United States Patent [19]

Landis et al.

[11] **3,713,261**

[45] **Jan. 30, 1973**

[54] BUILDING CONSTRUCTION

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[22] Filed: **March 8, 1971**

[21] Appl. No.: **122,046**

[52] **U.S. Cl.** **52/289**, 52/301, 52/502, 52/580, 52/584, 52/618

[51] **Int. Cl.**.....**E04b 5/10**, E04c 2/34

[58] **Field of Search**.....52/300, 301, 580, 584, 731, 52/93, 289, 90, 502, 618

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[57] **ABSTRACT**

A building construction having a panel assembly provided with an inner panel, an outer panel and an interposed insulating panel. The inner panel has a plurality of horizontally disposed, integrally formed hollow girt elements. Opposed vertical marginal edges of the panel assembly are secured to hollow columns. Each hollow column is formed from a pair of generally channel shaped column forming sections having substantially the same cross sectional configuration. Joining means securing each panel assembly vertical marginal edge to one column forming section. Each column forming section having a base element and two spaced upstanding sidewalls integrally connected therewith and disposed substantially perpendicular thereto. Each sidewall having a transversely inwardly disposed portion adjacent the free end thereof. The column forming sections disposed with their channel openings facing each other and the transversely inwardly disposed portions of one column forming section disposed in surface to surface contact with respect to the transversely inwardly disposed portions of the other column forming section. This provides a generally rectangular hollow column member having fastener receiving recesses within a pair of opposed walls. The columns may have cap and sill plates enclosing the ends of the hollow section. The cap section may be employed to support an overlying structural member such as a joist.

A beam construction having the identical configuration as the column construction.

11 Claims, 8 Drawing Figures

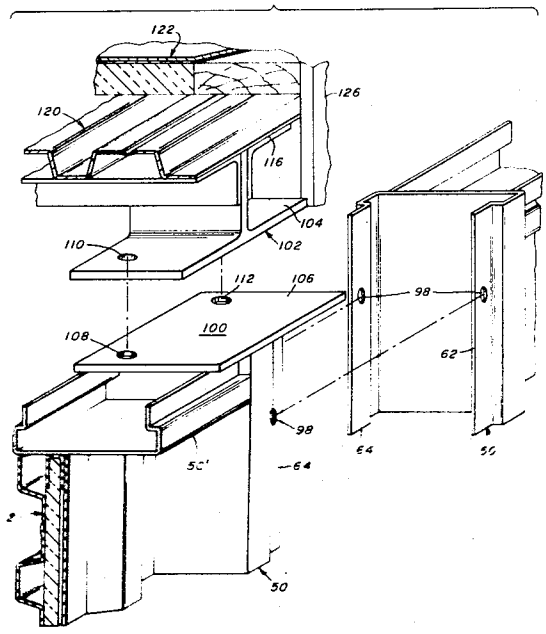


FIG. 2.

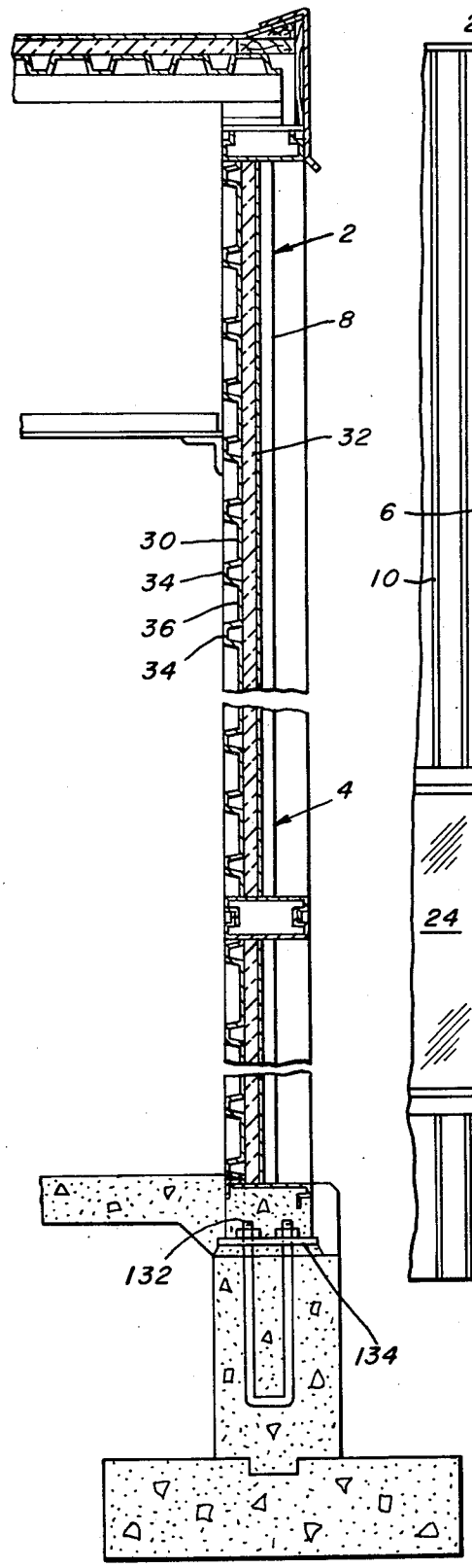
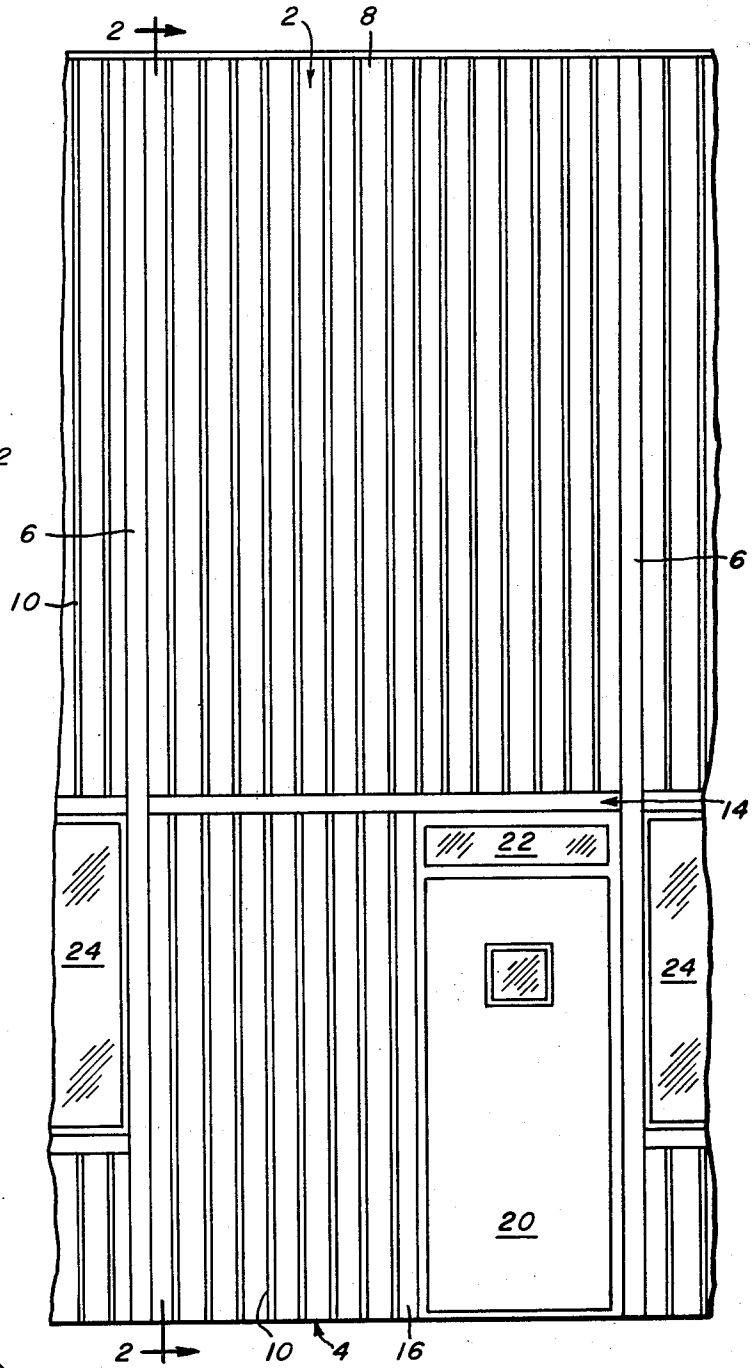


