United States Patent

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[54] **BUILDING CONSTRUCTION SYSTEMS**

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[52] **U.S. Cl.** **52/258,** 52/281, 52/393, 52/427

[51] **Int. Cl.** **E04b 2/68**

[58] **Field of Search**.....52/258, 281, 427, 426, 300, 52/428, 431, 421, 425, 440, 566, 567, 393

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[57] **ABSTRACT**

A building system characterized in that the main and auxiliary reinforced concrete beams and columns are cast in place using the wall panels as physical shuttering forms but having no actual contact with the concrete. The wall panels are separated from the concrete beams and columns by insulating liners, and load isolating cushions are provided between the panels and the concrete beams and columns to allow considerable latitude of thermal and load strain movement of the building frame without effect on the wall panels.

15 Claims, 5 Drawing Figures

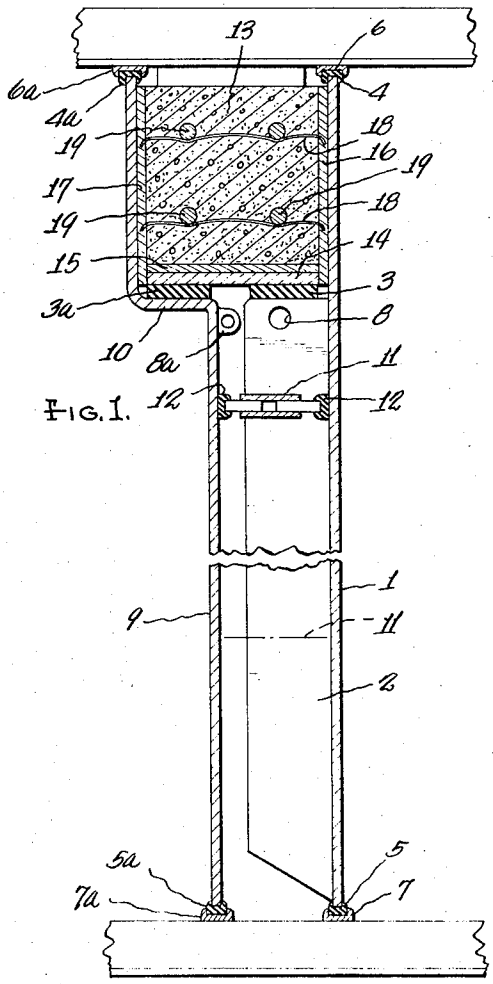


FIG. 1.

