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(54) **BUILDING PANELS WITH SUPPORT MEMBERS EXTENDING PARTIALLY THROUGH THE PANELS AND METHOD THEREFOR**

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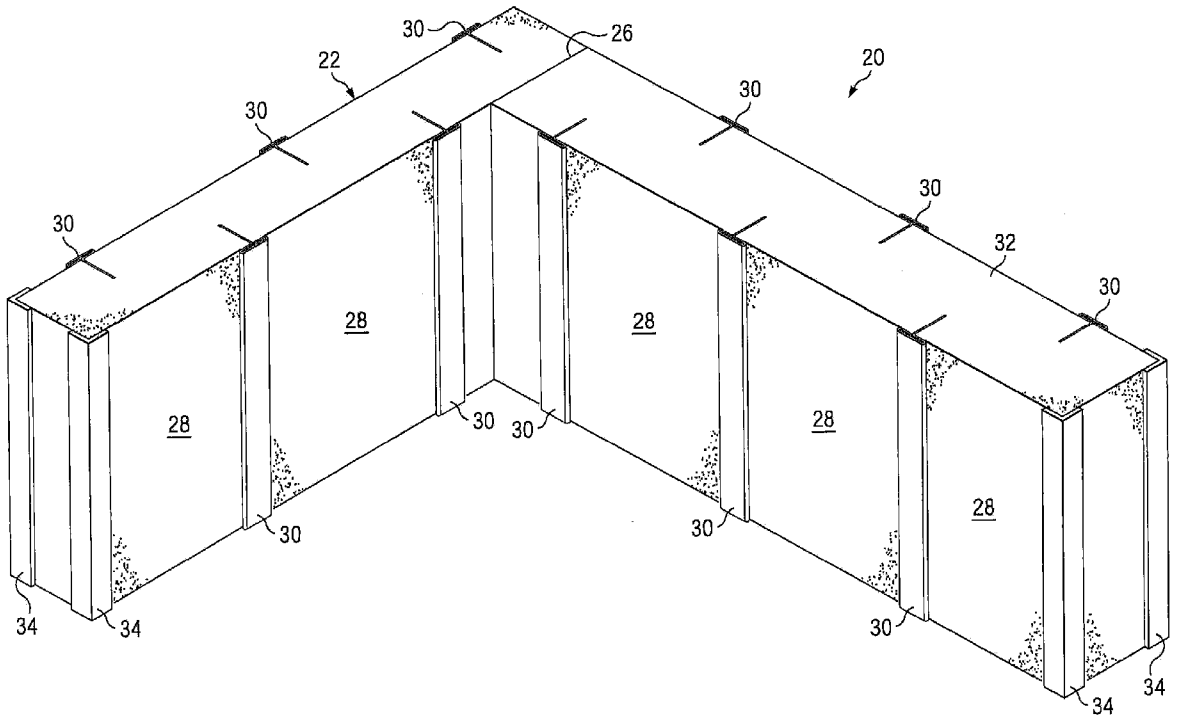
(52) **U.S. Cl.** **52/309.7**

(57) **ABSTRACT**

A building panel for residential and commercial construction uses a plurality of insulating blocks connected together by adhesive. The insulation blocks are typically made of foam. A plurality of support members are disposed on opposite sides of the insulting blocks and offset with respect to the adjacent support member. The support member are typically made of metal and can have different shapes including "T" shape, "U" shape, and "L" shape. Each support member has a head portion in contact with a surface of the insulating block and a stem portion extending into the insulating block and having a length less than a width of the insulating block so that a thermal conduction path of the support member is discontinuous across the insulating block. The panel can be used as a curtain wall panel in high-rise construction, as well as bodies for aircraft, automotive, and marine applications.



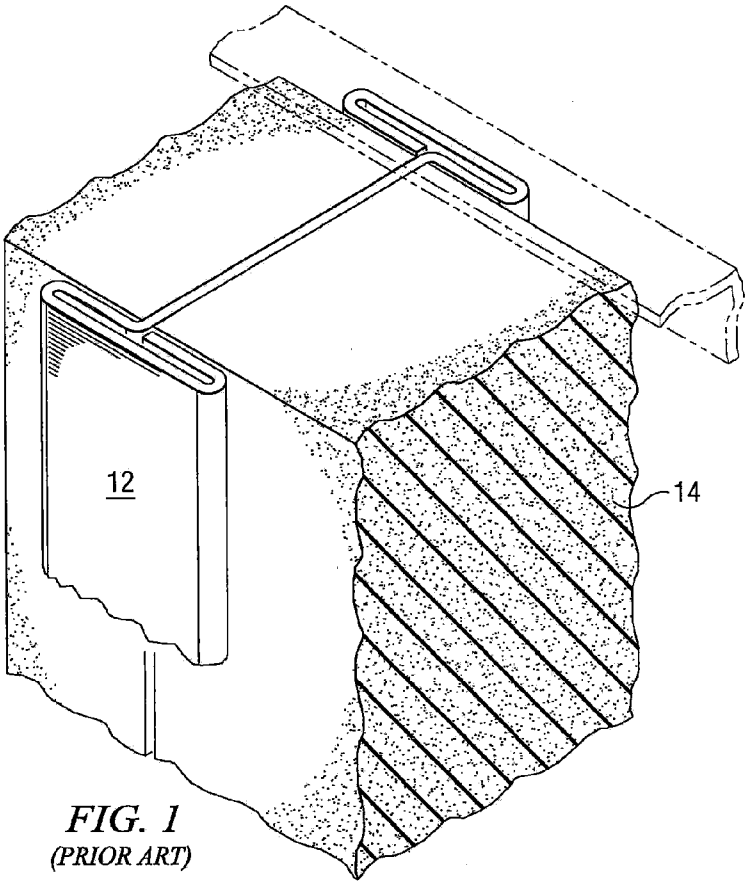


FIG. 1
(PRIOR ART)

