IN-FILL WALL SYSTEM

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ABSTRACT

An in-fill wall system for use in building construction including substantially horizontal floors and ceilings held in substantially parallel relationship relative to each other by a plurality of substantially vertical support columns comprising a plurality of multi-layer panels secured between adjacent substantially vertical support columns, each multi-layer panel comprises an inner panel core including a pair of panel surfaces or sides at least the major portion of which is covered by an outer panel member wherein the lower edge portions of multi-layer panels are held in place by a substantially C or U-shaped channel or lower attached member affixed to the floor and held vertically in place by a pair of substantially L-shaped upper attachment members affixed to the ceiling on opposite sides of the upper edge portion of the multi-layer panels together with a pair of substantially L-shaped side attachment members affixed to a corresponding substantially vertical support column disposed on opposite sides of each side edge portion of the multi-layer panels.
IN-FILL WALL SYSTEM

BACKGROUND OF THE INVENTION

1. Field of the Invention

An in-fill wall system comprising a plurality of multi-layer panels secured vertically in place by a frame system.

2. Description of the Prior Art

Building construction of multiple stories typically comprise block or metal stud framing in-fill. Metal stud and block in-fill walls, however, have several disadvantages. Each type of such construction is expensive because of the significant time, labor and material required to construct such in-fill walls.

In contrast, the present invention employs multi-layer panels of known fabrication secured in place in building construction by a frame system affixed thereto. There are a number of existing multi-layer panel systems as disclosed below.

U.S. Pat. No. 6,112,489 relates to a monocoque concrete structure including a core structure of foam panels. A layer of concrete is applied to opposite sides of the core structure to form a double monocoque concrete structure having a load bearing concrete shell on each of the opposite sides of the core structure.

U.S. Pat. No. 5,404,685 describes an outside polystyrene plastic wall or fence constructed by anchoring each of at least two styrofoam H-columns to a concrete base in the ground supporting a steel reinforcing bar which extends up into a hollow of the column by filling the hollows with concrete.

U.S. Pat. No. 5,335,472 relates to a reinforced concrete building having vertical walls formed of prefabricated modules that may be assembled off site and then transported to the construction site for installation and application of concrete. The prefabricated modules are supported between lower and upper support members and spaced from each other a sufficient distance for a concrete column therebetween. A backing member is secured between adjacent modules and vertical reinforcing rods are provided adjacent backing member in the space between the modules for the concrete columns. Concrete is applied pneumatically against the backing member to fill the space between the modules to form the concrete column.

U.S. Pat. No. 5,033,248 describes a reinforced concrete building constructed from a plurality of prefabricated modules which may be assembled off site and then transported or shipped to the building construction site for installation and application of concrete. Each prefabricated module includes a rectangular frame having channel-shaped frame members which form the ends and sides of the frame. An insulation layer is mounted within the frame in spaced relation to one side frame member. A channel-shaped concrete column form is secured between the insulation layer and the adjacent side frame member to close the frame. A wire mesh layer is secured to the outer surface of the frame with an overhanging side portion. The prefabricated module when shipped to a construction site receives reinforcing bars and concrete is pneumatically applied for forming a reinforced concrete wall. A drywall panel is then mounted on modules for the interior of the building.

U.S. Pat. No. 5,515,659 teaches a building system for wall construction including a prefabricated panel having two layers of foamed insulating sheets sandwiched around a layer of concrete or other cementitious material. Channels are cut into an interior face of one of the panels. The channels receive cement which provides a reinforcing structure when hardened. Steel vertical channel studs encase the sandwiched layers on two sides of the panel. The vertical channel studs have a vertical surface which is fastened to a similar, opposing vertical channel stud of an adjoining panel to effectively create a vertical I-beam support when the panels are assembled together. The panels of the invention can be readily transported to a worksite, assembled, and finished on-site with a stress-skin to yield a wall which is extremely rigid, insulative, and resistant to forces such as fire, water, termites, and impact.

U.S. Pat. No. 4,489,530 shows a method of making a sandwich type insulating wall having internal framework formed by channel bars and transverse members bridging two adjacent channel bars. A plurality of channel bars having lateral wings are erected to form the main skeleton with insulating material inserted into the channels of the bars to secure them in place. Transverse members are positioned to cover the wall spaced from the insulating board by the wings and transverse members. Both sides of the structure are grouted with a grouting cement or vermiculite.

