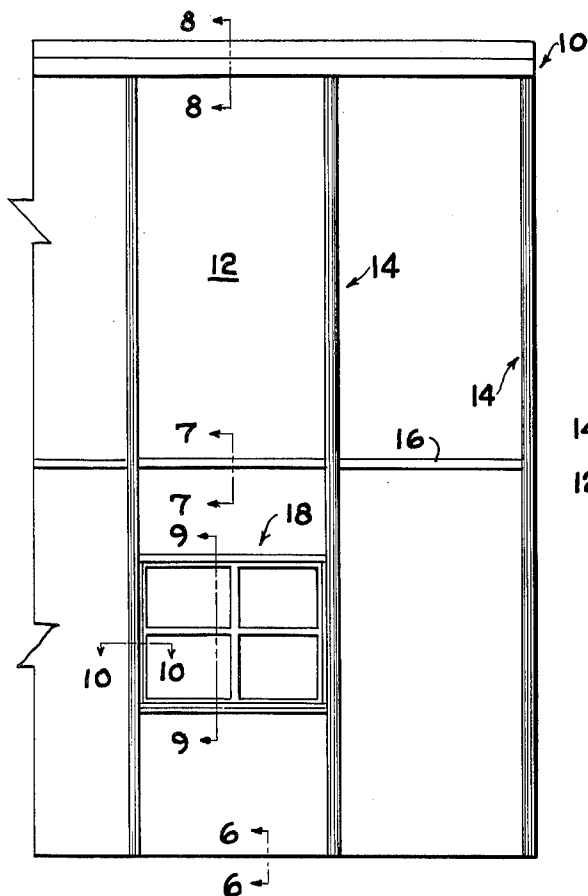


Fig. 1.

Fig. 6.

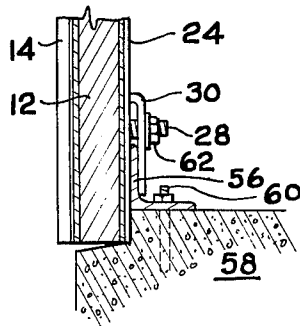


Fig. 5.

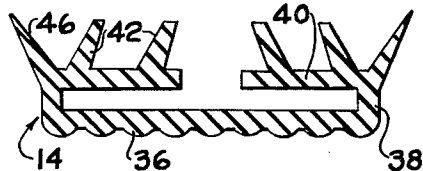
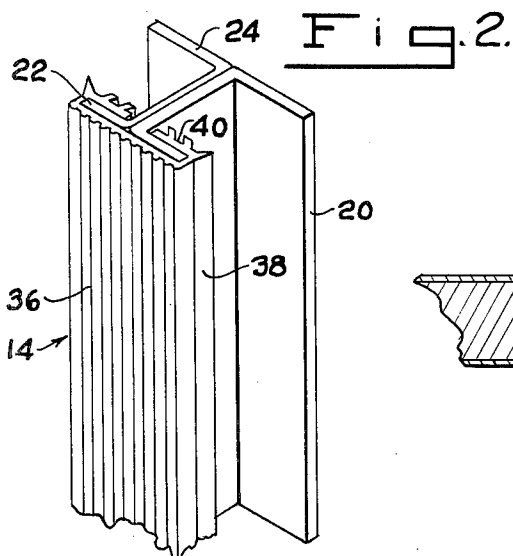
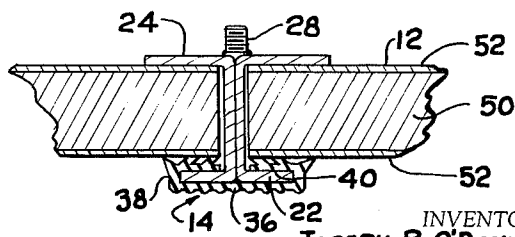


Fig. 2.

Fig. 4.



INVENTOR.
JOSEPH R. O'DONNELL

BY

John A. McKinney

ATTORNEY

Feb. 15, 1966

J. R. O'DONNELL

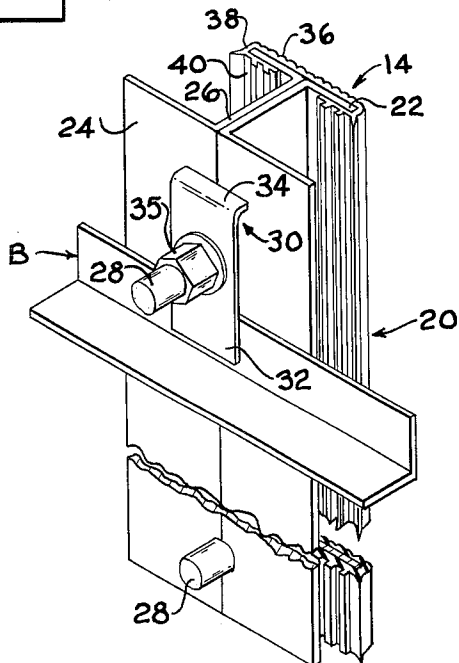
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F. 9. 3.



