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(54) **VENTED WALL GIRTS**

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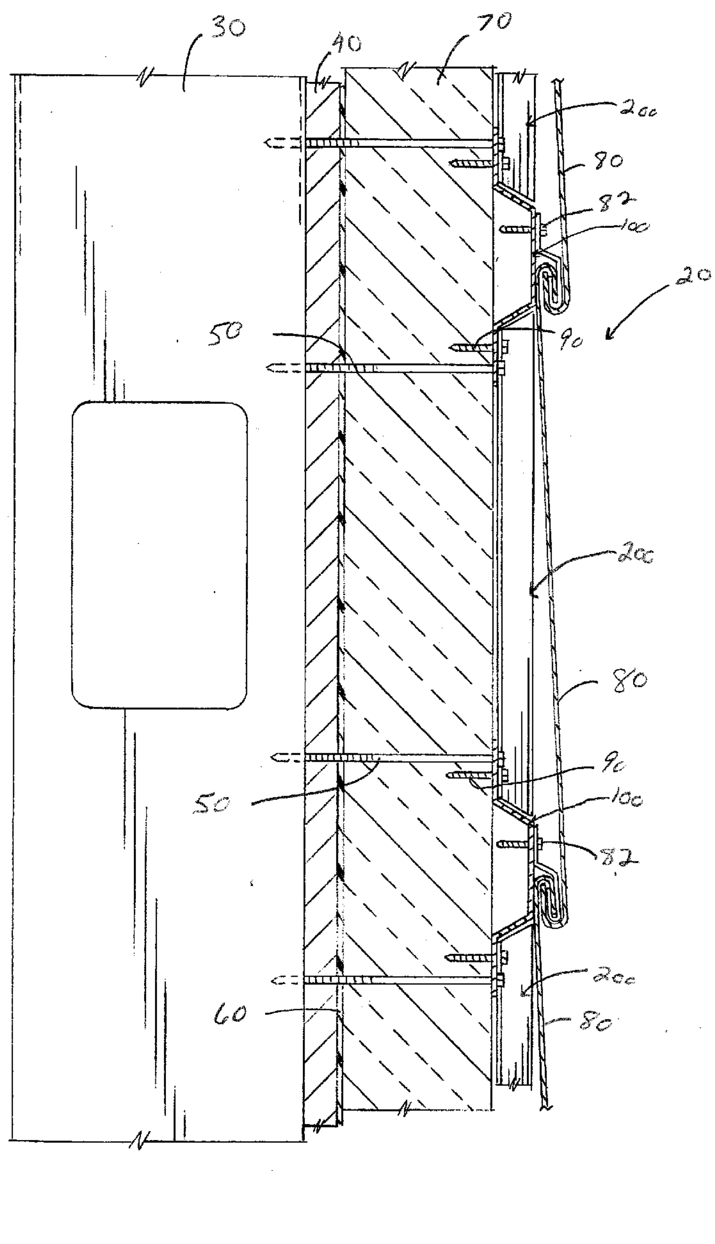
USPC **52/302.1**; 52/745.1

(57) **ABSTRACT**

The invention is directed to an improved sub-structural wall construction component which provides support for exterior building cladding materials, allows for air ventilation to aid in drying the exterior wall cavity, and allows for drainage of incidental moisture that may infiltrate into the exterior wall cavity.