U.S. Pat. No. 6,418,686 describes a structural building system including a structural-load-bearing building component, such as a building panel, having front and back sections, an insulating core, integral symmetrical joinery, a thermal break, and at least one shear resistance connector. The panel is asymmetrical about one axis, and is designed to be directionally positioned with respect to the maximum anticipated force. A shear resistance connector array may be positioned between the front and back sections or may be integral to the front or back section. A face sheet may span one or more than one building panel, and provides structural support to the building system.

Additional examples of the prior art are found in U.S. Pat. No. 4,297,820 and Publication 2002/0189182.

SUMMARY OF THE INVENTION

The present invention relates to an in-fill wall system comprising at least one multi-layer panel secured in place by a frame system.

Each multi-layer panel comprises a panel core that may be at least partially covered on at least one side by an outer member or layer of material.

The frame system comprises at least one lower attachment member and at least one upper attachment member affixed to the floor and ceiling respectively and at least one side attachment member affixed to a support column disposed on each side of the multi-layer panel.

When assembled and constructed, a plurality of multi-layer panels may be secured together to extend across an extended opening or space between adjacent support columns. In turn, the exterior surfaces of the multi-layer
panel and attachment members of the frame system may be coated or surfaced to finish and protect the in-fill wall system.

[0018] The invention accordingly comprises the features of construction, combination of elements, and arrangement of parts which will be exemplified in the construction hereinafter set forth, and the scope of the invention will be indicated in the claims.

BRIEF DESCRIPTION OF THE DRAWINGS

[0019] For a fuller understanding of the nature and object of the invention, reference should be had to the following detailed description taken in connection with the accompanying drawings in which:

[0020] FIG. 1 is a front view of the in-fill wall system of the present invention.

[0021] FIG. 2 is a front view of an alternate configuration of the in-fill wall system of the present invention.

[0022] FIG. 3 is a front view of another alternate configuration of the in-fill wall system of the present invention.

[0023] FIG. 4 is a front view of yet another alternate configuration of the in-fill wall system of the present invention.

[0024] FIG. 5 is a front view of still another alternate configuration of the in-fill wall system of the present invention.

[0025] FIG. 6 is a cross-sectional end view of the in-fill wall system of the present invention.

[0026] FIG. 7 is a partial cross-sectional top view of the in-fill wall system of the present invention.

[0027] FIG. 8 is an exploded view of the frame system of the in-fill-wall system of the present invention.

[0028] FIG. 9 is a partial view of the in-fill wall system of the present invention with a reinforcing structure.

[0029] FIG. 10 is a partial view of the in-fill wall system of the present invention with an alternate embodiment of the reinforcing structure.

[0030] FIG. 11 is a partial view of the in-fill wall system of the present invention with another alternate embodiment of the reinforcing structure.

[0031] Similar reference characters refer to similar parts throughout the several views of the drawings.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

[0032] As shown in FIGS. 1 through 5, the present invention relates to an in-fill wall system generally indicated as 10 for use in building construction including substantially horizontal floors and ceilings indicated as 12 and 14 respectively held in substantially parallel relationship relative to each other by a plurality of substantially vertical support columns each indicated as 16. The in-fill wall system 10 comprises a plurality of multi-layer panels each generally indicated as 18 held in a substantially vertical position by a peripheral frame system as described hereinafter.

[0033] As best shown in FIGS. 6 and 7, each multi-layer panel 18 comprises an inner panel core 20 including a pair of panel surfaces 22 at least the major portion of which is covered by an outer panel member 24. Adjacent multi-layer panels 18 can be coupled or interlocked together by an interlocking element generally indicated as 26 or similar attachment or fastening device on the adjacent sides 28 of adjacent multi-layer panels 18.

[0034] As best shown in FIG. 8, the peripheral frame comprises an upper and lower panel retaining structure generally indicated as 30 and 32 respectively affixed to the ceiling 14 and floor 12 respectively to engage the upper and lower portions of the multi-layer panels 18 in place. In addition, the peripheral frame may include a side panel retaining structure generally indicated as 34 affixed to the corresponding substantially vertical support column 16 disposed on opposite sides of the in-fill wall system 10 to engage the side portions of the outermost multi-layer panels 18 to secure the multi-layer panels 18 in place.