Fi eq. 9.

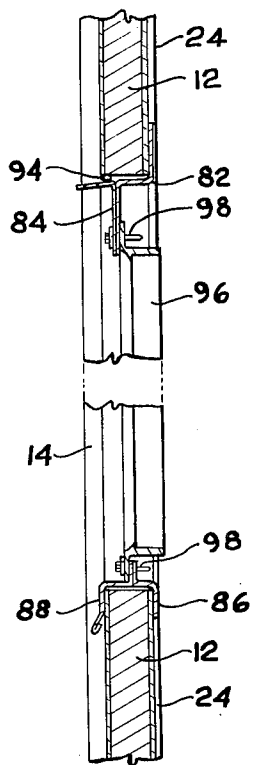
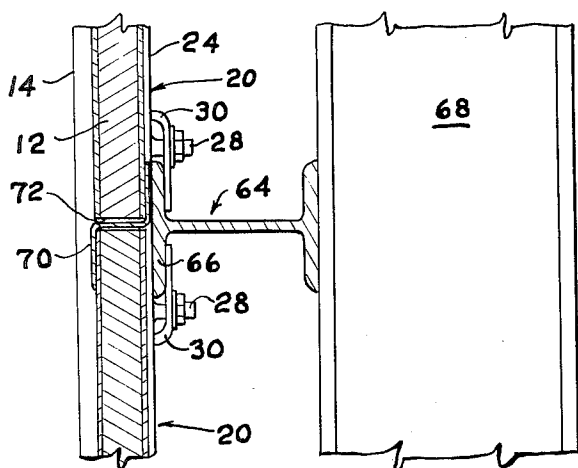


Fig. 7.



INVENTOR.
JOSEPH R. O'DONNELL

BY

John A. McKinney

ATTORNEY

Feb. 15, 1966

J. R. O'DONNELL

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Fig. 8.

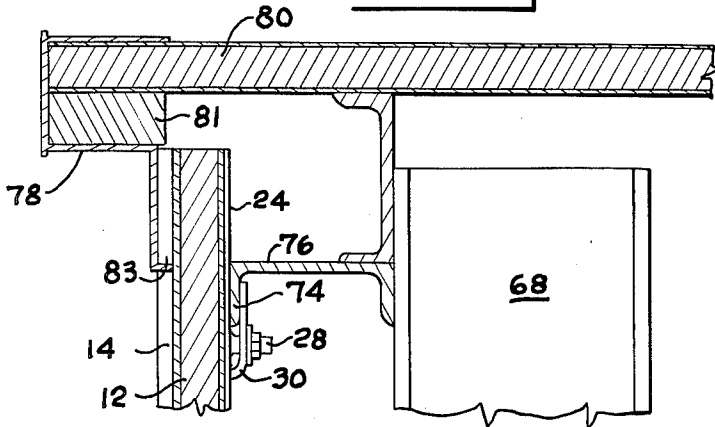


Fig. 10.

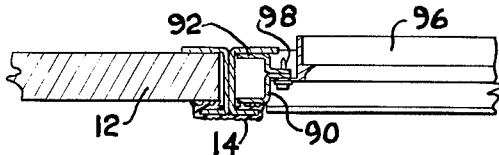
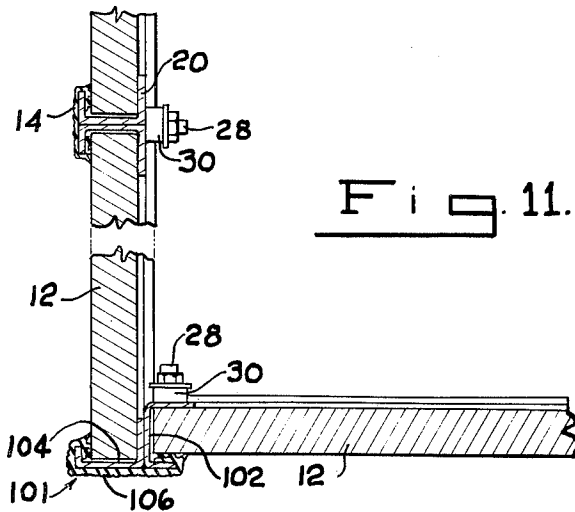


Fig. 11.



