United States Patent [19]

Tischuk

[11] **3,777,430**

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[54] **COMPLEMENTARY MATING ELEMENTS FOR DOUBLE-SKIN FOAM CORE PANEL**

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[73] Assignee: **H. H. Robertson Company,** Pittsburgh, Pa.

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[52] **U.S. Cl.** **52/309,** 52/483, 52/595

[51] **Int. Cl.** **E04c 1/10,** E04c 2/20

[58] **Field of Search** 52/235, 309, 595, 52/483, 489, 492, 520, 521

[56] **References Cited**

UNITED STATES PATENTS

3,290,845	12/1966	Snyder	52/588 X
3,372,520	3/1968	Hensel	52/595 X
3,535,844	10/1970	Glards	52/595
3,667,180	6/1972	Tischuk	52/595

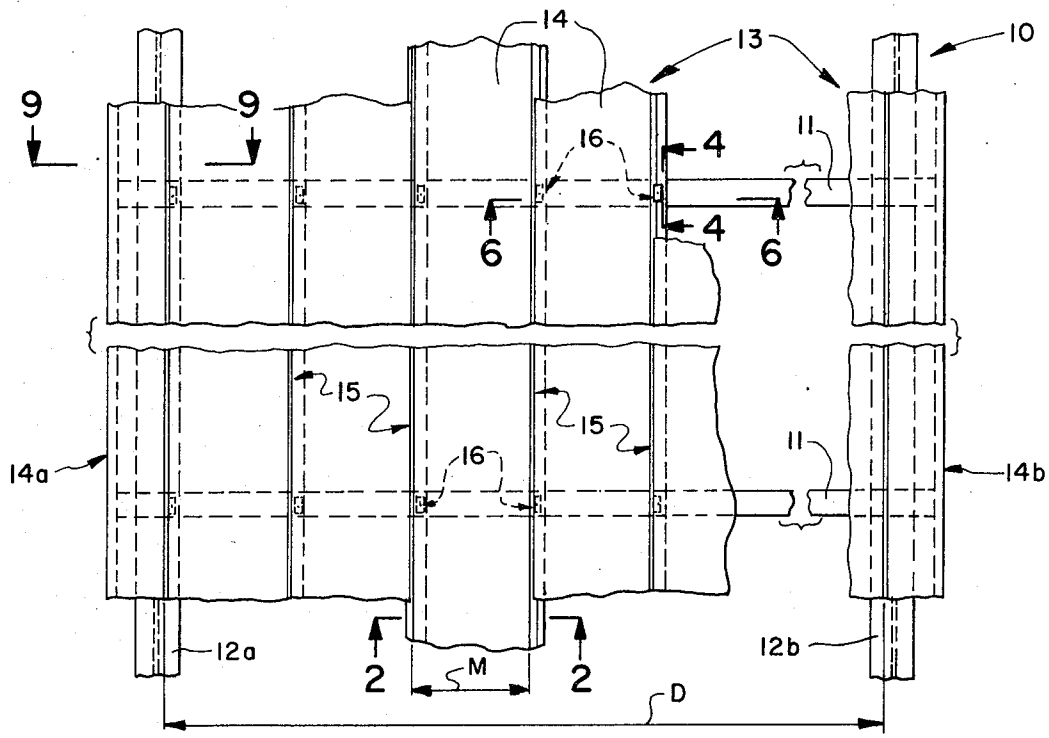
Primary Examiner—Price C. Faw, Jr.

Attorney—Harry B. Keck et al.

[57] **ABSTRACT**

A double-skin building construction panel having a foam core and having an outer facing sheet laterally offset from and spaced apart from an inner facing sheet. Each panel presents an overlapping edge portion along one side and an overlapped edge portion along its opposite side. The panels are adapted to be assembled in lapped relation without externally visible fasteners. Mating elements in the outer facing sheets provide a positive mechanical connection of adjacent outer facing sheets and provide for lateral adjustment in the position each panel relative to the previously erected panel. The arrangement is such that during erection, the panels may be gathered or spread apart to conform the coverage provided by all of the panels with that required by the structural framework.

