Nov. 15, 1960 L. TOTH 2,960,195

WALL FACING

Filed Dec. 10, 1954

2 Sheets-Sheet 1

Fig. 1.

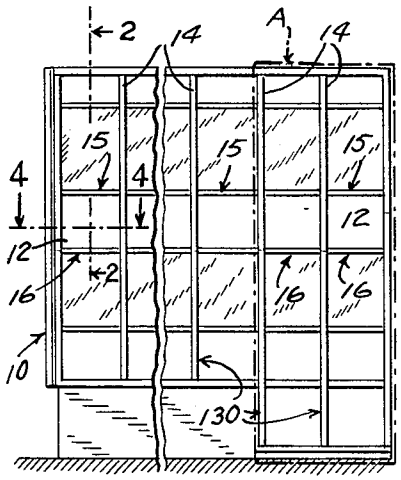

Fig. 2.

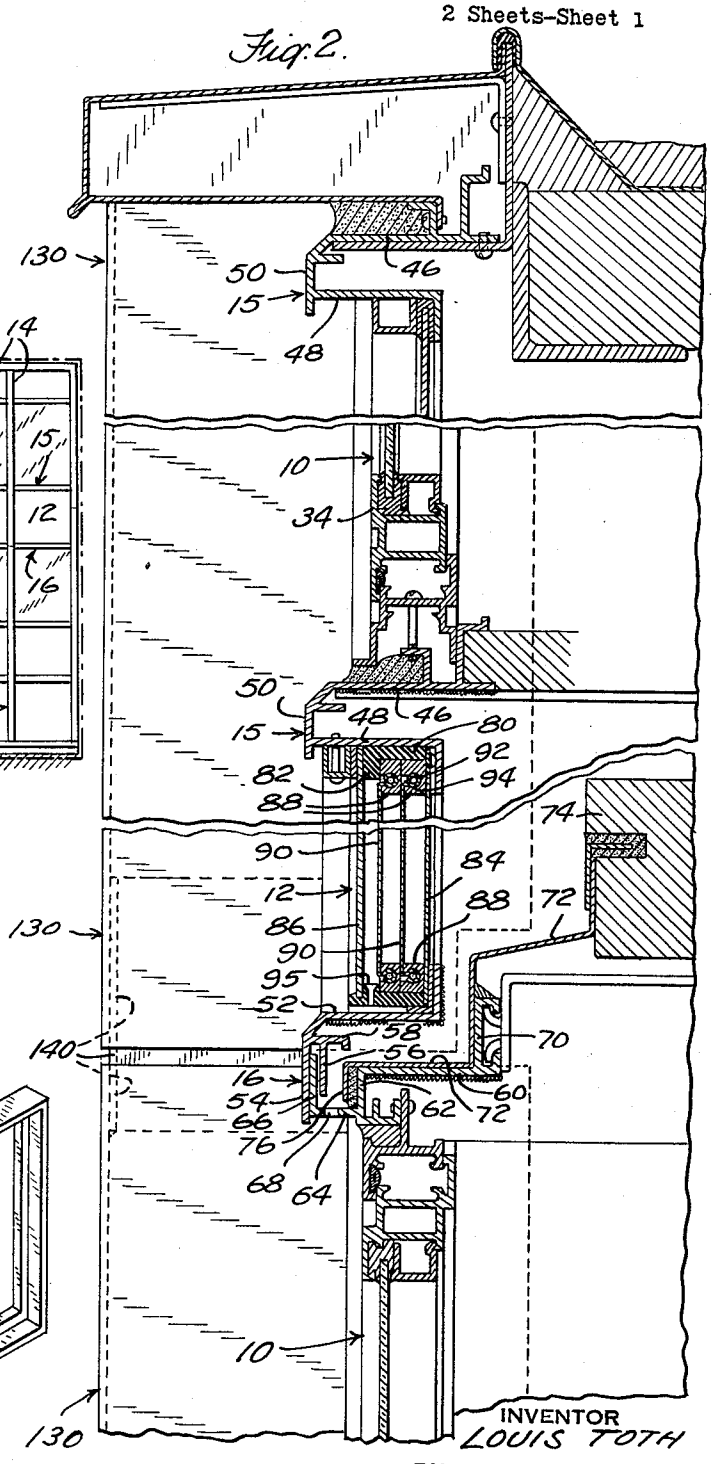

Fig. 3.