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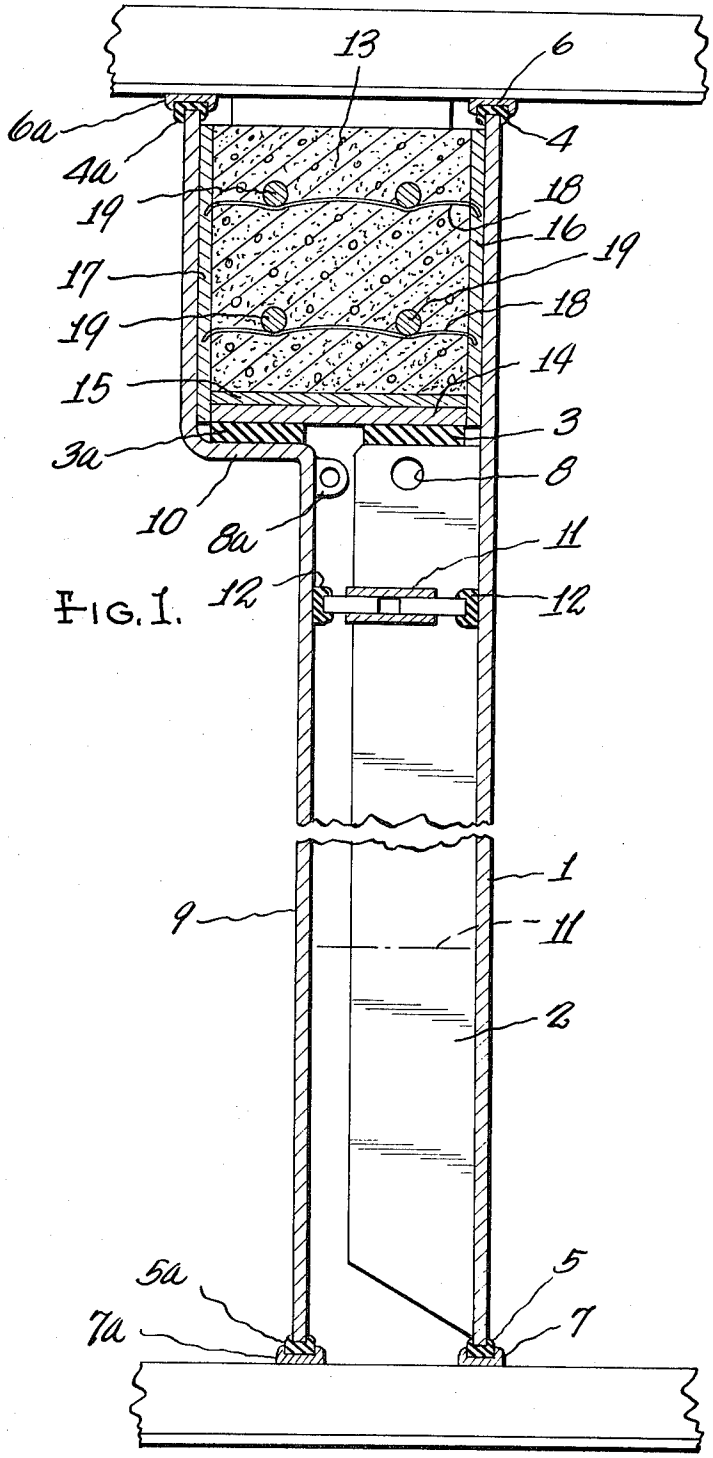


FIG. 1.

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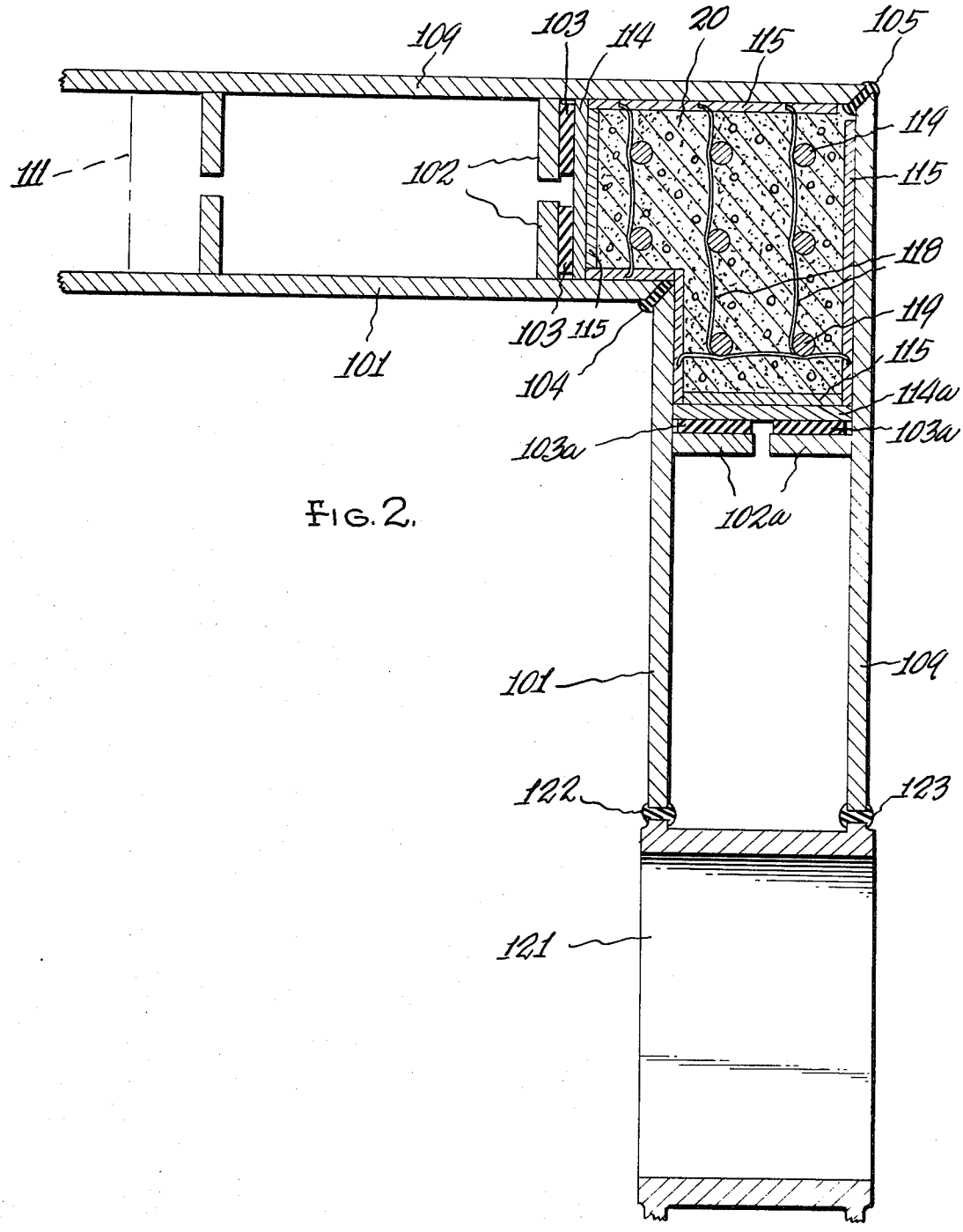