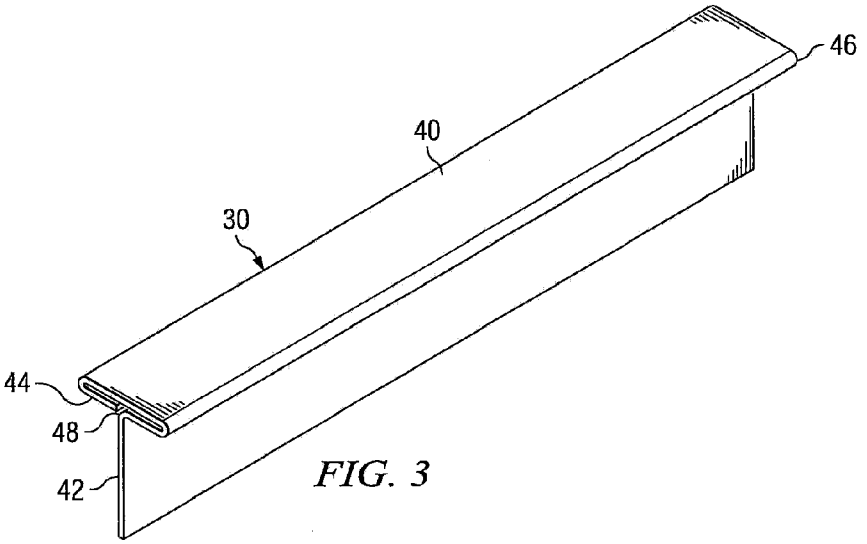


FIG. 3

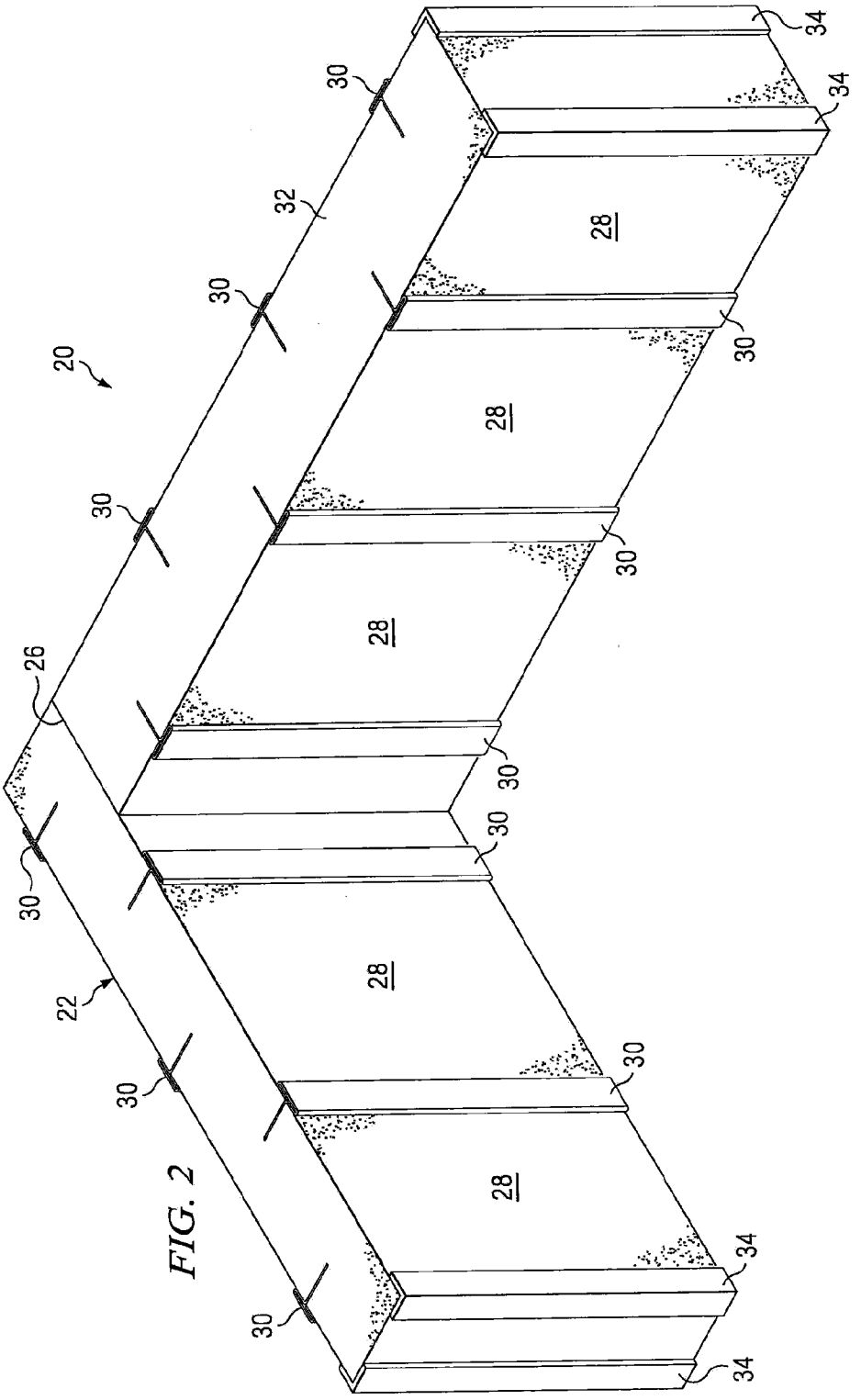


FIG. 2

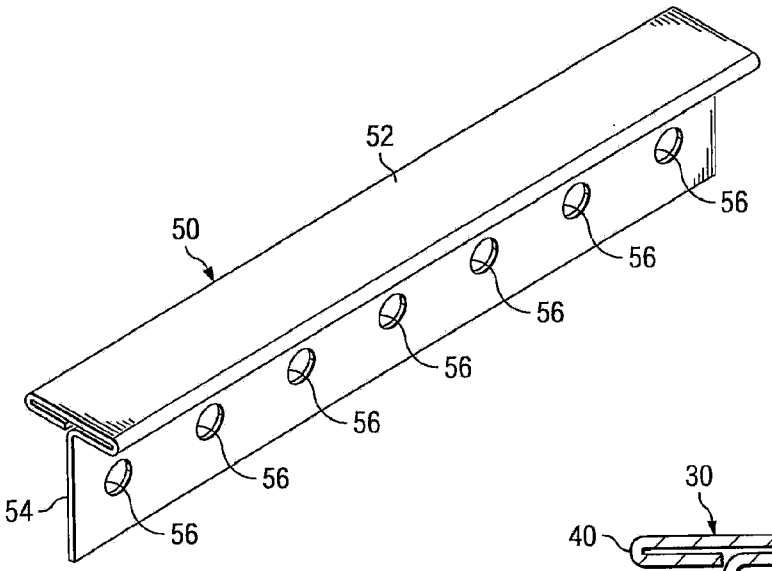


FIG. 4

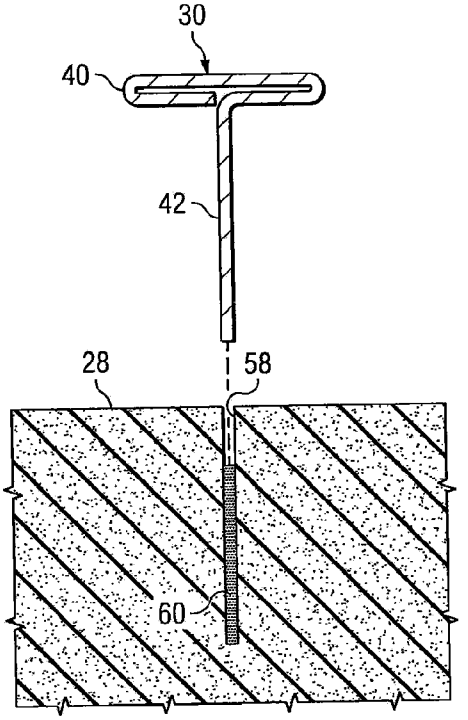


FIG. 6

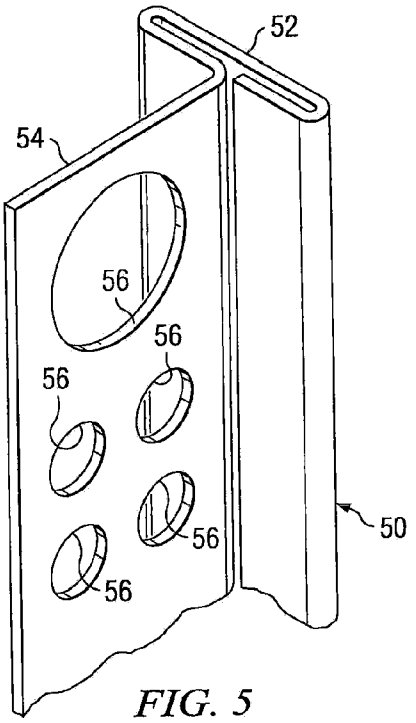


FIG. 5

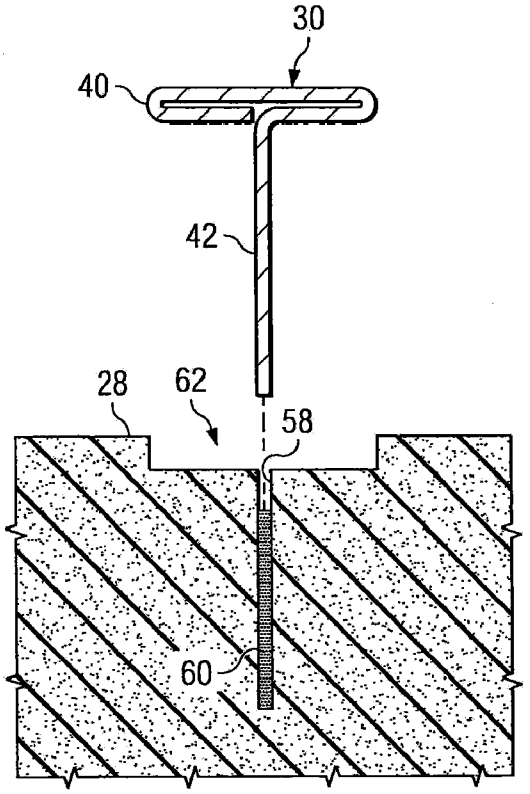


FIG. 7

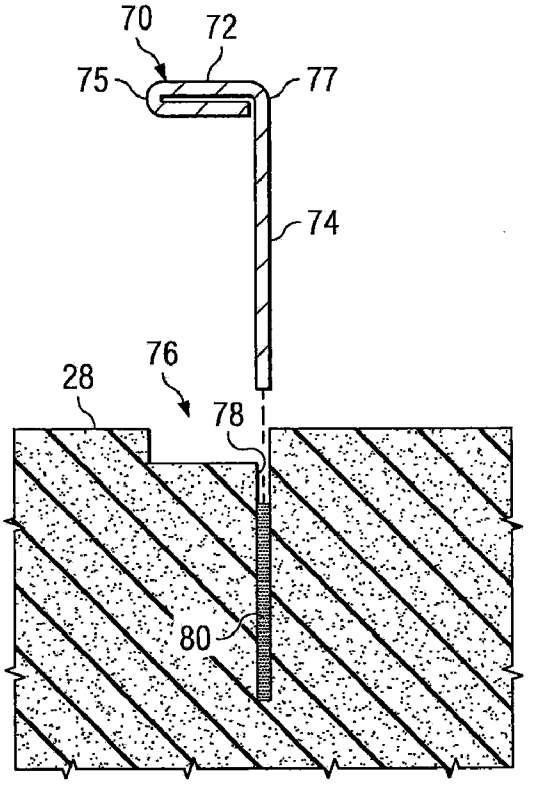


FIG. 8

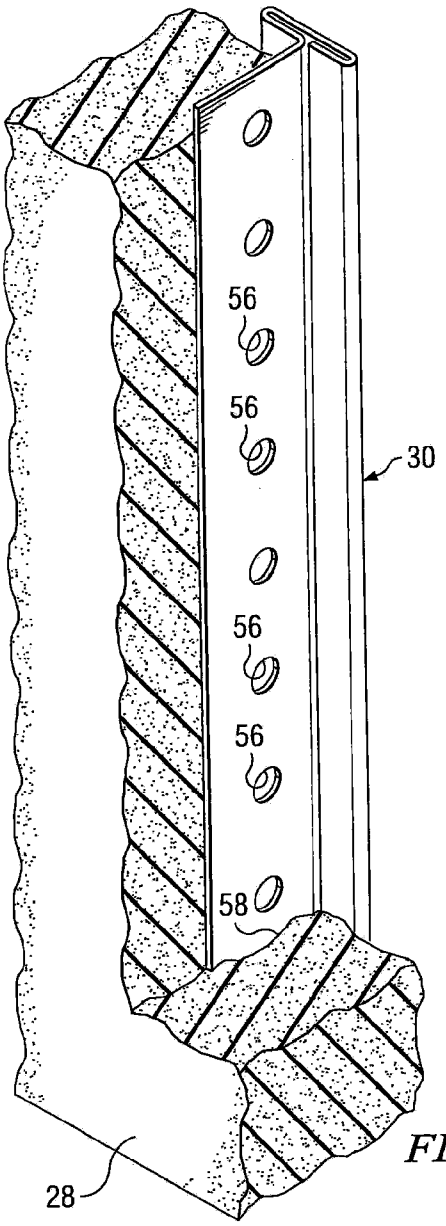


FIG. 9

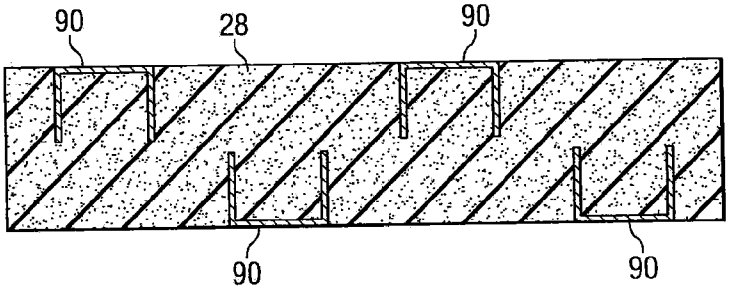


FIG. 10a

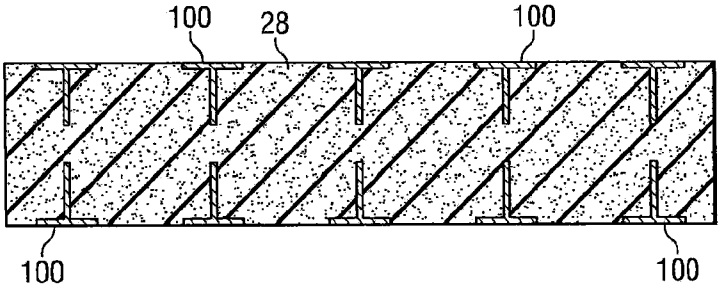


FIG. 10b

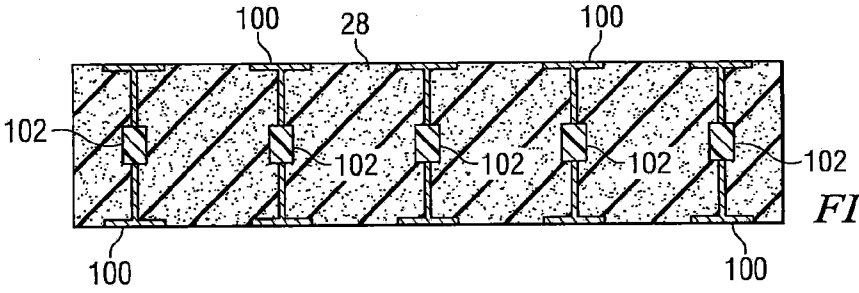


FIG. 10c

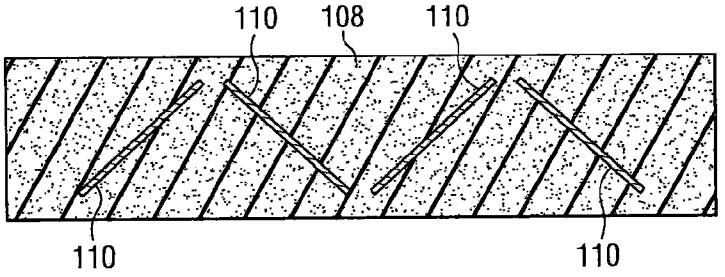


FIG. 10d

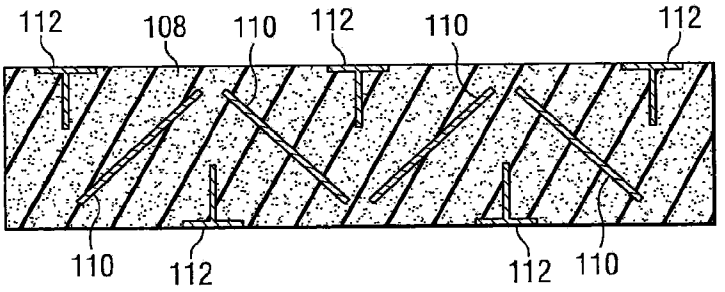


FIG. 10e

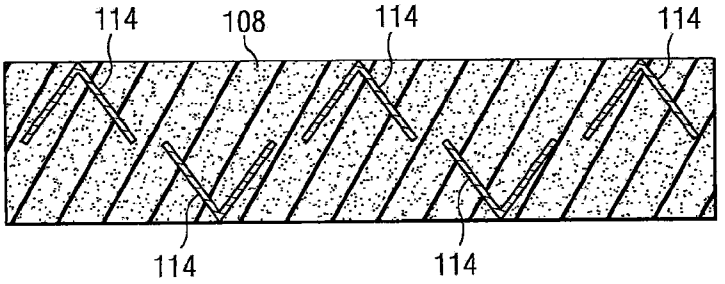


FIG. 10f

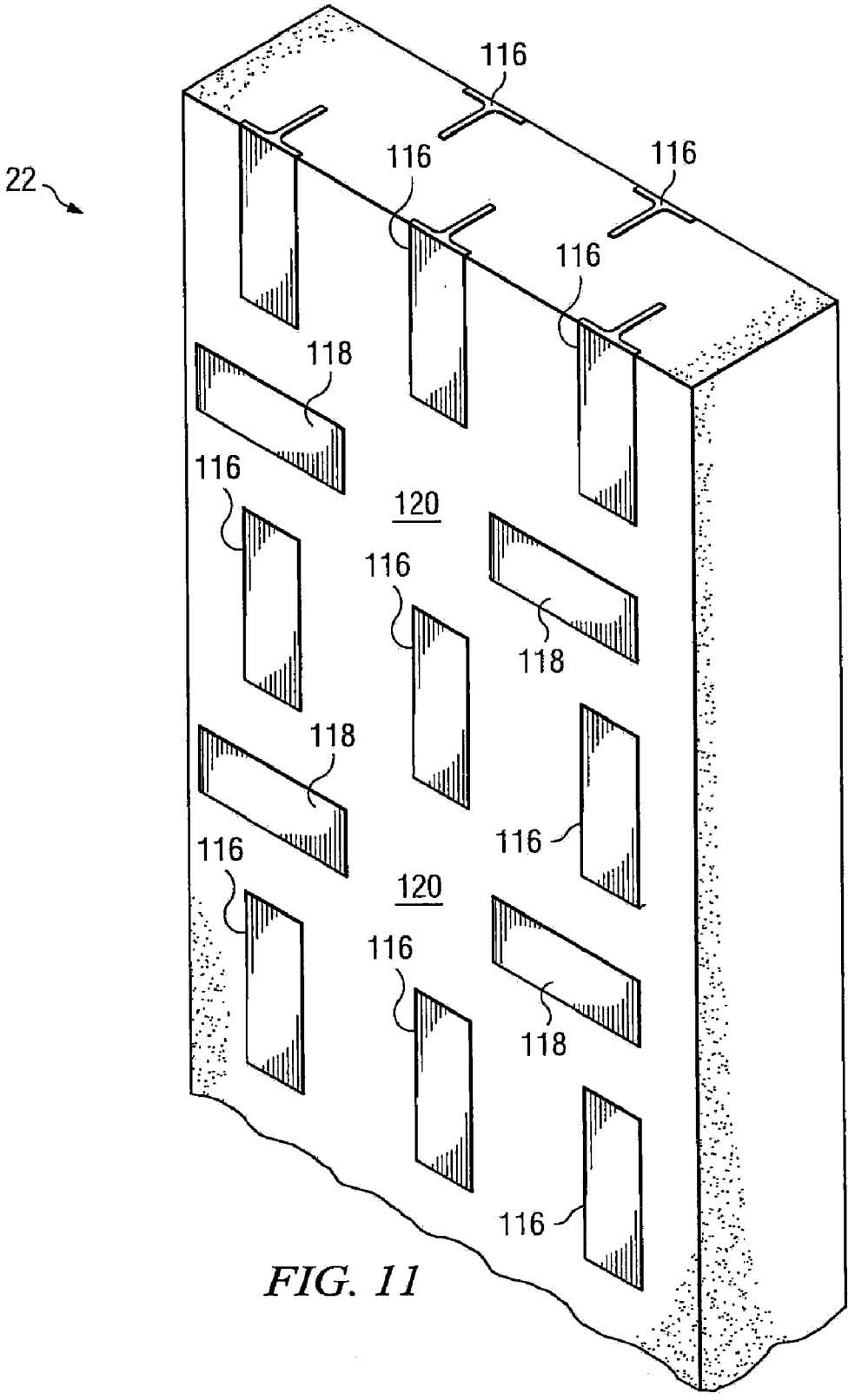

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FIG. 11

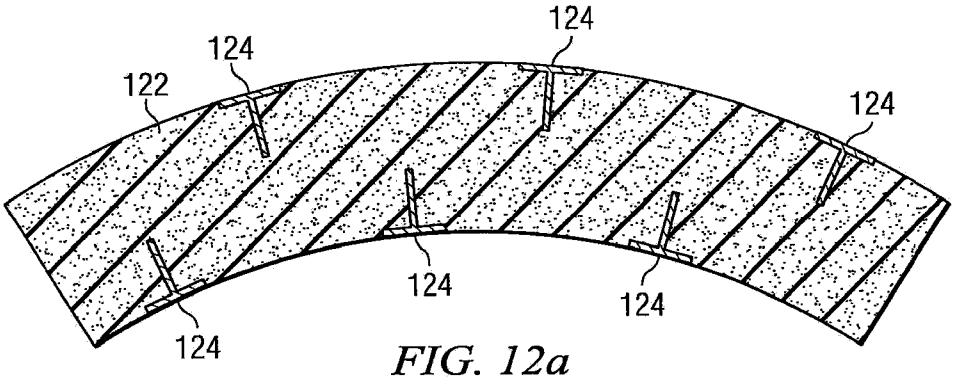

FIG. 12a

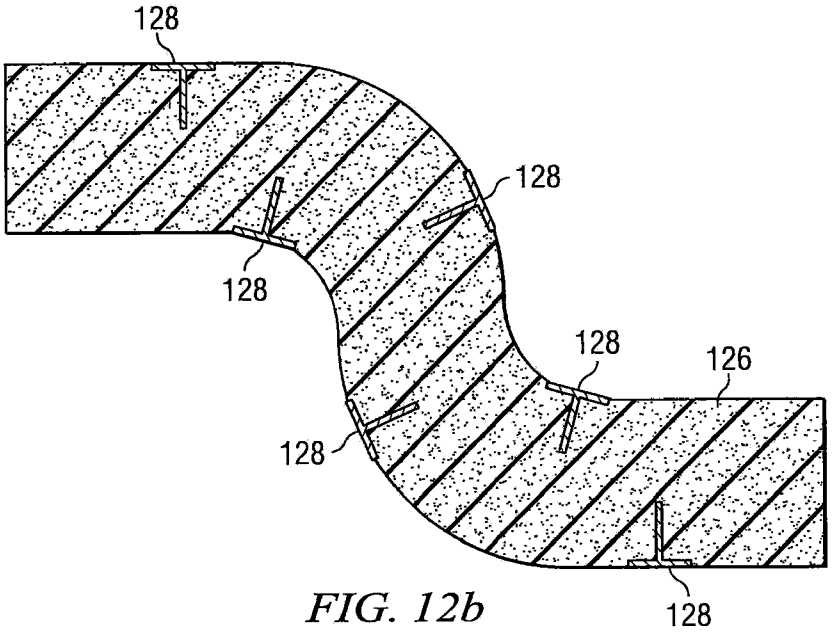

FIG. 12b

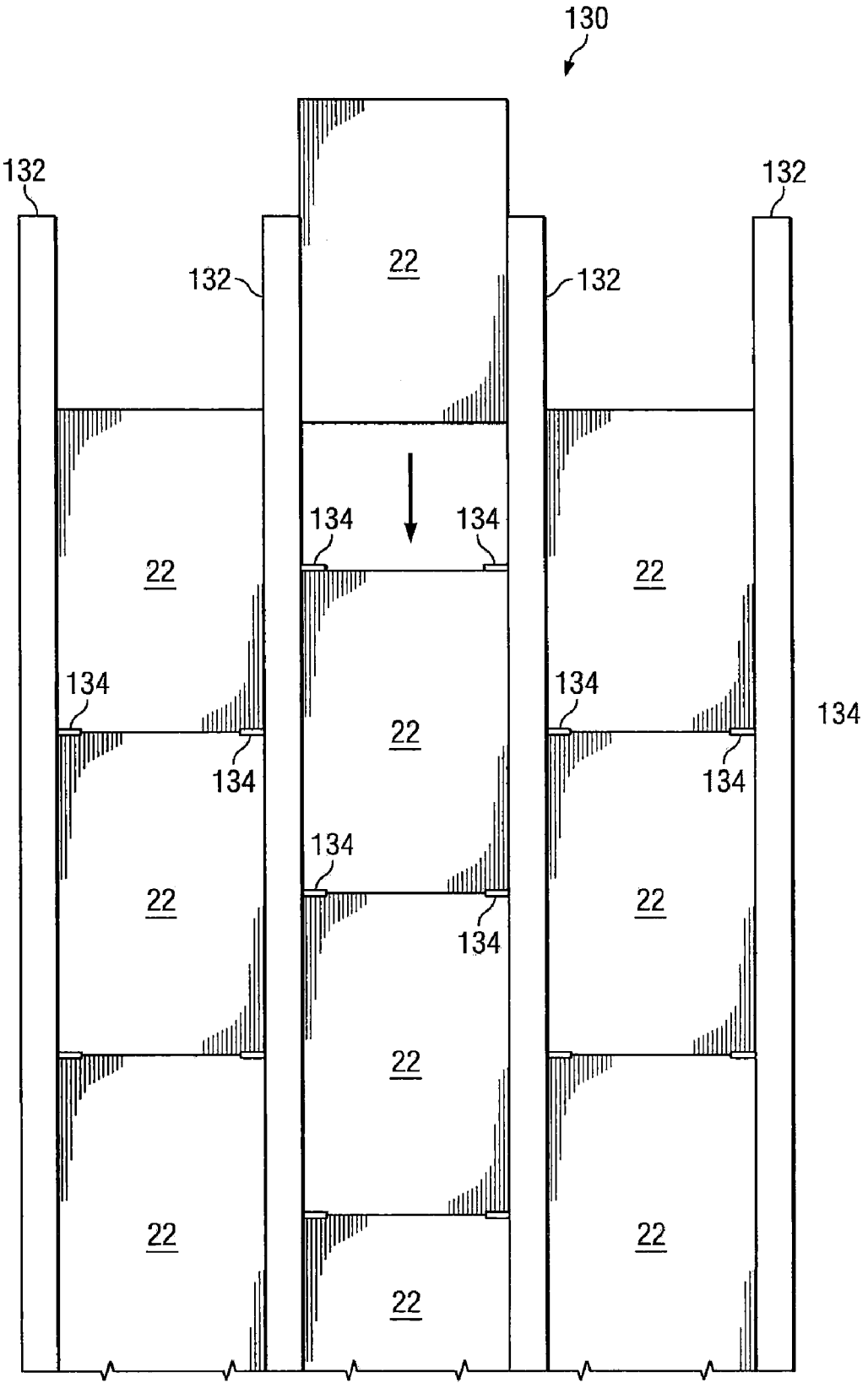

FIG. 13

BUILDING PANELS WITH SUPPORT MEMBERS EXTENDING PARTIALLY THROUGH THE PANELS AND METHOD THEREFOR

Claim to Domestic Priority

[0001] The present non-provisional patent application claims the benefit of priority of provisional application Ser. No. 60/782,372 entitled "Insulating Building Panels," filed Mar. 14, 2006.

FIELD OF THE INVENTION

[0002] The present invention relates in general to construction materials and, more particularly, to residential and commercial building panels containing insulating foam and support members extending partially through the insulating foam.

BACKGROUND OF THE INVENTION