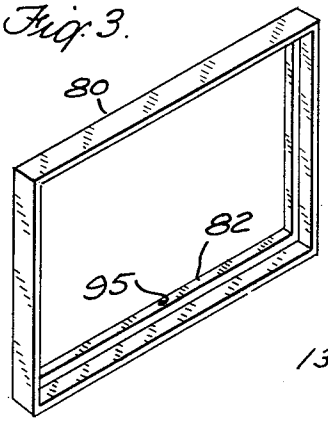

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Fig. 4.

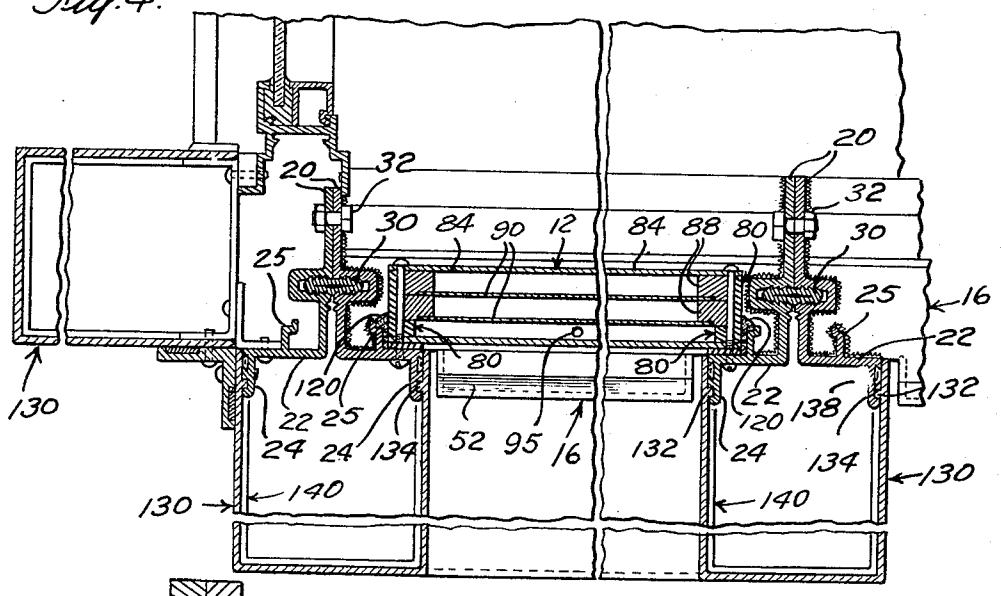

Fig. 5.

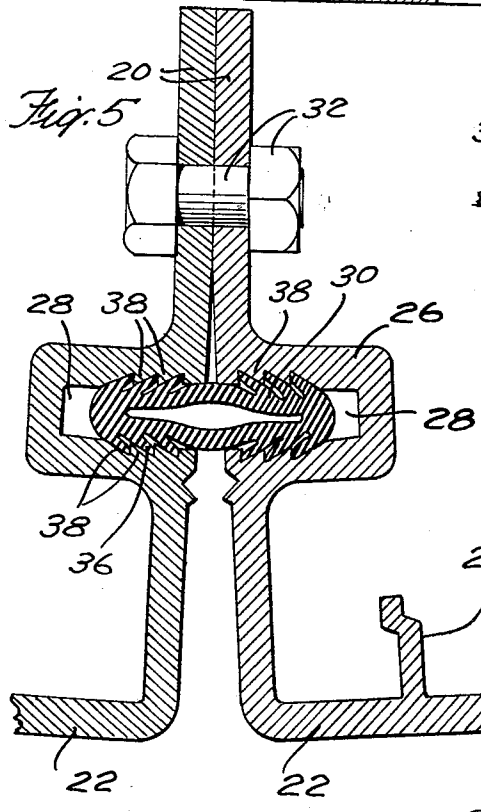

Fig. 6.

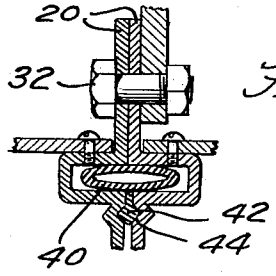

Fig. 7.