FIG. 2.

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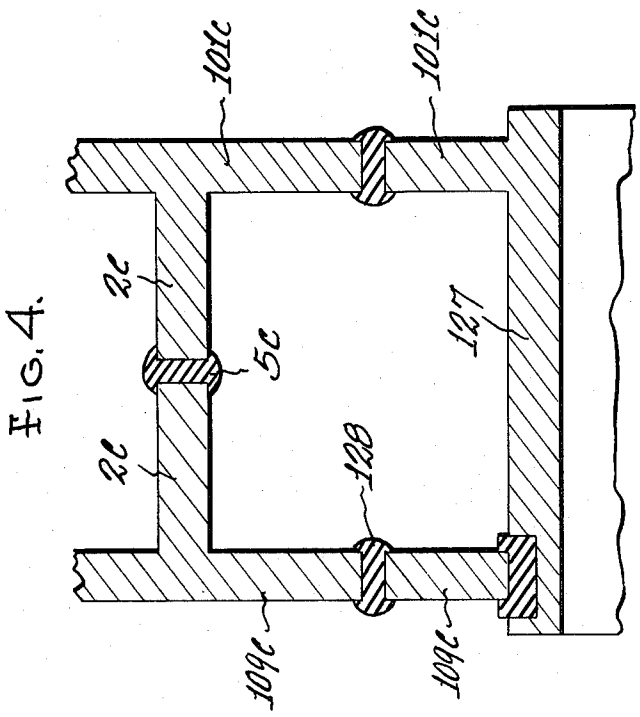


FIG. 4.

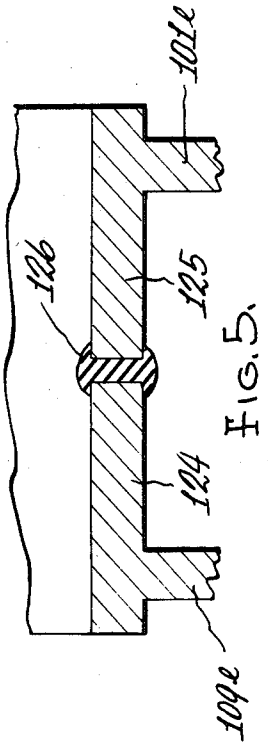


FIG. 5.