INVENTOR
JOSEPH R. O'DONNELL

BY

John A. McKinney

ATTORNEY

Feb. 15, 1966

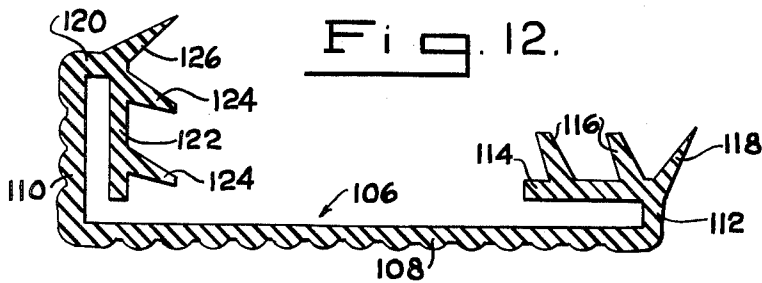
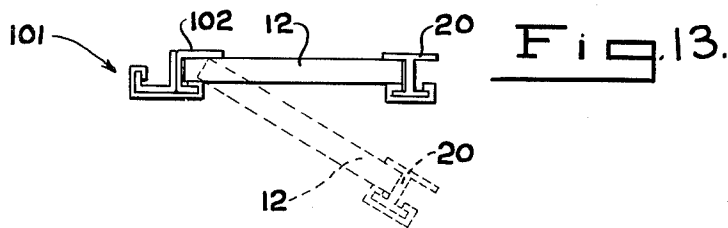
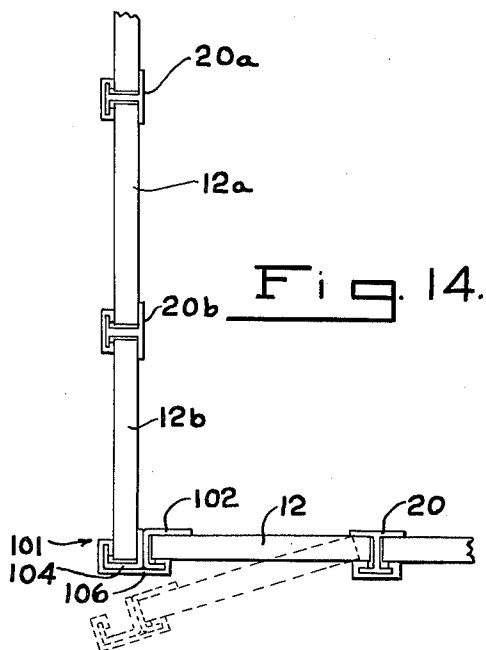
J. R. O'DONNELL

3,235,039

CURTAIN WALL SUPPORT SYSTEM

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INVENTOR
JOSEPH R. O'DONNELL

BY

John A. McKinney
ATTORNEY

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3,235,039

CURTAIN WALL SUPPORT SYSTEM

Joseph R. O'Donnell, Somerville, N.J., assignor to Johns-Manville Corporation, New York, N.Y., a corporation of New York

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15 Claims. (Cl. 52-235)

This invention relates to a curtain wall construction, and more particularly, to a novel joint and supporting system for a curtain wall panel.

The panels used in curtain wall constructions for industrial and commercial buildings receive little or no vertical stresses but must be capable of resisting wind loads. Prime considerations in selecting a suitable material for a curtain wall panel are its weathering ability, fire resistance, maintenance, appearance, and cost, including the cost of installation. Curtain wall panels can be broken down into two categories: insulated panels and noninsulated panels. Examples of insulated panels are sandwich panels having an insulating core such as fiberboard, gypsum, plastic foam, or other suitable material, between fire resistant facing sheets such as metal, porcelain enamel, fibrous cement or other suitable material. Examples of noninsulated panels are planar sheets of glass, metal, or fibrous cement or corrugated sheets of plastic, fibrous cement, or other suitable materials.

