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(54) **PREFABRICATED WALL ASSEMBLY HAVING AN INSULATING FOAM LAYER**

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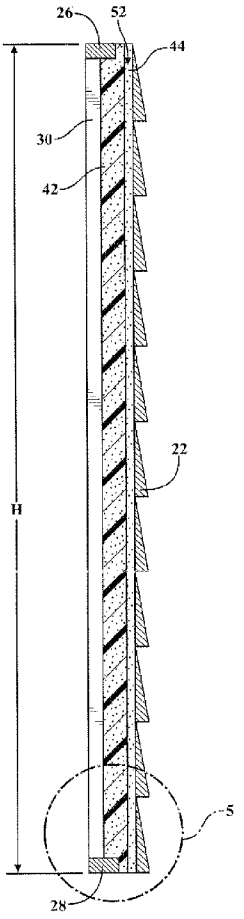
CPC ***E04B 2/00*** (2013.01); ***E04F 13/0869*** (2013.01); ***E04F 13/007*** (2013.01)

USPC **52/302.1**; 52/745.1; 52/742.13

(57) **ABSTRACT**

A prefabricated wall assembly receives an exterior covering of a building. The prefabricated wall assembly includes a frame assembly and an insulating foam layer. The frame assembly includes a top member, a bottom member opposite the top member, and a plurality of vertical members coupled to and extending between the top and bottom members. The frame assembly also has an interior side and an exterior side opposite the interior side. The insulating foam layer is disposed between the plurality of vertical members of the frame assembly and also extends from the exterior side of the frame assembly terminating in a plurality of integral ribs. An exterior surface of the insulating foam layer is presented between the plurality of ribs. The ribs space the exterior covering from the exterior surface of the insulating foam layer for allowing airflow and drainage between the prefabricated wall assembly and the exterior covering.