FIG. 1.



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FIG. 5.

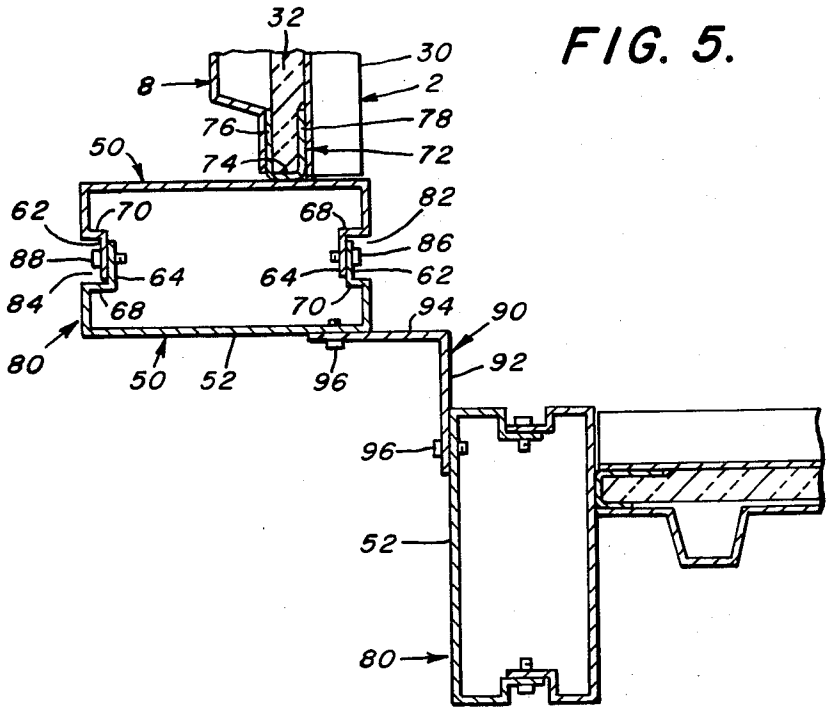


FIG. 8.