Curtain wall panels, and particularly sandwich panels, have been installed almost without exception by means of bolts or other exposed fasteners secured to horizontal beams or girts of a building structure. The joints between the panels have been sealed by a variety of means. One type of construction utilizes a joint sealing arrangement comprised of asbestos-cement batten boards bolted to the panels over an asphalt saturated felt. Other types of joint constructions include metal flashing, aluminum battens having a threaded attaching means, and locking gaskets of suitable elastic material. These prior art methods of installation, however, have a number of disadvantageous features. The use of horizontal girts as curtain wall panel supports detracts from the appearance of the interior of the building, and in many environments causes additional maintenance and cleaning problems, since horizontal girts have a tendency to accumulate dust and dirt. The use of exposed fasteners to secure the panels to the girts and to attach the joint sealing means to the panels detracts from the exterior appearance of the building and causes the time of installation to be rather lengthy and costly. In those installations not utilizing exposed fasteners in the joint arrangement, the high cost of the curtain wall panels and fastening means and the lengthy time of installation have made such curtain walls very expensive.

It is an object of the present invention to provide a novel curtain wall panel support system which requires no exposed fasteners and which can be installed in a relatively short time.

Another object of the invention is to provide a curtain wall panel support system which eliminates the need for horizontal girts.

A further object of the invention is to provide a curtain wall panel support system which satisfies the structural, functional, and esthetic requirements of such walls and is at the same time easy and economical to install and maintain.

Briefly, this invention relates to a curtain wall com-

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prised of a plurality of spaced vertical support beams, each having a front and back flange connected approximately centrally thereof by a web portion, and a combined locking and sealing gasket attached to the front flange of each beam. The vertical support beams are secured at their ends to building structure members, and the curtain wall panels are held in place between the front and back flanges of successive support beams. The combined locking and sealing gasket tightly holds the panels in place and prevents moisture from entering between the panels. This construction eliminates the need for horizontal girts and exposed fasteners, thereby enhancing the appearance of both the interior and exterior of the building. Furthermore, rapid installation of the curtain wall is possible without requiring power tools or any specially adapted installation tools. In addition, this construction is especially suited for use with sandwich panels, since the front and back flanges of the vertical support beam effectively clamp the face sheets of the panel, thereby preventing any tendency of the panels to delaminate.

The nature of the invention will be more fully understood and other objects may become apparent when the following detailed description is considered in connection with the accompanying drawing, wherein:

FIG. 1 is a partial front elevation of a building having a curtain wall construction according to the present invention;

FIG. 2 is a pictorial representation of the vertical support beam used in the curtain wall construction of the invention, showing the combined locking and sealing gasket attached to the front flange of the beam;

FIG. 3 is a pictorial representation of the vertical support beam, showing the locking clip arrangement for attaching the beam to a building support member;

FIG. 4 is a horizontal sectional view of the vertical support member, showing curtain wall panels secured therein;

FIG. 5 is an enlarged transverse sectional view of the combined locking and sealing gasket;

FIG. 6 is a transverse sectional view taken on lines 6-6 of FIG. 1;

FIG. 7 is a transverse sectional view taken on lines 7-7 of FIG. 1;

FIG. 8 is a transverse sectional view taken on lines 8-8 of FIG. 1;

FIG. 9 is a transverse sectional view taken on lines 9-9 of FIG. 1;

FIG. 10 is a horizontal sectional view taken on lines 10-10 of FIG. 1;

FIG. 11 is a horizontal sectional view showing a corner arrangement of the curtain wall construction;

FIG. 12 is an enlarged transverse sectional view of the combined locking and sealing gasket adapted for use in a corner arrangement;

FIG. 13 is a diagrammatical view illustrating the manner of installation of a curtain wall panel; and,

FIG. 14 is a diagrammatical view illustrating the manner of installation of the final curtain wall panel in a horizontal course.

Referring to FIG. 1 of the drawing, a building 10 is shown with a curtain wall construction comprised of panels 12 and combined locking and sealing gaskets 14. The horizontal joints between the panels are provided with suitable sealing means 16, which may comprise gaskets, flashing, or the like. A window installation 18 is illus-

trated as being positioned between successive locking and sealing gaskets 14.

Referring now to FIGS. 2-4, a vertical support beam 20 is comprised of substantially parallel front and back flanges 22 and 24 respectively, connected approximately centrally thereof by a web 26. The length of the front flange 22 is approximately one-half that of the back flange 24 for a purpose described hereinafter. The support beam 20 is shown as being formed from two modified channel members secured in back-to-back relationship by suitable means such as spot welding. The beam may be formed from any suitable construction material, such as, for example, hot rolled or cold formed steel, or extruded aluminum. It should be understood, however, that the beam may be of integral construction, if desired.