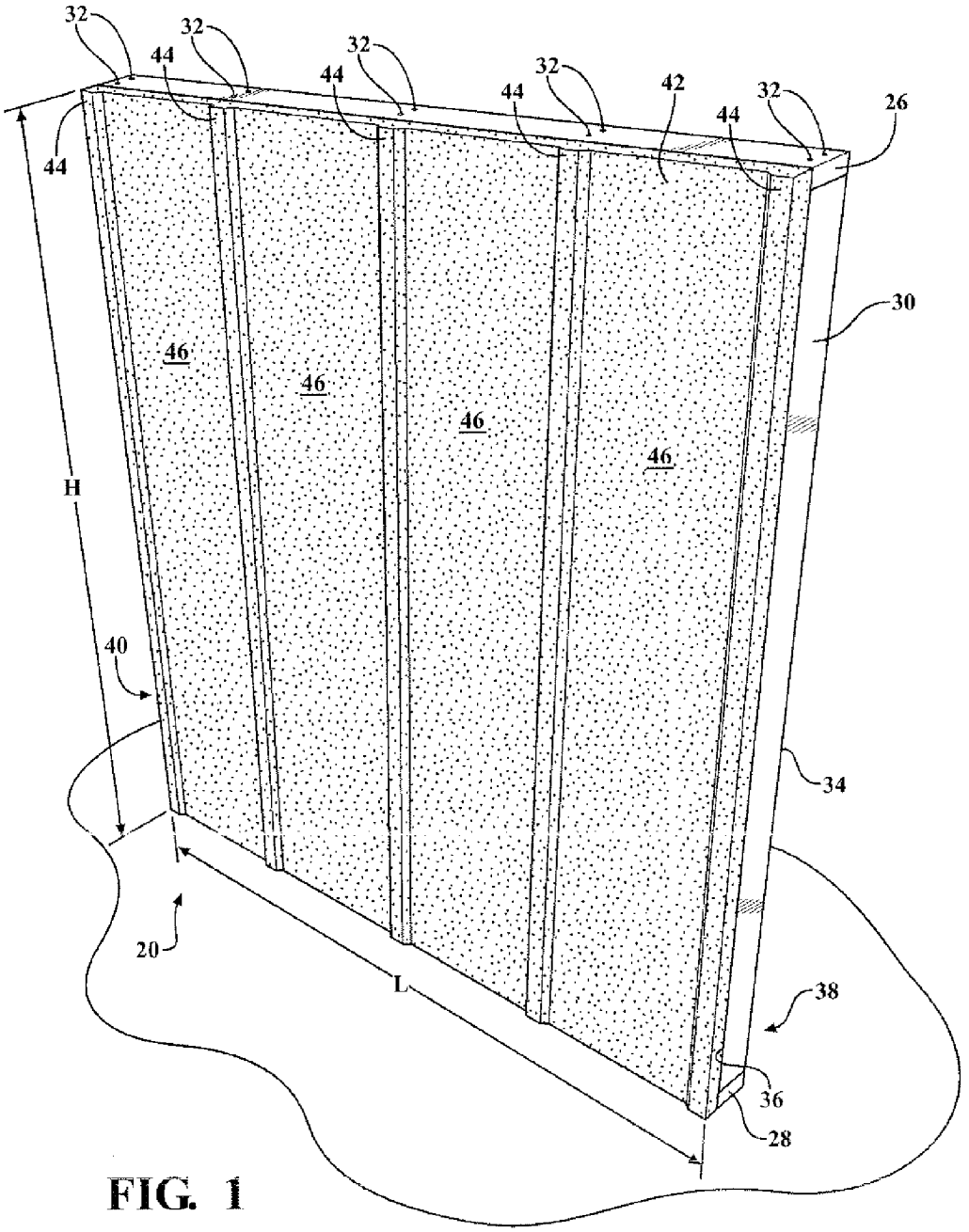


FIG. 1

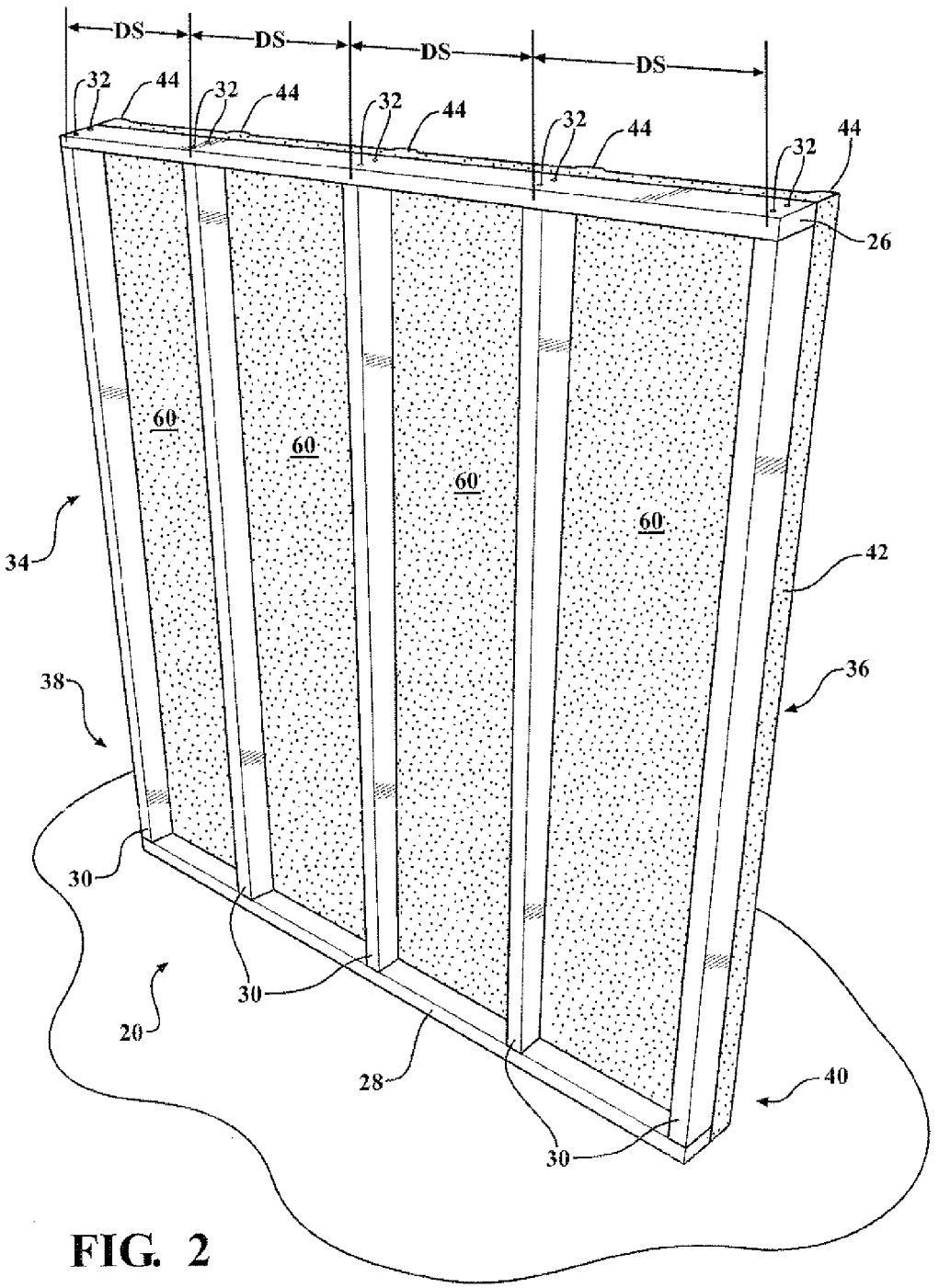


FIG. 2

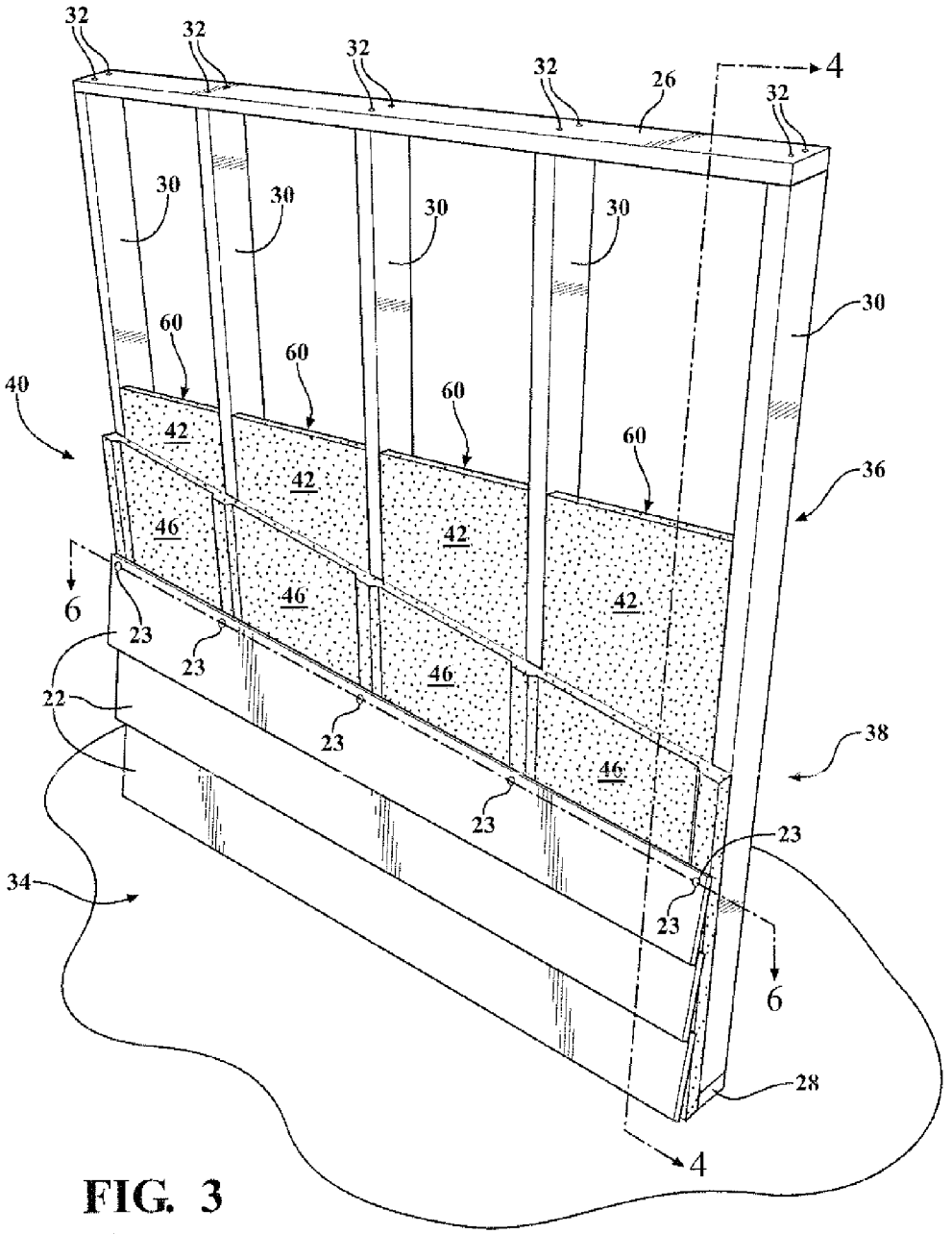

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FIG. 3