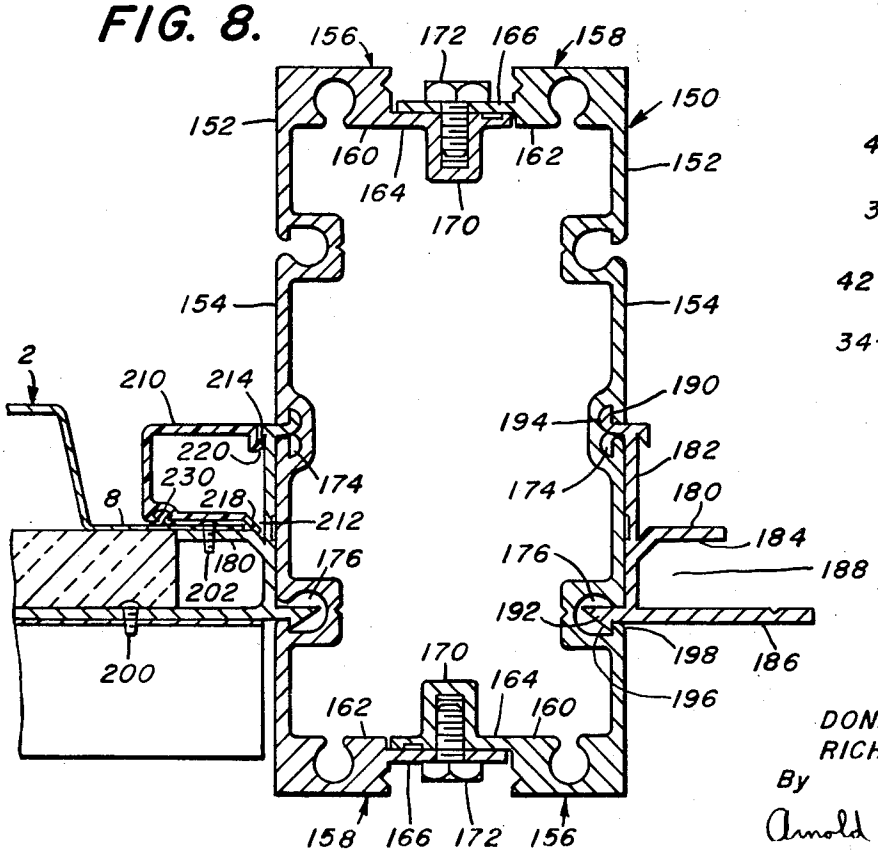
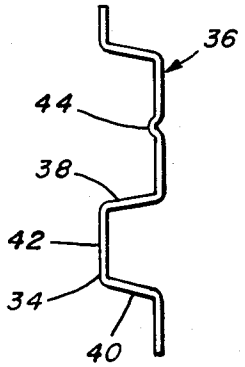


FIG. 3.



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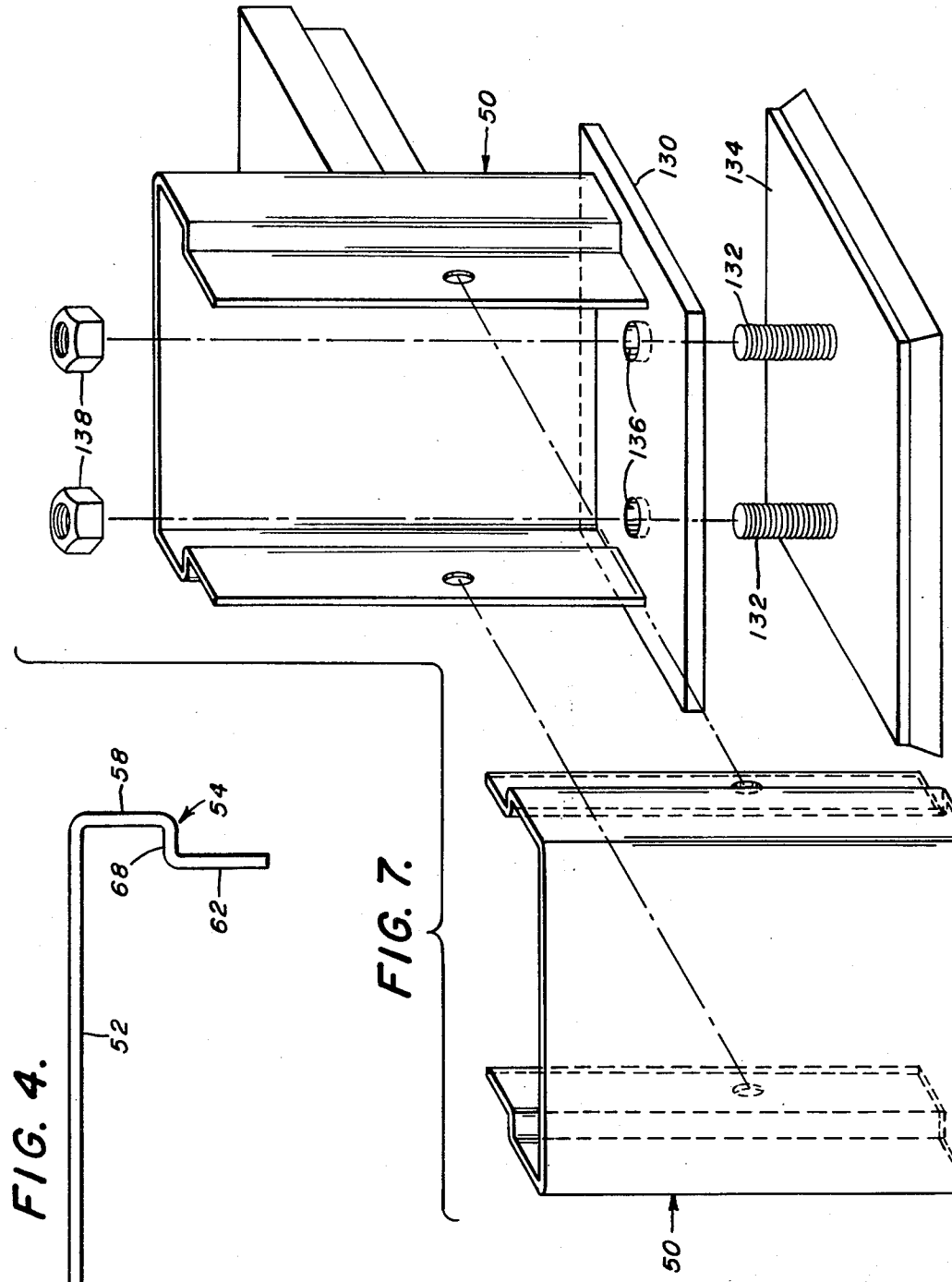
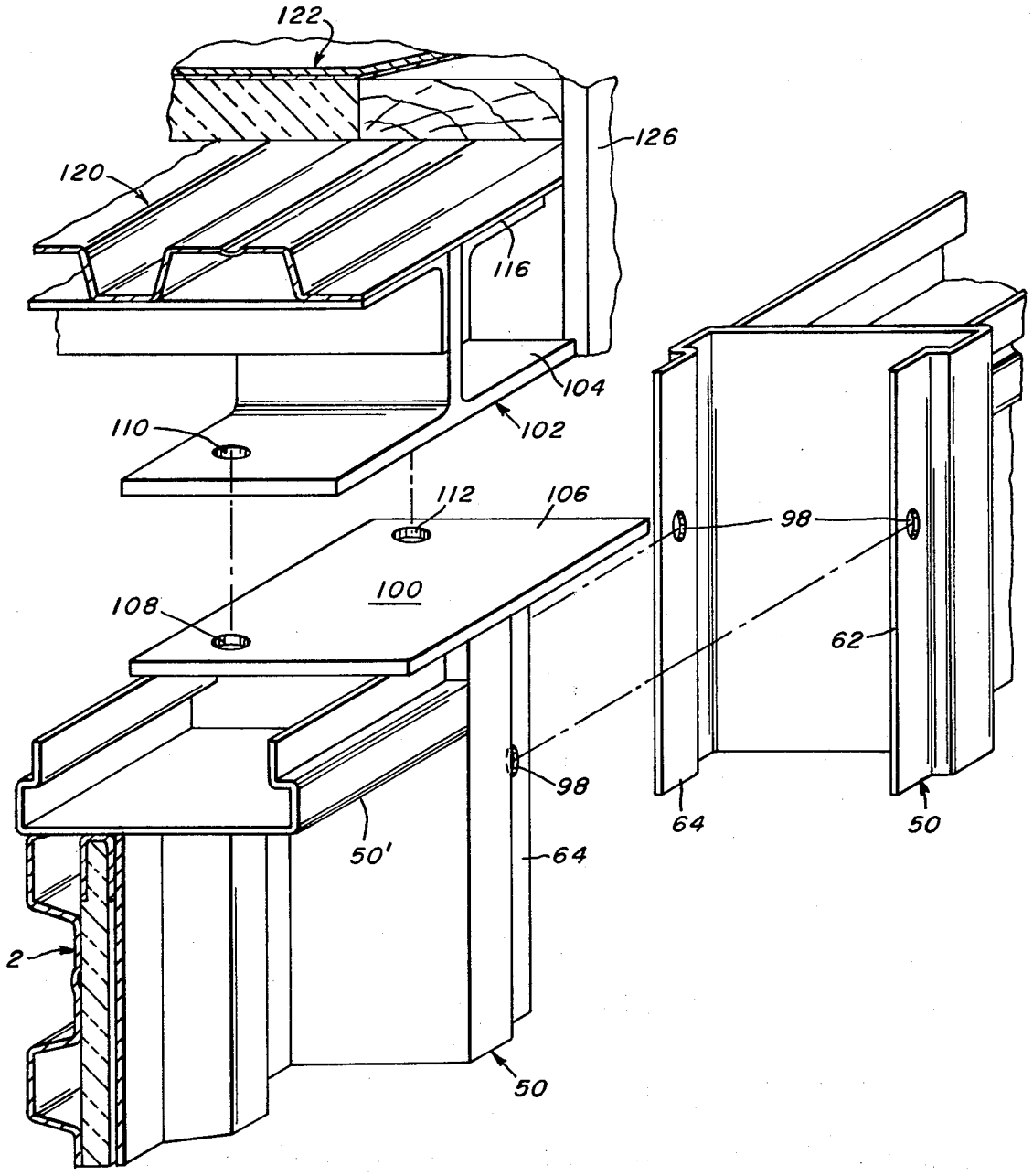