Connected, as by welding, to the back flange 24 substantially centrally thereof adjacent the top and bottom ends of the beam 20 are threaded studs 28. As shown in FIG. 3, the studs are inserted through a suitable aperture of a J-shaped clip member 30 having an elongated leg portion 32 and a transverse portion 34 to secure the beam 20 to a building structure member B. Since the studs 28 are integral with the beam 20, it is merely necessary to position the beam in place, slip the clip 30 over the stud so that the edge of the transverse portion 34 of the clip abuts the beam 20 and the leg portion 32 is engaged with the structure member B, and then to tighten the assembly by means of a nut 35.

As shown in FIG. 4, attached to the front flange 22 of the beam 20 is the combined locking and sealing gasket 14, which comprises a front wall portion 36, side portions 38 extending transversely of the front wall 36, and leg portions 40 extending from the side portions 38 substantially parallel with the front wall. The gasket 14 is dimensioned to receive the front flange 22 of the beam 20 between the front wall portion 36 and leg portions 40.

As shown in FIG. 5, the rear face of each leg portion 40 is provided with two locking and sealing fingers 42 extending at an angle to the leg portion 40 of less than 90° and directed away from the side portions 38. The fingers 42 are disposed in this manner so that when compressed by a curtain wall panel, they will bend in a direction toward the web of the vertical support beam to resist any tendency of the panel to be withdrawn from the beam. The fingers are spaced apart a distance sufficient to permit the fingers to be bent or folded by a panel to a position substantially parallel to the leg portions 40 without such bending movement being impaired by the base or root of the next adjacent finger. Upon being compressed by a curtain wall panel, the fingers exert a force against the panel which holds it in place between the fingers and the back flange of the vertical support beam. In addition, the fingers 42 effectively seal the joint against the entry of moisture.

Extending from each side portion 38 adjacent the intersection of the side portion 38 and the leg portion 40 is a finger 46 which is disposed at a slight angle to and directed away from the side portion 38. Fingers 46 function to provide an additional seal and to improve the appearance of the installation. The fingers 46 should be of a length to provide a tight seal, but not so long that unsightly bulges or buckling are present with the panels installed.

The gasket 14 may be formed of vinyl, neoprene or any other suitable material having the necessary elastic and weathering characteristics. Since the actual locking function of the gasket and the bulk of the sealing function is provided by the fingers 42, the front wall portion 36 is not necessary to hold a curtain wall panel in place. It is preferred that the gasket be provided with a front wall portion, however, for several reasons. It simplifies the step of attaching the gasket to the front flange of a vertical support member and adds to the appearance of the construction. In this latter respect, the face of the front wall portion may be pro-

vided with a decorative design such as vertical striations, or the like.

Since the most deleterious weathering effect on vinyl is sunlight, due to ultraviolet rays and the creation of ozone, the side portions 38 and fingers 46 are provided to serve the additional function of protecting or shielding the fingers 42 and leg portions 40 from the sun's rays. Of course, the front wall portion 36 also contributes in this respect, but to a lesser degree since the support beam effectively provides a shielding function.

As illustrated in FIG. 4, the vertical support beam is adapted to receive a curtain wall panel 12 which may be a sandwich panel having a core 50 and face panels 52. The distance between the front flange 22 and the back flange 24 should be equal to the thickness of the panel 12, allowing for manufacturing tolerances, plus the compressed thickness of the leg portions 40 and fingers 42 of the gasket 14. This arrangement insures that the panel 12 will be tightly held between gasket fingers 42 and back flange 24 to prevent the panels from becoming loose or delaminated. There should be a slight gap between the end of a panel and the web 26 of the beam 20 to allow for expansion and contraction of the panel 12.

A typical panel installation at the foundation of a building is illustrated in FIG. 6. An angle beam 56 is secured to the foundation 58 by a suitable fastener 60. To secure the panel 12 and beam 20 to the foundation, it is merely necessary to position the leg portion of a J-shaped clip 30, which has been slipped over the stud 28, against the inner surface of the upright flange of the angle beam 56, and to tighten the installation by a nut 62.