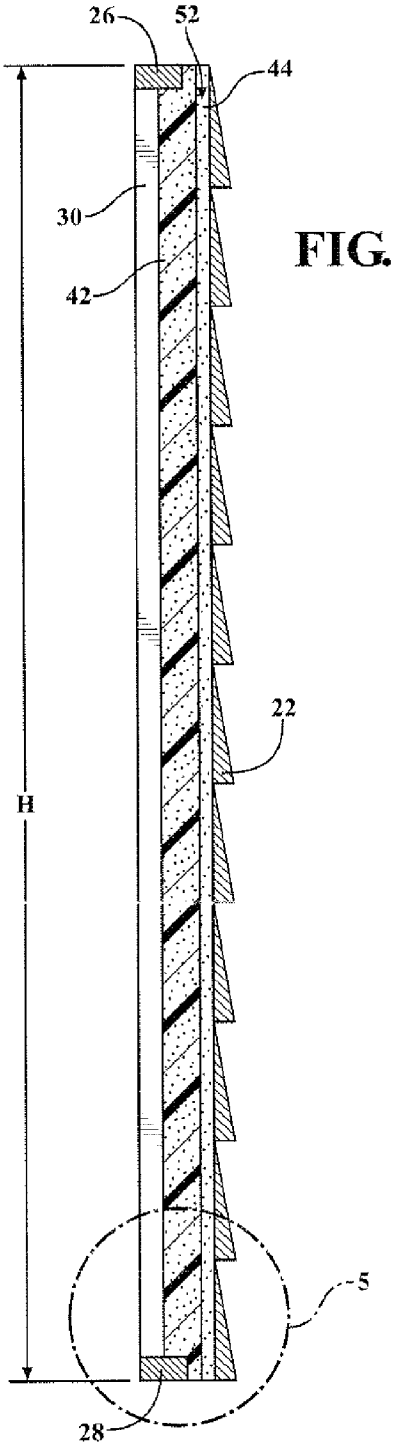


FIG. 4

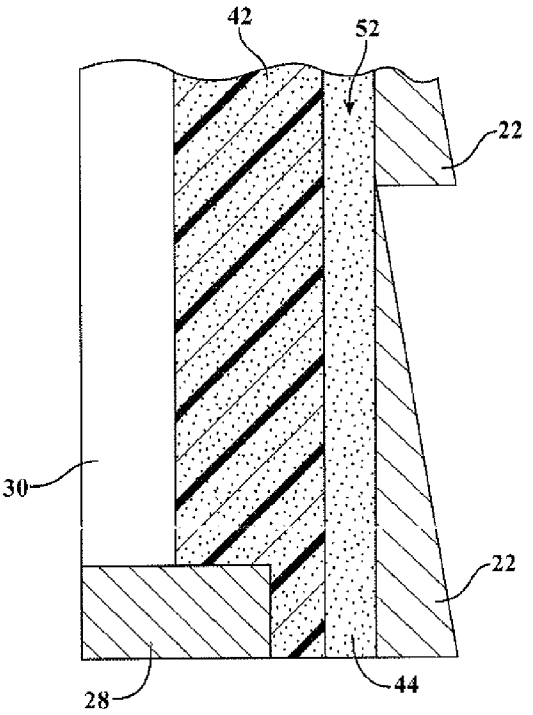


FIG. 5

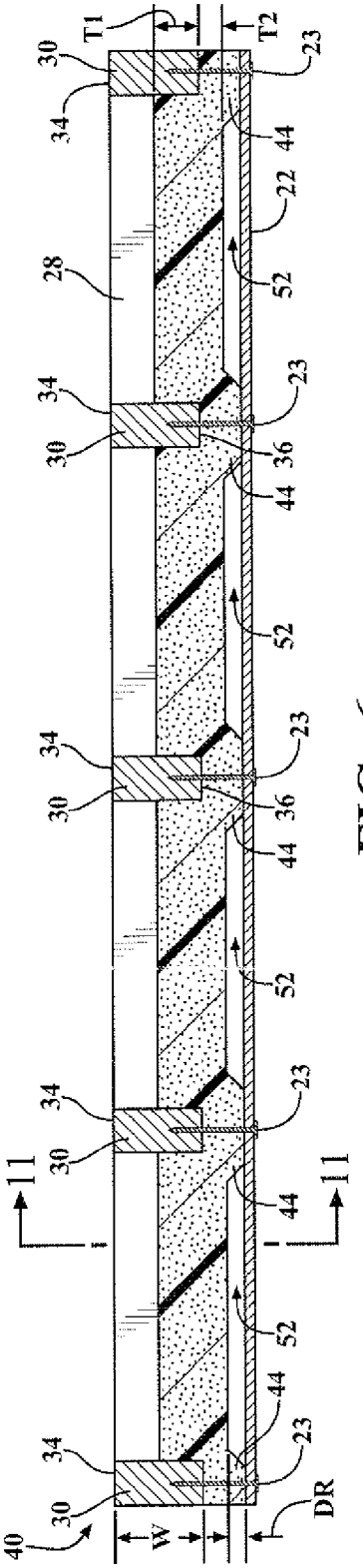


FIG. 6