[0035] The upper panel retaining structure 30 comprises a first or outer upper retaining member and a second or inner upper retaining member generally indicated as 36 and 38 respectively. The first or outer upper retaining member 36 and the second or inner upper retaining member 38 each comprises a first or outer upper retains element 40 and a second or inner upper retain element 42 and a first or outer upper attachment element 44 and a second or inner upper attachment element 46 formed at a substantially right angle relative to each other respectively to cooperatively form a substantially L or V shaped configuration to engage the upper portions of the outer and inner surface of the in-fill wall 10 respectively and the ceiling 14.

[0036] The lower panel retaining structure 32 comprises a first or outer lower retaining member and a second or inner lower retaining member generally indicated as 48 and 50 respectively. The first or outer lower retaining member 48 and the second or inner lower retaining member 50 each comprises a first or outer lower retains element 52 and a second or inner lower retain element 54 interconnected by a lower attachment element 56 to cooperatively form a substantially C or U shaped configuration to engage the lower portions of the outer and inner surface of the in-fill wall 10 respectively and the floor 12.

[0037] Each side panel retaining structure 34 comprises a first or outer side retaining member and a second or inner side retaining member generally indicated as 58 and 60 respectively. The first or outer side retaining member 58 and the second or inner side retaining member 60 each comprises a first or outer side retain element 62 and a second or inner side retain element 64 and a first or outer side attachment element 66 and a second or inner side attachment element 68 formed at a substantially right angle relative to each other respectively to cooperatively form a substantially L or V shaped configuration to engage the upper portions of the outer and inner surface of the in-fill wall respectively and the ceiling 14.

[0038] When fully assembled, the various retaining structures 30, 32 and 34 are secured in place by a plurality of fasteners each indicated as 70 extending through retainer elements 40, 42, 44, 46, 52, 54, 62, 64, 66 and 68, and through
attachment element 56 into the substantially horizontal floor 12, substantially horizontal ceiling 14 and substantially vertical support columns 16.

[0039] FIG. 9 shows a reinforcing structure 74 affixed to at least one side of the multi-layer panel 18 by a plurality of fasteners each indicated as 70. The reinforcing structure 74 comprises a substantially L or V shaped member disposed adjacent the corners of the multi-layer panels 18 formed around a portal in the wall.

[0040] FIG. 10 shows a reinforcing structure 76 affixed to at least one side of the multi-layer panel 18 by a plurality of fasteners each indicated as 70. The reinforcing structure 76 comprises a substantially arrow shaped member disposed adjacent the corners of the multi-layer panels 18 formed around a portal in the wall.

[0041] FIG. 11 shows a reinforcing structure 78 embedded inside of the multi-layer panel 18 and secured by a plurality of fasteners each indicated as 70. The reinforcing structure 78 comprises a substantially L or V shaped member disposed adjacent the corners of the multi-layer panels 18 formed around a portal in the wall.

[0042] It will thus be seen that the objects set forth above, among those made apparent from the proceeding description are efficiently attained and since certain changes may be made in the above construction without departing from the scope of the invention, it is intended that all matter contained in the above description or shown in the accompanying drawing shall be interpreted as illustrative and not in a limiting sense.

[0043] It is also to be understood that the following claims are intended to cover all of the generic and specific features of the invention herein described, and all statements of the scope of the invention which, as a matter of language, might be said to fall therebetween.

[0044] Now that the invention has been described,

What is claimed is:

1. An in-fill wall system for use in building construction including substantially horizontal floors and ceilings held in substantially parallel relationship relative to each other by a plurality of substantially vertical support columns comprising a plurality of multi-layer panels secured between adjacent substantially vertical support columns, each said multi-layer panel comprises an inner panel core including a pair of panel surfaces at least the major portion of at least one of said panel surfaces is covered by an outer panel member wherein the lower edge portions of said multi-layer panels are held in place by a channel affixed to the floor and held vertically in place by a pair of upper attachment members affixed to the ceiling on opposite sides of the upper edge portion of said multi-layer panels together with a pair of side attachment members affixed to a corresponding substantially vertical support column disposed on opposite sides of each side edge portion of said multi-layer panels.

2. A in-fill wall system for use in building construction including substantially horizontal floors and ceilings held in parallel relationship relative to each other by a plurality of substantially vertical support columns comprising at least one panel having an inner surface and an outer surface held in a substantially vertical position by a peripheral frame system; said peripheral frame system comprises an upper and lower panel retaining structure affixed to the ceiling and floor respectively to engage the upper and lower portions of said panel to secure said panel in place.