Although the curtain wall construction of the present invention eliminates the need for horizontal girt members, the ends of the panel members must be supported by a horizontal structural member in installations where the distance from the foundation to the eave is greater than the height of a curtain wall panel. Where the height of the panel corresponds to the height of each story in a multi-story building, the panel members may be secured to the structural members of the floor. Where the height of the building is greater than the height of a panel and there are no intermittent floors between the foundation and the eave of the building, a horizontal spandrel beam is required. Referring to FIG. 7, a horizontal spandrel beam 64 having flanges 66 is connected to a support column 68. The top and bottom ends of the support beams 20 are secured respectively to the lower and upper legs of the outer flange 66 by a J-clip installation similar to that described in connection with the foundation installation. A Z-shaped flashing member 70 is illustrated as forming the horizontal joint between adjacent panels 12. To protect against moisture, caulking or rope putty may be provided. Any other suitable sealing means such as gaskets, for example, may be provided in place of the flashing member 70.

Referring to FIG. 8, the upper end of the top curtain wall panel is attached to the flange 74 of the eave structural beam 76 by means of the J-clip arrangement described above. A flashing member 78 may be provided over the roofing deck 80, the eave 81 and the upper portion of the panel 12. The flashing member may be suitably formed to fit around the gasket 14, as for example, by notching the horizontal ledge 83 opposite the gasket, to provide a pleasing appearance.

FIG. 9 illustrates a typical window head and sill arrangement, while FIG. 10 illustrates a typical window jamb arrangement. As shown in FIG. 9, the window head comprises a Z-shaped member 82 secured to an L-shaped member 84 as by welding, to provide a suitable support for the panel 12 engaged therewith. The window sill comprises two Z-shaped members 86 and 88 connected with legs thereof back-to-back as by welding to form a channel-shaped receptacle for the upper edge of the subjacent panel 12. As shown in FIG. 10, Z-shaped members 90 and 92 are connected similarly to members

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86 and 88 to form a channel-shaped member, the depth of which is approximately equal to the thickness of a panel 12. The frame members which form the window head, sill, and jamb are welded together to provide an integral frame which may be fitted into place in the same manner as a curtain wall panel 12. It is desirable to provide caulking or rope putty 94 between the window head frame and the abutting lower edge of the curtain wall panel to provide a suitable seal. To install the window sash 96, suitable fasteners such as self-tapping screws 98 may be used to attach the sash to the inwardly extending projections of the frame members.

The curtain wall installation at a corner requires a modified vertical support beam to receive panels at right angles to each other. Referring to FIGS. 11 and 12, the modified vertical support beam 101 comprises channel members 102 and 104 of the same configuration as the channel members which form the vertical support beam 20. Instead of welding the beams with their webs back-to-back, the longer flange of one beam is welded to the web of the other beam to form a support adapted to receive curtain wall panels at right angles to each other. The stud 28 is welded to the longer flange of the channel member 102, which is the only flange exposed to the interior of the building. As illustrated in FIG. 12, the combined locking and sealing gasket 106 adapted for use with the corner vertical support beam is shaped to extend around the corner beam and to engage the outer faces of the corner curtain panels 12. The gasket 106 comprises a relatively wide wall portion 108 and a relatively narrow wall portion 110 extending at right angles thereto. The wall portion 108 is connected to a side portion 112 extending transversely therefrom which is connected to a leg portion 114 spaced from and substantially parallel to the wall 108. Fingers 116 and 118, of the same configuration respectively as fingers 42 and 46 of FIG. 5, extend from the back surface of leg portion 114 in the same manner as the fingers 42 and 46 extend from the back surface of leg portion 40. A side edge portion 120 extends transversely from the wall portion 110 and a leg portion 122 extends from the side portion 120 spaced from and substantially parallel to the face 110. The leg portion 122 is provided with fingers 124 and 126 which are identical in shape and function to the fingers 116 and 118.

Referring now to FIG. 13, the preferred manner of installation of the curtain wall panels will be described. A vertical corner support beam 101 is secured at top and bottom to a spandrel beam or eave member and foundation angle respectively. Assuming a panel installation progressing from left to right, a vertical support beam 20 is fitted on the right vertical edge of a panel 12 while the panel is still on the ground. The panel 12 with beam 20 attached is then moved into place, as indicated by the dotted lines in FIG. 13, so that the left rear corner abuts the back flange of channel member 102, and the left front corner of the panel 12 abuts the web of channel member 102. The panel 12 is then rotated or snapped into place in a counterclockwise direction to cause the left edge of the panel to be securely held between the front and back flanges of the channel member 102 by the locking fingers of the gasket 106. If the panel is not seated in the channel member 102 properly, it is tapped with a suitable hammer or the like to space the panel edge about 1/8 inch from the channel web. The vertical support beam 20 is then secured in place at top and bottom to the building structure by the clip arrangement previously described. Other panels are successively installed in a similar manner until the starting point is reached. Since the panels initially are inserted into the vertical support beams at an angle to the flanges, the front flange of a support beam should be of lesser length than the back flange to permit the panel initially to abut the back flange.