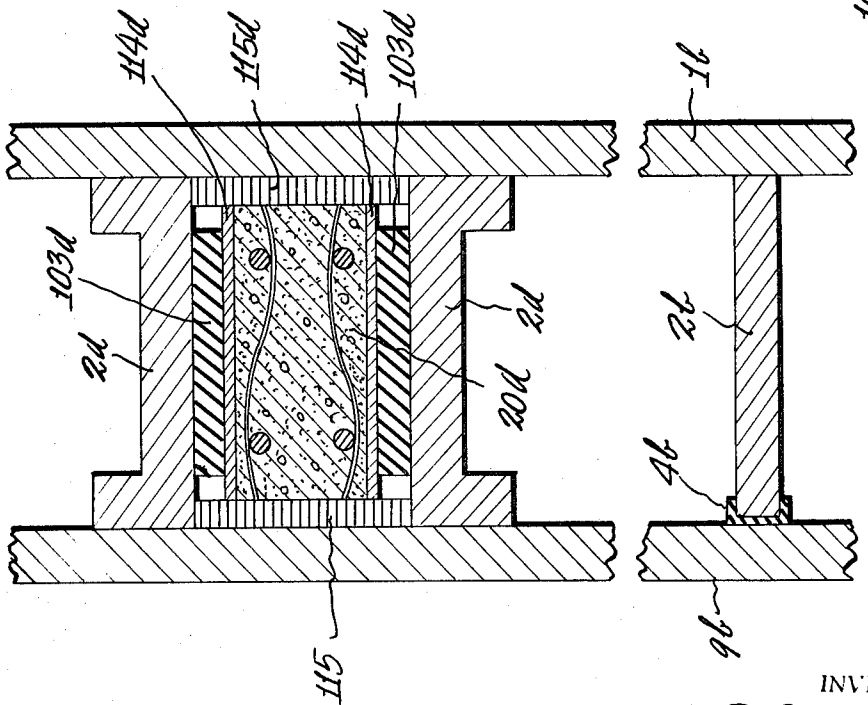


FIG. 3.

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BUILDING CONSTRUCTION SYSTEMS

BACKGROUND AND SUMMARY

It is well known in building concrete multi-storied structures to utilize pre-cast concrete slabs and beams united by tongues or keys, with or without steel in the structure other than as internal reinforcement of the pre-casts.

It is also well known to erect a steel structure which is subsequently surrounded by shoring or shuttering into which concrete is poured and from which, when set, the shuttering is removed before the brick, concrete, metal or wood enclosing walls are erected.

Also well known is shoring or shuttering, supported by scaffolding, onto which concrete is cast, with reinforcement, to form at the same time the ceiling of one level and the floor of the level above. Here again, when the concrete is fully set, the shuttering is removed and the uncovered uneven surface is subsequently plastered or otherwise prepared for decoration.

The principal object of the present invention is to provide a building system wherein the shuttering is not a means of erection, requiring subsequent removal, and wherein the ceiling finish after casting and setting of the concrete floor slab does not require further preparation for decoration, and wherein the walls also do not require to be introduced subsequently to encasement of the structural steel work stanchions, beams and lintels.

DESCRIPTION OF THE DRAWINGS

In the drawings accompanying this description and forming a part of this specification, there are shown, for purpose of illustration, embodiments which my invention may assume, and in these drawings:

FIG. 1 is a vertical section showing a preferred form of wall formation, and the section of a cast-in situ beam,

FIG. 2 is a horizontal section showing a corner formed between two preferred forms of wall formation, and the section of a cast-in situ column,

FIG. 3 is a horizontal section showing an intermediate column, and

FIGS. 4 and 5 are fragmentary sections showing alternative constructions.

DESCRIPTION OF PREFERRED EMBODIMENT

Referring to FIG. 1, a right hand panel 1 is shown, this panel being surface finished on its exposed side before erection so that subsequent decoration is not required. The panel may be formed of any suitable material, such as wood, metal, plastic or thin reinforced concrete slab.