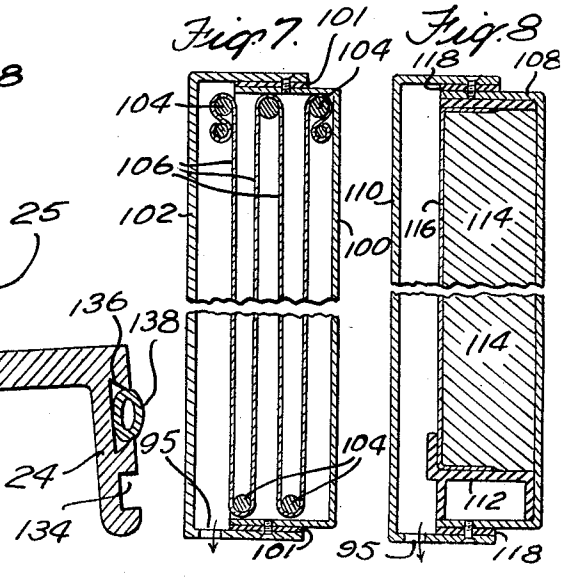

Fig. 8.

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WALL FACING

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11 Claims. (Cl. 189—34)

This invention relates to wall construction for buildings and particularly to building wall facings made of metal and glass, or of metal, glass and spandrels or panels.

In the building of wall facings of the character described in which the main supporting members are metal, difficulties are experienced because of the relatively high coefficient of expansion of the metal, for example aluminum, as compared with other elements of the building. Owing to this expansion and contraction, it is difficult to permanently seal the various building elements in such a way as to prevent leakage. In accordance with the present invention a construction is provided in which this difficulty is overcome and expansion and contraction are provided for in both vertical and horizontal directions without permitting leakage to take place.

Wall facings constructed according to the principle herein disclosed may be assembled at the factory in units as large as can be conveniently shipped to the place where the building is to be located. These units include mullion sections, horizontal members, spandrels and windows, all joined together at the factory, the mullions and horizontal members being of such construction that when the units are assembled they are joined together in such a way that while vertical and horizontal expansion is permitted there is no leakage between the joined units.

One object of the present invention is to provide construction of the vertical members or mullions of the building facing, which are so made as to firmly hold the window frame and spandrel members, but to permit expansion and contraction without permitting leakage.

Another object of the invention is to provide a construction of the horizontal members permitting expansion in a vertical direction to take place. Expansion joints may be provided at every floor level or at spaced floor levels, such as at every other floor level depending upon the size of the unit built at the factory which can be shipped to the building location.

Another object of the invention consists in constructing the horizontal expansion joints in such manner that any water leakage, if it occurs, or condensation will be trapped by means of flashing attached to the floors or floor beams, which will lead such leakage or condensation to the horizontal members of the facing which are constructed to collect such water and permit it to pass to the outside of the building walls, as by means of weep holes. A construction is also preferably provided to prevent water from being blown up through the weep holes and being forced above the flashing joints.

Among the other objects of the invention are to provide sealing means which may easily be introduced between mullion sections at the time of their erection so as to prevent leakage; to provide covering means for the mullions by which the desired architectural appearance may be secured while at the same time further protection against leakage and additional strength is provided; to provide a construction in which joints around window

frame and spandrel elements may be packed or repacked from the inside of the structure; and to provide improved spandrel or panel constructions which are light, strong and effective insulators against heat losses.

Other objects and advantages of the invention will appear in the course of the following description of certain preferred embodiments of the invention chosen to illustrate the principles thereof.

In the accompanying drawings:

Figure 1 is a front elevation of the facade of a building, such as a store or office building;

Figure 2 is a vertical section on line 2—2 of Fig. 1 parts being broken away;

Figure 3 is a perspective view of a plastic frame for an insulated panel or spandrel;

Figure 4 is a horizontal section on line 4—4 of Fig. 1, parts being broken away;

Figure 5 is a fragmentary horizontal section on an enlarged scale of one of the mullions, showing the same in expanded condition;

Figure 6 is a fragmentary horizontal sectional view of a modified form of mullion;

Figure 7 is a vertical sectional view of a modified form of spandrel panel; and

Figure 8 is a similar view of another modified form of panel.

Referring to the drawings in detail, the invention is shown for purposes of illustration in a building facade comprising windows **10**, spandrels **12**, mullions **14** and horizontal members **15** and **16** joined to the mullion between the windows and spandrels.