Referring to FIG. 14, the second last panel in the hori-

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zontal course initiated by panel 12 is indicated at 12a. To install the last panel 12b in the course, it is necessary first to loosen the vertical corner support beam 101 and pivot or rotate the panel 12, with beam 101 attached, to the position shown in dotted lines. The left vertical edge of panel 12b is then inserted between the flanges of support beam 20a, and the panel is pivoted to its final position, as shown in FIG. 14. By pivoting or rotating panel 12 back to its full line position, thus moving the corner support beam 101 back to its initial position, the channel member 104 of the beam 101 is moved toward and receives the right vertical edge of the panel 12b. Upon securing the corner support beam 101 in place once again, the horizontal course is firmly secured to the building structure.

It should be understood that while the invention has been described with respect to a sandwich panel, it is not so limited but is equally applicable to other types of panels adapted to be held between the front and rear flanges of the vertical support beam. It should be understood further that other types of fastening means may be used instead of the J-clip described.

The vertical support beam need not be limited to the specific shape disclosed but may assume other configurations, as long as the basic relationship between the front and back flanges is maintained. For example, the front flange may have a hollow rectangular configuration in cross-section to present an architectural mullion effect, instead of the flat plate effect presented by the illustrated embodiment. The combined locking and sealing gasket associated with such beam would be of such dimensions and shape so as to cover the front flange, if desired, whatever the configuration of the support beam.

It should now be apparent that the present invention provides a simple method of installing curtain wall panels which is not only economical, but results in a curtain wall having no exposed fasteners and presenting a pleasing appearance. The elimination of unsightly exposed fasteners without increasing the cost of the installation is an extremely desirable feature in commercial and industrial buildings. Because the threaded studs are integral with the vertical support beams and because simple hand tools can be used to install curtain wall panels according to the foregoing disclosure, much time and expense are saved during installation. The wall satisfies the structural and functional requirements of curtain walls, as well as being esthetically pleasing.

It should be understood that variations and modifications of the present invention may be made without departing from the spirit of the invention. It also should be understood that the scope of the invention is not to be interpreted as limited to the specific embodiment disclosed herein but only in accordance with the appended claims, when read in the light of the foregoing disclosure.

What I claim is:

1. In a curtain wall construction,
 - (a) a plurality of spaced vertical support beams,
 - (b) each beam comprising a front flange connected to a back flange spaced therefrom,
 - (c) a plurality of panels,
 - (d) the vertical side edges of each panel being disposed between the front and back flanges of successive support beams, and
 - (e) a combination locking and sealing gasket attached to each front flange and extending between the back surface of the front flange and the adjacent panel,
 - (f) the adjacent panel engaging the back flange and the gasket but not the front flange, whereby the panels are held in place between the gasket and the back flange of each support beam.

2. A curtain wall construction as recited in claim 1, wherein the distance between the front flange and back flange of each beam is less than the combined thicknesses

of the adjacent panel and an uncompressed combination locking and sealing gasket.

3. A curtain wall construction as recited in claim 2, wherein each locking and sealing gasket includes a plurality of elastic fingers bent by the panel associated therewith in a direction to resist removal of the panel from the support beam.

4. In a curtain wall construction,

- (a) a plurality of spaced vertical support beams,
- (b) each beam comprising a front flange and a back flange connected substantially centrally thereof by a web,
- (c) the front flange extending from said web a lesser distance than the back flange,
- (d) a combination locking and sealing gasket attached to the front flange of each beam and extending between the front and back flanges, and
- (e) a plurality of curtain wall panels,
- (f) the vertical side edges of each panel being disposed between the front and back flanges of successive beams,
- (g) the face of each panel adjacent the front flange of the beam in which the panel edge is received engaging the gasket only and not the front flange of the beam.

5. In a curtain wall construction as recited in claim 4, including additionally means integral with the back flange of the beams for attaching the beams to a building structure.

6. In a curtain wall construction as recited in claim 5, wherein each gasket includes at least one elastic finger bent by the panel associated therewith to hold the panel in place.