FIG. 7.

FIG. 4.

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FIG. 6.



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BUILDING CONSTRUCTION

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to a building construction employing an integrally reinforced composite panel assembly secured between symmetrical hollow column and/or beam elements which are generally rectangular and provide with two opposed walls having recessed portions.

2. Description of the Prior Art

It has been known to provide wall panels which are rigidified by either integrally formed ribbing or separately attached girt elements. See U. S. Pat. No. 2,277,791.

It has also been known to provide various forms of hollow column structures formed by the assembly of two or more sectional components. See U. S. Pat. Nos. 1,883,871, 3,001,245, 3,218,768 and 3,398,499.

There has been lacking a means of effecting a unitary wall construction employing a composite panel assembly having appropriate integral reinforcement and economical, readily assembled multipiece hollow column and beam elements adapted to provide effective load bearing capacity and being joined by fasteners which are received within reinforcing recesses in the column and beam end walls.

There is also lacking column and beam structures of this type adapted to have pre-secured sill and cap plates which facilitate, respectively, anchoring and support for an overlying load such as an overlying floor supporting element or a roof deck construction.

SUMMARY OF THE INVENTION

This invention has fulfilled the above-described need. The wall construction of this invention consists of a panel assembly having inner and outer panel elements with an interposed insulating panel. The inner panel has a plurality of horizontally disposed integrally formed upstanding hollow reinforcing girts or ribs. These ribs preferably are defined by sidewalls which extend rearwardly and angularly transversely inwardly toward each other, terminating in a substantially flat rear rib wall. Each panel assembly has at least one vertical marginal edge secured to a column forming section. The column forming section has a base and a pair of spaced sidewalls integrally formed with the base and disposed substantially perpendicular thereto to define a generally channel shaped section. The column forming section has a maximum transverse width between first sectors of the sidewalls disposed closely adjacent to the base and a reduced transverse width at second sectors of the sidewalls disposed adjacent the free ends thereof.

The columns are formed by positioning the column defining sections with their channel openings facing each other and the second sectors of one column forming section disposed in surface to surface contact with the second sectors of the other column forming section. A headed fastener may then be passed through the transverse outermost second sectors and into the transverse inner second sections, thereby securing the two column defining sectors while retaining the fastener heads in the recesses of the column end walls.

With respect to the column forming sections, one section may have a pre-secured sill plate which is adapted to close the base of the hollow column. The

other column forming section may have a cap plate adapted to close the upper end of the hollow column structure. The cap plate may be secured in underlying supporting relationship with respect to a joist. Also, the cap plate may be employed to directly or by means of interposed supporting elements provide support for a roof deck construction thereby eliminating the need for additional roof supporting joists.