Referring particularly to Figs. 4 and 5, the mullions are preferably formed of two members, a left hand shape **18** and a right hand shape **19**, each comprising webs **20**, right angle flanges **22**, and at the outer edges outwardly turned flanges **24**. The mullion members are also preferably provided with Z-shaped guide flanges **25** on the right angle flanges **22**. The mullion members also have channel formations **26** midway of the web portions **20** which provides channels **28** for the reception of a sealing or packing member **30** to be described. The inner parts of the web **20** are firmly clamped together in the finished construction in any suitable manner as by bolts **32**. The mullion members may be made by any suitable process, for example by rolling, but in the construction shown are extruded sections usually of aluminum.

The structure is preferably assembled in units at the factory, each unit comprising a right and left half-mullion of suitable length, for example of sufficient length to receive a pair of windows and spandrel sections, and these mullion parts are welded or otherwise tightly connected to the ends of the transverse members **15** and **16**, window frames **34** and spandrels **12** being mounted in position at the same time. The size of the unit which is assembled at the factory depends upon the size of the individual windows and the conditions under which the unit can be shipped to the job. It is desirable to make the units as large as possible, and each unit may include a central mullion or mullions in addition to the outer mullion parts, together with the windows, spandrels and transverse members mounted therebetween. In vertical height the unit may correspond with the distance between floors, or it may be high enough to extend over a plurality of floor levels, the height of two floor levels being a usual practice. In Fig. 1 a single wall facing unit is indicated at A comprising the two vertical rows of windows and spandrels at the right hand side of the figure with the mullion parts and horizontal members forming the framework enclosing the same.

Upon erection of adjacent units the packing **30** is inserted between adjacent mullion members which are then bolted tightly together by bolts **32**. Owing to the expan-

sion and contraction of the metal mullions, window frames and spandrels some relative movement of the parts necessarily takes place and this is provided for primarily by the two part mullion construction, the outer parts of the mullions being capable of spreading apart as clearly shown in Fig. 5. At least some of the cross members, such as the member **16**, which may be introduced at every floor level or at least the top and bottom of each factory assembled unit, are also made in two parts so as to permit relative movement to take care of expansion in the vertical direction.

While the inner parts of the webs **20** of the mullion members are described as tightly bolted together, it is obvious that with the passage of years and the constant expansion and contraction, leakage might take place between the adjacent surfaces. To guard against the possibility of such leakage, the flexible packing **30** fitting in the channels **28** is provided. The packing **30**, as shown particularly in Fig. 5, preferably takes the form of a flattened tube of permanently flexible plastic such as a vinyl plastic which is provided with a plurality of inclined tongues or ribs **36** directed towards the adjacent faces of the mullion members and fitting in saw-toothed shaped grooves **38** formed in the walls of the channels **28**. In an extruded section the formation of these grooves is very simple. It will be seen that the plastic ribs fitting in the grooves will yield upon separation of the mullion webs, while still fitting tightly in their grooves, and that upon expansion bringing the webs closer together, they will not become loose so that an effective seal against leakage is provided under all conditions, and for an indefinite length of time. The several ribs and grooves also provide a labyrinthine path forming an effective obstruction against leakage.

A slightly modified form of packing is shown in Fig. 6 in which a flattened tube **40** is used which is not provided with ribs fitting in grooves. This will be especially suitable in connection with a rolled section where the formation of the grooves **38** would present some difficulty. If desired a packing **42** of mastic or the like may be inserted in the space outside of packing tube **40** in grooves **44** in the webs of the mullion members.

The transverse bars **15** are shown in the example illustrated as extruded aluminum sections having top walls **46** and bottom walls **48** connected by a connecting web **50**. This construction provides a limited amount of flexibility taking care of some of the vertical expansion. The main cross members **16**, particularly those located at the top and bottom of the factory built units, are preferably made in two telescopic parts, the upper part being designated **52** and being provided with an outer flange **54**, an inner flange **56** and a hook shaped deflector or baffle flange **58**. The lower part **60** of the member **16** is provided with a downwardly turned flange **62**, a horizontal flange portion **64** and an outer flange **66**, the latter sliding between the flanges **54** and **56** of the upper member **52** so as to provide an expansion joint. The flange portion **64** is preferably provided with one or more weep holes **68**. At the inner side of the member **60** is an upwardly turned flange **70**, and a flashing member **72** is preferably extended from the floor slab **74** down in front of the flange **70** over the horizontal part of the member **60** and terminates in a flange **76** extending into the trough or gutter formed between the members **62**, **64** and **66**. Thus any leakage or condensation passes down over the flashing and out of the weep hole **68**. The deflector or baffle flange **58** retards the blowing of water back into the joint by high winds.