6 Claims, 11 Drawing Figures



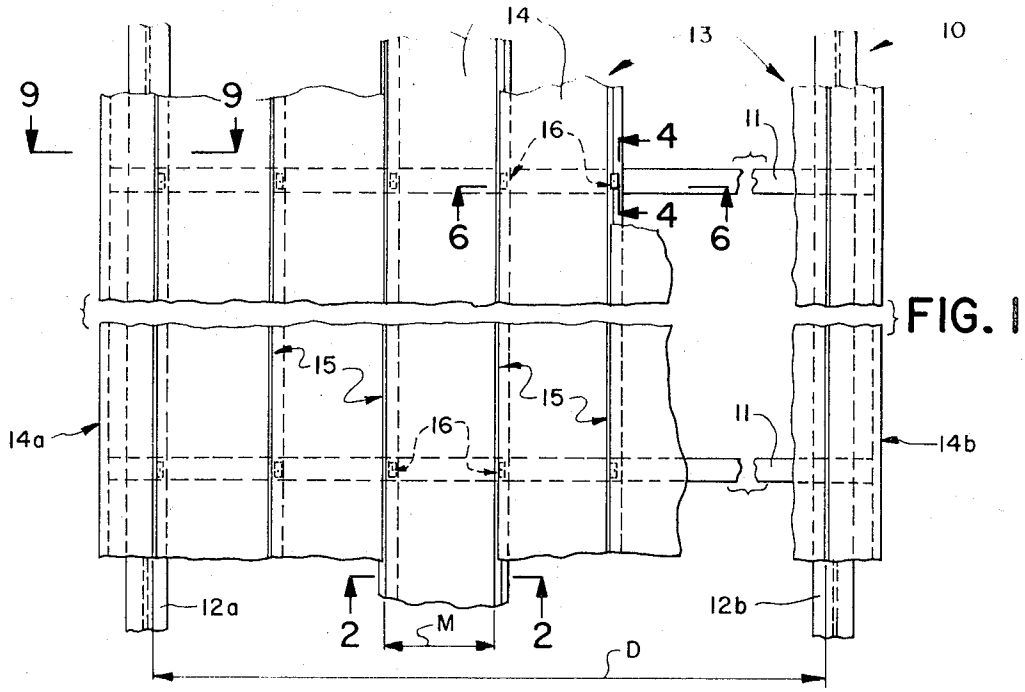


FIG. 1

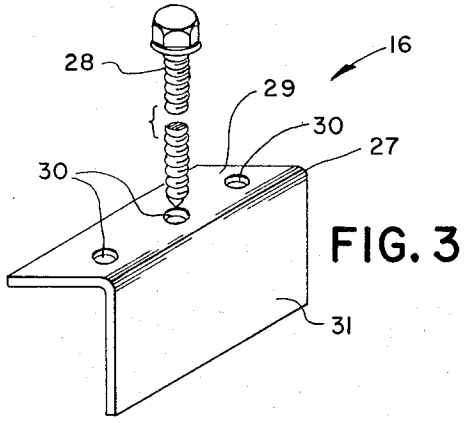


FIG. 3

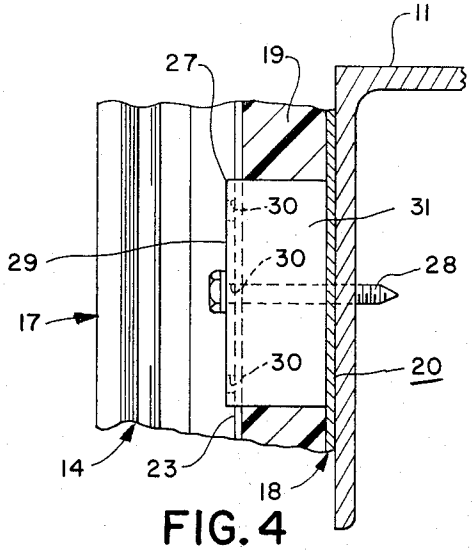


FIG. 4

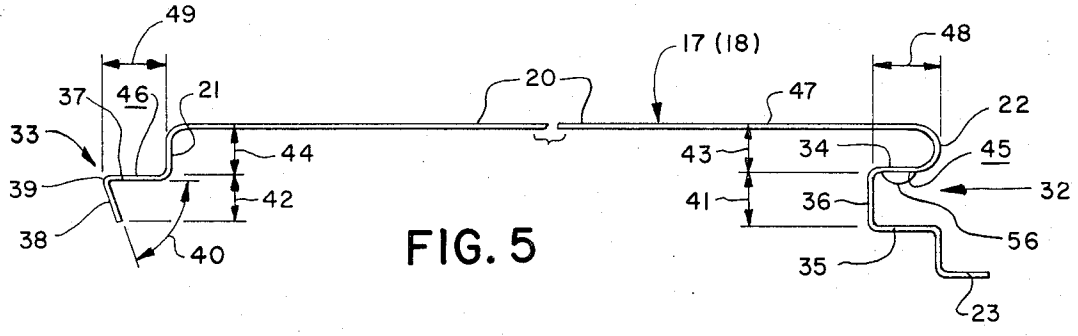


FIG. 5

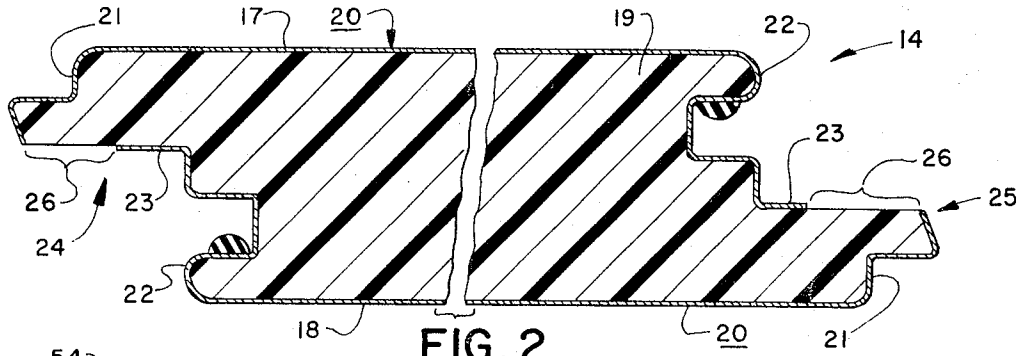


FIG. 2

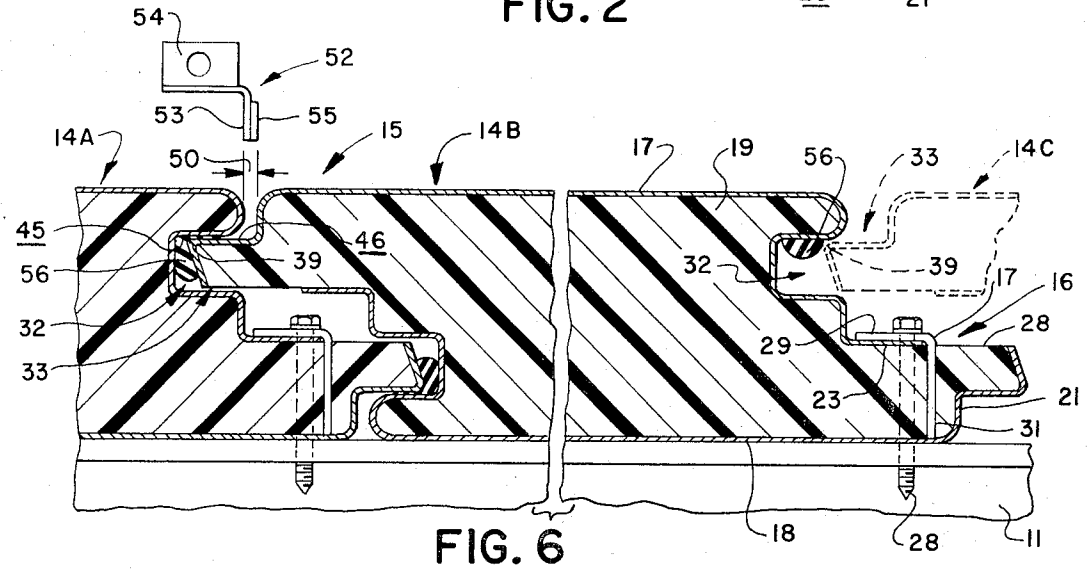


FIG. 6

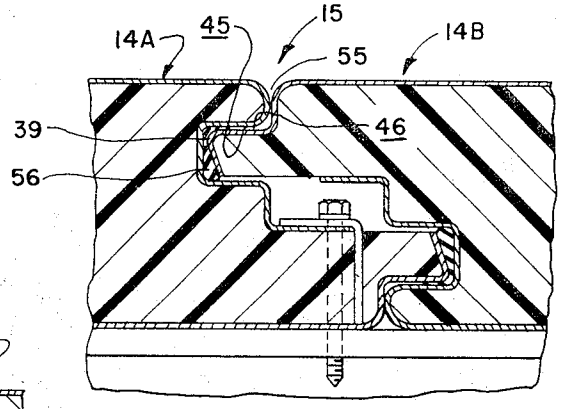


FIG. 8

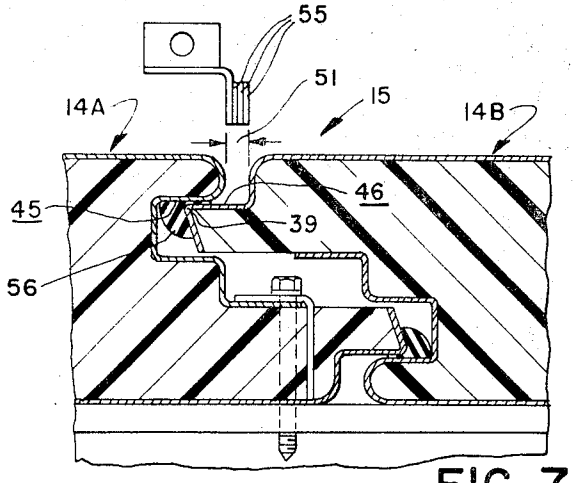


FIG. 7

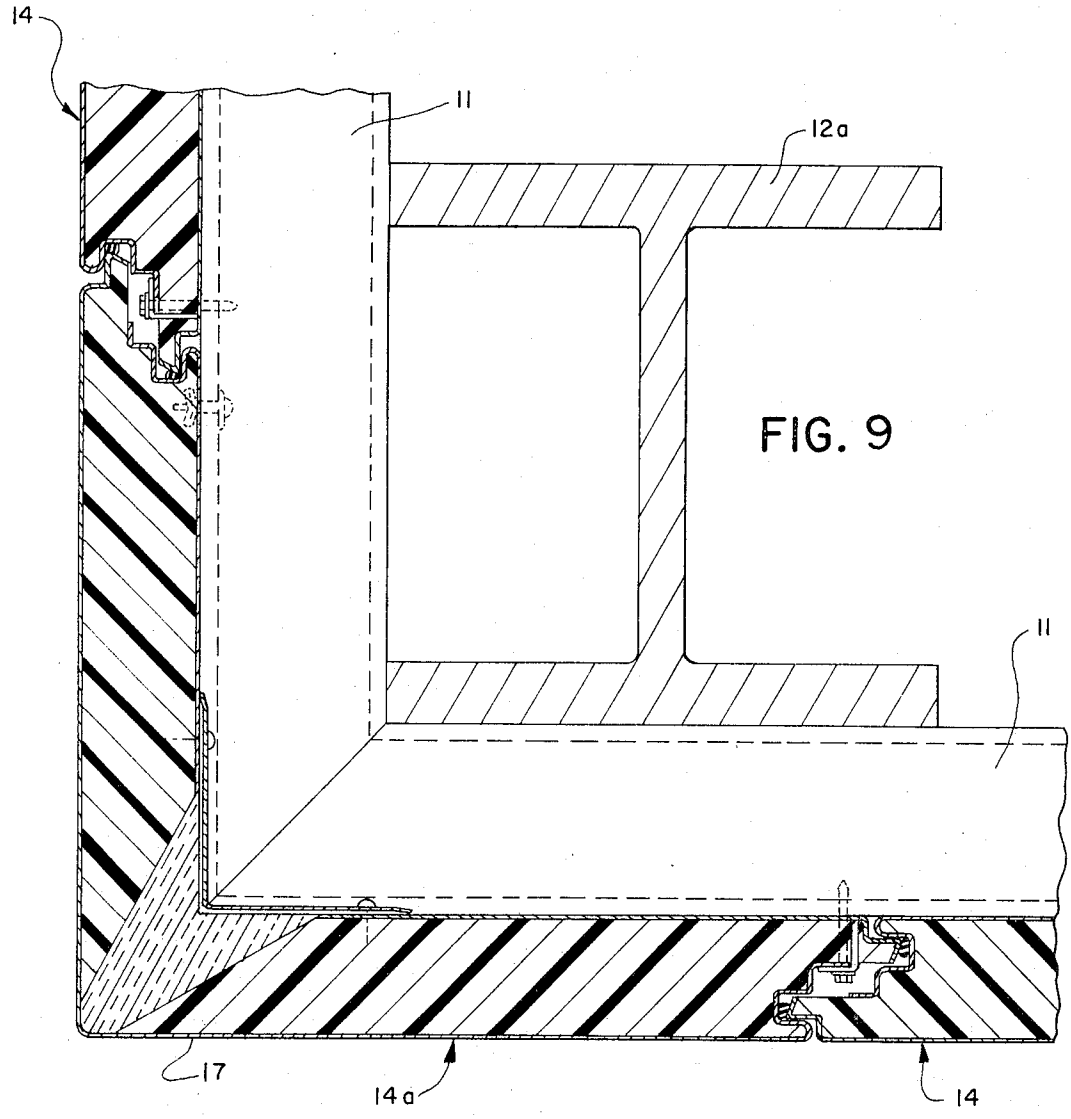


FIG. 9

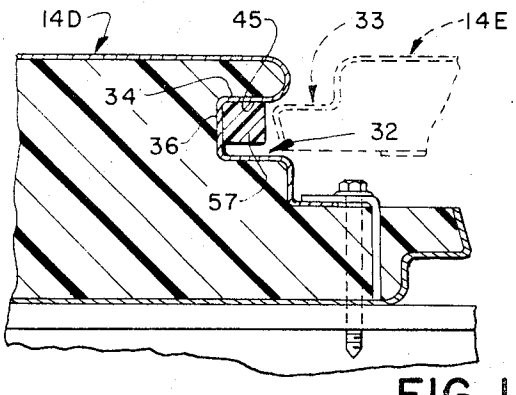


FIG. 11

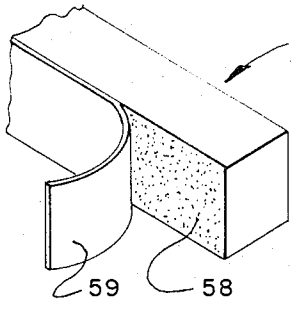


FIG. 10

COMPLEMENTARY MATING ELEMENTS FOR DOUBLE-SKIN FOAM CORE PANEL

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to double-skin foam core building construction panels of the type erected without externally visible fasteners, and more particularly to improvements in complementary mating elements formed in at least the outer facing sheets of such building construction panels.

2. Description of the Prior Art