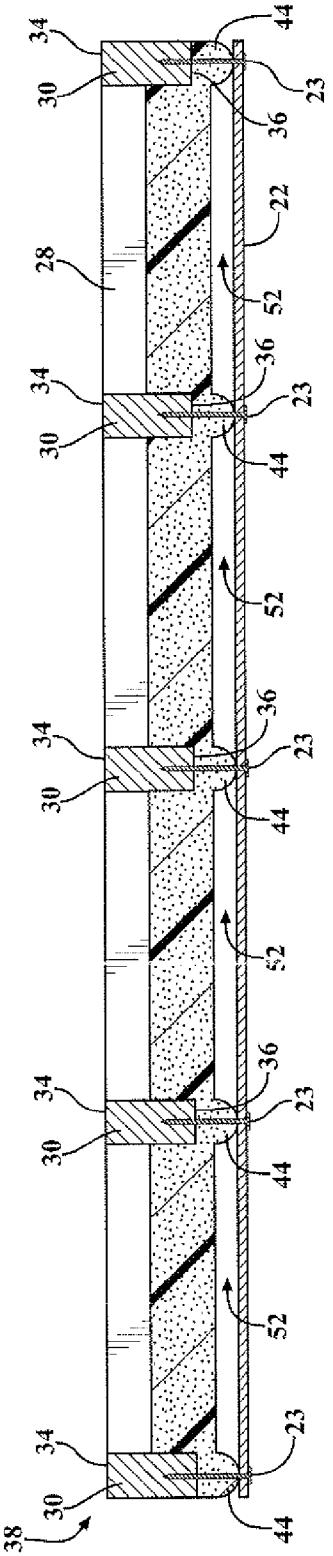


FIG. 7

FIG. 8

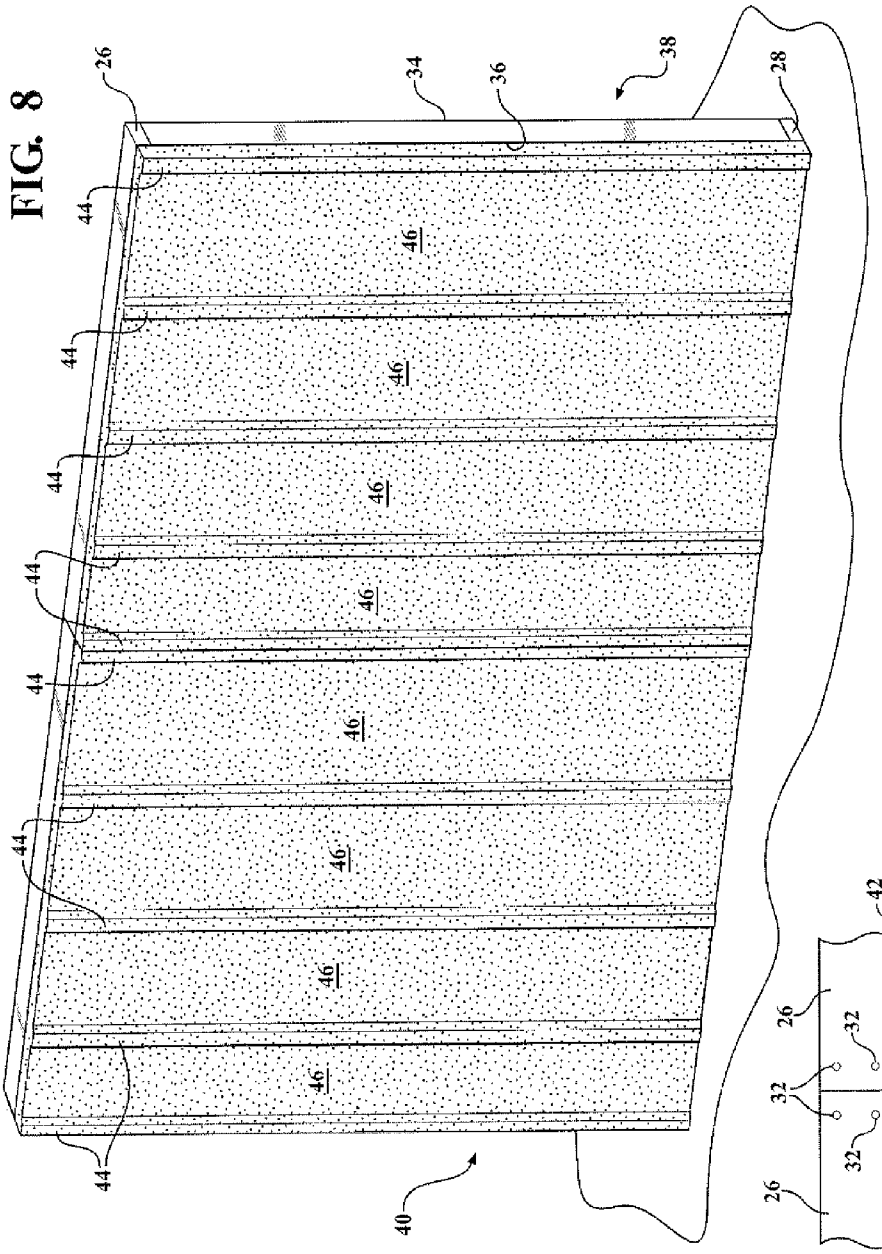


FIG. 9

FIG. 10

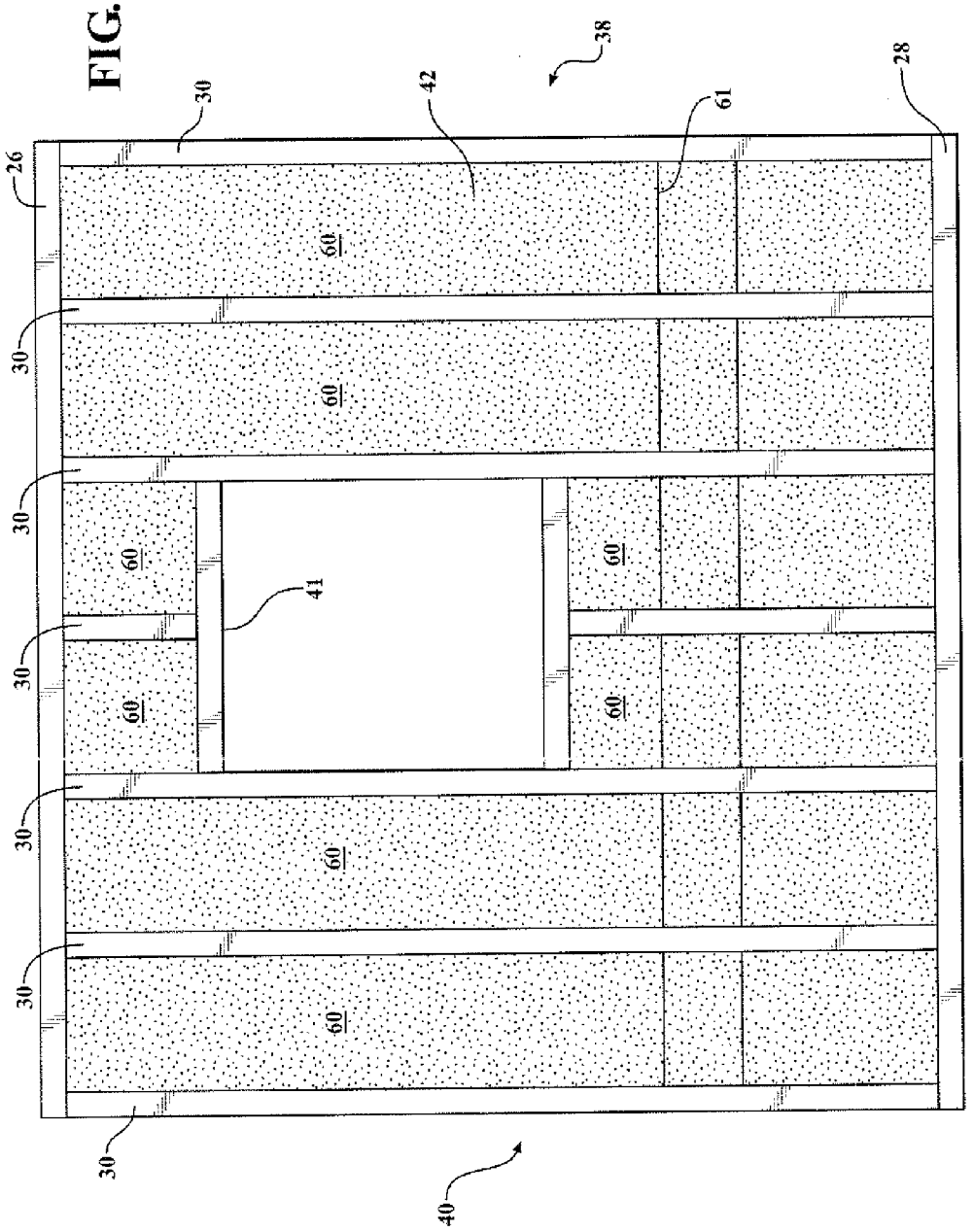
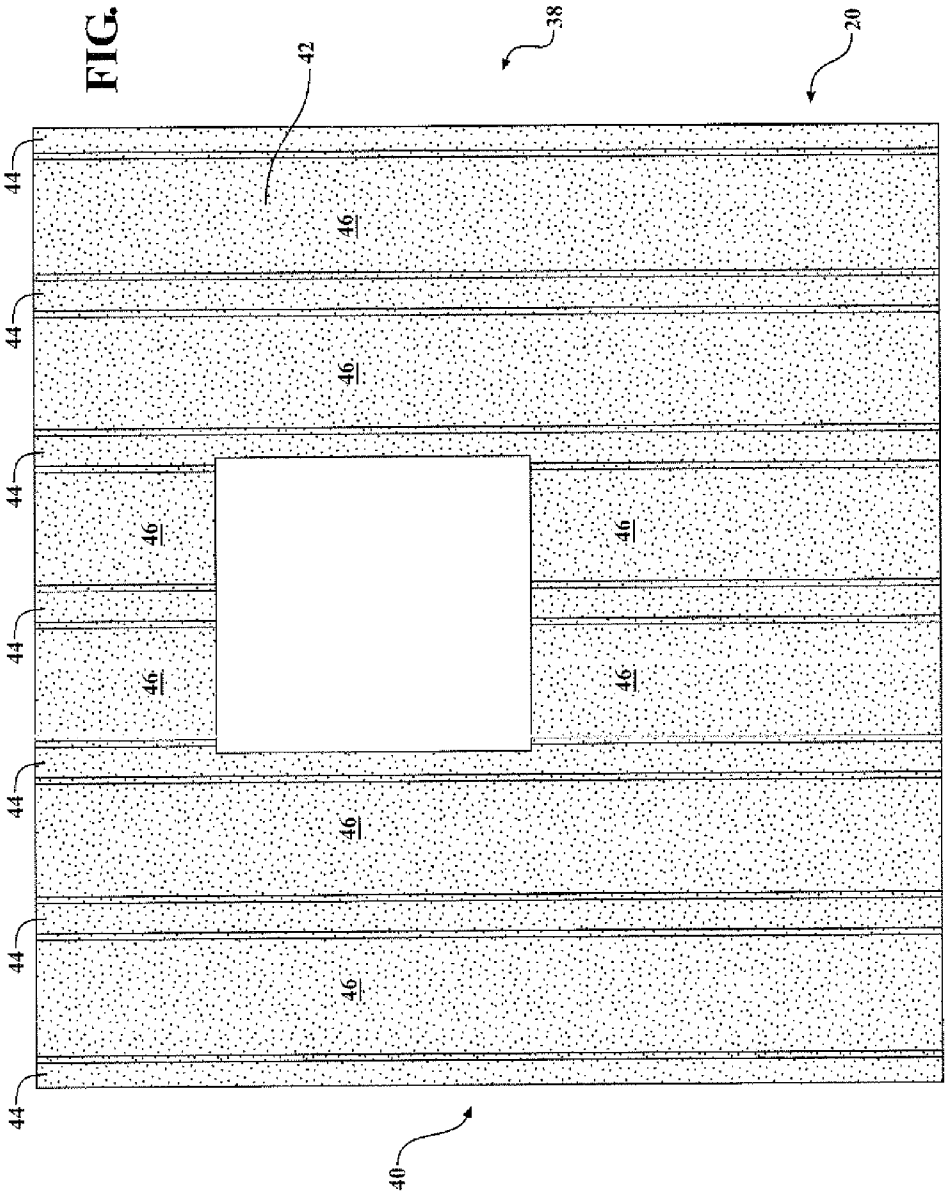