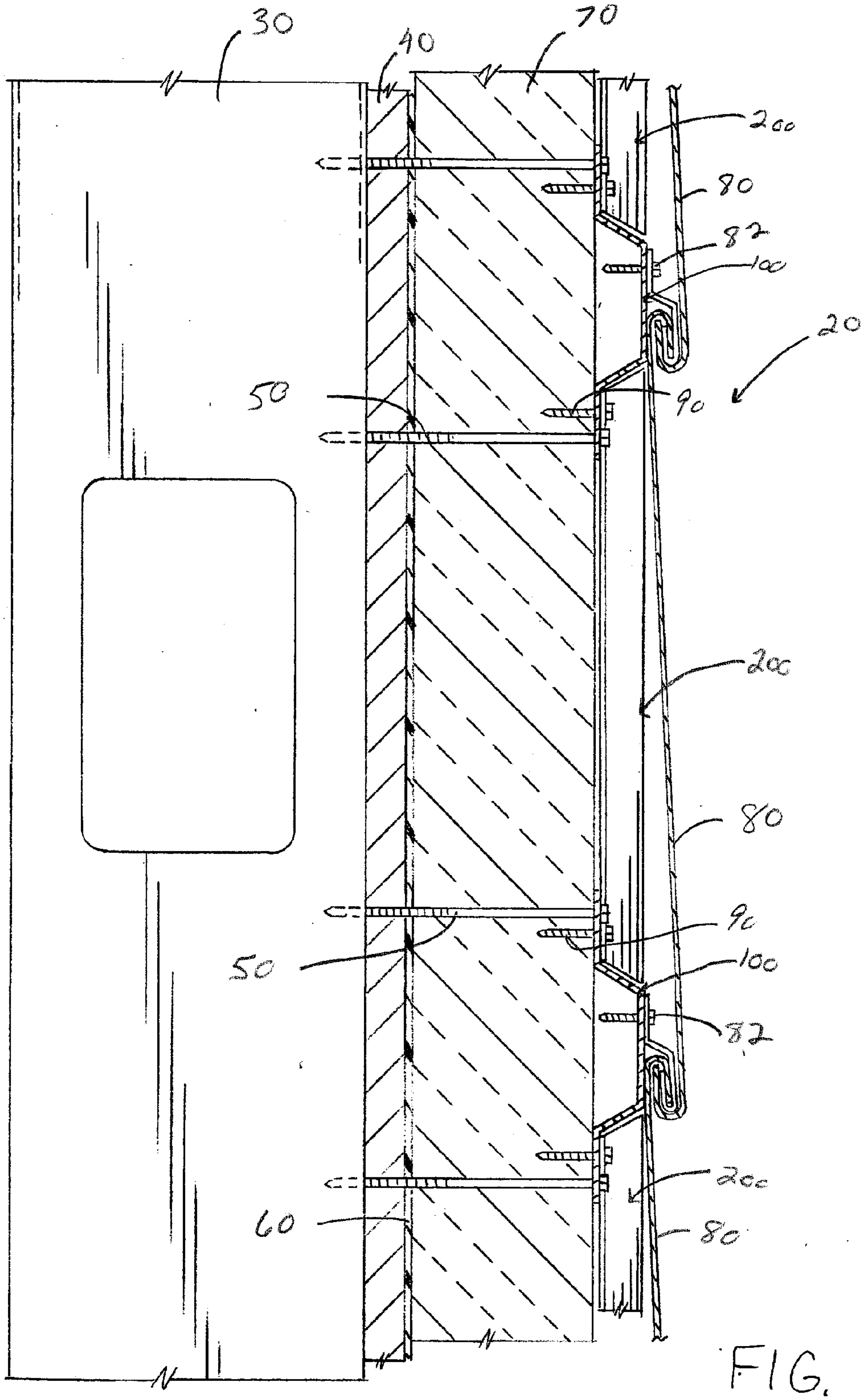


FIG. 1

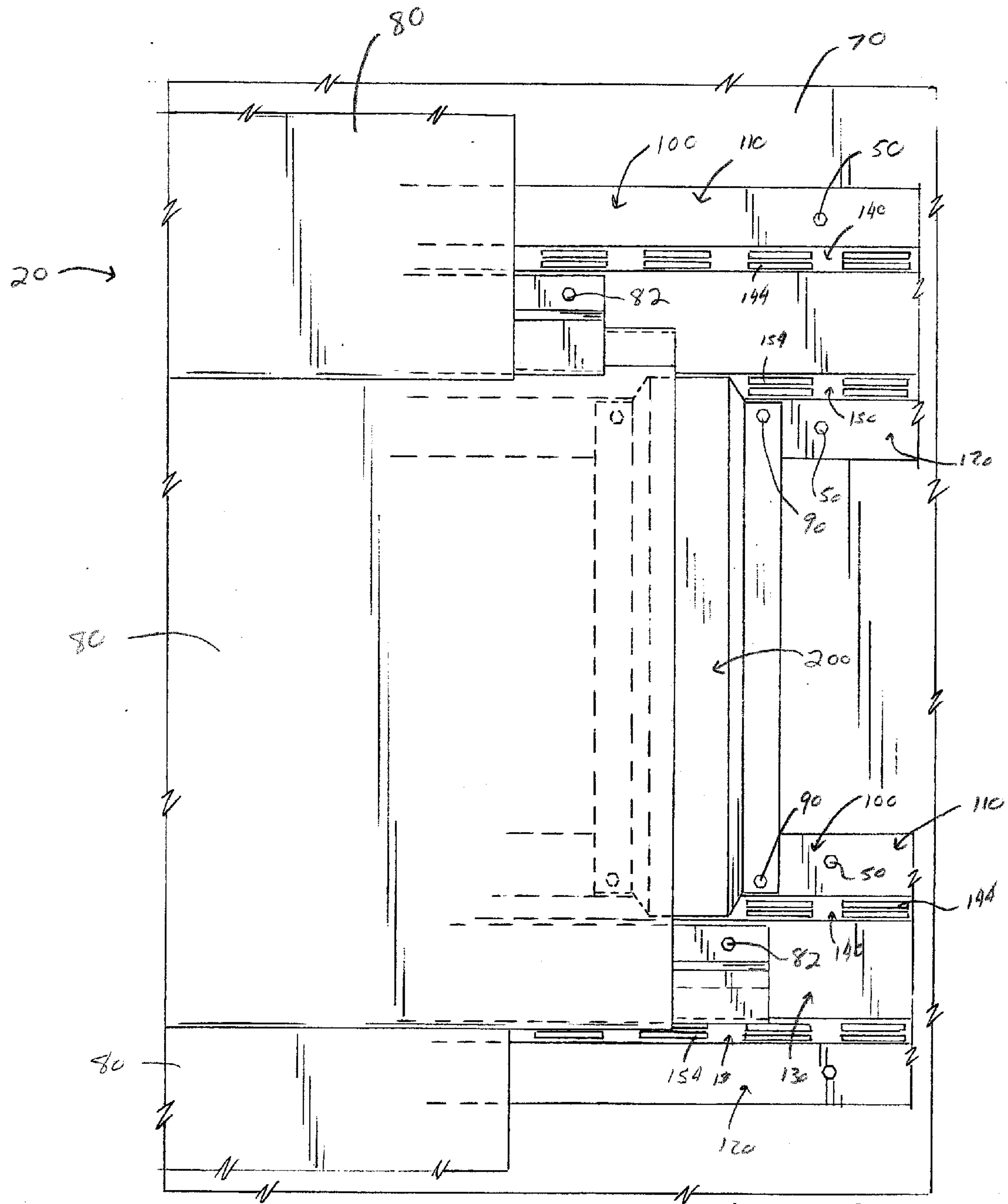

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FIG. 2

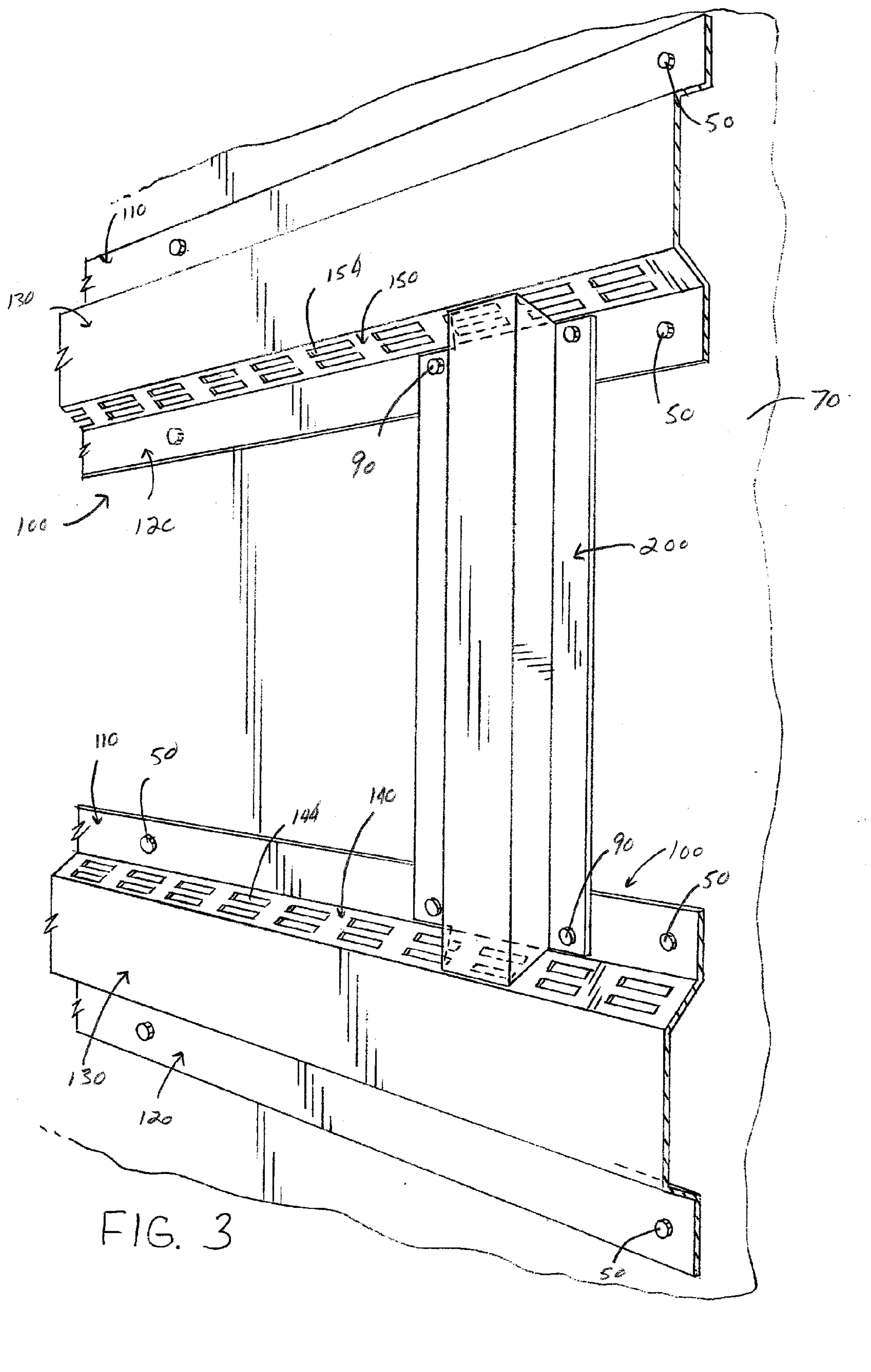
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FIG. 3