On its interior surface, the panel 1 has a regularly spaced series of deep, vertical ribs 2, which may be formed integral with or connected to the panel. The ribs 2 serve to strengthen the panel and are adapted to support a load-isolating cushion 3 which may be made of any suitable resilient material, such as synthetic rubber; foamed Neoprene for example.

Load-isolating cushion strips 4 and 5 are fitted over the top and bottom edges of the panel and are located in shoe plates 6 and 7 on the ceiling and floor respectively. Lifting eyes, such as shown at 8, are provided near the top of selected ribs. The shoe plates 6 and 7

may be formed of cushioning material, such as rubber, and may be formed in position before the setting of the concrete floor and ceiling.

The left hand panel 9 which also may be formed of material and finished, such as designated with respect to the panel 1, is formed with an outward step 10 which supports a load-isolating cushion 3*a*, and is fitted with isolating strips 4*a*, 5*a* located in shoe plates 6*a*, 7*a*, and formed with lifting eye 8*a*. The cushion and strips may be made of suitable resilient material, such as of the type mentioned in connection with parts 3, 4 and 5 heretofore described.

The panels 1 and 9 are tied together to restrict their separation, and suitable bonding ties 11 may take the form of one way telescopic struts fitted with resilient pads 12 bonded to the interior faces of those panels.

The cast-in-situ beam 13, preferably formed of concrete, is poured in plastic state over a beam retaining plate which is borne by the isolating cushions 3 and 3*a*. Liners 15, 16 and 17, of any suitable rigid material, insulate the beam from contact with the plate 14 and the panels 1 and 9 respectively. Wire ties 18 serve for initial location of the liners 16 and 17 and as spacers for reinforcing rods 19.

The isolating cushions 3, 3*a*, if formed of foamed synthetic rubber or plastic, should be skinned on the exposed surfaces to which the bonding agent, compatible with both the cushion skin and with the wall panels, is pre-coated.

When set, a beam such as 13, is supported upon previously cast columns, such as shown at 20 in FIG. 2. In the disclosed embodiment, the column 20 is formed at the junction between two walls. Inner and outer wall panels 101 and 109, respectively, are isolated from one another and from load bearing stresses by cushion strips 104 and 105. Column-retaining plates 114 and 114*a* are located against isolating cushions 103, 103*a* which are bonded to ribs 102, 102*a*.

Insulating liners, such as those shown at 115, are interposed between the panels 101, 109, plates 114, 114*a* and the poured concrete of the beam 20, while wire ties 118 locate reinforcing rods 119. The position of a one-way telescoping bonding tie, similar to tie 11, is indicated at 111. In place of, or in addition to, one-way telescopic struts, the inner and outer wall panels 1*b* and 9*b* (FIG. 3) may be interconnected by the bonding of a rib 2*b* formed on one of them to the other through the intermediary of an isolating or insulating strip 4*b*. Or, where ribs 2*c* (FIG. 4) formed on both panels 101*c*, 109*c* are juxtaposed, they may each be bonded to a strip 5*c*. Alternatively, channel shaped spacers 2*d* may be bonded to the panels 1*b*, 9*b* and serve to locate plates 114*d* through load isolating strips 103*d* and insulators 115*d*, so that an intermediate column 20*d* may be cast.

A door or window frame 121 (FIG. 2) is fitted into a cut-out in the panels 101, 109, and is load-isolated and insulated from those panels by cushion strips 122 and 123. Alternatively, as shown in FIG. 5, the frame may be molded in two parts 124, 125, integrally with the panels 101*e*, 109*e*, and bonded to a cushion strip 126. In a further alternative frame formation, the frame 127, (FIG. 4) is molded integrally with only one panel 101*c*. Where wall panels are of insufficient length, two or more may be bonded end to end through a load isolating strip 128.

It will be appreciated that in a completed building the wall panels, such as **1, 9, 101** and **109** have served as shuttering for the casting of load bearing columns and beams, and remain as virtually unloaded parts of the finished structure.