Double-skin building construction panels having no lateral adjustment capability and which are erected without externally visible fasteners are known in the prior art for use in the construction of buildings, see U.S. Pat. Nos. 3,290,845 (SNYDER, Dec. 13, 1966), 3,535,844 (GLAROS, Oct. 27, 1970); 3,667,180 (TISCHUK, June 6, 1972). Double-skin building construction panels having some lateral adjustment capability and which are erected without externally visible fasteners also are known in the prior art, see U.S. Pat. No. 3,372,520 (HENSEL, Mar. 12, 1968).

The SNYDER, GLAROS and TISCHUK panels require extensive field cutting and fitting to conform the lateral coverage of the panels with that dictated by the structural framework. The HENSEL arrangement requires the use of specially shaped, slotted and apertured subgirts in combination with a special clamping plate and fastener to achieve erection and lateral adjustment of the panels. Moreover, the erection and lateral adjustment require the cooperative effort of workmen positioned exteriorly and interiorly of the building framework.

SUMMARY OF THE INVENTION

The principal object of this invention is to provide an improved laterally adjustable weather-tight joint between double-skin foam core building construction panels.

Another object of this invention is to provide improved complementary mating elements for at least the outer facing sheet of a double-skin foam core building construction panel, which mating elements permit the panels to be gathered or spread apart thereby to conform the lateral coverage of the panels with that required by the structural framework.

Still another object of this invention is to provide improved complementary mating elements which permit lateral adjustment of the position of each panel relative to a previously erected panel without impairing the weather seal.

The present invention provides improvements in the building construction panel described and illustrated in U.S. Pat. No. 3,667,180, supra. In the building construction panel of U.S. Pat. No. 3,667,180, supra, each of the facing sheets includes a central web, first and second side walls extending along the opposite side edges of the central web and a flange extending outwardly from the second side wall generally parallel to the central web. The facing sheets are assembled such that the flange of each facing sheet confronts the opposing central web of the other facing sheet and is laterally spaced-apart from the first side wall of the other facing sheet.

In accordance with the present invention, connecting means formed in the first and second side walls of the outer facing sheet provide a positive mechanical connection between the outer facing sheets of adjacent panels. The connecting means, in the form of a recess and a complementary tongue, are arranged such that the position of each panel relative to the previously erected panel may be adjusted laterally, whereby the lateral coverage provided by all of the panels is conformed with that required by the lateral dimensions of the building structural framework.