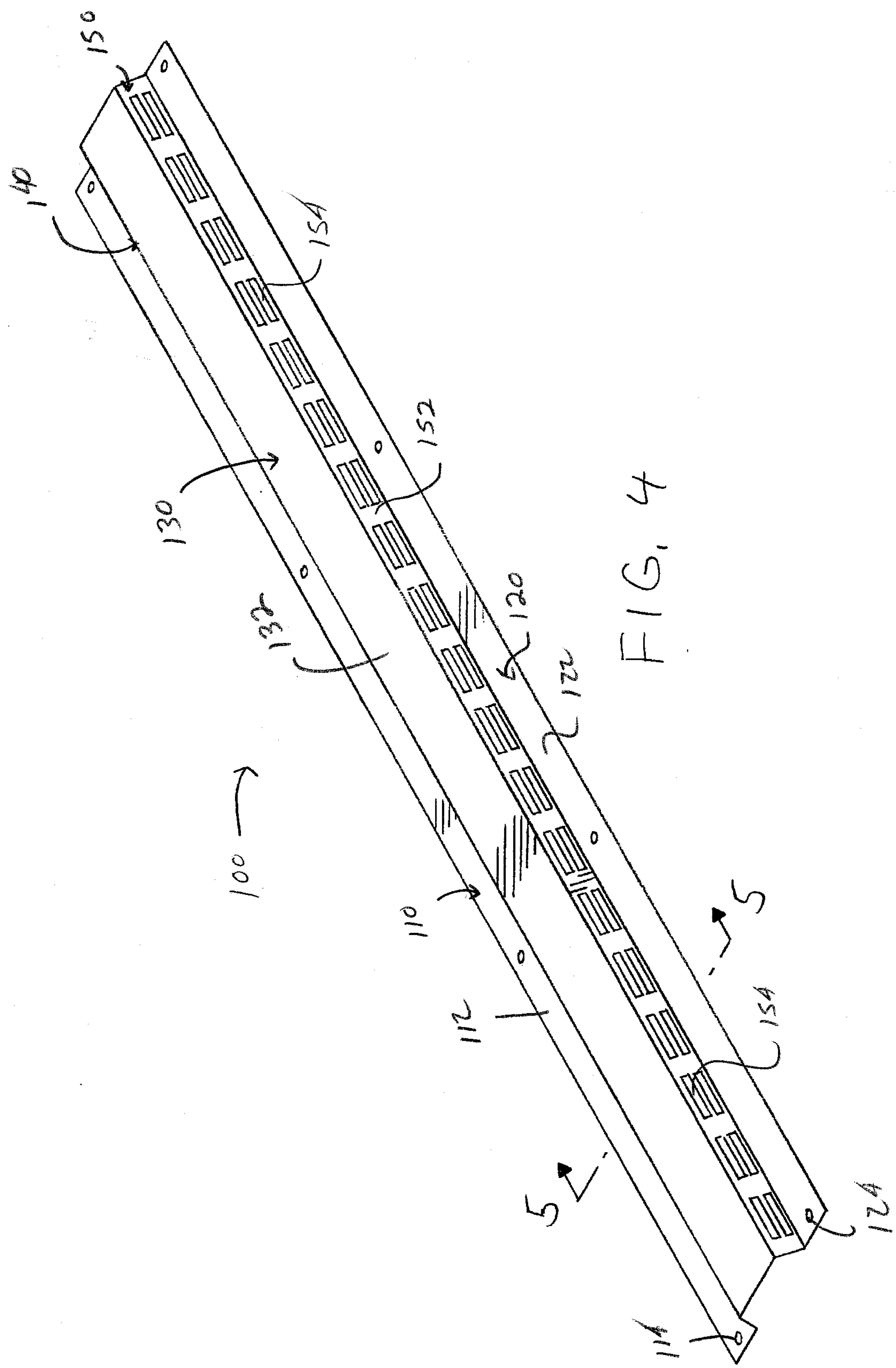

FIG. 4

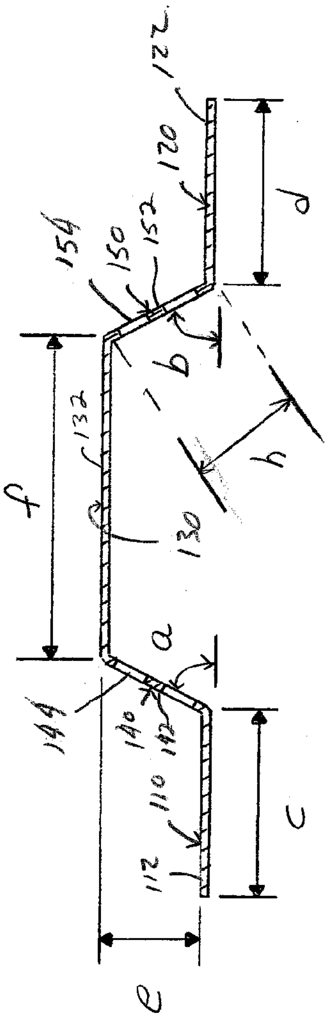
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FIG. 5

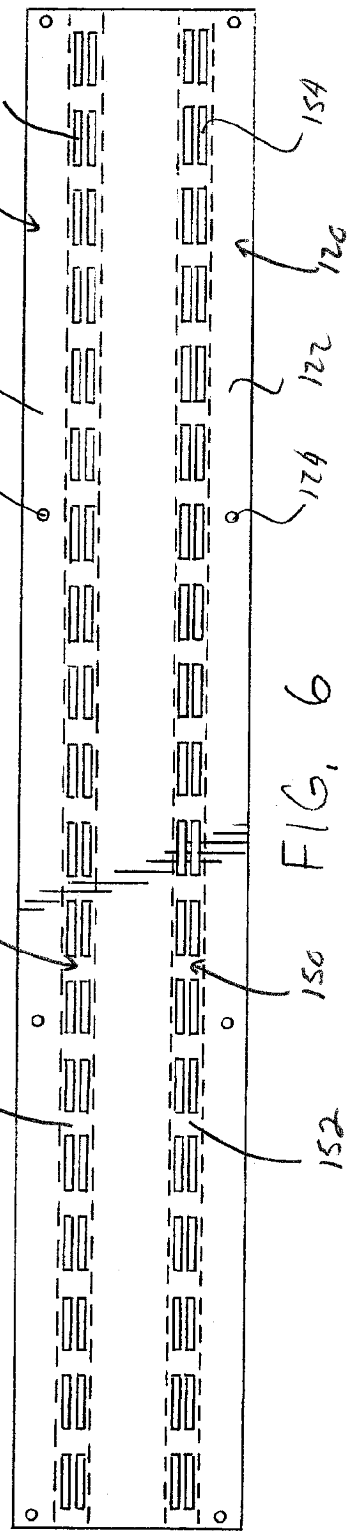
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FIG. 6

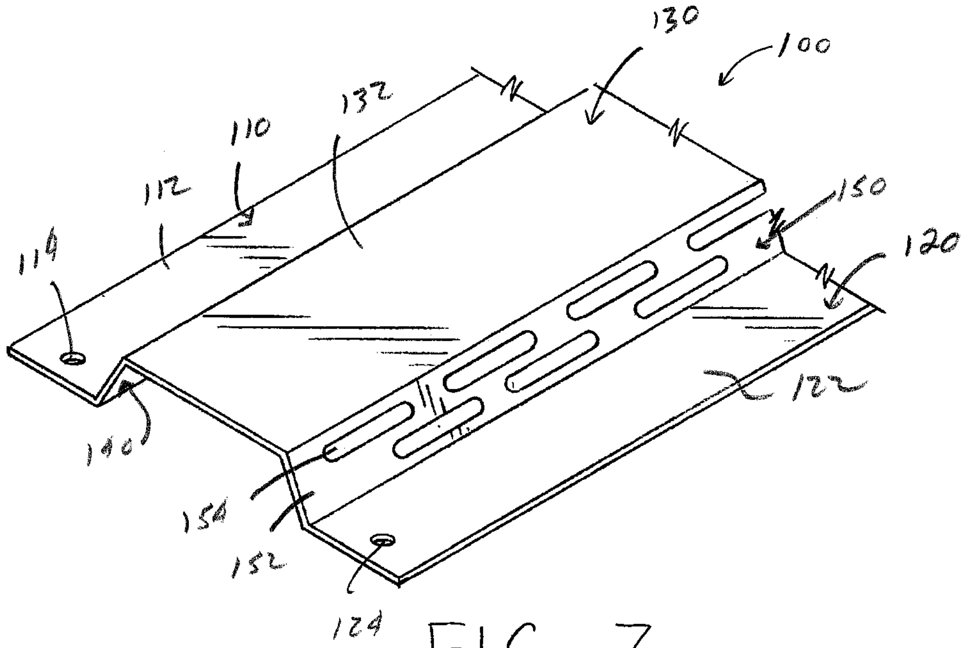
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FIG. 7

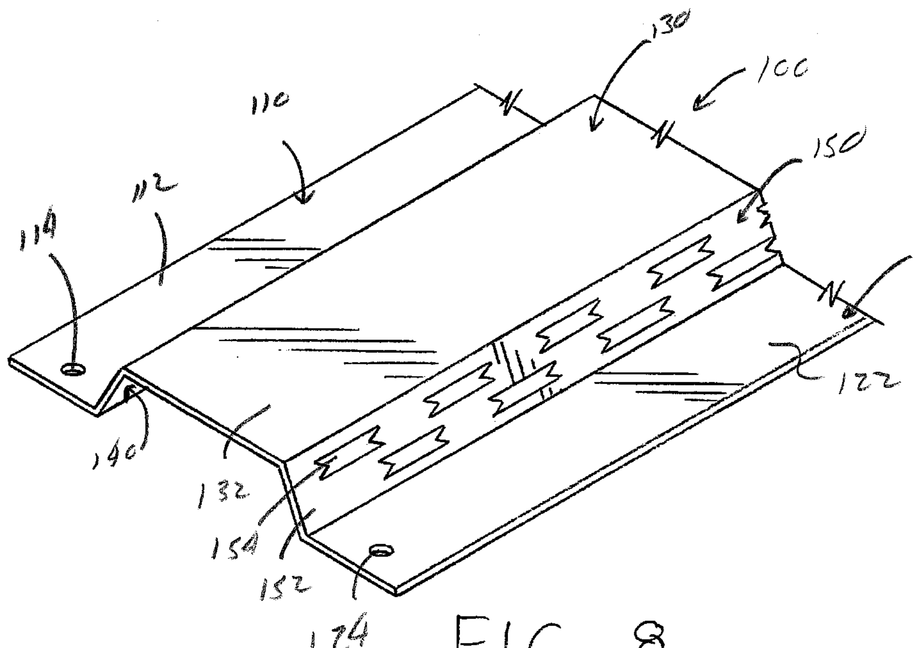
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FIG. 8

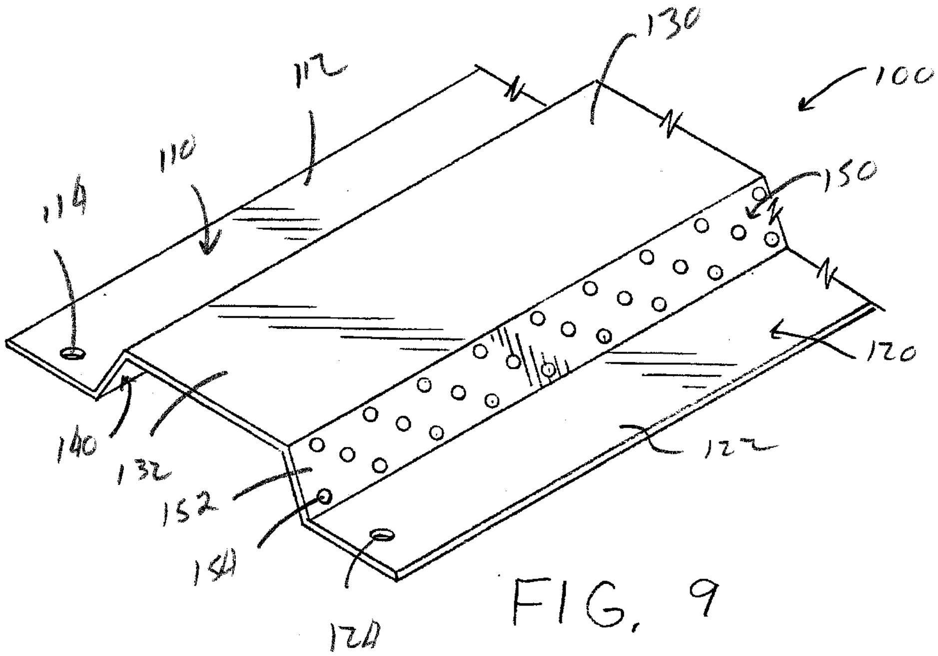
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FIG. 9