FIG. 11



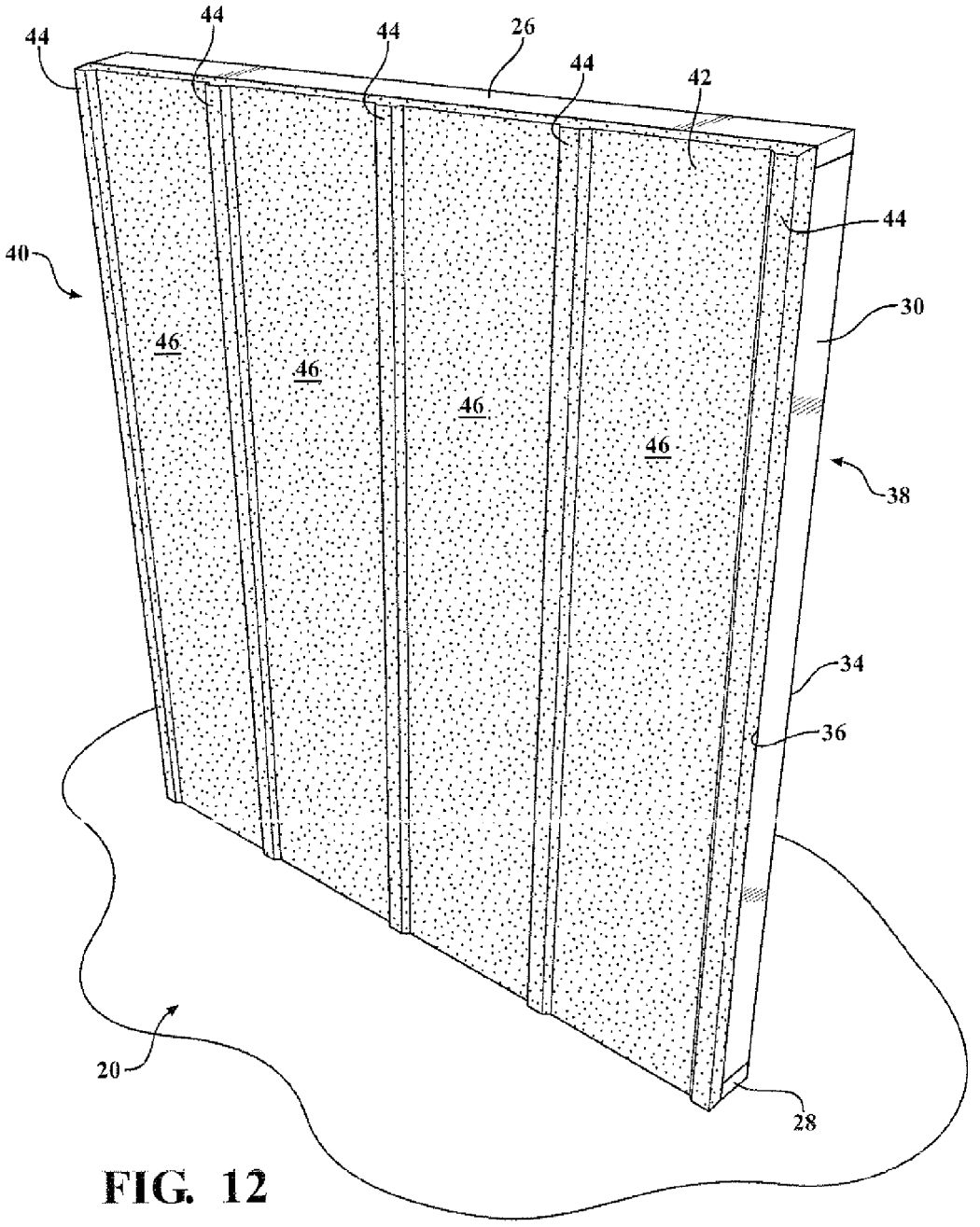


FIG. 12

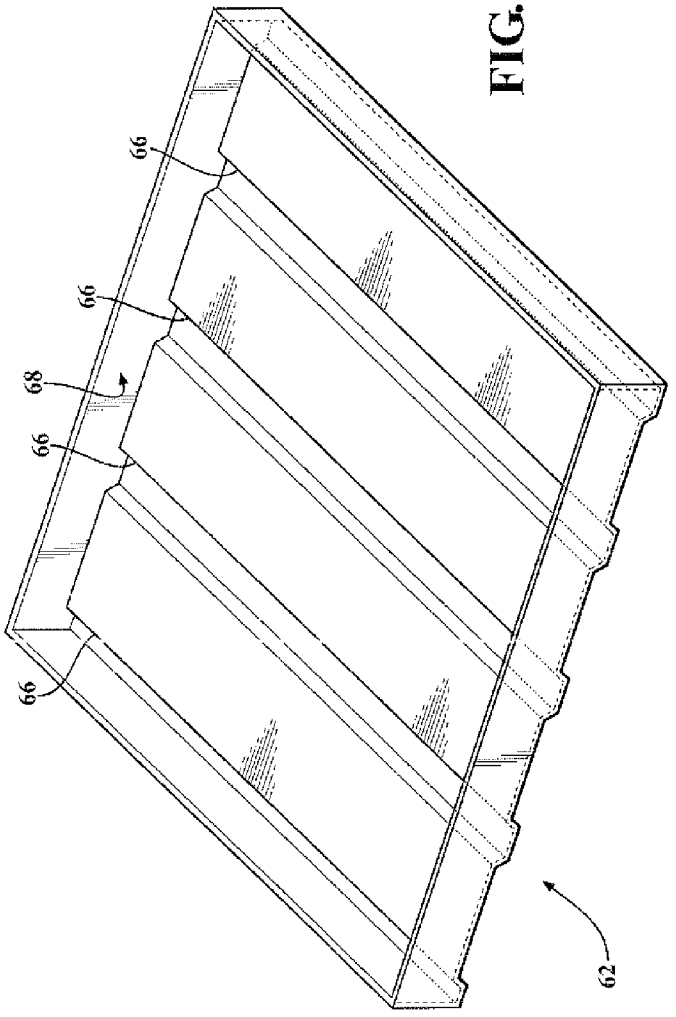


FIG. 13

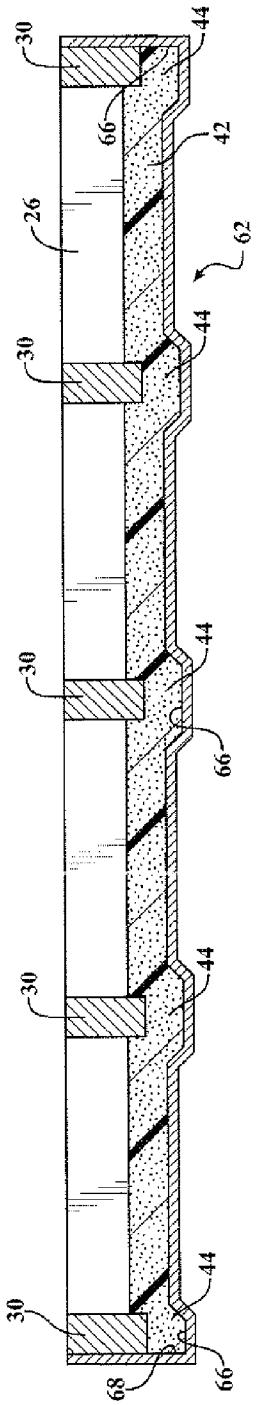


FIG. 14

PREFABRICATED WALL ASSEMBLY HAVING AN INSULATING FOAM LAYER

CROSS REFERENCE TO RELATED APPLICATION

[0001] This application claims priority to and all the advantages of U.S. Provisional Patent Application No. 61/498,094 filed on Jun. 17, 2011, which is incorporated by reference.

BACKGROUND OF THE INVENTION

[0002] 1. Field of the Invention

[0003] The invention generally relates to a prefabricated wall assembly. More specifically, the invention relates to a prefabricated wall assembly having an insulating foam layer.

[0004] 2. Description of the Related Art

[0005] Prefabricated wall assemblies for use as walls of a building, such as residential buildings, or commercial buildings, are known in the art. A conventional prefabricated wall assembly is assembled offsite at a factory or warehouse. After assembly, the conventional prefabricated wall assembly is transported on-site were the building is to be constructed. The conventional prefabricated wall assembly reduces construction time to construct the building and reduces the labor cost for constructing the building.

[0006] The conventional prefabricated wall assembly includes a frame assembly. The frame assembly includes a top member, a bottom member spaced from the top member, and a plurality of vertical members disposed between the top and bottom members. Typically, the top, bottom, and vertical members of the frame assembly comprise wood. The top, bottom, and vertical members of the frame assembly are coupled together using fasteners, such as nails or screws.

[0007] The conventional prefabricated wall assembly also includes an insulating layer coupled to the frame assembly. Typically, the fasteners are also used to couple the insulating material to the frame assembly. The insulating layer comprises preformed panels made from polystyrene. The insulating layer has a minimum thermal resistance value, or R-value, which depends on the climate in which the building is to be constructed. The thickness of the insulating layer is varied to produce different R-values. However, because the insulating layer comprises panels, which are preformed, a plurality of seams result between adjacent panels. The seams can be a source of reduced R-value and provide a path for weather elements, such as wind and water, to enter the frame assembly, which is undesirable.

[0008] The conventional prefabricated wall assembly includes an exterior sheathing, such as plywood or press wood board, adjacent the insulating layer opposite the frame assembly. The exterior sheathing is coupled to the frame assembly with the fasteners. As is the case with the preformed panels of the insulating layer, the exterior sheathing is available in preformed sheets. A plurality of seams are also formed between adjacent preformed sheets of the exterior sheathing. The seams between preformed sheets of the exterior sheathing also provide a pathway for the weather elements to penetrate the frame assembly. Typically, once the weather elements penetrate the conventional prefabricated wall assembly, the weather elements penetrate the frame assembly and eventually the building itself, which causes damage to an interior sheathing, such as drywall or gypsum board.

[0009] Once the conventional prefabricated wall assembly is on-site, a barrier layer, such as Tyvek® is added to the exterior sheathing in an effort to minimize the penetration of the weather elements into the conventional prefabricated wall assembly. However, over time, the weather elements can penetrate or circumvent the barrier layer, thus penetrating the conventional prefabricated wall assembly. Therefore, there remains a need to provide an improved prefabricated wall assembly.

SUMMARY OF THE INVENTION AND ADVANTAGES

[0010] A prefabricated wall assembly receives an exterior covering of a building. The prefabricated wall assembly comprises a frame assembly and an insulating foam layer. The frame assembly is assembled with a top member, a bottom member opposite the top member, and a plurality of vertical members coupled to and extending between the top and bottom members. The frame assembly also has an interior side and an exterior side opposite the interior side.

[0011] The insulating foam layer is disposed between the plurality of vertical members of the frame assembly. The insulating foam layer also extends from the exterior side of the frame assembly and terminates in a plurality of integral ribs. The ribs are opposite the frame assembly. An exterior surface of the insulating foam layer is presented between the plurality of ribs. The ribs space the exterior covering from the exterior surface of the insulating foam layer. Spacing the exterior covering from the exterior surface of the insulating foam layer allows airflow and drainage between the prefabricated wall assembly and the exterior covering. Providing airflow and drainage between the prefabricated wall assembly and the exterior covering prevents environmental elements, such as water, from entering the building.

[0012] Additionally, a method of manufacturing the prefabricated wall assembly is disclosed.

BRIEF DESCRIPTION OF THE DRAWINGS

[0013] Other advantages of the present invention will be readily appreciated, as the same becomes better understood by reference to the following detailed description, when considered in connection with the accompanying drawings wherein:

[0014] FIG. **1** is a perspective view of an exterior face of a prefabricated wall assembly having a frame assembly and an insulating foam layer;

[0015] FIG. **2** is a perspective view of an interior face of the prefabricated wall assembly having a frame assembly and an insulating foam layer;

[0016] FIG. **3** is another perspective view of the exterior face of the prefabricated wall assembly having an exterior covering coupled to the frame assembly;

[0017] FIG. **4** is a cross-sectional view of the prefabricated wall assembly taken along line **4-4** of FIG. **3**;

[0018] FIG. **5** is an enlarged view of a portion of the cross-sectional view of FIG. **4**;

[0019] FIG. **6** is a cross-sectional view of the prefabricated wall assembly taken along line **6-6** in FIG. **3** showing the insulating foam layer terminating in a plurality of ribs with the ribs having a trapezoidal configuration;

[0020] FIG. **7** is an alternative embodiment of the prefabricated wall assembly illustrated in FIG. **6** showing the ribs having an end that has a radius;

[0021] FIG. **8** is a perspective view of the exterior face of two prefabricated wall assemblies joined together;

[0022] FIG. **9** is a top view of a portion of the prefabricated wall assemblies of FIG. **8**;

[0023] FIG. **10** is a view of the interior face of prefabricated wall assembly having an opening for receiving a window frame;

[0024] FIG. **11** is a view of the interior face of the prefabricated wall assembly of FIG. **10** having the opening for receiving the window frame;

[0025] FIG. **12** is a perspective of the exterior face of the prefabricated wall assembly which is free of fasteners;

[0026] FIG. **13** is a perspective view of a mold for forming the insulating foam layer of the prefabricated wall assembly; and

[0027] FIG. **14** is a cross-sectional view of the mold of FIG. **13** and the prefabricated wall assembly disposed within the mold.