The recess is formed integrally with the second side wall of the outer facing sheet and is spaced-apart from both the central web and the flange. The recess, having a generally U-shaped configuration, presents confronting first and second interior wall segments extending generally parallel with the central web, and a connecting wall segment. The complementary tongue is formed integrally with the first side wall of the outer facing sheet and extends outwardly therefrom into the recess of the adjacent facing sheet. The complementary tongue comprises a first exterior wall segment which is generally parallel with the first interior wall segment of the recess. A second exterior wall segment adjoins the first exterior wall segment to provide a leading edge remote from the first side wall. Preferably, the second exterior wall segment of the tongue forms an acute angle with the first exterior wall segment. A sealant in the form of a bead of caulking material or a sealant strip formed from a soft, closed cell plastic or sponge rubber, is introduced into the recess at a location wherein the sealant is penetrated by the leading edge of the adjacent facing sheet to provide a weather-tight seal.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a fragmentary elevation view of the present building wall panels erected on a building structural framework;

FIG. **2** is a cross-sectional view taken along the line **2—2** of FIG. **1**, illustrating the transverse profile of the present building construction panel;

FIG. **3** is an exploded, isometric view of clip and fastener means;

FIG. **4** is a fragmentary cross-sectional view taken along the line **4—4** of FIG. **1**;

FIG. **5** is an end view illustrating the profile of the facing sheets used in the building panel of FIG. **2**;

FIG. **6** is a fragmentary cross-sectional view, taken along the line **6—6** of FIG. **1**, illustrating the normal joint spacing between adjacent panels;

FIGS. **7** and **8** are fragmentary cross-sectional views, similar to FIG. **6**, illustrating the minimum and maximum joint spacing between adjacent building panels;

FIG. **9** is a fragmentary cross-sectional view taken along the line **9—9** of FIG. **1**;

FIG. **10** is an isometric view illustrating an alternative sealant strip; and

FIG. **11** is a fragmentary cross-sectional view similar to the right hand half of FIG. **6**, illustrating the sealant strip of FIG. **10** installed in the present panel.

DESCRIPTION OF THE PREFERRED EMBODIMENT

FIG. **1** illustrates a building structural framework **10** of which only vertically spaced horizontal sub-girts **11** and two laterally spaced vertical columns **12***a*, **12***b* are illustrated. The building structural framework **10** supports a wall structure **13**. The wall structure **13** is assembled from plural building panels **14** erected in edge

overlapped relation and presenting plural joints **15.** Each of the panels **14** is secured to selected ones of the subgirts **11** by clip and fastener means **16.**

Each of the panels **14** (FIG. **2**) comprises an outer facing sheet **17,** an inner facing sheet **18** and a plastic foam core **19** disposed between the facing sheets **17, 18.** Each of the facing sheets **17, 18** includes a central web **20** having first and second side walls **21, 22** provided along the opposite longitudinal edges thereof. A flange **23** extends outwardly from the second side wall and is generally parallel with the central web **20.**

The facing sheets **17, 18** are laterally offset from one another, overall arrangement being such that the flange **23** of each facing sheet **17(18)** confronts the opposing central web **20** of the other facing sheet **18(17)** and is laterally spaced-apart from the first side wall **21** of the other facing sheet **18(17).** The panel **14** presents an overlapping edge portion **24** and an overlapped edge portion **25.** A gap **26** is presented at each of the edge portions **24, 25** between the flange **23** and the adjacent first side wall **21.** The foam core **19** is exposed at the gaps **26.**

The fastening means **16** (FIG. **3**) comprises a clip member **27** and a fastener **28.** The clip member **27** includes a first arm **29** provided with central and end apertures **30** and a second arm **31.** The clip member **27** preferably is in the form of an angle wherein the first and second arms **29, 31** are mutually perpendicular. The fastener **28** preferably is of the self-tapping type.

When the clip **17** is installed (FIGS. **4** and **5**), the first arm **29** overlies the flange **23** of the outer facing sheet **17** and the second arm **31** extends into the foam core **19** in the region (gap **28**) between the flange **32** of the outer facing sheet **17** and the first side wall **21** of the inner facing sheet **18.** The fastener **28,** when installed, extends through one of the openings **30** in the first arm **29,** the foam core **19,** the inner facing sheet **18** into the sub-girt **11.** It will be appreciated that the clip member **17** and the fastener **28** cooperate to provide a positive connection between the outer facing sheet **17** and the inner facing sheet **18,** and to positively secure the inner facing sheet **18** to the sub-girt **11.** For a more complete description of the fastening means **16,** reference is made to U.S. Pat. No. 3,667,180, supra.