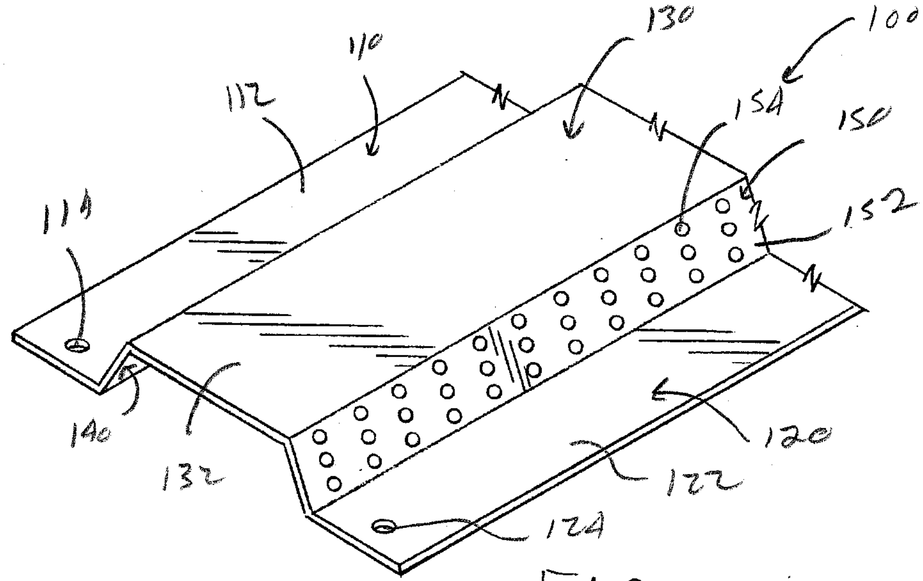
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FIG. 10

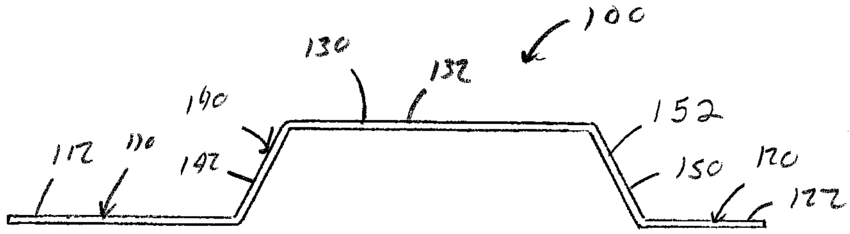

FIG. 11

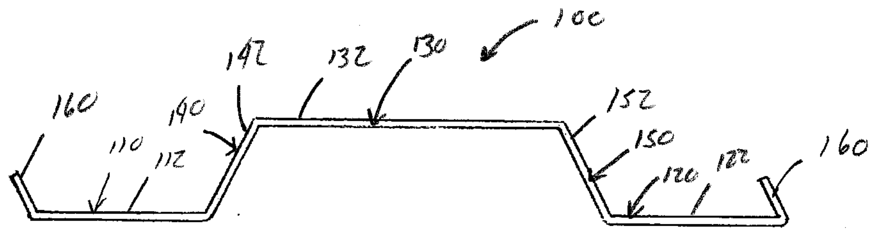

FIG. 12

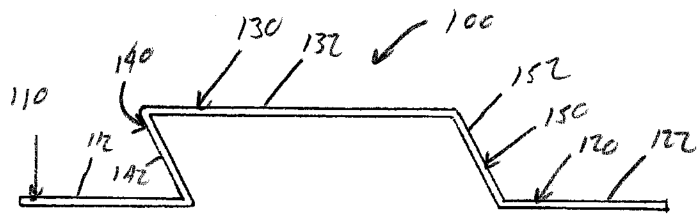

FIG. 13

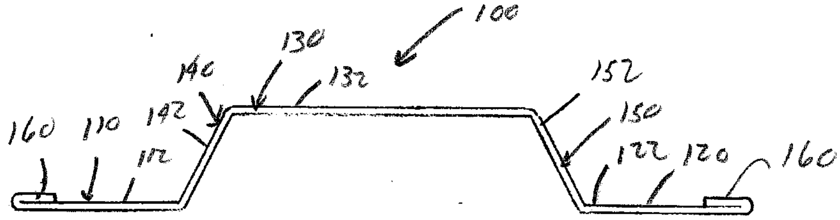

FIG. 14

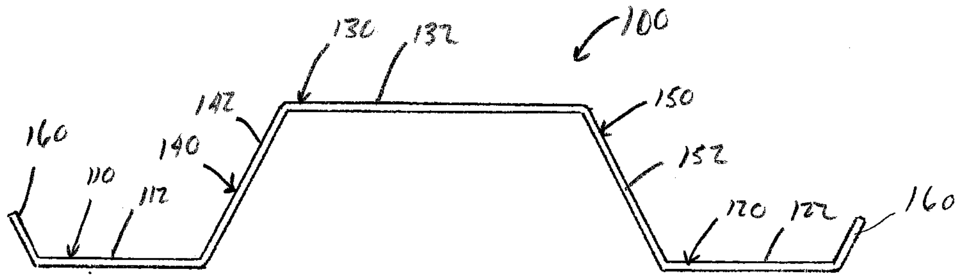
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FIG. 15

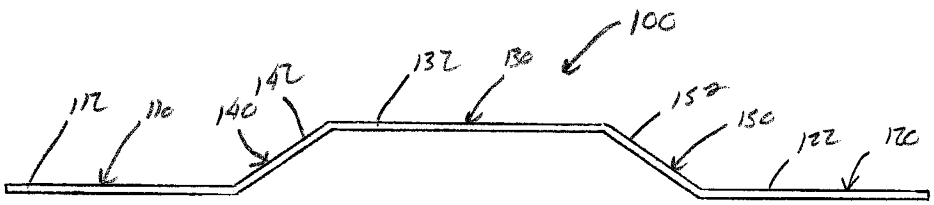
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FIG. 16

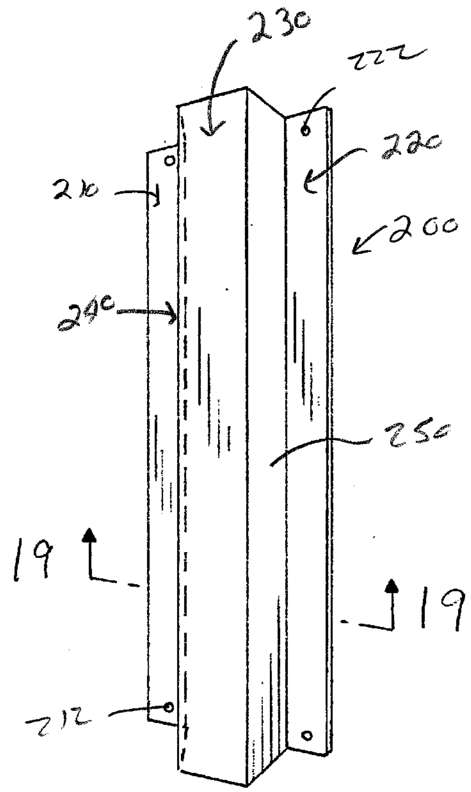

FIG. 17

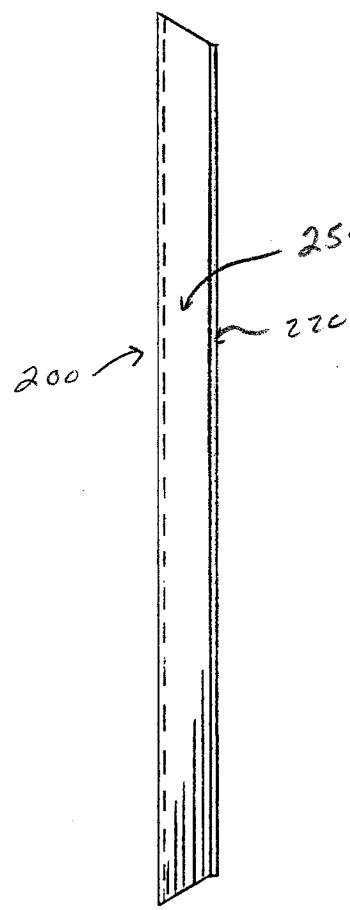

FIG. 18

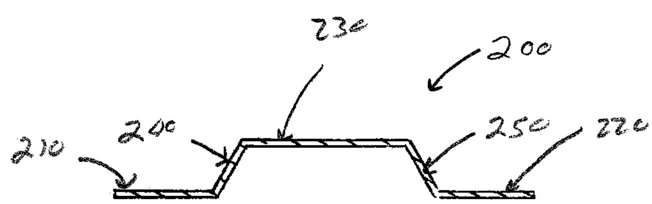

FIG. 19

VENTED WALL GIRTS

[0001] The present invention claims priority on U.S. Provisional Patent Application Ser. No. 61/642,655, filed May 4, 2012, which is incorporated herein.