DETAILED DESCRIPTION OF THE EXEMPLARY EMBODIMENT

[0028] Referring to the Figures, wherein like numerals indicate corresponding parts throughout the several views, a prefabricated wall assembly is generally shown at **20**. The prefabricated wall assembly **20** is for constructing a building, such as a residential building or a commercial building. For example, the prefabricated wall assembly **20** is at least one of a plurality of exterior walls of the building. It is to be appreciated that the prefabricated wall assembly **20** may only be one of the plurality of exterior walls of the building or the prefabricated wall assembly **20** may be all of the plurality of exterior walls of the building. Said differently, the prefabricated wall assembly **20** may be used to construct a single exterior wall of the building.

[0029] Alternatively, multiple prefabricated wall assemblies may be used to construct the exterior walls of building. Said differently, the prefabricated wall assembly **20** may be coupled to another prefabricated wall assembly **20** to define a perimeter of the building. Additionally, the prefabricated wall assembly **20** may be coupled to a traditional field constructed wall to define the perimeter of the building. It is to be appreciated that the prefabricated wall assembly **20** may be coupled to the traditional field constructed wall or another prefabricated wall assembly **20** by any suitable methods. For example, fasteners, such as nails or screws, an adhesive bead, or straps could be used to the couple together the adjacent high performance wall assemblies **20**.

[0030] Generally, the prefabricated wall assembly has an exterior face, which faces an exterior of the building when the prefabricated wall assembly is the wall of the building. Additionally, the prefabricated wall assembly has an interior face, which faces an interior of the building when the prefabricated wall assembly is the wall of the building. The prefabricated wall assembly **20** can be manufactured in any length L or height H desired for use as the wall of the building. Additionally, the prefabricated wall assembly **20** may be used completely above grade or extend below grade such that a portion of the prefabricated wall assembly **20** is embedded within the ground. Furthermore, the prefabricated wall assembly **20** can be used as interior walls of the building.

[0031] A method manufactures the prefabricated wall assembly **20**. Typically, the prefabricated wall assembly **20** is manufactured by assembling the prefabricated wall assembly **20** off-site from the location of the building. Said differently, the prefabricated wall assembly **20** may be manufactured at a location that is different from the location that the building is to be constructed. For example, the prefabricated wall assembly **20** can be manufactured at a factory or a warehouse and subsequently transported to the location that the building is to be constructed. Once the prefabricated wall assembly **20** is delivered on-site, the prefabricated wall assembly **20** is secured in position on a support structure of the building, such as a footer, foundation wall, or another prefabricated wall assembly **20**. Alternatively, the prefabricated wall assembly **20** may be manufactured on-site at the location where the building is to be constructed. It is to be appreciated that the prefabricated wall assembly **20** may be positioned with the assistance of machinery, such as a crane. Typically, once the prefabricated wall assembly **20** is secured in position, the prefabricated wall assembly **20** receives an exterior covering **22** of the building, such as siding and/or brick. However, it is to be appreciated that the prefabricated wall assembly **20** may receive the exterior covering **22** prior to arriving on-site, i.e., in the factor or the warehouse. The exterior covering **22** may be secured to the prefabricated wall assembly by an exterior fastener **23**, such as nails, screws, or ties. For example, when the exterior covering **22** is brick, the prefabricated wall assembly **20** may include brick ties as the exterior fastener **23**. Alternatively, the exterior covering **22** may be secured to the prefabricated wall assembly **20** by an adhesive. For example, when the exterior covering **22** is siding, panels of the siding may be adhesively bonded to the prefabricated wall assembly **20**.

[0032] With reference to FIGS. **1-3**, the prefabricated wall assembly **20** comprises a frame assembly **24**. The frame assembly **24** includes a top member **26** and a bottom member **28** spaced from the top member **26**. The frame assembly **24** also includes a plurality of vertical members **30** coupled to and extending between the top and bottom members **26**, **28**. Generally, the top and bottom members **26**, **28** are horizontal and the vertical members **30** are perpendicular to the top and bottom members **26**, **28**. However, it is to be appreciated that the top and bottom members **26**, **28** may be vertical.

[0033] The top, bottom, and vertical members **26**, **28**, **30** are typically coupled together using fasteners **32**, such as nails and/or screws. The top, bottom, and vertical members **26**, **28**, **30** of the frame assembly **24** present an interior side **34** of the frame assembly **24** and an exterior side **36** of the frame assembly **24** opposite the interior side **34**. Generally, when the prefabricated wall assembly **20** is secured in position on the support structure of the building, the interior side **34** of the frame assembly **24** faces an interior of the building and the exterior side **36** of the frame assembly **24** faces an exterior of the building. Typically, the bottom member **28** is secured in position on the support structure of the building. The frame assembly **24** may also include a structural support member for providing resistance to axial loads, shear loads, and lateral loads applied to the prefabricated wall assembly **20**. For example, the frame assembly **24** may include wind bracing, hurricane straps, and/or up-lifting clips.

[0034] Typically, the top, bottom, and vertical members **26**, **28**, **30** comprise wood. However, it is to be appreciated that the top, bottom, and vertical members **26**, **28**, **30** may comprise any suitable material, such as fiberglass, aluminum, or other metals. The top, bottom, and vertical members **26**, **28**, **30** may be of any desired dimensions. For example, the top, bottom, and vertical members **26**, **28**, **30** may have a nominal cross-section of 2 inches by 4 inches or a nominal cross-section of 2 inches by 6 inches. It is to be appreciated that the top, bottom, and vertical members **26**, **28**, **30** may be of

different dimensions relative to each other. For example, the top and bottom members **26**, **28** may have the nominal cross-section of 2 inches by 6 inches and the vertical members **30** may have the nominal cross-section of 2 inches by 4 inches.

[0035] As best illustrated in FIGS. **4** and **5**, the vertical members **30** along with the top and bottom members **26**, **28** define the height H of the prefabricated wall assembly **20**. Typically, the height H of the prefabricated wall assembly **20** is of from about 2 to about 24, more typically of from about 6 to about 12, and even more typically of from about 8 to about 12 feet. With reference to FIGS. **6** and **7**, a nominal width W of the frame assembly **24** is defined by a width of the top, bottom, and vertical members **26**, **28**, **28**. Typically, the nominal width W of the frame assembly **24** is of from about 1 to about 8, more typically of from about 2 to about 8, and even more typically of from about 4 to about 6 inches.

[0036] With reference to FIG. **2**, the frame assembly **24** has a first end **38** and a second end **40** spaced from the first end **38**. Typically, one of the vertical members **30** is disposed at the first end **38** of the frame assembly **24** and another one of the vertical members **30** is disposed at the second end **40** of the frame assembly **24** with other vertical members **30** equally spaced between the first and second ends **38**, **40** of the frame assembly **24**. The length L of the prefabricated wall assembly **20** is defined between the first and second ends **38**, **40** of the frame assembly **24**. Additionally, the top and bottom members **26**, **28** are generally equal to the length L of the prefabricated wall assembly **20**. Typically, the length L of the prefabricated wall assembly **20** is of from about 1 to about 52, more typically of from about 5 to about 25, and even more typically of from about 12 to about 16 feet.

[0037] The length L of the prefabricated wall assembly **20** may vary depending on specific needs of a customer. For example, the length L of the prefabricated wall assembly **20** may be equal to a length of the exterior wall of the building in which the prefabricated wall assembly **20** is to be used. Alternatively, the length L of the prefabricated wall assembly **20** may be shorter than the exterior wall of the building in which the prefabricated wall assembly **20** is to be used, such that multiple prefabricated wall assemblies are joined together, as shown in FIGS. **8** and **9**, to form a unitary wall of the building.

[0038] With reference to FIG. **2**, the vertical members **30** are typically spaced apart from each other a distance DS. A plurality of voids is defined by the vertical members **30**. Said differently, the plurality of voids is between the vertical members **30**. Typically, the distance DS is measured from a centerline of one of the vertical members **30** to a centerline of another one of the vertical members **30**. As alluded to above, the vertical members **30** are typically equally spaced apart throughout the frame assembly **24**. However, it is to be appreciated that the distance DS between adjacent vertical members **30** may vary throughout the frame assembly **24**. For example, as shown in FIGS. **10** and **11**, the distance DS between the vertical members **30** may vary for defining an opening **41** in the frame assembly **24** to receive a window frame. It is to be appreciated that the distance DS between the vertical members **30** may vary for defining other openings in the frame assembly **24** to receive other desired structures, such as door frames. The distance DS between adjacent vertical members **30** is typically of from about 1 to about 30, more typically of from about 10 to about 30 even more typically of from about 12 to about 28 inches.