It is an object of this invention to provide a building construction including a curtain wall panel assembly having an inner panel member provided with a plurality of horizontal integrally formed hollow rib or girt elements providing effective longitudinal stiffening of the panel assembly.

It is a further object of this invention to provide such a panel assembly which has two or more marginal edges attached to column or beam forming sections which are adapted to be secured to like sections in order to provide a unitary stable wall construction.

It is another object of this invention to provide a hollow load bearing column or beam of generally rectangular configuration having longitudinal fastener receiving recesses in a pair of opposed walls which recesses also serve to add rigidity to the column or beam.

It is another object of this invention to provide hollow columns and beams having pre-attached cap and sill covers in order to effectively close the hollow members and also provide means for anchoring the members and providing means for securing and supporting cooperating structural members.

It is yet another object of this invention to provide such a construction which is adapted to facilitate economic fabrication of the component elements and reduced construction cost as a result of designs which facilitate rapid field erection.

These and other objects of the invention will be more fully understood from the following description of the invention, on reference to the illustrations appended hereto.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a front elevational view of building construction contemplated by this invention.

FIG. **2** is an elevational view of one form of wall construction taken through **2—2** of FIG. **1**.

FIG. **3** is a fragmentary illustration of a portion of a modified form of inner wall construction.

FIG. **4** is a cross sectional configuration of one form of column defining section provided by this invention.

FIG. **5** is a partially broken away sectional view of a corner construction employing the column defining section of FIG. **4**.

FIG. **6** illustrates a preferred form of upper end of the column forming sections including a roof supporting structure.

FIG. **7** is an exploded view of the lower portion of a pair of column defining sections and anchoring means.

FIG. **8** illustrates a sectional view of a modified form of column construction in accordance with this invention.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

As used herein, unless expressly indicated to the contrary, words such as "inwardly", "outwardly", "forwar-

dly", "rearwardly" and words of similar import are employed only for simplicity and clarity of illustration within the present context and are not intended to be, in any fashion, limiting of the invention.

In the wall construction shown in FIG. 1, there is shown a pair of panel assemblies 2, 4 interposed between a pair of columns 6. The exteriorly facing panels 8 have a plurality of integrally formed hollow vertical ribs 10 which serve to provide longitudinal vertical stiffening of the panels 8. Also shown are header member or beam 14, which preferably has the same cross sectional configuration as columns 6, and column 16 which cooperate to define portions of the frame for door 20 and overlying fixed lite 22. Disposed transversely outwardly of column 6 are similar wall constructions employed in walls having windows 24.

Referring now to FIG. 2, it is seen that the panel assemblies 2, 4, which in the form shown are curtain walls, consist of an outer panel 8, an inner panel 30 and an interposed panel 32 which is composed of insulating material. The inner panel 30 has a plurality of hollow, horizontally disposed integrally formed girts or ribs 34. Generally flat panel sections 36 are interposed between and wider than adjacent ribs 34. Each horizontally disposed rib, in the preferred form, as is shown in FIG. 3, has a pair of rearwardly directed, straight transversely inwardly extending sidewalls 38, 40 which terminate in a substantially flat transverse rear rib wall 42. In the form shown in FIG. 3, supplemental reinforcing means in the form of relatively small rearwardly directed ribs 44 are provided in panel sections 36. Ribs 44 are of substantially reduced width and rearward dimension as compared with ribs 34. These horizontal ribs 34, 44 serve to provide longitudinal reinforcement to the panel assembly 2, 4 in a horizontal direction.

In the form of outer panel member 8 shown in FIGS. 1 and 2, the vertically disposed hollow ribs 10 provide stiffening or reinforcement to the panel assembly in a direction perpendicular to the reinforcement afforded by horizontal ribs 34. Thus, this panel assembly while preferably destined for use as a curtain wall will provide integral reinforcement in both directions. It will be appreciated that the principal desired integral reinforcing feature for the panel assembly 2, 4 is provided by the inner panel 30 and that various forms of exterior panel 8 may be employed in order to provide the desired aesthetic appearance for the panel assembly. For example, panels composed of flat or irregularly configurated sheet with integral coloring or decorative surface finishes may be provided. The panels may be composed of metal, such as steel or aluminum, glass (transparent, translucent or opaque), as well as combinations thereof. In addition, reference to the outer panel 8 as employed herein shall include other forms of facing materials such as concrete, for example.

Referring now to FIGS. 4 and 5, one form of column forming section 50 will be described. As is shown in FIG. 4, this type of column forming section 50 has a base portion 52 of substantially uniform thickness and of substantially straight configuration. Extending outwardly and disposed substantially perpendicular thereto are a pair of integrally formed sidewalls 54, 56, each having a generally Z-shaped cross sectional configuration. Each sidewall has a first section 58, 60, respectively, which emerges from the transverse edges of base 52 and is preferably substantially straight. Disposed transversely inwardly with respect to first sections 58, 60 are second sections 62, 64, respectively, which are also substantially straight. First sections 58, 60 are connected to second sections 62, 64 by connecting sections 68, 70, respectively. Connecting sections 68, 70 are preferably disposed substantially parallel to base portion 52. It will, therefore, be appreciated that this form of column forming section 50 preferably has a substantially uniform thickness throughout its base portion 52 and sidewalls 54, 56 and is preferably of substantially uniform cross sectional configuration throughout its longitudinal extent.

As is shown in FIG. 5, the panel assembly has a generally channel shaped end cap 72 which is preferably longitudinally coextensive with the panel assembly 2. In the form shown end cap 72 has a generally channel shaped configuration with a base portion 74 and two legs 76, 78. Leg 76 is interposed between outer panel 8 and intermediate panel 32 and secured therein. Leg 78 is interposed between inner panel 30 and intermediate panel 32 and secured therein. Base portion 74 is secured to base portion 52 of the column forming section 50. Base 74 is preferably in surface to surface contact with base 52. Joinder of end cap 72 to column forming section 50 may be conveniently effected by any structurally effective joining means such as spot welding, resistance welding, adhesives or separate fastener elements. In the preferred form of this invention, column forming section 50 will be pre-secured to panel assembly 2 in order to minimize the expense of material handling and reduce erection time.