[0002] The present invention is directed to the building industry, particularly to siding systems for buildings, and more particularly to a ventilation and/or drainage system that provides support for metal and/or wood panel exterior cladding materials.

BACKGROUND OF INVENTION

[0003] For a number of decades, recent building construction techniques have sought to create a perfect seal between the exterior and interior environments at the exposed exterior cladding material of a building's wall assembly. Examples of such arrangement are metal panels with sealed and caulked joints, brick and masonry treated with sealing compounds, and other materials that are expected to completely and perfectly seal the exterior of a building's wall surfaces.

[0004] Recently, especially over the last decade, an older wall construction technique has been reintroduced as an alternate, and in many cases, results in superior method of design and construction of building exterior wall assemblies. Possibly tracing its inception to 19th century "two-stage weather tightening" techniques of the Scandinavian region, this competing method of exterior wall construction is currently commonly known as a "Rainscreen Wall" design. In many instances, the same general design and construction technique is also referred to as "cavity wall" or "open joint" wall construction.

[0005] In the modern era, the Alcoa Building of Pittsburgh, Pa. (now the Regional Enterprise Tower), built in 1953, may be the first modern commercial example of a structure purposely designed in accordance with the "Rainscreen Wall" principle. In 1971, the American Architectural Manufacturers' Association published its first document regarding guidelines for Rainscreen Wall systems. Finally, in 2008, the U.S. Department for Communities and Local Governments had included "Rainscreen Wall" principles as an "innovative" design method.

[0006] The Rainscreen Design Principle

[0007] There are a number of ways in which the Rainscreen Wall design principle differs from traditional face-sealed building facade design. In its most basic definition, a Rainscreen Wall assembly consists of the following elements:

[0008] a. An exterior cladding material, such as metal panels, glazing, masonry, wood panels, clay panels, ceramic panels, cementitious panels, stone panels, polymeric exterior cladding system or other material to provide resistance to wind, impact, and radiation. The exterior cladding is intended to have some small amount of porosity, allowing only a minimal amount of moisture to infiltrate the wall cavity.

[0009] b. A drainage plane behind the exterior cladding system, most often acting as both an air and water barrier between the exterior wall cavity and the interior controlled space. The drainage plane may be impermeable to water vapor diffusion or may have properties making it slightly to extremely permeable with respect to water vapor diffusion.

[0010] c. An airspace between the exterior cladding material and the drainage plane. This airspace, in conjunction with requisite openings in the exterior cladding (unsealed joints and/or designed air intake-exhaust vents) serves to allow for air convection to promote drying of the exterior wall cavity. The airspace also acts as a barrier to capillary, kinetic, and gravity forces that might otherwise drive exterior infiltrating moisture into contact with the concealed drainage plane. It is a widely held assumption that a 1-inch (25 mm) airspace is sufficient to prevent most wind driven rain from contacting the drainage plane.

[0011] d. Various flashings and weep holes are generally necessary to direct moisture from the drainage plane across the airspace and to the exterior of the wall system. Flashings are also generally necessary at fenestration openings such as doors and windows.

[0012] e. Continuous insulation, while optional, is frequently included in the exterior wall cavity, directly in contact with the exterior face of the drainage plane.

[0013] f. A structural back-up wall is the element on the inbound face of the air barrier that provides load-bearing support for the walls, the floor, ceiling, and roof structure above, and provides a finished interior surface for the interior spaces. Commonly, the structural back-up wall can be comprised of either a) load-bearing steel studs with gypsum wallboard applied to both faces; b) a structural steel or concrete frame in-filled with non-load bearing studs with gypsum wallboard applied to both faces of the steel studs; or, c) a masonry wall (most commonly concrete block) with interior wood or metal furring with gypsum wallboard applied to the interior face of the furring. The structural back-up wall may or may not contain insulation materials.

[0014] Problems Associated with Constructing an Airspace in a Rainscreen Wall Assembly

[0015] Walls designed according to Rainscreen Wall design principles perform well, as compared to traditional face sealed wall systems, due to the redundant methods of actively managing moisture infiltration in the wall system. While the airspace in the exterior cavity wall is a key element structure in a functioning Rainscreen Wall design wall system, it is a difficult structure to construct in a practical and/or effective manner. For instance, when the exterior cladding material is a brick veneer, the veneer must be secured to the structural back-up wall which is usually several inches from the interior face of the brick veneer. Such securing arrangement used to be accomplished by continuous horizontal steel ledger angles placed every few courses of brick veneer. However, the ledger angles didn't allow for vertical air flow in the airspace.

[0016] Recently, the current "best practice" replaces the ledger angles with discontinuous steel "brick ties." The general design of the brick ties consists of one leg of a steel angle attached to the structural back-up wall, and the other leg of the steel angle extending across the airspace and embedded into the mortar joint of the exterior brick veneer. In theory, this brick tie does create an airspace in the exterior cavity wall. However, in practice, the brick tie arrangement i) makes the installation of the drainage plane and continuous insulation difficult, ii) creates significant energy loss due to thermal bridging across the continuous insulation, and iii) exacerbates the blockage of air circulation due to mortar drippings catching and accumulating on the brick ties.

[0017] There are, likewise, difficulties in constructing a practical and effective airspace in wall systems which include metal or wood panels as the exterior cladding material. Whereas some brick, stone, and masonry veneer exterior cladding materials can support their own weight (brick ties are utilized in these systems to allow the veneer to resist lateral loads such as those imposed by wind or seismic activity), most metal or wood panel exterior cladding systems rely on some system of framing, furring, or structural sheathing to support the weight of the metal or wood panels, as well as to transfer lateral loads to the structural back-up wall. Similar to the ledger angle used with brick veneer, these panel support systems most often prevent air circulation in the exterior wall cavity and act as thermal bridges, causing significant losses in the effectiveness of thermal insulation.

[0018] Some arrangements exist which consist of a discontinuous angle (similar to a brick tie) attached to the structural back-up wall and extending through the continuous insulation, and a continuous furring angle, channel, or zee shape attached to the discontinuous angle. This arrangement, while better than continuous metal shapes, generally still results in more than a 10% loss in effective thermal insulation value due to thermal bridging of the discontinuous angles and, many times, restricts air circulation in the exterior cavity due to partial blockage by the continuous furring member. Furthermore, these arrangements generally result in the webs and/or flanges of the furring members and/or discontinuous angles being oriented along the true horizontal plane, which can then accumulate water. Water accumulation on these members can slow or prevent drainage via the flashings and weep holes, and can lead to the deterioration of the furring members and discontinuous angles.

[0019] There exists in the prior art certain innovative methods of improving the performance or practicality of supporting metal or wood panels while maintaining an open air ventilation and drainage space. One such system is offered by Knight Wall. The most notable disadvantage of this system, and others like it, is that it requires the installation of both vertical and horizontal furring components, and at least one metal furring surface is aligned on the horizontal plane which can accumulate water.

[0020] In view of the current state of the prior art, there remains a need for a ventilation and/or drainage system that provides support for exterior cladding materials.

SUMMARY OF THE INVENTION

[0021] The invention disclosed herein is an improved design that is superior to all prior art as a practical and effective means of creating a ventilation and drainage airspace while providing support for cladding materials. The present invention is directed to a sub-structural wall construction component (e.g., vented girt) that is designed to create a ventilation and drainage airspace while providing support for cladding materials, such as, but not limited to, wood, metal, clay, ceramic, cementitious, stone, or polymeric exterior cladding system materials. The sub-structural wall construction component can be partially or fully formed of a metal material (e.g., tin, stainless steel, copper, steel, coated steel [galvanized, painted, etc.], aluminum [painted or bare], bronze, zinc, or other metals or metal alloys etc.); however, it can be appreciated that the sub-structural wall construction component can be formed form other or additional materials (e.g., composite materials, plastic, fiber reinforced materials, etc.). The sub-structural wall construction component can be formed of one or more pieces of material. In one non-limiting configuration, the sub-structural wall construction component is formed of a single piece of material; however, this is not required. The sub-structural wall construction component can be formed by one or more process (e.g., cold forming, hot forming, extruded, molded, stamped, etc.). In one non-limiting arrangement, the sub-structural wall construction component is formed of a metal material that is cold formed from a sheet of metal material; however, this is not required. In such a process, the sub-structural wall construction component is formed into the desired profile folding, press brake, roll forming, or by other means. The sub-structural wall construction component can be punched and/or lanced by use of mechanical dies, drills, laser cutting, water jet, plasma cutting, or other means; however, this is not required. The sub-structural wall construction component can be linearly installed in either a vertical orientation, horizontal orientation, or some other orientation.