Referring to FIG. **5,** each of the facing sheets **17 (18)** presents a recess **32** and a complementary tongue **33.** The recess **32** is formed in the second side wall **22** and is spaced-apart from both the central web **20** and the flange **23.** The recess **32** has a generally U-shaped configuration including confronting first and second interior wall segments **34, 35** which extend generally parallel with the central web **20,** and a connecting wall segment **36.**

The complementary tongue **33** is formed in the first side wall **21** and comprises first and second exterior wall segments **37, 38.** The first exterior wall segment **37** adjoins the first side wall **21** and extends outwardly therefrom generally parallel with the central web **20.** The second exterior wall segment **38** adjoins the first exterior wall segment **37** to provide a leading edge **39** remote from the first wall segment **21.** The second exterior wall segment **38** extends away from the central web **20** and forms an acute angle indicated at **40,** with the first exterior wall segment **37.**

It will be observed in FIG. **5** that the recess **32** has an interior height indicated at **41** and that the tongue **33** has an exterior thickness indicated at **42.** Also, the hidden face **45** of the first exterior wall segment **34** of the recess **32** is spaced from the exterior web face **47** at a distance indicated at **43;** and that the exposed face **46** of the first exterior wall segment **37** of the tongue **33** is spaced from the exterior web face **47** at a distance indicated at **44.** In accordance with the present invention and depending upon the gauge of metal used in forming the facing sheet **17, 18,** the interior height **41** of the recess **32** exceeds the thickness **42** of the tongue **33** by 2 to 4 metal thicknesses; and the distance **44** exceeds the distance **43** by 1 to 2 metal thicknesses. The overall arrangement is such that when adjacent panels **14A, 14B** (FIG. **6**) are assembled to form the joint **15,** the tongue **33** of the panel **14B** is centered with respect to the recess **32** of the adjacent panel **14A.** Note also that the exposed tongue face **46** is spaced apart from the hidden recess face **45.**

Further in accordance with this invention, a bead **56** of sealant material (FIG. **5**) is applied across substantially the entire width and along the entire length of the hidden face **45** of the recess **32.**

FIG. **6** illustrates the normal installed position of the adjacent panels **14A, 14B.** It will be observed that a space **50** — normal joint spacing — is presented at the joint **15.** However, the dimensions **48** and **49** (FIG. **5**) are such that the normal joint spacing **50** can be adjusted between two extremes, that is, wherein no space — minimum joint spacing **55** (FIG. **8**) — is presented at the joint **15;** and wherein a maximum joint spacing **51** (FIG. **7**) is presented at the joint **15.** Thus in accordance with this invention, the position of each panel may be adjusted laterally with respect to that of the previously erected panel prior to securing each panel to the subgirts **11.** For example, in the joint formed between panels of one commercial embodiment, the normal joint spacing is three-thirtysecondth inch; the maximum permissible joint spacing is three-sixteenth inch; and the permissible variation in the joint space from three-thirtysecondth inch is plus or minus three-thirtysecondth inch.

It will also be appreciated that since the fastening means **16** (FIG. **6**) is installed from the exterior of the building framework, the entire wall structure **13** (FIG. **1**) can be erected by workmen positioned solely at the exterior of the building framework.

The importance of the position and extent of the sealant bead **56** (FIG. **5**) within the recess **32** will now become apparent from the following. A fragment of a panel **14C** is illustrated in dotted outline at the right hand side of FIG. **6.** It will be observed that as the tongue **33** of the panel **14C** enters the recess **32** of the previously erected panel **14B,** the leading edge **39** is positioned to engage the sealant bead **56.** When the tongue **33** reaches its final position, as shown at the left hand side of FIG. **6,** a portion of the sealant bead **56** has been displaced from its initial position. However, since the exposed tongue face **46** is spaced-apart from the hidden recess face **45,** a portion of the sealant bead **56** remains between the exposed tongue face **46** and the hidden recess face **45.** The same is true for the panels at the maximum joint spacing **51** (FIG. **7**) and for the minimum joint spacing **55** (FIG. **8**). Accordingly, regardless of the joint spacing, a weather-tight seal is provided.