[0003] Residential and commercial building construction uses a variety of building materials and construction techniques to complete the structure. In some building projects, lumber or metal studs are used for the framing. The frame structure is held together with nails, screws, and bolts. An exterior siding such as stucco, wood, vinyl, brick, or aluminum is placed over the frame structure. Insulation is placed between the studs of the frame structure. The interior coverings such as drywall are affixed to the inside of the frame structure. The entire building project is typically performed on the construction site. The use of interior and exterior siding over frame is costly and labor and time intensive. Wood framing is of inferior quality and subject to insect damage and warping. Metal framing is thermally conductive which is undesirable in view of energy costs. The frame-based structure is susceptible to the effects of aging and storm damage. While frame construction has been dominant in the building industry for many years, other more cost effective and time efficient solutions are becoming more common.

[0004] One alternative building approach involves the use of hollow sectional forms, which are put together in the shape of the exterior wall. The hollow forms are filled with concrete and then disassembled when the concrete sets, leaving a concrete wall. The concrete wall is long-lasting and strong against the elements, but the forms are generally expensive to setup.

[0005] Another building approach involves the use of pre-fabricated building panels which are manufactured off-site and then assembled together on-site. One such building panel is discussed in U.S. Pat. No. 6,796,093 as having a plurality of I-beam-shaped metal struts spaced about 18 inches apart with insulating foam blocks disposed between the metal struts. The metal struts have cut-outs along the length of the I-beam to reduce the total metal area and associated thermal conductivity. FIG. **1** shows exemplary prior art I-beam metal strut **12** between foam blocks **14**. While the structural panel has good load-bearing characteristics, the I-beam metal strut **12** is continuous across foam block **14**, at least through portions of the metal struts and, consequently, is thermally conductive through the continuous metal areas. Since I-beams **12** go completely through foam blocks **14**, heat and cold will conduct from one side to the other side of the wall structure. In the summer, I-beam **12** conducts heat from the exterior to the interior of the building. In the winter, I-beam **12** conducts cold from the exterior to the interior of the building. In any case, the I-beam construction decreases the thermal insulation property of the building panels.

[0006] A need exists for building panels combining strength with thermal insulating efficiency.

SUMMARY OF THE INVENTION

[0007] In one embodiment, the present invention is a building panel for residential and commercial construction comprising a plurality of insulating blocks connected together by adhesive. A plurality of support members are disposed on opposite sides of the insulting blocks for providing structural support. Each support member has a head portion in contact with a surface of the insulating block and a stem portion extending into the insulating block and having a length less than a width of the insulating block so that a thermal conduction path of the support members is discontinuous across the insulating blocks.

[0008] In another embodiment, the present invention is a building panel comprising an insulating material having a width. A plurality of support members is disposed in the insulating material for providing structural support. Each support member has a thermal conduction path that is less than the width of the insulating material.

[0009] In another embodiment, the present invention is a building panel comprising an insulating material having a width. A plurality of support members is disposed in the insulating material for providing structural support. The support members have a thermal conduction path that is discontinuous across the width of the insulating material.

[0010] In another embodiment, the present invention is a method of making a building panel comprising the steps of providing an insulating material having a width, and disposing a plurality of support members into the insulating material for providing structural support The support members have a thermal conduction path that is discontinuous across the width of the insulating material.

[0011] In another embodiment, the present invention is a building structure, comprising a frame having a plurality of columns and a plurality of building panels disposed between the columns of the frame. Each building panel includes an insulating material having a width, and a plurality of support members disposed in the insulating material for providing structural support. The support members have a thermal conduction path that is discontinuous across the width of the insulating material.