In effecting joinder of the two column forming sections 50 to establish hollow column 80, the two sections 50 are positioned with their channel openings facing each other and are subjected to relative closing movement until the second sections 62, 64 of one column forming section 50 are in surface to surface engagement with the second sections 64, 62 of the other column defining section 50. This may be accomplished, if desired, by establishing relative closing movement between the two column forming sections 50 until the free edges of sidewalls 62 engage connecting walls 68. It will be noted that once this position has been established the resultant hollow column structure will have a generally rectangular configuration with a pair of recesses 82, 84 formed within opposed end walls thereof. Recesses 82, 84 are defined by connecting sections 68, 70 and second sections 62, 64 of sidewalls 54, 56.

In securing the joints, a plurality of longitudinally spaced fasteners such as headed bolts 86, 88 are introduced through the second sections 62, 64, thereby establishing the desired unitary column 6. It will also be noted that in the preferred form of the invention as shown in FIG. 5 the recesses are of sufficient depth that the head is received entirely therewithin and does not protrude outwardly beyond the outer periphery of the hollow column 80.

Referring once again to FIG. 5, a convenient means of effecting a corner joint between adjacent hollow columns 80 is illustrated. An elongated right angled corner element 90 has a first leg 92 secured to one column 80 and a second leg 94 secured to the other column 80. It is noted that the legs are secured by

fasteners **96** to provide surface to surface engagement between legs **92, 94** and base **52**. The fasteners **96** have been illustrated as screws, but other suitable fastening means including welding or adhesives may be employed.

It will be appreciated that in effecting the preferred column construction between a pair of aligned panel assemblies **2** there will be a pair of column forming sections **50** secured to vertical marginal edges and the joint will be established in the same fashion as has been described above in connection with FIG. **5**, with the exception being that the panel assemblies will be in general aligned orientation rather than disposed perpendicular or angularly with respect to each other.

Referring now to FIG. **6**, there is shown a pair of vertical sections **50** having a number of longitudinally spaced fastener receiving openings **98** within second sidewalls **62, 64**. The column forming section **50** shown at the left hand side is also shown with a portion of panel assembly **2** and a portion of a beam forming section **50'** disposed horizontally and secured to the upper portion of panel assembly **2**. (For convenience of reference when column forming sections **50** and columns **80** are disposed horizontally they will be referred to as beam defining sections **50'** and beams **80'**, but it will be understood that they have the identical configuration as the respective column counterparts. Thus, column defining section **50'** may be considered as a beam forming section.) A cap plate **100** is pre-secured to column forming section **50** and has a generally rectangular configuration with an area larger than the hollow region contained with the column to be formed. When the column **80** is established by joinder of the sections **50** the cap or cover plate **100** will be in overlying position closing the upper end of hollow column **80**. In the form shown in FIG. **6**, the cover plate **100** serves an additional function. It is adapted to receive and support joist **102** and be secured to the same. Base **104** of joist **102** will be in overlying surface to surface engagement with upper surface **106** and will be secured thereto by means of a fastener (not shown) which extends through openings **108, 110** and a second fastener which extends through an opening in base **104** and opening **112**. Headed bolts and nuts may be advantageously employed for this purpose. Upper surface **116** of joist **102** provides support for a conventional roof deck **120** which in turn may support a conventional overlying roof structure indicated generally by the reference numeral **122**. A suitable fascia plate **126** is provided to enclose the assembly. It will be appreciated that not only does cover plate **100** serve to close the upper end of the hollow interior of column **80**, but also it serves to support joist members and may be employed, if desired, to directly support a portion of the roof structure, thereby eliminating the need for an additional joist. Depending upon the roof configuration, an intermediate plate-like member may be interposed between the cap plate **100** and roof deck **120**, again eliminating the need for a joist at the particular location.

Referring now to FIG. **7**, the column anchoring structure provided by this invention will be discussed. As is shown in FIG. **7**, a pair of column forming sections **50** have been illustrated spaced apart for clarity of illustration. As the left hand column forming section **50** of FIG. **6** has been provided with cover plate **100**, the right hand column forming section **50** shown in FIG. **7** has been provided with sill plate **130**. Sill plate **130** is of substantially uniform thickness and has greater area than the hollow interior of the column to be formed. In this fashion, the lower end of the hollow column **80** will be closed. The column is anchored at its base by means of anchor bolts **132** which have their lower extremities suitably secured as in concrete and extend through anchor plate **134**. These anchor bolts **132** pass through openings **136** in sill plate **130**. Nuts **138** are threadedly secured to bolts **132** in order to firmly anchor the sill plate **130**.

As a result of the panel assemblies **2** having pre-attached column forming sections **50** and/or beam forming sections **50'**, ready field assembly of the load bearing structural components and curtain wall elements is facilitated. It will be appreciated that the cover plates **100** and sill plates **130** are preferably pre-attached and provide closed ends for the hollow column structure **80**. The beams have their opposed ends secured to hollow columns **80** by any suitable means including separate fasteners, welding and the use of separate fastening components such as the use of angle irons. The beams may be provided with end caps or, alternatively, the base portions **52** of columns **80** to which the beams are secured may be relied upon to close the hollow ends. It will be appreciated that the beams serve to provide structural stability and resist relative separating or closing movement of pairs of adjacent columns **80**. In addition, ribs or girts **34** formed within inner panel **30** provide longitudinal reinforcement which resists undesired column movement.

With respect to materials, it should be noted that the column forming sections **50** may conveniently and economically be formed from a wide range of materials, with steel and aluminum being preferred. The sections such as that shown in FIG. **4** may conveniently be formed by extrusion or roll forming. If desired, materials such as galvanized steel, stainless steel and bronze may be employed depending upon the economic needs, structural characteristics and environmental factors to be encountered in a particular installation. In addition, the exposed surface of the column may be provided with a suitable decorative appearance by either the natural metal surface or an applied finish.