7. In a curtain wall construction,

- (a) a plurality of spaced vertical support beams,
- (b) each beam comprising a back flange and a front flange connected approximately centrally thereof by a web,
- (c) the back flange being of greater width than the front flange,
- (d) a gasket attached to the front flange of each beam and positioned between the front and back flanges to substantially cover the entire back surface of the front flange,
- (e) at least one elastic finger on each gasket extending toward the back flange,
- (f) a plurality of wall panels,
- (g) each panel having a width of slightly less than the distance between the webs of successive beams, and having a thickness slightly greater than the distance between the end of the gasket finger, in uncompressed condition and the back flange of each beam,
- (h) the edge portions of the panels being disposed between the front and back flanges of the adjacent beams, whereby each wall panel is held between the back flanges and the gaskets of successive beams.

8. In a curtain wall construction as recited in claim 7, including additionally a threaded stud extending from the back flange of the beam and means connecting the stud and the building structure to secure the beams to the building structure.

9. A curtain wall construction for a single story building comprising,

- (a) a plurality of vertical support beams spaced around the periphery of the building,
- (b) means securing the ends of said beams to the building adjacent the foundation and eave thereof,
- (c) each beam comprising a front flange connected to a spaced back flange,
- (d) a combination locking and sealing gasket fitted on the front flange of each beam to be disposed between the front and back flanges, and
- (e) a plurality of wall panels,
- (f) each panel being positioned between successive

beams and being held in place between the gaskets and the back flanges thereof.

10. A curtain wall construction for a building comprising,

- (a) a lower course of vertical support beams spaced around the periphery of the building,
- (b) means securing the lower ends of said beams to the building foundation,
- (c) an upper course of vertical support beams aligned with the beam of the lower course,
- (d) means securing the upper ends of the beams of the upper course to the eave structure of the building,
- (e) horizontal support members on the building structure adjacent the ends of the lower and upper courses of vertical support beams,
- (f) means securing the lower ends of the vertical support beams of the upper course and the upper ends of the vertical support beams of the lower course to the horizontal support members,
- (g) each vertical beam comprising a front flange connected to a back flange by a web,
- (h) a plurality of wall panels positioned between the vertical support beams,
- (i) the vertical side edges of each panel being disposed between the front and back flanges of successive vertical support beams, and
- (j) a combination locking and sealing gasket positioned between the front flange of each vertical support beam and the front face of each panel associated therewith, the front face of the panels engaging the gasket only and not the front flange, to securely hold the panel in place.

11. A curtain wall construction as recited in claim 10, wherein the vertical support beams at the corners of the building comprise two channel-shaped members at right angles to each other.

12. A curtain wall construction as recited in claim 10, wherein the horizontal support members comprise floor support members.

13. A curtain wall construction for a building comprising,

- (a) a lower course of vertical support beams spaced around the periphery of the building,
- (b) means securing the lower ends of said beams to the building foundation,
- (c) an upper course of vertical support beams aligned with the beam of the lower course,
- (d) means securing the upper ends of the beams of the upper course to the eave structure of the building,
- (e) at least one intermediate course of vertical support beams aligned with the beams of the upper and lower courses,
- (f) horizontal support members on the building structure adjacent the ends of the vertical support beams of the lower, upper, and intermediate courses,
- (g) means securing the lower ends of the vertical beams of the upper course, the ends of the beams of the intermediate course, and the upper ends of the beams of the lower course to the horizontal support members,
- (h) each vertical beam comprising a front flange connected to a back flange by a web,
- (i) a plurality of wall panels positioned between the vertical support beams,
- (j) the vertical side edges of each panel being disposed between the front and back flanges of successive vertical support beams, and
- (k) a combination locking and sealing gasket positioned between the front flange of each vertical support beam and the front face of each panel associated therewith, the front face of the panel engaging the gasket only and not the front flange, to securely hold the panel in place.

14. A curtain wall construction as recited in claim 13,

wherein the vertical support beams at the corners of the building comprise two channel-shaped members at right angles to each other.

15. A curtain wall construction as recited in claim 13, wherein the horizontal support members comprise floor support members.

References Cited by the Examiner

UNITED STATES PATENTS

2,187,148	1/1940	Fisher	189—1	10
2,302,047	11/1942	Olsen	189—34	X
2,736,403	2/1956	Gwynne	189—76	

2,843,233	7/1958	Walsh.	
3,039,232	6/1962	Dunn	189—34 X
3,053,353	9/1962	Miller	189—34
3,062,339	11/1962	Geyser	189—34
3,079,653	3/1963	Cornell	20—69
3,082,491	3/1963	Millhouse et al.	20—69
3,082,849	3/1963	Keller	189—34

FRANK L. ABBOTT, *Primary Examiner.*
RICHARD W. COOKE, JACOB L. NACKENOFF,
Examiners.