BRIEF DESCRIPTION OF THE DRAWINGS

[0012] FIG. **1** illustrates a known wall panel with I-beam strut disposed completely through the panel;

[0013] FIG. **2** illustrates interconnected foam-filled wall panels with support members inserted partially into the panel;

[0014] FIG. **3** illustrates a "T"-shaped support member;

[0015] FIG. **4** illustrates the "T"-shaped support member with multiple cut-outs;

[0016] FIG. **5** illustrates the "T"-shaped support member with alternate cut-outs;

[0017] FIG. **6** illustrates the "T"-shaped support member for insertion into the foam-filled panel;

[0018] FIG. **7** illustrates the "T"-shaped support member for insertion into a recess of foam-filled panel;

[0019] FIG. **8** illustrates an "L"-shaped support member for insertion into a recess of the foam-filled panel;

[0020] FIG. **9** illustrates a cut-away of the foam-filled panel with the "T"-shaped support member installed;

[0021] FIGS. **10***a*-**10***f* illustrate a top view of the foam-filled panel with different arrangements of support members;

[0022] FIG. **11** illustrates the foam-filled panel with support members installed in horizontal and vertical positions;

[0023] FIGS. **12***a*-**12***b* illustrate alternate shapes for the foam-filled panel with support members; and

[0024] FIG. **13** illustrates the use of foam-filled panels in high-rise buildings between frame columns.

DETAILED DESCRIPTION OF THE DRAWINGS

[0025] The present invention is described in one or more embodiments in the following description with reference to the Figures, in which like numerals represent the same or similar elements. While the invention is described in terms of the best mode for achieving the invention's objectives, it will be appreciated by those skilled in the art that it is intended to cover alternatives, modifications, and equivalents as may be included within the spirit and scope of the invention as defined by the appended claims and their equivalents as supported by the following disclosure and drawings.

[0026] Residential, commercial, and industrial building construction can be done much more efficiently and cost effectively with pre-manufactured wall, roof, floor, and ceiling panels. The pre-manufactured panels can be made in a controlled environment, such as a manufacturing facility, shipped to the construction site, and then assembled together to form the walls and roof of the building. The pre-manufactured panels stand strong against adverse environmental conditions, such as wind, rain, snow, hurricane, flood, and earthquake. The wall and roof panels are easy to assemble into the complete building structure on the job site. As will be demonstrated, the wall and roof panels of the present invention provide improved insulation, i.e., higher R-value insulation factor, as compared to the prior art.

[0027] To construct a building with the wall and roof panels as described herein, an architect or builder will design and layout the building structure. The building may be a home, office, industrial, hotel, or commercial structure of any size and shape and as tall as the local building codes permit. The building designer will specify a blueprint of the building, including dimensions for the walls and roof. The designer then selects wall and roof panels to conform to the building blueprint, i.e., the walls and roof are made with a plurality of building panels assembled together according to the design. The panels can be round, rectangle, triangle, curved, polygon, or any other convenient shape. The selected panels are connected together on the job site to form the walls and roof of the building. The building panels can be stacked on-end with appropriate support for multi-story structures.

[0028] FIG. **2** illustrates a portion of building structure **20** with two building panels or sections **22** connected together at joint **26**. Building panels are each made with one or more insulating blocks **28**. The insulating blocks **28** may be made with expanded polystyrene (EPS) foam formed in 48-inch blocks. Alternatively, the blocks **28** can have other lengths and be made with fiberglass, paper, or any other thermally insulating material. The height of each insulating block depends on the building design, typically ranging from 8-10 feet. The thickness of the insulating blocks ranges from 4-8 inches. In other embodiments, the insulating blocks may range from 2 to 12 inches in thickness. For walls greater than 48 inches in length, a plurality of insulating blocks **28** are interconnected to run the length of the wall. Adjacent insulating blocks **28** are held together with an adhesive, e.g., urethane glue. Building panel **22** may have side end caps **34** for support and protection of the foam block. Building panel **22** may also have top and bottom end caps (not shown). The top cap is a metal angle or "L"-shaped brace running along the top perimeter of panel **22**, contacting the top and sides of the insulating blocks. The bottom cap is a metal angle or "L"-shaped brace running along the bottom perimeter of panel **22**, contacting the bottom and sides of the insulating blocks. For the wall panels, the bottom cap may be formed in or attached to the foundation of the building structure to aid in aligning the walls and to meet hurricane and earthquake standards.

[0029] Support members or struts **30** are inserted into insulating blocks **28** to provide structural support and withstand the environmental elements, e.g., wind, rain, and snow. The building panels **22** are also resistant to water, mold, mildew, insects, fire, hurricanes, and earthquakes. Support members **30** and insulating blocks **28** compliment one another to provide a strong yet thermally isolating building panel. Support member **30** can be made from a variety of materials capable of providing structural support with the insulating block, such materials including metal (steel, aluminum or composite metal), ceramic, concrete, fiberglass, graphite, wood, plastic, cardboard, rubber, and composites of such materials.

[0030] In one embodiment, support members **30** are formed in the shape of a "T" and run the height of the wall, from top to bottom. The stem of support member **30** extends partially into the insulating block **28** but does not extend completely through the insulating block. The support members **30** are installed on opposite sides of panel **22**, in an alternating pattern and offset or staggered with respect to the adjacent support members on the other side of the building panels, as shown in FIG. **2**. The support members are about 12-18 inches apart on center of each member, and about 24-36 inches apart on each side of the building panel.

[0031] The use of panel **22** provides several advantages for building construction. The building panels can be made off-site, in a controlled environment such as a manufacturing facility, and then transported to and assembled at the building site. The off-site manufacturing provides cost saving efficiencies in terms of accessibility to mass production equipment, sheltered work environment, and ready access to raw materials. The building panels can be formed to any size and shape in accordance with the building design. The panels can be straight, curved, angled, etc. The insulating blocks **28** provide exceptional insulation properties against the outside elements. Each inch of thickness of the insulating block yields about R-4 insulation factor. A 6-inch thick foam panel would provide about R-24 value of insulation. The support members **30** provide structural strength to panel **22**. With support members **30**, an 8-foot by 8-foot by 6-inch section of panel **22** can withstand in excess of 27,000 lbs. of total axial loading directed against surface **32**.

[0032] In most if not all prior designs, the support struts in the foam blocks are continuous through the panel, see

exemplary I-beam **12** in FIG. **1**. The continuous metal structure of I-beam **12** through foam block **14** provides a continuous thermal conduction path from the interior surface to the exterior surface that reduces the R-value insulation factor of the prior art panel.

[0033] An important feature of building panel **22** is its thermal non-conductivity properties in combination with the structural strength it provides. The thermal non-conductivity property of panel **22** arises from the fact the support members extend only partially through the building panel. As seen in FIG. **2**, each support member **30**, on both sides of panel **22**, stops in the interior portion of the insulating block **28** and does not extend completely through from the interior surface to the exterior surface of the building panel. In one embodiment, the support member extends about half way through the insulating block. In a 6-inch insulating block, the "T" support member extends about 3 inches into the insulating block. Support members **30** are typically made with metal and as such have high thermal conductive properties. The support members **30** inherently exhibit a thermal conduction path through the metal. The foam portion of panel **22** has high thermal insulation properties. Since the support members **30** do not extend all the way from the interior surface to the exterior surface of panel **22**, there is no channel of high thermal conductivity from the interior surface to the exterior surface in the body of the building panel. Thus, the thermal conduction path associated with the support members is discontinuous through panel **22** as the insulating material blocks the thermal transfer at the point where the support member stops in the interior of the insulating block **28**.

[0034] It is understood that thermal transfer through panel **22** is not completely eliminated with the use of support members **30** as insulating blocks **28** are not perfect thermal isolators. However, the high thermal transfer associated with the metal support members is certainly discontinuous across the wall panel **22** and as such significantly improves its R-value insulation factor for the wall panel as a whole.

[0035] The structural strength of building panel **22** arises from the arrangement of the support members **30** in the insulating blocks **28**. Each "T"-shaped support member **30** has a head portion parallel to and in contact with the interior and exterior surfaces of panel **22**. The stem of the "T"-shaped support member extends into the insulating block **28**. The "T"-shaped support members **30** are positioned on opposite sides of panel **22**, in an alternating pattern and offset or staggered with respect to the adjacent support members on the opposite side of the building panel. The embedded stem of support members **30**, arranged as shown in FIG. **2**, increases the structural strength of panel **22**.