[0022] In one non-limiting aspect of the present invention, the sub-structural wall construction component includes a) one or more bottom flange elements, b) a top flange element, and c) one or more vented web elements. In one non-limiting design, the sub-structural wall construction component includes two bottom flange elements; however, this is not required.

[0023] In another and/or alternative aspect of the present invention, the one or more bottom flange elements are designed to mount the sub-structural wall construction component to a building structure (e.g., wall, ceiling, roof, etc.). When the sub-structural wall construction component includes two or more bottom flange elements, the size, shape, thickness, width and/or material can be the same or different for each of the bottom flange elements. In one non-limiting configuration, the sub-structural wall construction component includes two bottom flange elements that have the same size, shape, thickness, width and material; however, this is not required. One or more of the bottom flange elements are oriented such that a portion or the entire top surface of the one or more of the bottom flange elements are located in a plane that is generally parallel to the top surface of the top flange element; however, this is not required. In one non-limiting configuration, a majority or the entire top surface of the one or more of the bottom flange elements are located in a plane that is generally parallel to the top surface of the top flange element; however, this is not required. In another non-limiting configuration, a bottom flange element is connected along one edge to one vented web element; however, this is not required. The one or more bottom flange elements can optionally include one or more holes (e.g., punched or stamped holes, etc.) for alignment and/or ease of installing fasteners; however, this is not required.

[0024] In still another and/or alternative aspect of the present invention, the top flange element is generally a solid, un-punched surface; however, the top flange element can include one or more openings. The top flange element is generally formed of a single piece of material; however, this is not required. The top flange element is generally a flat structure wherein the top surface generally lies in a single plane; however, this is not required. For instance, the top surface of the top flange element can have an arcuate shape or some other shape; however, this is not required. The top flange element is generally connected to an edge of each of the vented web elements. The top surface of the top flange element is generally oriented in the vertical plane (plumb with respect to the ground); however, this is not required. One non-limiting purpose of the top flange element is to function as a mounting surface for the exterior cladding material/system. The top flange element may or may not have punched holes for alignment and/or ease of installing fasteners. The top flange element is generally formed of the same material and/or has the same material thickness as the material used to form the one or more bottom flange elements and/or one or more vented web elements; however, this is not required.

[0025] In yet another and/or alternative aspect of the present invention, the one or more vented web elements are secured to the top flange element and/or bottom flange element. In one non-limiting configuration, one edge of a vented web element is connected to an edge of the top flange element and another edge of the vented web element is connected to an edge of one of the bottom flange elements. Generally the sub-structural wall construction component includes two vented web elements; however, this is not required. In one non-limiting configuration of the sub-structural wall construction component, a first edge of a first vented web element is connected to a first edge of the top flange element and the second edge of the first vented web element is connected to a first edge of the first bottom flange element, and a first edge of a second vented web element is connected to a second edge of the top flange element and the second edge of the second vented web element is connected to a first edge of the second bottom flange element. At least a portion of the top surface of one or more of the vented web elements lies in a plane that is non-parallel to the plane of the top surface of the top flange element and/or the top surface of the one or more bottom flange elements. A majority or all of the vented web elements are generally created at a non-orthogonal angle with respect to the top flange element and the bottom flange element; however, this is not required. In one non-limiting arrangement, at least a portion of the top surface of one or more of the vented web elements angle upwardly from the top surface of the one or more bottom flange elements at an angle of about 5°-185°, typically 15°-165°, more typically about 30°-150° and, still more typically, about 60°-120°. When two or more vented web elements are used, the upward angle can be the same or different. In one non-limiting configuration, the sub-structural wall construction component includes two vented web elements and at least a portion of the top surface of each of the vented web elements angle toward one another. In another and/or alternative non-limiting configuration, the sub-structural wall construction component includes two vented web elements and at least a portion of the top surface of each of the vented web elements are parallel to one another. In still another and/or alternative non-limiting configuration, the sub-structural wall construction component includes two vented web elements and at least a portion of the top surface of each of the vented web elements angle away from one another. One non-limiting purpose of the upward angle of the one or more vented web elements is that when the sub-structural wall construction component is linearly placed in a horizontal orientation on a building structure, at least a portion or the entire vented web element will not be aligned with a plane parallel to the ground; thus, the sub-structural wall construction component will promote drainage of liquid moisture and be less prone to accumulation of moisture on any vented web element once the sub-structural wall construction component is mounted to a building structure. The one or more openings in the vented web elements can be formed by stamping or punching (a slug of metal material removed), lanced (the metal material is pierced and displaced, but not removed), and/or by some other or additional process so as to form one or more holes/vents in the vented web elements to allow both air and water to pass through the vented web elements. As can be appreciated, the one or more openings can be formed by other methods (casting, molding, etc.). The size, shape and/or number of openings in the vented web elements are non-limiting. The orientation of the one or more openings in the vented web elements is non-limiting. Generally, each of the vented web elements includes a plurality of openings. Generally, the surface area of the openings on the vented web elements is less than 70% of the total surface area of the top surface of the vented web element, typically the surface area of the openings on the vented web elements is less than 50% of the total surface area of the top surface of the vented web element and, more typically, the surface area of the openings on the vented web elements is less than 40% of the total surface area of the top surface of the vented web element.

[0026] In still yet another and/or alternative aspect of the present invention, the top surface of the top flange element has a width that is generally greater than a width of the top surface of at least one of the vented web elements; however, this is not required. In one non-limiting configuration, the top surface of the top flange element has a width that is at least about 150% greater than a width of the top surface of at least one of the vented web elements, typically the top surface of the top flange element has a width that is at least about 200% greater than a width of the top surface of at least one of the vented web elements and, more typically, the top surface of the top flange element has a width that is at least about 250% greater than a width of the top surface of at least one of the vented web elements; however, this is not required. In another and/or alternative non-limiting embodiment of the invention, the top surface of the top flange element has a width that is generally greater than a width of the top surface of at least one of the bottom flange elements; however, this is not required. In one non-limiting configuration, the top surface of the top flange element has a width that is at least about 110% greater than a width of the top surface of at least one of the bottom flange elements, typically the top surface of the top flange element has a width that is at least about 140% greater than a width of the top surface of at least one of the bottom flange elements and, more typically, the top surface of the top flange element has a width that is at least about 150% greater than a width of the top surface of at least one of the bottom flange elements; however, this is not required. In still another and/or alternative non-limiting embodiment of the invention, the top surface of the top flange element has a width that is generally greater than a combined width of the top surface of at least one of the bottom flange elements and top surface of at least one of the vented web elements; however, this is not required. In still yet another and/or alternative non-limiting embodiment of the invention, the top surface of at least one of the bottom flange elements has a width that is generally greater than a width of the top surface of at least one of the vented web elements; however, this is not required. In one non-limiting configuration, the top surface of at least one of the bottom flange elements has a width that is at least about 110% greater than a width of the top surface of at least one of the vented web elements, typically the top surface of at least one of the bottom flange elements has a width that is at least about 130% greater than a width of the top surface of at least one of the vented web elements and, more typically, the top surface of at least one of the bottom flange elements has a width that is at least about 150% greater than a width of the top surface of at least one of the vented web elements; however, this is not required. In another and/or alternative non-limiting embodiment of the invention, the top surface of the top flange element is elevated above the top surface of at least one of the bottom flange elements. Generally, the top surface of the top flange element is elevated above the top surface of at least one of the bottom flange elements at a distance of at least about 0.25 inches, typically at least about 0.4 inches, more typically at least about 0.5 inches and, still more typically, at least about 0.75 inches.

[0027] In another and/or alternative aspect of the present invention, one or more of the bottom flange elements include one or more stiffener elements; however, this is not required. The configuration of the one or more stiffener elements, when used, is non-limiting. For example, the stiffener element can have the configuration of a short lip, hem, rib, return, etc. that is positioned on or attached on one edge of a bottom flange element; however, other shapes can be used. One non-limiting function of the stiffener elements is to provide the otherwise terminal edge of the bottom flange element with a structure that can stiffen, straighten, and/or strengthen the bottom flange element to resist buckling, waving, and/or other stresses; however, this is not required.

[0028] In still another and/or alternative aspect of the present invention, there can optionally be provided a vertical strut that can be positioned between two sub-structural wall construction component. The vertical strut, when used, can facilitate in the attachment of exterior cladding that may benefit from support along the vertical edges of the cladding panel. The size, length, width, shape and/or materials of the vertical strut are non-limiting. The number of vertical struts positioned between the two spaced apart sub-structural wall construction components and/or the spacing of the vertical struts from one another is non-limiting. Generally, the length of the vertical strut is the same or substantially the same as the distance between the two spaced apart sub-structural wall construction components such that each end contacts or is positioned closely adjacent to a sub-structural wall construction component; however, this is not required. Generally, each end of the vertical strut is connected to a sub-structural wall construction component; however, this is not required. The connection arrangement is non-limiting (e.g., rivet, solder, weld bead, adhesive, mechanical connection, bolt, screw, etc.). The top surface of the vertical strut generally lies parallel to and/or in the same plane as the top surface of the top flange element of the sub-structural wall construction component when the sub-structural wall construction component is connected to the building and the vertical strut is connected to the building and/or the sub-structural wall construction component; however, this is not required. One or both ends of the vertical strut can be cut (e.g., miter cut) or otherwise shaped or formed such that they nest within the space created by the two spaced apart sub-structural wall construction components and to thereby facilitate in a flush sub-structural framing arrangement; however, this is not required.