Referring now to FIG. **8**, there is shown a modified form of column structure **150** which is secured to a similar form of panel assembly **2**. This type of column **150** is formed from a pair of substantially identical column forming sections **152**. Each column forming section **152** has a base section **154** which has a generally straight exterior surface and a pair of sidewalls **156, 158**. Each sidewall **156, 158** has a relatively thick first sector **160, 162**, respectively, and a generally web-like relatively thin second section **164, 166** disposed adjacent the free end thereof. The relatively thin second sections **164, 166** have an outer transverse surface which is disposed transversely inwardly of the outer transverse surface of first sectors **160, 162**. Second sectors **164** are each provided with a transversely inwardly directed hollow boss **170** which is adapted to receive a fastener and is preferably threaded to receive a threaded fastener element.

As is shown in FIG. 8, headed bolts 172 extend through second sections 166 and are threadedly engaged within the hollow boss 170. Second sections 166 are preferably provided with preformed openings at the longitudinal positions where bolts will be secured. It should be noted that as a result of the difference in thickness of the first sectors 160, 162 and second sectors 164, 166, the hollow column 150 has a generally rectangular configuration with end wall recesses. As was true in connection with the other column structure 80, the recess provides a means of employing a headed fastener 172 which does not project transversely outwardly beyond the outer surface of the column. In addition, the recess region as a result of elongated boss 170 in the form shown in FIG. 8 and as a result of the configuration of the form shown in FIGS. 4 and 5 provides increased rigidity to the column 80.

As was true in connection with the other form of column forming section 50, it is preferred to pre-attach one column forming section 152 to a vertical marginal edge of panel assembly 2 in order to facilitate ready handling and expeditious assembly of the wall construction. In the form shown in FIG. 8, the base 154 is provided with a pair of recesses 174, 176.

A clip 180 is adapted to be secured to the column forming sections 152 and to the vertical marginal edges of the panel assembly 2. The clip 180 has a base section 182 and a pair of upstanding generally parallel legs 184, 186 which define a channel 188. Projecting from the base section 182 in an opposite direction from legs 184, 186 are a pair of anchor elements 190, 192. In securing the clip 180 to the column forming section 152, anchor element 190 which has a curved outer surface 194 is first introduced into recess 174. At that point the base 182 of clip 180 is generally perpendicular to the base 154 of column forming section 152. By establishing relative rotational movement between the base 182 and base 154, anchor element 192 is caused to approach recess 176 until pilot surface 196 engages recess throat 198. Continued rotational movement causes anchor element 192 to be engaged within recess 176 thereby establishing an effective joint between the clip 180 and the column forming section 152. In this position the base 182 is in surface to surface engagement with base 154 intermediate anchor element 190, 192.

Legs 184, 186 may be attached to the panel assembly in the fashion illustrated in FIG. 8 with a first fastener 200 extending through leg 186 and securing the same to inner panel element 30. Leg 184 may be secured to outer panel element 8 by means of a second fastener 202. In this fashion, the clip element provides an effective joint between the panel element 2 and the panel forming section 152.

One additional feature provided with the form illustrated in FIG. 8 is hollow molding element 210 which may be composed of any generally rigid material including metals, rubber and plastic. Base 182 of clip 180 is provided with a pair of recesses 212, 214 which receive flanges 218, 220, respectively, in order to establish interlocking mechanical engagement between molding element 210 and clip 180. In the form shown, a resilient gasket element 230 is shown engaged within a recess of clip 180 and in contact with the outer surface of outer sheet 8.

It will, therefore, be appreciated that the building construction of this invention provides a panel assembly having horizontally disposed reinforcing ribs or girts formed within one panel thereof and providing longitudinal reinforcement to the panel assembly. If desired, the outer panel element may be provided with integral reinforcing means which provide rigidity in a direction substantially perpendicular to that provided by the horizontal ribs on the inner panel. By means of a uniquely configurated column forming section a hollow load bearing column and/or beam which is adapted to be secured by means of fasteners received within an integrally formed recess is provided. Connecting means facilitate pre-attachment of the column or beam defining sections to the vertical or horizontal marginal edges of the panels which in turn improves the economic advantages of manufacturing this system by reducing handling and erection costs. The invention also facilitates the use of integral cap and sill cover plates which not only close the ends of the hollow column or beam but also serve as supporting members for other structural components such as overlying wall or roof components and a means of anchoring vertical columns, respectively.

The structure of this invention is adapted to be employed with a wide range of outer panel materials having various configurations. In addition, the system is adapted for use with single story, as well as multiple story, constructions. In a preferred form the hollow column structures have sides of sufficient length that they project forwardly with respect to the outer panel and provide an aesthetically pleasing recessed panel appearance to the building exterior, or, if desired, the column projection may be provided into the building interior.

Whereas particular embodiments of the invention have been described above for purposes of illustration, it will be evident to those skilled in the art that numerous variations of the details may be made without departing from the invention as defined in the appended claims.

We claim:

1. A wall construction comprising

a panel assembly having an inner metal panel, an outer metal panel and an interposed intermediate thermally insulating panel,

said inner panel having a plurality of horizontally disposed integrally formed rearwardly directed hollow reinforcing ribs,

said inner and outer panels disposed in spaced relationship with respect to each other,

portions of said inner panel disposed between said hollow reinforcing ribs disposed in contact with the rear surface of said thermally insulating panel,

portions of said outer panel disposed in contact with the forward surface of said thermally insulating panel,

said panel assembly having opposite vertical marginal edges secured to hollow load bearing columns,

each said hollow column formed from a pair of generally channel shaped column forming sections having substantially the same cross sectional configuration,

joining means securing one said vertical marginal edge of said panel assembly to one said column forming section,

each said column forming section having a base and two spaced upstanding sidewalls formed integrally therewith and disposed substantially perpendicular thereto,