Returning to FIG. **1,** it will be observed that corner panels **14a, 14b** are applied to the vertical columns **12*a*, 12*b*.** The construction and installed position of a

typical corner panel is illustrated in FIG. **9.** The corner panel **14***a* (**14***b*) has no exposed trim elements and provides an aesthetically pleasing, visual continuity in the appearance of the panels along adjacent building faces. The panel **14***a* may comprise one of the panels **14** which is bent along its longitudinal center line of the facing sheet **17.**

Referring again to FIG. **1,** each of the panels **14** has a modular width indicated at M, which corresponds to the distance between the first and second side walls **21, 22** (FIG. **5**). Prior to erecting the panels **14,** the overall distance indicated at D in FIG. **1,** between the corner panels **14***a* and **14***b* is determined. If the position of the vertical columns **12***a*, **12***b* is in accordance with the engineering drawings, then the panels **14** can be erected at the normal joint spacing **50** (FIG. **6**). However, if the distance between the vertical columns **12***a*, **12***b* is either less than or greater than that specified, the difference will be reflected in the overall distance D.

The joint spacing is determined by subtracting from the overall distance D, the product of the number of panels times the modular coverage M. The remainder is then divided by the number of joints. Erection of the panels **14** to the desired joint spacing may be accomplished by the aid of gauges **52** of which only one is illustrated in FIGS. **6** and **7.** The gauge **52** has a gauging end **53** adapted to be inserted between the adjacent panels **14***a*, **14***b* and a handle **54.** The gauging end **53** may, for example, be provided with one or more strips **55** of predetermined thickness to arrive at the desired joint spacing.

FIG. **10** illustrates an alternative sealant strip **57** formed from soft polyvinyl chloride or soft silicone rubber preferably of the closed cell type. One face of the sealant strip **57** is provided with an adhesive coating **58** which is protected by a stripable backing sheet **59.** The sealant strip **57** is installed in the recess **32** of the panel **14D** (FIG. **11**). When installed, the sealant strip **57** is secured by the adhesive coating **58** (FIG. **10**) to the connecting wall segment **36.** The sealant strip **57** also engages the interior face **45** of the first interior wall segment **34** and is thus positioned for engagement by the tongue **33** of the adjacent panel **14E** thereby to provide a weather-tight seal.

I claim:

1. In a wall structure assembled from plural building panels spanning across plural spaced-apart sub-girts of a structural framework and erected in side-by-side overlapped relation; each of said panels having an outer facing sheet laterally offset from and spaced-apart from an inner facing sheet, and a foam core disposed therebetween; each of said facing sheets including a central web, first and second side walls extending along the opposite sides of said central web, and a flange extending outwardly from the second side wall generally parallel to said central web, the flange of each facing sheet confronting the opposing central web of the other facing sheet and being laterally spaced-apart from the first side wall of the other facing sheet; said panels being erected (a) with the first side wall of each facing sheet confronting the second side wall of the adjacent facing sheet, and (b) with said flange of each outer facing sheet positioned inboard of and spaced-apart from said flange of each said inner facing sheet; and clip and fastener means engageable with the flanges of the outer facing sheets for securing said panels to certain of said sub-girts; the improvement in laterally adjustable connecting means providing a positive mechanical connection between the outer facing sheets of adjacent panels, comprising:

said second side wall of each outer facing sheet having a recess formed integrally therein and saced-apart from said central web and from said flange. said recess comprising confronting first and second interior wall segments extending generally parallel with said central web, and a connecting wall segment; and

a complementary tongue formed integrally with said first side wall of each outer facing sheet and extending outwardly therefrom into the recess of the adjacent facing sheet, said complementary tongue comprising a first exterior wall segment confronting said first interior wall segment and being generally parallel therewith, and a second exterior wall segment adjoining said first exterior wall segment to provide a leading edge remote from said first side wall;

the width of said complementary tongue and the depth of said recess being such that prior to securing said panels to said subgirts, the position of each panel may be adjusted laterally with respect to the previously erected panel, thereby to conform the lateral coverage provided by all of said panels with that required by said structural framework.

2. The improvement of claim **1** including

a sealant material applied to the first interior wall segment of said recess, said sealant material being penetrated by said leading edge of the adjacent facing sheet to provide a weathertight seal.

3. The improvement of claim **2** wherein

said second exterior wall segment forms an acute angle with said first exterior wall segment.

4. The improvement of claim **2** wherein

the first interior wall segment of said recess is positioned adjacent to said central web.

5. The improvement of claim **1** wherein

the spacing between the first and second side walls of the outer facing sheets of adjacent panels is uniform throughout said wall structure.

6. The improvement of claim **1** wherein

said second and first side walls of each said inner facing sheet are provided with a said recess and a said complementary tongue, whereby laterally adjustable positive mechanical connections also are provided between the inner facing sheets of adjacent panels.

* * * * *