[0029] In yet another and/or alternative aspect of the present invention, there is provided a sub-structural wall construction component that creates a ventilation and drainage airspace while providing support for cladding materials. The sub-structural wall construction component can be designed to adequately support a wood, metal, clay, ceramic, cementitious, stone, or polymeric exterior cladding system. The sub-structural wall construction component can be designed to allow the exterior cladding system to be supported some distance away from the drainage plane of the building, thus creating an airspace between the exterior cladding system and the drainage plane. The sub-structural wall construction component can be designed to include punched and/or lanced openings such that when the sub-structural wall construction component is installed in a linear horizontal orientation, the sub-structural wall construction component does not block or prohibit vertical air circulation and/or water drainage. The sub-structural wall construction component can be designed to include elements that are articulated at some angle with respect to the horizontal plane so as to promote drainage and discourage standing water accumulation on any surface of the component. The sub-structural wall construction component that does not necessarily interfere or degrade upon the continuous exterior insulation of the building except to the extent that prerequisite threaded fasteners pierce the insulation so that the effective insulation value losses due to "thermal bridging" are limited only to that of the threaded fasteners. The sub-structural wall construction component (optionally) incorporates preformed holes in one or more of the flanges to facilitate the location and/or installation of attachment fasteners.

[0030] It is one non-limiting object of the present invention to provide a device that creates a ventilation and drainage airspace while providing support for cladding materials.

[0031] It is another and/or alternative non-limiting object of the present invention to provide a sub-structural wall construction component that includes a) one or more bottom flange elements, b) a top flange element, and c) one or more vented web elements.

[0032] It is still another and/or alternative non-limiting object of the present invention to provide a sub-structural wall construction component that adequately supports a wood, metal, clay, ceramic, cementitious, stone, or polymeric exterior cladding system.

[0033] It is yet another and/or alternative non-limiting object of the present invention to provide a sub-structural wall construction component that allows the exterior cladding system to be supported some distance away from the drainage plane of the building, thus creating an airspace between the exterior cladding system and the drainage plane.

[0034] It is another and/or alternative non-limiting object of the present invention to provide a sub-structural wall construction component with punched and/or lanced openings such that when the sub-structural wall construction component is installed in a linear horizontal orientation, the sub-structural wall construction component does not block or prohibit vertical air circulation and/or water drainage.

[0035] It is still another and/or alternative non-limiting object of the present invention to provide a sub-structural wall construction component in which some of the elements (or segments) of the sub-structural wall construction component are articulated at some angle with respect to the horizontal plane so as to promote drainage and discourage standing water accumulation on any surface of the component.

[0036] It is yet another and/or alternative non-limiting object of the present invention to provide a sub-structural wall construction component that does not necessarily interfere or degrade upon the continuous exterior insulation of the building except to the extent that prerequisite threaded fasteners pierce the insulation so that the effective insulation value losses due to "thermal bridging" are limited only to that of the threaded fasteners.

[0037] It is still yet another and/or alternative non-limiting object of the present invention to provide a sub-structural wall construction component that (optionally) incorporates preformed holes in one or more of the flanges to facilitate the location and/or installation of attachment fasteners.

[0038] It is another and/or alternative non-limiting object of the present invention to provide a vertical strut that can be positioned between two sub-structural wall construction component and wherein the vertical strut can facilitate the attachment of exterior cladding that may benefit from support along the vertical edges of the cladding panel.

[0039] It is still another and/or alternative non-limiting object of the present invention to provide a vertical strut that can be positioned between two sub-structural wall construction components and wherein the vertical strut includes ends that can be miter cut such that they nest within the space created by the two spaced apart sub-structural wall construction components and thereby facilitate in a flush sub-structural framing arrangement.

[0040] It is still another and/or alternative non-limiting object of the present invention to provide a sub-structural wall construction component that includes one or more stiffener elements on one or more bottom flange elements.

[0041] These and other objects and advantages will become apparent to those skilled in the art upon reading and following the description taken together with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

[0042] Reference may now be made to the drawings which illustrate various non-limiting embodiments that the invention may take in physical form and in certain parts and arrangement of parts wherein:

[0043] FIG. **1** is a is a cross-section view of an exterior cladding system that includes the use of the sub-structural wall construction component in accordance with the present invention;

[0044] FIG. **2** is front view of the exterior cladding system of FIG. **1**;

[0045] FIG. **3** is a front perspective view of two sub-structural wall construction components and vertical strut positioned between such sub-structural wall construction components which are mounted to a building structure;

[0046] FIG. **4** is a front perspective view of one non-limiting sub-structural wall construction component in accordance with the present invention;

[0047] FIG. **5** is a cross-section view along line **5-5** of FIG. **4**;

[0048] FIG. **6** is a top plan view of the sub-structural wall construction component illustrated in FIG. **4**;

[0049] FIGS. **7-10** is a front perspective view of several sub-structural wall constructions that illustrate non-limiting alternative opening configurations that can be used in the sub-structural wall construction component;

[0050] FIGS. **11-16** illustrate cross-section views of non-limiting alternate cross-sectional configurations of the sub-structural wall construction component;

[0051] FIG. **17** is a front perspective view of one non-limiting vertical strut in accordance with the present invention;

[0052] FIG. **18** is a side view of the vertical strut of FIG. **17**; and,

[0053] FIG. **19** is a cross-section view along line **19-19** of FIG. **17**.

DETAILED DESCRIPTION OF THE NON-LIMITING EMBODIMENTS

[0054] Referring now to the drawings wherein the showings are for the purpose of illustrating preferred embodiments of the invention only and not for the purpose of limiting same, FIGS. **1-17** illustrate non-limiting configurations of a novel sub-structural wall construction component **100** that can be used in combination with a novel cladding system **20** in accordance with the present invention. The sub-structural wall construction component **100** can be used with a novel vertical strut **200**; however, this is not required. A non-limiting example of a vertical strut is illustrated in FIGS. **1-3** and **17-20**.

[0055] The sub-structural wall construction component **100** is designed to create a ventilation and drainage airspace while providing support for cladding materials. The sub-structural wall construction component can be designed to adequately support a wood, metal, clay, ceramic, cementitious, stone, or polymeric exterior cladding system. The sub-structural wall construction component can be designed to allow the exterior cladding materials to be supported some distance away from the drainage plane of the building, thus creating an airspace between the exterior cladding system and the drainage plane. The sub-structural wall construction component can be designed to include punched and/or lanced openings such that when the sub-structural wall construction component is installed in a linear horizontal orientation, the sub-structural wall construction component does not block or prohibit vertical air circulation and/or water drainage. The sub-structural wall construction component can be designed to include elements that are articulated at some angle with respect to the horizontal plane so as to promote drainage and discourage standing water accumulation on any surface of the component. The sub-structural wall construction component can be designed so as to not necessarily interfere or degrade upon the continuous exterior insulation of the building except to the extent that prerequisite threaded fasteners pierce the insulation so that the effective insulation value losses due to “thermal bridging” are limited only to that of the threaded fasteners.

[0056] Referring now to FIGS. **1-3**, there is illustrated a non-limiting cladding system **20** in accordance with the present invention. The cladding system **20** is illustrated as connected to a building or building structure **30** (e.g., outer wall surface, wall studs, etc.). The material of the building to which the cladding system is connected to is non-limiting (e.g., concrete, brick, stone, wood, metal, plastic, fiberglass, etc.). For example, the building structure could be an uninsulated stud wall.

[0057] Positioned on the outer surface of building or building structure **30** is a wall sheathing board **40**. The thickness and material of the wall sheathing board are non-limiting. One non-limiting wall sheathing board that can be used is a wood fibre board that has a thickness of 0.5-1 inch. The wall sheathing board is an optional component of the cladding system. The wall sheathing board can be connected to, secured to, or otherwise maintained in position relative to the outer surface of building or building structure **30** by an adhesive, mechanical connector (e.g., nail, screw, rivet, staple, bolt, hooks, hook and loop fastener, etc.), etc. As illustrated in FIG. **1**, a mechanical connector in the form of a nail **50** is used to secure the wall sheathing board to the outer surface of building or building structure.