[0036] The support member **30** is shown in FIG. **3** having head portion **40** and stem portion **42**. The support member is formed from a rolled sheet of steel that is bent to the desired "T" shape. The steel is **20** gauge thickness, although other gauge steel could be used as well. The "T"-shape of the support member is formed using a sheet metal bending machine and process. At about 1 inch into the width of the steel plate a first 180° bend is made at point **44**, commonly known as a "double-hem." At another 2 inches into the width of the steel plate a second 180° bend is made at point **46**. At another 1 inch into the width of the steel plate a third bend at 90° is made at point **48**. The steel plate is cut at about 3 inches past point **48** to form stem **42**. The result is the double-hem "T"-shaped support member **30** having head portion **40** width of 2 inches, stem portion **42** of 3 inches, and a length the same as the height of panel **22**, i.e., 8-10 feet. In other embodiments, the head portion **40** can range from 2-4 inches and the stem portion **42** can range from 1-6 inches.

[0037] A support member **50** is shown in FIG. **4** having the same dimensions as support member **30** including head portion **52** and stem portion **54**. The support member **50** has a plurality of cut-outs or openings **56** formed in the stem portion **52**. FIG. **5** shows that support member **50** can have cut-outs or openings **56** of different sizes, shapes, and patterns. The cut-outs reduce the thermal conductivity and weight of the support member without significantly reducing its structural strength for panel **22**.

[0038] FIG. **6** illustrates in cross-section groove or slot **58** cut into a side surface of insulating blocks **28** from the bottom to the top of panel **22**. For a 6-inch thick insulating block, the groove **58** is about 3 inches deep into the insulating block. An adhesive **60** such as urethane glue is disposed into groove **58**. A groove **58** is cut into insulating blocks **28** of panel **22** for each support member **30**. The stem portion **42** of support members **30** are then inserted into the groove **58** until the head portion **40** contacts the surface of insulating block **28**. The stem portion **42** cures with adhesive **60** and forms a secure union between support member **30** and insulating block **28**.

[0039] In an alternate embodiment, a shallow trench or recess **62** is cut into insulating block **28** to sufficient depth to contain head portion **40**, as shown in cross-section in FIG. **7**. The stem portion **42** is inserted into groove **58** to cure with adhesive **60**. The top surface of head portion **40** is co-planar with the side surface of insulating blocks **28** and provides a flush surface for panel **22**.

[0040] Another embodiment for the support member is shown in cross-section in FIG. **8**. The "L"-shaped support member **70** has head portion **72** and stem portion **74**. The support member is formed from a rolled sheet of steel that is bent to the "L" shape. About 1 inch into the width of the steel plate a first 180° bend is made at point **75**. At another 1 inch into the width of the steel plate a third bend at 90° is made at point **77**. The steel plate is cut at about 3 inches past point **77** to form stem **74**. The result is an "L"-shaped support member **70** having head portion **72** width of 1 inch, stem portion **74** of 3 inches, and a length the same as the height of panel **22**, i.e., 8-10 feet.

[0041] A shallow trench or recess **76** is cut into insulating block **28** to sufficient depth to contain head portion **72**. A groove **78** cut into a side surface of insulating blocks **28** from the bottom to the top of panel **22**. For a 6-inch thick insulating block, the groove **78** is cut about 3 inches deep into the insulating block. An adhesive **80** such as urethane glue is disposed into groove **78**. A groove **78** is cut into insulating blocks **28** of panel **22** for each support member **30**. The stem portion **74** of support members **70** are then inserted into the grooves **78** until the top surface of head portion **74** is co-planar with the side surface of insulating blocks **28**. The recessed head portion provides a flush surface for panel **22**.

[0042] FIG. **9** shows a cut-away of insulating block **28** with support member **30** in place. Note that the cut-outs or openings **56** in the support member **30** also improve the adhesive of the stem portion to the insulating block **28**. Alternately, the stems portions can be textured, roughened,

corrugated, or partially punched for better adhesion in groove **58** to the insulating block.

[0043] FIGS. **10***a*-**10***f* illustrate alternate embodiments of the support members. Each figure is a cross-sectional view of panel **22**.

[0044] FIG. **10***a* shows "U"-shaped support members **90** disposed in insulating block **28** extending the height of panel **22**. The "U"-shaped support members **90** are formed by making two 90° bends in the sheet of steel. The "U"-shaped support member **90** has a head portion and two stem portions extending partially into insulating block **28**, but does not extend all the way through from the interior surface to the exterior surface of panel **22**. Accordingly, the thermal conduction path through panel **22**, attributed to the metal support members, is discontinuous. The support members **90** are installed on opposite sides of panel **22**, in an alternating pattern and offset or staggered with respect to the adjacent support members on the other side of the building panel. The support members are about 12-18 inches apart on center of each member. The "U"-shaped support member **90** can also be recessed into insulating block **28** as described in FIG. **7**.

[0045] FIG. **10***b* shows "T"-shaped support members **100** disposed in insulating block **28** extending the height of panel **22**. Opposing "T"-shaped support members **100** are directly opposite one another, but still do not extend all the way through from the interior surface to the exterior surface of panel **22**. In the embodiment of FIG. **10***b*, there is a break or gap between opposing "T" support members **100**, the space being filled with foam to block the thermal conduction path from the interior surface to the exterior surface of panel **22**. Accordingly, the thermal conduction path through panel **22**, attributed to the metal support members, is discontinuous.

[0046] FIG. **10***c* illustrates the "T"-shaped support members **100** of FIG. **10***b* with thermally insulating connectors **102** placed between opposing "T"-shaped support members **100**. The thermal insulating connectors **102** are made of plastic or other rigid thermally isolating material. The thermal insulating connectors **102** provide additional strength for the support members **100**, while blocking the thermal conduction path from the interior surface to the exterior surface of panel **22**. Accordingly, the thermal conduction path through panel **22**, attributed to the metal support members, is discontinuous.

[0047] FIG. **10***d* shows straight support members **110** embedded within the interior of insulating material **108**. In this embodiment, the panel **22** can be made by creating a form of the outline of the building panel. The support members **110** are placed into the form, and the form is filled with the insulating material **108**, e.g., paper, foam, or fiberglass. The insulating material **108** is mixed with an adhesive to create a semi-fluid mixture that surrounds and encases the support members **110** as the form is filled. When the insulating material hardens, the panel forms are removed, leaving panel **22**. The support members **110** do not extend all the way through from the interior surface to the exterior surface of panel **22**. In the embodiment of FIG. **10***d*, there is a break or gap on either end of the support member **110** before the interior and exterior surfaces of panel **22**. The space of the gap is filled with the insulating material **108** to block the thermal conduction path from the interior surface to the exterior surface of panel **22**. Accordingly, the thermal conduction path through panel **22**, attributed to the metal support members, is discontinuous.

[0048] FIG. **10***e* shows straight support members **110** in combination with "T"-shaped support members **112** embedded within the interior of insulating material **108**. As with FIG. **10***d*, the panel **22** can be made by creating a form of the outline of the building panel. The support members **110** and **112** are placed into the form, and the form is filled with the insulating material **108** in its semi-fluid state to surround and encase the support members **110** and **112** as the form is filled. When the insulating material hardens, the panel forms are removed, leaving panel **22**. The support members **110** and **112** do not extend all the way through from the interior surface to the exterior surface of panel **22**, which blocks the thermal conduction path from the interior surface to the exterior surface of panel **22**. Accordingly, the thermal conduction path through panel **22**, attributed to the metal support members, is discontinuous.