3. The in-fill wall system of claim 2 wherein said upper panel retaining structure comprises a first upper retaining member and a second upper retaining member disposed on opposite panel surfaces and said lower panel retaining structure comprises a first lower retaining member and a second lower retaining member disposed on opposite panel surfaces.

4. The in-fill wall system of claim 3 wherein said first upper retaining member and said second upper retaining member each comprises a first upper retainer element and a second upper retainer element and a first upper attachment element and a second upper attachment element to engage the upper portions of the outer and inner surface of the in-fill wall respectively and the ceiling; said first lower retaining member and said second lower retaining member and comprise a first lower retainer element and second lower retainer element interconnected by a lower attachment element to engage the lower portions of the outer and inner surface of said in-fill wall respectively and the floor.

5. The in-fill wall system of claim 4 wherein said first upper retainer element and said second upper retainer element and first upper attachment element and second upper attachment element form a right angle relative to each other to cooperatively form an L or V shaped configuration; and said first lower retainer element and said second lower retainer element are interconnected by said lower attachment element to cooperatively form a substantially C or U shaped configuration.

6. The in-fill wall system of claim 2 wherein said peripheral frame further includes a side panel retaining structure affixed to the corresponding substantially vertical support column disposed on opposite sides of said in-fill wall system to engage the side portions of said panel to secure said panel in place.

7. The in-fill wall system of claim 6 wherein each said side panel retaining structure comprises a first retaining member and a second side retaining member disposed on opposite panel surfaces.

8. The in-fill wall system of claim 7 wherein said first side retaining member and said second side retaining member each comprises a first side retainer element and a second side retainer element and a first side attachment element and a second side attachment element to engage the upper portions of said outer surface and said inner surface of the in-fill wall respectively and the ceiling.

9. The in-fill wall system of claim 8 wherein said first side retainer element and said second said retainer element and a first side attachment element and a second side attachment element disposed at a right angle relative to each other to cooperatively form a L or V shaped configuration.

10. The in-fill wall system of claim 2 wherein said panel comprises an inner panel core having at least the major portion of one of said panel surfaces covered by an outer panel member.

11. The in-fill wall system of claim 10 wherein a plurality of said panels are interlocked by an interlocking element.

12. The in-fill wall system of claim 6 wherein said upper panel retaining structure comprises a first upper retaining member and a second upper retaining member disposed on opposite panel surfaces and said lower panel retaining structure comprises a first lower retaining member and a second lower retaining member disposed on opposite panel
surfaces and each said side panel retaining structure comprises a first retaining member and a second side retainer member disposed on opposite panel surfaces.

13. The in-fill wall system of claim 12 wherein said first upper retaining member and said second upper retaining member each comprises a first upper retainer element and a second upper retainer element and a first upper attachment element and a second upper attachment element to engage the upper portions of the outer and inner surface of the in-fill wall respectively and the ceiling; said first lower retaining member and said second lower retaining member and comprise a first lower retainer element and second lower retainer element interconnected by a lower attachment element to engage the lower portions of the outer and inner surface of said in-fill wall respectively and the floor and said first side retaining member and said second side retaining member each comprises a first side retainer element and a second side retainer element and a first side attachment element and a second side attachment element to engage the upper portions of said outer surface and said inner surface of the in-fill wall respectively and the ceiling.

14. The in-fill wall system of claim 13 wherein said first upper retainer element and said second upper retainer element and first upper attachment element and second upper attachment element form a right angle relative to each other to cooperatively form a substantially C or U shaped configuration and said first side retainer element and said second side retainer element and a first side attachment element and a second side attachment element disposed at a right angle relative to each other to cooperatively form a L or V shaped configuration.

15. The in-fill wall system of claim 14 wherein said panel comprises an inner panel core having at least the major portion of one of said panel surfaces covered by an outer panel member.

16. The in-fill wall system of claim 15 wherein a plurality of said panels are interlocked by an interlocking element.

17. The in-fill wall system of claim 2 wherein said panel includes at least one opening and further including a reinforcing member secured to said panel to reinforce said panel adjacent the opening.

18. The in-fill wall system of claim 17 wherein said reinforcing member comprises a substantially L or V shaped member disposed adjacent the corners of said panels formed around an opening.

19. The in-fill wall system of claim 17 wherein said reinforcing member comprises a substantially arrow shaped member disposed adjacent the corners of said panels formed around an opening.

20. The in-fill wall system of claim 17 wherein said reinforcing member comprises a substantially L or V shaped member embedded adjacent the corners of said panels formed around an opening.

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