[0039] With reference to FIGS. **1-7**, the prefabricated wall assembly **20** comprises an insulating foam layer **42** coupled to the frame assembly **24**. With reference to FIG. **6**, the insulating foam layer **42** extends from the exterior side **36** of the frame assembly **24**. More specifically, a first portion of the insulating foam layer **42** extends from the exterior side **36** of the frame assembly **24**. The insulating foam layer **42** terminates in a plurality of integral ribs **44** opposite the frame assembly **24**. Said differently, the ribs **44** and the insulating foam layer **42** are a single unitary component. As such, the insulating spray foam layer **42** and the ribs **44** are formed simultaneously. Forming the ribs **44** simultaneously with the insulating spray foam layer **42** eliminated the additional step of coupling the ribs **44** to the insulting spray foam layer **42**. Additionally, the ribs **44** may identify the location of the vertical members **30** when the ribs **44** are aligned with the vertical members **30**.

[0040] As best illustrated in FIG. **1**, an exterior surface **46** of the insulating foam layer **42** is presented between the ribs **44**. The insulating foam layer **42** is generally planar. Said differently, the exterior surface **46** of the insulating foam layer **42** is generally parallel to the exterior side **36** of the frame assembly **24**. Each of the plurality of ribs **44** has an end **48**, which has a contact surface **50** for receiving the exterior covering **22** of the building. As such, the ribs **44** space the exterior covering **22** from the exterior surface **46** of the insulating foam layer **42**. Spacing the exterior covering **22** from the exterior surface **46** of the insulating foam layer **42** allow airflow and drainage between the prefabricated wall assembly **20** and the exterior covering **22**. More specifically, the ribs **44**, the exterior surface **46** of the insulating foam layer and the exterior covering **22** define a channel **52**. Generally, the channel **52** spans the height H of the prefabricated wall assembly **20**. Weather elements, such as water, that enter the prefabricated wall assembly **20** will follow the channel **52** down the prefabricated wall assembly **20** where the weather elements can exit the prefabricated wall assembly **20**. Providing weather elements with an exit from the prefabricated wall assembly **20** prevents the weather elements from entering the building. Additionally, the channel **52** allows positive airflow through the prefabricated wall assembly **20**, which maintains a thermal resistance, or R-value of the prefabricated wall assembly **20**. Additionally, the positive airflow through the prefabricated wall assembly **20** limits water adsorption and accelerates drying capacity of the prefabricated wall assembly **20**. Furthermore, the positive airflow provides convection cooling to cool the exterior surface **46** of the insulating foam layer **42**.

[0041] Typically, each of the plurality of ribs **44** extends from the exterior surface **46** of the insulating foam layer **42** a distance DR of from about 0.125 to about 2.00, more typically of from about 0.25 to about 1.00, and even more typically of from about 0.25 to about 0.50 inches. The end **48** of each of the ribs **44** may have a radius. Said differently, the end **48** of each of the ribs **44** is rounded. Typically, the radius of each of the ribs **44** is of from about 0.125 to about 2.00, more typically of from about 0.25 to about 1.00, and even more typically of from about 0.25 to about 0.50 inches. However, it is to be appreciated that the end **48** of the ribs **44** may not have the radius. Additionally, the ribs **44** may have a trapezoidal cross-sectional configuration. Alternatively, the ribs **44** may have other configurations, such as a rectangular cross-sectional configuration or a V-shaped cross-section configuration for receiving the exterior covering **22**.

[0042] The centerline of the ribs **44** is aligned with a centerline of one of the plurality of vertical members **30**. Said

differently, the ribs **44** are aligned with the vertical members **30**. Aligning the ribs **44** with the vertical members **30** allows the exterior fastener **23** to be installed through the exterior covering **22** and through the insulating foam layer and into the vertical members **30** to secure the exterior covering **22** to the prefabricated wall assembly **20** without entering the channel **52**.

[0043] The first portion of the insulating foam layer **42** defines a first thickness T1 of the insulating foam layer **42**. The first thickness T1 is measured from the exterior side **36** of the frame assembly **24** to the exterior surface **46** of the insulating foam layer **42**. Said differently, the first thickness T1 of the insulating foam layer **42** is defined by the insulating foam layer **42** that extends from the exterior side **36** of the frame assembly **24**. Typically, the first thickness T1 of the insulating foam layer **42** is of from about 0.25 to about 3.00, more typically of from about 0.25 to about 2.00, and even more typically of from about 0.50 to about 1.50 inches.

[0044] A second portion of the insulating foam layer **42** is disposed between the plurality of vertical members **30** of the frame assembly **24**. Said differently, the second portion of the insulating foam layer **42** extends into the frame assembly **24** and terminates at an interior surface **60**. It is to be appreciated that the second portion of the insulting foam layer **42** may be in contact with the vertical members **30** or, alternatively, the second portion of the insulating foam layer **42** may be spaced from the vertical members **30** while still being disposed between the vertical members **30**. The second portion of the insulating foam layer **42** defines a second thickness T2 of the insulating foam layer **42**, which is measured from the exterior side **36** of the frame assembly **24** to the interior surface **60** of the insulating foam layer **42**. Said differently, the second thickness T2 is defined by the second portion of the insulating foam layer **42** that is within the plurality of voids that are defined by the plurality of vertical members **30**. It is to be appreciated that the insulating foam layer **42** may extend into the frame assembly **24** the entire nominal width W of the frame member such that the insulating foam layer **42** fills the plurality of voids that are defined by the plurality of vertical members **30**. Said differently, the second thickness T2 may be equal to the nominal width W of the frame assembly **24**. Alternatively, the insulating foam layer **42** may only extend into a portion of the nominal width W of the frame assembly **42** such that the plurality of voids defined by the plurality of vertical members **30** is not completely filled. The second thickness T2 of the insulating foam layer **42** is typically of from about 0.5 to about the nominal width W of the frame assembly **24**, more typically of from about 1.0 to about 3.0, and even more typically of from about 1.5 to about 2.5 inches.

[0045] The first and second portions of the insulating foam layer **42** are typically integral with one another. However, it is to be appreciated that the first and second portions may be discrete components of one another. Said differently, the first and second portions may be separate components relative to one another. The first and second portions of the insulating foam layer **42** provide the prefabricated wall assembly **20** with a thermal resistance value, often referred to as an R-value. Generally, the first thickness T1 and the second thickness T2 affect the thermal resistance. The thermal resistance desired varies depending on the climate of the location where the building is to be constructed, the R-vale desired will change, and therefore the first thickness T1 and the second thickness T2 of the insulating foam layer **42** are changed. Typically, the thermal resistance of the insulating foam layer **42** is from about 3.00 to about 9.00 per inch.

[0046] Generally, the insulating foam layer **42** limits moisture and air from passing through the prefabricated wall assembly **20** and into the building. For example, the insulating foam layer **42** is a vapor retarder and an air barrier. Generally, the insulating foam layer **42** meets ASTM E2357, which related to the determination of air leakage. A density of the insulating foam layer **42** impedes the infiltration of water vapor through the insulating foam layer **42**. Additionally, the density of the insulating foam layer **42** prevents air from passing through the insulating foam layer **42** thereby providing the prefabricated wall with the thermal resistance. Typically, the density of the insulating foam layer **42** is of from about 0.50 to about 5.00, more typically of from about 0.50 to about 4.00, and even more typically of from about 0.50 to about 3.50 pounds per cubic foot. Generally, the thermal resistance value of the insulating foam layer **42** depends on the density and the first thickness T1 of the insulating foam layer **42**. Generally, the thicker and denser the insulating foam layer **42**, the higher the thermal resistance value.

[0047] Typically, the insulating foam layer **42** comprises a foam selected from the group of polyurethane foams, polyurea foams, blown polyvinylchloride foams, polyethylene foams, polypropylene foams, and combinations thereof. More typically, the insulating foam layer **42** comprises a sprayable foam selected from the group of polyurethane sprayable foams, polyurea sprayable foams, and combinations thereof. However, the sprayable foam may be selected from the group of acrylic foams, latex foams, melamine foams, isocyanurate foams, and silicone foams. When the sprayable foam is the polyurethane sprayable foam, the sprayable foam may be the reaction product of a polyether polyol and an isocyanate. Alternatively, when the sprayable foam is the polyurethane sprayable foam, the sprayable foam may be the reaction product of a polyester polyol and the isocyanate. The use of the polyester polyol imparts the insulating foam layer **42** with a fire retardant. When the sprayable foam is the polyurea sprayable foam, the sprayable foam is the reaction product of a polyamine and an isocyanate. An example of an isocyanate suitable for the sprayable foam is lubrinate. The insulating foam layer **42** meets ASTM C578 for the Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation. The insulating foam layer **42** may include additives, such as fire retardants, and impact modifiers.