The windows may be of any desired type either fixed, pivoted or sliding, and need not be described in detail.

The spandrel panels may be of any suitable construction, either metal or otherwise, and may, if desired, be of glass. A preferred panel construction, however, is formed of spaced aluminum plates, mounted in a plastic frame, a suitably insulated filling being provided between the plates if desired. In the construction shown in Figs. 2, 3 and 4, the panel comprises a plastic frame **80** having a flange **82**. Mounted at the back of the plastic frame is an aluminum plate **84**, and at the front of the frame is mounted an aluminum plate **86**. The plastic frame and the aluminum plates thus enclose a dead air space. As an additional insulating means, one or more plastic frames **88** may be mounted in the frame **80** and these may carry sheets of aluminum foil or plastic **90** having reflecting surfaces. As shown the foil sheets **90** are held in grooves **92** in the frames **88** by tubes or rods **94**, snapped into place in the grooves. A weep hole **95** is preferably provided at the bottom of the frame between the front plate and the insulation to permit condensation to drain outside.

In Fig. 7 a modified construction of panel is shown in which the inside member of the panel comprises a flanged aluminum shell **100** over which fits an outer flanged shell **102**, there being insulation **101** between the flanges. Rods **104** are mounted at the top and bottom of the shells and a strip of bright aluminum foil or plastic **106** is wound back and forth over the rods.

Fig. 8 shows another modified form of panel in which there is an inner shell **108**, an outer shell **110** and an intermediate plastic shell **112** which fits into the inner shell and encloses an insulating filling **114** of glass fiber, mineral wool or the like. This is preferably covered in front by a sheet **116** of bright aluminum foil or plastic. The inner and outer shells are preferably separated by a layer of insulation **118**.

The small Z-shaped flanges **25** on the mullion members serve as guide or spacing flanges to properly position the window frame or panel members mounted between the mullion members. They also serve to help retain packing **120** which may be inserted either at the factory or after the erection of the units in the wall facing. The spaces for the packing are accessible from the inside of the building before the inner trim (not shown) is placed, and this packing may be tightened or replaced whenever necessary upon removal of the inner trim.

The outer faces of the mullions may be finished to provide visible exterior surfaces, but they are preferably enclosed by mullion covers **130** which are shown in the form of deep channels of sheet aluminum or the like having ribs **132** on the inner sides of their legs, which snap over or slide into channels **134** formed in the faces of the flanges **24**. The flanges **24** preferably also have channels **136** therein, into which are fitted packings **138** preferably in the form of flattened plastic tubes. The deep channel mullion covers **130** have sufficient flexibility to take care of the spread or contraction of the mullion walls. To take care of the vertical expansion, the covers are preferably divided into sections connected by expansion joints located opposite to the expansion joints in the transverse members **16**. As shown in Fig. 2, a sleeve or channel section **140** is welded into the upper end of the lower section of the cover and the seams caulked so as to prevent leakage. The upper part of the sleeve **140** extends up inside of the lower part of the upper section of the cover so that a leak proof telescopic joint is provided between the two sections of the mullion cover. The mullion covers assist in preventing the entrance of rain or moisture between the mullion parts. They also add a certain amount of physical support to the mullion structure and they may be so shaped as to provide the desired architectural effect in the finished building facade.

While certain preferred embodiments of the invention have been illustrated and described in detail, it is to be understood that changes may be made therein and the invention embodied in other structures. It is not, therefore, the intention to limit the patent to the specific constructions illustrated, but to cover the invention broadly in whatever form its principles may be utilized.