each said sidewall having a portion adjacent its free end disposed transversely inwardly with respect to the portion of said sidewall disposed adjacent said base,

said column forming sections having a web-like base of substantially uniform thickness,

said sidewalls having a uniform thickness substantially equal to the thickness of said base throughout their length, apart from fastener receiving openings which pass therethrough,

said sidewalls having a generally Z-shaped configuration with a first section disposed at the edge of said base, a second section spaced transversely inwardly with respect to said first section disposed adjacent the free end of said sidewall and a third section disposed substantially parallel to said base connecting said first and second sections,

said column forming sections disposed with their channel openings facing each other and said transversely inwardly disposed portions of said sidewalls disposed in surface to surface contact, and

fastener means extending into said contacting sidewall portions securing said channel forming sections to each other and having head portions received within recesses defined by said second and third sections of said sidewalls, whereby a pair of hollow generally rectangular columns having recesses in a pair of opposed walls receiving fastening means therein secure said panel assembly therebetween with relative closing movement between said columns resisted by said integrally reinforced inner panel.

2. The wall construction of claim 1 including

said integrally formed ribs on said inner panel defined by a pair of substantially straight sidewalls which are directed angularly rearwardly toward each other and terminate in a substantially straight transverse rib end wall, and

a horizontal hollow beam having the same cross sectional configuration as said hollow columns secured to a horizontal marginal edge of said panel assembly and having opposed ends secured to said hollow columns.

3. The wall construction of claim 2 including

one column forming section of each said column having a cover plate secured to the upper end thereof completely closing the upper end of said hollow column,

the other said column forming section of said column having a sill plate secured to the lower end thereof completely closing the lower end of said hollow column, and

anchor means secured to said column sill plate.

4. The wall construction of claim 3 including

a roof supporting structural member secured to said cover cap in overlying relationship with respect thereto, and

a portion of a roof structure secured to and supported by said structural member.

5. A panel assembly comprising

an outer metal panel element,

an inner metal panel element spaced rearwardly from said outer panel element,

an intermediate panel element interposed between said outer panel element and said inner panel element,

said intermediate panel element is of substantially uniform thickness and is composed of thermally insulating material,

said inner panel element having a plurality of horizontallY disposed rearwardly directed generally parallel hollow reinforcing ribs formed integrally therewith,

said hollow ribs having a pair of substantially straight angularly transversely inwardly directed sidewalls terminating in a substantially straight transverse rib end wall,

the maximum transverse width of said hollow ribs is less than the width of the inner panel portions disposed between adjacent ribs,

said inner panel portions disposed between adjacent ribs being in contact with said thermally insulating intermediate panel element,

said outer panel element having a plurality of integrally formed forwardly directed vertically disposed hollow ribs,

said panel assembly having an elongated substantially rigid first column forming section secured to a vertical marginal edge thereof,

said panel assembly having an elongated substantially rigid second column forming section secured to the other vertical marginal edge thereof, and

said first and second column forming sections having substantially identical cross sectional configurations, whereby each said column forming section is adapted to be secured to a column forming section of an adjacent panel assembly in order to define a hollow column therebetween.

6. The panel assembly of claim 5 including

said inner panel portions disposed between adjacent hollow ribs having integrally formed reinforcing means disposed generally parallel to said hollow ribs.

7. The panel assembly of claim 5 including

said column forming sections are generally channel shaped having a base and a pair of spaced sidewalls formed integrally with and emerging from said base,

each said sidewall having a first section adjacent said base disposed generally perpendicular to said base,

a second sidewall section which apart from any fastener receiving opening which may pass therethrough is of substantially uniform thickness throughout and is oriented generally perpendicularly to said base spaced transversely inwardly with respect to said first section and a transversely inwardly directed connecting section substantially parallel to said base extending from said first section to said second section, and

the distance between said second sections is less than the width of said base.

8. The panel assembly of claim 7 including

said vertical marginal edges of said panel assembly having an elongated metal channel shaped end cap secured to each said marginal edge,

each said column defining section having its base secured to said end cap,

each said end cap channel provided with a base and a pair of spaced generally parallel legs,

one said end cap channel leg secured between said inner panel element and said insulating material panel element,

said other end cap leg secured between said outer panel element and said insulating material panel element, and

said end cap base welded to said column forming section base.

9. The panel assembly of claim **5** including

said column forming sections are generally channel shaped having a base and a pair of spaced sidewalls emerging from said base,

said sidewalls having an enlarged portion adjacent said base of said column forming section and a portion of substantially reduced thickness with respect to said enlarged portion disposed adjacent the free end thereof,

one said sidewall being a fastener receiving sidewall having a transversely inwardly projecting cylindrical closed ended hollow boss which defines a transversely outwardly disposed fastener receiving bore within said portion of substantially reduced thickness, and

each said sidewall portion of substantially reduced thickness having a transverse outer surface which is spaced transversely inwardly with respect to the transverse outer surface of said adjacent enlarged portion of said sidewall, whereby each said column forming section is adapted to be secured to a column forming section of an adjacent panel by means of a recessed headed fastener in order to cooperatively define a hollow column.

10. The panel assembly of claim **9** including

each said vertical marginal edge of said panel assembly having an elongated clip member secured thereto,

said column forming section base having a pair of spaced recesses separated by a generally flat surface portion of said base,

said elongated clip member having a pair of anchor legs disposed in interlocking engagement within said column forming section recesses,

said elongated clip having a base portion, a pair of upstanding spaced legs emerging from said base and engaged with said vertical marginal edge of said panel assembly,

said anchor legs extending from said clip base portion in a direction generally opposite from said upstanding legs,

a first said anchor leg providing a convexly curved outer surface in surface to surface contact with one said column forming section recess,

a second said anchor leg having a pilot surface for facilitating entry of said leg into the other said column forming section recess, and

said clip base in surface to surface contact with said column forming section base intermediate said recesses.

11. The panel assembly of claim **10** including

a hollow molding element mechanically interlocked with said elongated clip and disposed forwardly of the marginal edge of said outer panel.

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