[0048] As introduced above, the insulating foam layer **42** is typically applied to the frame assembly **24** off-site from the location where the building is to be constructed. For example, the prefabricated wall assembly **20** may be manufactured at a location that is different from the location that the building is to be constructed, such as the factory or warehouse. Manufacturing the prefabricated wall assembly **20** off-site decreases labor cost for constructing the building and decreases construction time required to construct the building once the prefabricated wall assembly **20** is on-site. Generally, the insulating foam layer **42** is spray applied to the frame assembly **24**. The use of the sprayable foam allows the insulating foam layer **42** to conform to the frame assembly **24** as opposed to pre-manufactured panels, such as polystyrene. For example, the sprayable foam can fill any gaps that result from variations in the top, bottom, and vertical members **26**, **28**, **30** when assembled into the frame assembly **24**. However,

it is to be appreciated that, although not required, the insulating foam layer **42** may be supplied in a sheet and coupled to the frame assembly **24**.

[0049] Generally, the insulating foam layer **42** provides structural support to the frame assembly **24**. Said differently, the insulating foam layer **42** may couple the top, bottom, and vertical members **26**, **28**, **30** together thereby reducing the number of fasteners **32** needed to structurally secure the top, bottom, and vertical members **26**, **28**, **30** together. Furthermore, as shown in FIG. **12**, the insulating foam layer **42** may completely eliminate the need for fasteners **32** to couple together the top, bottom, and vertical members **26**, **28**, **30** such that the frame assembly **24** is free of fasteners **32** while still meeting structural requirements, as illustrated in FIG. **12**.

[0050] The prefabricated wall assembly **20** may comprise a barrier layer coupled to the exterior surface **46** of the insulating foam layer **42**. The barrier layer may be an additional vapor retarder, and/or a radiant barrier. The barrier layer may be any suitable vapor retarder, including spray applied vapor retarders. Typically, the sprayable vapor retarder is applied to the exterior surface **46** of the insulating foam layer **42** and the plurality of ribs **44**.

[0051] With reference to FIG. **10**, a chase portion **61** may be formed in the insulating foam layer **42** for receiving utilities, such as electrical wires and/or plumbing. It is to be appreciated that the chase portion **61** may run vertically within the insulating foam layer **42** such that the chase portion **61** are parallel to the vertical members **30** or the chase portion **61** may run horizontally within the insulating foam layer **42** such that the chase portion **61** are perpendicular to the vertical members **30**.

[0052] A method manufactures the prefabricated wall assembly **20**. The method comprises the step of assembling the frame assembly **24** with the plurality of vertical members **30** coupled between the top member **26** and the bottom member **26**. It is to be appreciated that the assembly process can be competed manually or the process can be automated. With reference to FIG. **13**, the method used a mold **62** that has a configuration suitable for forming the insulating foam layer **42**. The frame assembly **24** is positioned adjacent the mold **62**. The mold **62** defines a plurality of cavities. The sprayable foam is applied within the cavities defined by the mold **62** between the vertical members **30** and the mold **62** itself. The sprayable foam cures to form the insulating foam layer, which results in the formation of the prefabricated wall assembly **20**, as shown in FIG. **14**. The prefabricated wall assembly **20** is then removed from the mold **62**. It is to be appreciated that the mold **62** may be treated to prevent the insulating foam layer **42** from sticking to the mold **62**. For example, a layer of plastic may be inserted into the mold **62** to prevent direct contact between the insulating foam layer **42** and the mold **62**.

[0053] The plurality of cavities defined by the mold **62** may include a plurality of rib forming cavities **66** and a main cavity **68**. The rib forming cavities **66** have a configuration suitable for forming the ribs **44** of the prefabricated wall assembly **20**. When the rib forming cavities **66** are present, the plurality of vertical members **30** of the frame assembly **24** is aligned with the plurality of rib forming cavities **66** defined by the mold **62**. The main cavity **68** has a configuration for forming the first thickness T1 of the insulating foam layer.

[0054] While the invention has been described with reference to an exemplary embodiment, it will be understood by those skilled in the art that various changes may be made and equivalents may be substituted for elements thereof without departing from the scope of the invention. In addition, many modifications may be made to adapt a particular situation or material to the teachings of the invention without departing from the essential scope thereof. Therefore, it is intended that the invention not be limited to the particular embodiment disclosed as the best mode contemplated for carrying out this invention, but that the invention will include all embodiments falling within the scope of the appended claims.

1. A prefabricated wall assembly for receiving an exterior covering of a building, said prefabricated wall assembly comprising:

a frame assembly having a top member, a bottom member opposite said top member, and a plurality of vertical members coupled to and extending between said top and bottom members with said frame assembly having an interior side and an exterior side opposite said interior side; and

an insulating foam layer disposed between said plurality of vertical members of said frame assembly and extending from said exterior side of said frame assembly;

wherein said insulating foam layer terminates in a plurality of integral ribs opposite said frame assembly with an exterior surface of said insulating foam layer presented between said plurality of ribs and with said plurality of ribs spacing the exterior covering from said exterior surface of said insulating foam layer to allow airflow and drainage between said prefabricated wall assembly and the exterior covering.

2. A prefabricated wall assembly as set forth in claim **1** wherein said frame assembly has a first end and a second end spaced from said first end defining a length of the prefabricated wall assembly and said insulating foam layer is seamless across said length of said frame assembly.

3. A prefabricated wall assembly as set forth in claim **1** wherein said insulating foam layer comprises a foam selected from the group of polyurethane foams, polyurea foams, and combinations thereof.

4. A prefabricated wall assembly as set forth in claim **1** wherein said insulating foam layer comprises a sprayable foam selected from the group of polyurethane foams, polyurea foams, and combinations thereof.

5. A prefabricated wall assembly as set forth in claim **1** wherein each of said plurality of ribs has a centerline that is aligned with a centerline of one of said plurality of vertical members.

6. A prefabricated wall assembly as set forth in claim **1** wherein said insulating foam layer between said frame assembly and said exterior surface of said insulating foam layer has a first thickness of from about 0.75 to about 1.5 inches.

7. A prefabricated wall assembly as set forth in claim **1** wherein each of said plurality of ribs extends from said exterior surface of said insulating foam layer a distance of from about 0.5 to about 1.0 inches.

8. A prefabricated wall assembly as set forth in claim **1** wherein said insulating foam layer terminates at an interior surface spaced from said exterior surface with said insulating foam layer having a second thickness measured from said exterior side of the frame assembly to said interior surface of said insulating foam layer of from about 0.5 inches to about a nominal width of said frame assembly.

9. A prefabricated wall assembly as set forth in claim **1** wherein a distance between said plurality of vertical members is of from about 1 to about 30 inches.

10. A prefabricated wall assembly as set forth in claim in claim **1** further comprising a vapor retarder coupled to said exterior surface of said insulating material.

11. A prefabricated wall assembly as set forth in claim **10** wherein said vapor retarder is a sprayable vapor retarder.

12. A prefabricated wall assembly as set forth in claim **1** wherein said frame assembly is coupled together by said insulating layer such that said frame assembly is free of fasteners.

13. A prefabricated wall assembly as set forth in claim **1** wherein each of said plurality of ribs has a radius of from about 0.125 to about 2.00 inches.

14. A method of manufacturing a prefabricated wall assembly comprising a frame assembly and an insulating layer extending from the frame assembly with a plurality of ribs integral with the insulating layer and extending from the insulating layer for spacing an exterior covering from the insulating material to allow airflow and drainage between the prefabricated wall assembly and the exterior covering

providing the frame assembly with a plurality of vertical members coupled between a top member and a bottom member;

positioning the frame assembly adjacent a mold such that a cavity is defined between a surface of the mold and an exterior surface of the vertical members;

applying a foam into the cavities defined by the mold and between the vertical members;

curing the foam to form the insulating layer, which results in the formation of the prefabricated wall assembly; and

demolding the prefabricated wall assembly from the mold.

15. A method as set forth in claim **14** wherein the cavity defined between the mold and the vertical members includes a plurality of rib forming cavities having a depth of from about 0.5 to about 1.0 inches and said step of positioning the frame assembly is further defined as aligning the plurality of vertical members with the plurality of rib forming cavities defined by the mold.

16. A method as set forth in claim **14** wherein the cavity defined between the mold and the vertical members further includes a main cavity having a depth of from about 0.75 to about 1.5 inches and said step of applying a sprayable foam is further defined as filling the main cavity and the plurality of rib forming cavities with a sprayable foam.

17. A method as set forth in claim **14** wherein the step of assembling the frame assembly is further defined as spacing the plurality of vertical members apart from one another a distance of from about 1 to about 30 inches.

18. A method as set forth in claim **14** further comprising the step of applying a sprayable vapor retarder to the exterior surface of the insulating layer and the plurality of ribs.

19. A method as set forth in claim **14** wherein the step of applying the foam is further defined as spraying the foam into the cavities defined by the mold and between the vertical members.

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