I claim:

1. A wall facing including at least one pair of mullion parts, each having a web transverse to the plane of the wall facing, said webs being clamped together near their edges towards the inside of the building and capable of spreading and contraction towards the outside of the building on change of temperature, each of said webs having a laterally turned flange at its edge towards the outside of the building, the flanges on a pair of connected mullion part webs turning away from each other, the web of each mullion part having a channel formed therein mating with the channel in the web of the adjacent mullion part, an elastic coherent plastic packing mounted in said channels and extending longitudinally of the mullion parts and into the channels for a distance greater than the possible separation of the mullion parts due to changes in temperature, transverse structural members secured to the mullion parts at intervals, and window and spandrel members mounted in the spaces bounded by mullion parts and transverse structural members.

2. A construction as claimed in claim 1 in which the laterally turned flanges of said mullion parts carry inwardly directed flanges engaging the window or spandrel members.

3. A construction as claimed in claim 1 in which the packing is a hollow tube provided with inclined ribs, the walls of the channels in the mullion parts being grooved and receiving such ribs.

4. A construction as claimed in claim 1 in which the pair of mullion parts are provided with a deep channeled mullion cover sufficiently flexible to allow for the spreading of the outer portions of the mullion parts.

5. A construction as claimed in claim 4 in which the laterally turned flanges of the mullion parts terminate in outwardly turned flanges, the mullion cover and said outwardly turned flanges having interlocking grooves and ribs, said outwardly turned flanges of said mullion parts also having longitudinal packing grooves therein, and resilient plastic packing strips mounted in said packing grooves for sealing the joint between said outwardly turned flanges and said mullion cover.

6. A wall facing comprising vertical side members and at least one mullion constructed of two parts clamped together at their edges toward the inside of the building, and capable of spreading and contraction toward the outside of the building upon change of temperature, the facing surfaces of said mullion parts having matching vertical channels therein, an elastic plastic flexible sealing strip fitting in said channels, and extending thereinto for a distance greater than the possible separation of the mullion members due to changes in temperature, thereby bridging the gap between the mullion parts so as to exclude leakage between the mullion parts at all temperatures, transverse structural members secured to the vertical side members and mullion parts at intervals, a plurality of wall forming elements including glazed window frames and spandrel members, mounted one above the other between the mullion and side members, and horizontal expansion joints between certain of said transverse structural members providing for vertical expansion and contraction upon change of temperature.

7. A construction as claimed in claim 6 in which the sealing member comprises a flattened tube of elastic plastic material.

8. A construction as claimed in claim 6 in which the side walls of the channels of the mullion parts and the sealing strip portions fitting therein are formed with longitudinally extending complementary grooves and ribs.

9. A building construction unit capable of being built at a factory and incorporated into a building construction as a unit in a wall facing, said unit having vertical side members, and at least one mullion intermediate said side members, said mullion being constructed of two metal bars clamped together at their edges toward the inside of the building and capable of spreading and contraction toward the outside of the building upon change of temperature, the facing surfaces of said mullion parts having matching vertical channels therein, a vertical elastic plastic sealing strip fitting tightly in said channels and extending thereinto for a distance greater than the possible separation of the mullion members due to changes in temperature, thereby bridging the gap between the mullion parts so as to exclude leakage between the mullion parts at all temperatures, transverse metal structural members including top and bottom members each extending between a side member and a mullion part and firmly secured thereto, and a plurality of wall forming elements including glazed window frames and spandrel members mounted between the mullion parts and side members, at least one of the transverse structural members at the top and bottom of said unit having projecting spaced flanges adapted to cooperate with a mating flange construction on an adjacent unit to form an expansion joint therewith.

10. A curtain wall comprising a plurality of wall facing sections each embodying two metal side members joined by metal cross members of lengths to extend between the side members and firmly fixed at their ends to the respective side members, the adjacent side members of contiguous wall sections consisting of metal angle bars having wide webs transverse to the plane of the wall and lateral flanges at the outer edges of said webs, the flanges of adjacent webs of contiguous wall sections facing away from each other, the transverse webs of said angle bars being formed midway of their widths with return bend formations providing facing deep channels in the adjacent webs, said webs being firmly clamped together near their inner edges only so that their outer portions may separate more or less depending on conditions of stress to which they are subjected, and flexible elastic sealing strips of coherent material fitting in said channels and extending thereinto for a distance greater than the possible separation of the adjacent webs due to changes in temperature, and wall forming elements mounted between the metal side and cross members of each section.

11. A curtain wall comprising a plurality of courses of joined wall facing sections as defined in claim 10 located one above the other and joined by weather-sealing horizontal expansion joints providing for vertical expansion and contraction.

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