I claim:

1. A building structure, comprising a plurality of non-load bearing wall panels arranged to provide a permanent physical shuttering form, and a load bearing member of concrete cast within said form, liners separating said panels from physical contact with said cast concrete member for permitting relative movement therebetween, and load isolating resilient cushions interposed between said panels and said cast concrete member to allow considerable latitude of thermal and load strain movement of said load bearing member without adverse effect on said wall panels.

2. The structure of claim **1** in which said wall panels are flat sheets, surface finished on at least one side.

3. The structure of claim **2**, in which said panels are made of material selected from the group consisting of wood, metal, plastic and thin reinforced concrete.

4. The structure of claim **1** in which said panels are provided with ribs which serve to locate said liners and cushions relative to said panels.

5. The structure of claim **1** wherein said panels are in spaced side-to-side relation, and further including one-way telescoping struts bonded to juxtaposed faces of said panels to maintain the spacing therebetween.

6. The structure of claim **1** wherein said panels are in spaced side-to-side relation, wherein said liners are disposed against the interior surface of respective panels, and wherein tie wires are fixed between said liners and serve to maintain the spacing therebetween and to locate reinforcing rods in the space between said liners.

7. A building structure, comprising a pair of non-load bearing flat panels in spaced side-to-side relation and extending vertically between the floor and ceiling of the structure, resilient cushioning means disposed between the upper edges of said panels and said ceiling and between the lower edges of said panels and said floor, a first liner extending between said panels, and other liners disposed adjacent the inner sides of said panels, said liners together defining a mold, a concrete beam cast in said mold, and further resilient cushioning means between at least certain of said liners and panels.

8. The structure of claim **7** wherein said last named cushioning means is disposed under said first liner.

9. A building structure, comprising a pair of flat panels in spaced side-to-side relation and extending vertically between the floor and ceiling of the structure, load cushioning means between the upper edges of said panels and said ceiling and between the lower edges of said panels and said floor, one of said panels having vertically extending ribs on its inner side, said ribs terminating short of said ceiling, and the other of said panels having a step to provide a wider space between said panels near said ceiling, further load cushioning means on the tops of said ribs and the bottom of said step, a first liner between said panels and backed up by said further cushioning means, other liners on the inside faces of said panels at the wider space therebetween, said first and other liners combining to form a mold, and a load-bearing member of concrete cast in said mold.

10. The construction of claim **9** and further including tie wire means secured to and extending between said other liners to maintain the spacing therebetween and to locate reinforcing rods in said mold.

11. A building structure, comprising two pair of flat panels, each pair in spaced side-to-side relation and extending vertically, said pair of panels being arranged to form a corner of said structure, cushioning means between adjoining vertical edges of said panels, each pair of panels having vertically extending ribs adjoining said corner, vertically extending cushioning means on said ribs, first liners backed up by said vertically extending cushioning means, other liners extending vertically along the inner sides of said panels and combining with said first liners to form a vertically extending mold, and a load-bearing member of concrete cast in said mold.

12. The structure of claim **11** and further including a frame for a window, door and the like, between a pair of panels and another pair of panels, and cushioning means between said frame and the adjoining edges of said panels.

13. The structure of claim **11** and further including means between each pair of panels removed from the area of the load bearing member, for maintaining the spacing between said panel pair.

14. The structure of claim **11** and further including tie wire means connected to and extending between at least certain of said liners to locate reinforcing rods in said mold.

15. A building structure, comprising a pair of flat wall panels in spaced side-to-side relation, a pair of ribs extending between said panels in spaced relation, a cushion strip bonded to each of the confronting surfaces of said ribs, isolating strips on each of the confronting surfaces of said strips and on each of the facing surfaces of said panels located between said strips, said isolating strips forming a mold, and a load-bearing member of concrete cast in said mold, said strips preventing physical contact between said concrete and the panel and rib surfaces, said cushion strips allowing considerable latitude of thermal and load strain movement of said load-bearing member without effect on said wall panels.

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