[0049] FIG. **10***f* shows angled support members **114** embedded within the interior of insulating material **108**. As with FIG. **10***d*, panel **22** can be made by creating a form of the outline of the building panel. The support members **114** are placed into the form, and the form is filled with the insulating material **108**. The insulating material **108** is mixed with an adhesive to create a semi-fluid mixture that surrounds and encases the support members **114** as the form is filled. When the insulating material hardens, the panel forms are removed, leaving panel **22**. The support members **114** do not extend all the way through from the interior surface to the exterior surface of panel **22**. In the embodiment of FIG. **10***f*, there is a break or gap on either end of the support member **114** before the interior and exterior surfaces of panel **22**. The space of the gap is filled with the insulating material **108** to block the thermal conduction path from the interior surface to the exterior surface of panel **22**. Accordingly, the thermal conduction path through panel **22**, attributed to the metal support members, is discontinuous.

[0050] Another embodiment of panel **22** is shown in FIG. **11**. The stem of "T"-shaped support members **116** and **118** extend only partially into the insulating material. However, the support members do not extend the complete height of panel **22**. Instead, panel **22** has a row of vertical support members **116**, followed by a row of horizontal support members **118**, followed by a row of vertical support members **116**, and another row of horizontal support members **118**, and so on. In areas **120**, there are horizontal support members **118** on the opposite surface of panel **22**.

[0051] Wall panel **22** can be formed with horizontal and vertical conduits or air channels to run electric wire and plumbing pipes. Doors and windows can be cut into wall panel **22** in the manufacturing facility or at the construction site. The wall panel can be formed to any shape. FIG. **12***a* shows a curved wall panel **122** with "T" support members **124**. FIG. **12***b* shows an "S" shaped wall panel **126** with "T" support members **128**.

[0052] Roof panels for the building structure **20** can be manufactured as described for building panel **22**. The same is true for floor and ceiling panels. Since roof panels rest at an angle or flat, these panels may include additional support for vertical loads bearing into the surface of the panel.

[0053] Another application for panel **22** involves high-rise construction. Most high-rise buildings have a frame structure with curtain wall panels placed between columns of the frame structure. Building panels like **22** are ideally suited to be disposed between the frame structure of a high-rise building. In FIG. **13**, frame structure **130** has columns **132**

made of red iron or steel. Curtain wall panels **22** are placed between columns **132** and rest on ears **134** or are pinned to columns **132**. Once in position, curtain wall panels **22** are welded to columns **132**. The curtain wall panel has an exterior surface that can be covered with mesh, sto, dinsglass, and an exposure surface such as stucco, granite, brick, or slate. The interior surface of the curtain wall panel has sheet rock and decorative covering such as paint or wall paper. Curtain wall panel **22** can be formed with horizontal and vertical conduits or air channels or chases to run electric wire and plumbing pipes. Alternatively, foam-filled panel **22** can be formed within another panel that acts as the curtain wall panel. The electric and plumbing lines can be placed in gaps between the curtain wall panel and the inner foam-filled panel **22**.

[0054] Panels like **22** have applications in many other industries, such as aircraft fuselage, automobile bodies, and marine hulls. The panels are strong, exhibit high thermal insulation properties, and can be formed to any size and shape, which would be well-suited to such applications.

[0055] While one or more embodiments of the present invention have been illustrated in detail, the skilled artisan will appreciate that modifications and adaptations to those embodiments may be made without departing from the scope of the present invention as set forth in the following claims.

What is claimed is:

1. A building panel for residential and commercial construction, comprising:

a plurality of insulating blocks connected together by adhesive; and

a plurality of support members disposed on opposite sides of the insulting blocks for providing structural support, each support member having a head portion in contact with a surface of the insulating block and a stem portion extending into the insulating block and having a length less than a width of the insulating block so that a thermal conduction path of the support members is discontinuous across the insulating blocks.

2. The building panel of claim **1**, wherein the support member is formed in a shape selected from the group consisting of "T"-shape, "L"-shape, "U"-shaped, and angled-shaped.

3. The building panel of claim **1**, wherein the insulating block is made with a material selected from the group consisting of foam, fiberglass, and paper products.

4. The building panel of claim **1**, wherein the support member is made with a material selected from the group consisting of metal, ceramic, concrete, fiberglass, graphite, wood, plastic, cardboard, rubber, and composites thereof.

5. The building panel of claim **1**, wherein the support member is recessed into the insulating block.

6. The building panel of claim **1**, wherein the stem of the support member is inserted into a groove of the insulating block and secured with an adhesive.

7. The building panel of claim **1**, further including a thermally isolating connector coupled between stems of opposing support members.

8. A building panel, comprising:

an insulating material having a width; and

a plurality of support members disposed in the insulating material for providing structural support, each support member having a thermal conduction path that is less than the width of the insulating material.

9. The building panel of claim **8**, wherein adjacent support members are disposed on opposite sides of the insulating block.

10. The building panel of claim **9**, wherein the support members are offset with respect to the adjacent support members on opposite sides of the insulating block.

11. The building panel of claim **8**, wherein the support member is formed in a shape selected from the group consisting of "T"-shape, "L"-shape, "U"-shaped, and angled-shaped.

12. The building panel of claim **8**, wherein the insulating block is made with a material selected from the group consisting of foam, fiberglass, and paper products.

13. The building panel of claim **8**, wherein the support member is made with a material selected from the group consisting of metal, ceramic, concrete, fiberglass, graphite, wood, plastic, cardboard, rubber, and composites thereof.

14. The building panel of claim **8**, wherein the stem of the support member is inserted into a groove of the insulating block and secured with an adhesive.

15. The building panel of claim **8**, wherein the support member is embedded in the insulating material.

16. The building panel of claim **8**, further including a thermally isolating connector coupled between opposing support members.

17. A building panel, comprising:

an insulating material having a width; and

a plurality of support members disposed in the insulating material for providing structural support, the support members having a thermal conduction path that is discontinuous across the width of the insulating material.

18. The building panel of claim **17**, wherein the support members are disposed on opposite sides of the insulating material.

19. The building panel of claim **17**, wherein the support member is formed in a shape selected from the group consisting of "T"-shape, "L"-shape, "U"-shaped, and angled-shaped.

20. The building panel of claim **17**, wherein the insulating block is made with a material selected from the group consisting of foam, fiberglass, and paper products.

21. The building panel of claim **17**, wherein the support member is made with a material selected from the group consisting of metal, ceramic, concrete, fiberglass, graphite, wood, plastic, cardboard, rubber, and composites thereof.

22. A method of making a building panel, comprising:

providing an insulating material having a width; and

disposing a plurality of support members into the insulating material for providing structural support, the support members having a thermal conduction path that is discontinuous across the width of the insulating material.

23. The method of claim **22**, further including forming the support member a shape selected from the group consisting of "T"-shape, "L"-shape, "U"-shaped, and angled-shaped.

24. The method of claim **22**, wherein the insulating block is made with a material selected from the group consisting of foam, fiberglass, and paper products.

25. The method of claim **22**, wherein the support member is made with a material selected from the group consisting of metal, ceramic, concrete, fiberglass, graphite, wood, plastic, cardboard, rubber, and composites thereof.

26. A building structure, comprising:
a frame having a plurality of columns; and
a plurality of building panels disposed between the columns of the frame, each building panel including,
(a) an insulating material having a width, and
(b) a plurality of support members disposed in the insulating material for providing structural support, the support members having a thermal conduction path that is discontinuous across the width of the insulating material.

27. The building structure of claim **26**, wherein the support member is formed in a shape selected from the group consisting of "T"-shape, "L"-shape, "U"-shaped, and angled-shaped.

28. The building structure of claim **26**, wherein the insulating block is made with a material selected from the group consisting of foam, fiberglass, and paper products.

29. The building structure of claim **26**, wherein the support member is made with a material selected from the group consisting of metal, ceramic, concrete, fiberglass, graphite, wood, plastic, cardboard, rubber, and composites thereof.

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