[0058] Positioned on the outer surface of the wall sheathing board **40** is an air and/or water barrier **60**. One non-limiting air and/or water barrier is WEATHERGUARD™ by Commercial Innovations, Inc. WEATHERGUARD™ is a water resistant, vapor permeable membrane. As can be appreciated, the air and/or water barrier can be in the form of a liquid material (e.g., liquid sealant, paint, etc.) that is sprayed on, rolled or brushed on, or otherwise applied. The material and thickness of the air and/or water barrier is non-limiting. In one non-limiting configuration, the thickness of the air and/or water barrier can be 0.01-0.2 inches. The air and/or water barrier can be connected to, secured to, or otherwise maintained in position relative to the wall sheathing board by an adhesive, mechanical connector (e.g., nail, screw, rivet, staple, bolt, hooks, hook and loop fastener, etc.), etc. As illustrated in FIG. **1**, a mechanical connector in the form of a nail **50** is used to secure the air and/or water barrier to the wall sheathing board. The use of the air and/or water barrier in the cladding system is optional.

[0059] Positioned on the outer surface of the air and/or water barrier **60** is insulation **70**. The material (e.g., wool, styrofoam, fiberglass, etc.) and thickness of the insulation is non-limiting. One non-limiting insulation material is a rock wool insulation having a thickness of about 0.5-10 inches. The insulation can be connected to, secured to or other maintained in position relative to the air and/or water barrier by an adhesive, mechanical connector (e.g., nail, screw, rivet, staple, bolt, hooks, hook and loop fastener, etc.), etc. As illustrated in FIG. **1**, a mechanical connector in the form of a nail **50** is used to secure the insulation to the air and/or water barrier. The use of the insulation in the cladding system is optional.

[0060] Positioned on the outer surface of the insulation **70** is sub-structural wall construction component **100**. As best illustrated in FIGS. **4-16**, the sub-structural wall construction component **100** includes first and second bottom flange elements **110**, **120**, a top flange element **130**, and first and second vented web elements **140**, **150**. The sub-structural wall construction component can be partially or fully formed of a metal material (e.g., tin, stainless steel, copper, steel, coated steel [galvanized, painted, etc.], aluminum [painted or bare], bronze, zinc, or other metals or metal alloys etc.); however, it can be appreciated that the sub-structural wall construction component can be formed of other or additional materials (e.g., composite materials, plastic, fiber reinforced materials, etc.). The sub-structural wall construction component can be formed of one or more pieces of material. As illustrated in FIGS. **4-16**, the sub-structural wall construction component is formed of a single piece of material. The sub-structural wall construction component can be formed by one or more process (e.g., cold forming, hot forming, extruded, molded, stamped, etc.). As illustrated in FIG. **6**, the one piece sub-structural wall construction component is illustrated in a pre-formed state. The flat piece of material illustrated in FIG. **6** can be formed into the final shape of the sub-structural wall construction component by folding, press brake, roll forming, or by other means.

[0061] The top flange element **130** is generally a solid, un-punched surface; however, the top flange element can include one or more openings. The top flange element is generally a flat structure wherein the top surface **132** generally lies in a single plane. The top surface of the top flange element is generally oriented in the vertical plane (plumb with respect to the ground). As illustrated in FIG. **1**, the top flange element functions as a mounting surface for the exterior cladding material **80**.

[0062] The first and second bottom flange elements **110**, **120** are designed to be secured to or connected to the outer surface of building or building structure **30** and/or one or more other structures of the cladding system. The first and second bottom flange elements can be connected to, secured to, or otherwise maintained in position relative to the outer surface of building or building structure **30** and/or one or more other structures of the cladding system by an adhesive, mechanical connector (e.g., nail, screw, rivet, staple, bolt, hooks, hook and loop fastener, etc.), etc. As illustrated in FIG. **1**, a mechanical connector in the form of a nail **50** is used to secure the first and second bottom flange elements to insulation **70** and to ultimately connect the first and second bottom flange elements to the building or building structure **30**. A secondary fastener **90** (e.g., nail, screw, rivet, staple, bolt, hooks, hook and loop fastener, etc.), can optionally be used to secure the first and second bottom flange elements to insulation **70**. As illustrated in FIG. **1**, secondary fastener **90** in the form of a screw is shorter than nail **50**. Secondary fastener **90** is illustrated as not contacting the building or building structure **30**, thereby not forming a thermolink between the sub-structural wall construction component and the building or building structure **30**. Only nail **50** forms a thermolink between the sub-structural wall construction component and the building or building structure **30**. The minimal thermo connection between the sub-structural wall construction component and the building or building structure **30** formed by nail **50** minimizes thermo-insulation reduction of the cladding system. The first and second bottom flange elements are designed such that the top surface **112**, **122** of the bottom flange elements are located in a plane that is generally parallel to the top surface **132** of the top flange element **130** as illustrated in FIGS. **5** and **11-16**. The first and second bottom flange elements can optionally include openings **114**, **124**. The openings are generally spaced from the edge of the first and second bottom flange elements; however, this is not required. The openings are used to facilitate in inserting fasteners **50** and/or **90** through the first and second bottom flange elements when securing the sub-structural wall construction component building or building structure **30** and/or insulation. When the openings are used, generally a plurality of openings are positioned on each of the first and second bottom flange elements. The openings on the first and second bottom flange elements can be aligned with one another as illustrated in FIG. **4**; however, this is not required.

[0063] The first and second vented web elements **140**, **150** are secured to the top flange element **130** and the bottom flange elements **110**, **120**. As illustrated in FIGS. **4** and **5**, a first edge of a first vented web element **140** is connected to a first edge of the top flange element **130** and the second edge of the first vented web element **140** is connected to a first edge of the first bottom flange element **110**. Also, a first edge of a second vented web **150** element is connected to a second edge of the top flange element **130** and the second edge of the second vented web element **150** is connected to a first edge of the second bottom flange element **120**. As illustrated in FIG. **5**, the top surface **142**, **152** of the first and second vented web elements lies in a plane that is non-parallel to the plane of the top surface **132** of top flange element **130** and the top surface **112**, **122** of the first and second bottom flange elements **110**, **120**. The top surface **142**, **152** of the first and second vented web elements angles upwardly from the top surface **112**, **122** of the first and second bottom flange elements at an angle of a, b. Angles a and b can be the same or different. Angles a and b are generally about 5°-185°, typically 15°-165°, more typically about 30°-150° and, still more typically, about 60°-120°. In one non-limiting arrangement angles a and b are the same and are about 60°-65°. As illustrated in FIGS. **3**-**5**, **7**-**12** and **14**-**15**, the two vented web elements angle toward one another. However, as illustrated in FIG. **13**, the two vented web elements are parallel to one another. As can be appreciated, the two vented web elements can angle away from one another. One purpose of the upward angle of the vented web elements is that when the sub-structural wall construction component is placed in non-vertical orientation (e.g., a horizontal orientation, etc.) on a building structure, at least a portion or all of the vented web element will not be aligned with a plane parallel to the ground; thus, the sub-structural wall construction component will promote drainage of liquid moisture and be less prone to accumulation of moisture on any vented web element once the sub-structural wall construction component is mounted to a building structure.

[0064] Each of the vented web elements includes a plurality of openings **144**, **154**. The openings in the vented web elements can be formed by stamping or punching (a slug of metal material removed), lanced (the metal material is pierced and displaced, but not removed), and/or by some other or additional process. The size, shape, orientation and/or number of openings in the vented web elements are non-limiting. The orientation of the one or more openings in the vented web elements is non-limiting. As illustrated in FIG. **4**, two rows of aligned openings having a generally rectangular shape are illustrated. FIG. **7**. illustrates two rows of non-aligned openings having a generally elongated oval shape. FIG. **8** illustrates two rows of non-aligned openings having another shape. FIG. **9** illustrates three rows of non-aligned openings having a generally circular shape. FIG. **10** illustrates three rows of aligned openings having a generally circular shape. As can be appreciated, a plurality of different shaped openings can be used on the one or both of the vented web elements. As also can be appreciated, a single row of openings or more than three rows of openings can be used on the one or both of the vented web elements. As can also be appreciated, additional shapes of the openings can be used on the one or both of the vented web elements. Generally, the surface area of the openings on the vented web elements is less than 70% of the total surface area of the top surface of the vented web element, typically the surface area of the openings on the vented web elements is less than 50% of the total surface area of the top surface of the vented web element and, more typically, the surface area of the openings on the vented web elements is less than 40% of the total surface area of the top surface of the vented web element.

[0065] Referring now to FIG. **5**, the top surface **132** of the top flange element **130** has a width f that is generally greater than a width h of the top surface of the vented web elements **140**, **150**; however, this is not required. The top surface **132** of the top flange element **130** has a width f that is generally greater than a width c of the top surface of the bottom flange elements **110**, **120**; however, this is not required. The top surface **132** of the top flange element **132** has a width f that is generally greater than a combined a width (c+h) of the top surface **112**, **124** of the bottom flange elements **110**, **120** and top surface **142**, **152** of the vented web elements **140**, **150**; however, this is not required. The top surface **112**, **124** of the bottom flange elements **110**, **120** has a width f that is generally greater than a width h of the top surface of the vented web elements **140**, **150**; however, this is not required.

[0066] The top surface **132** of the top flange element **130** is elevated a distance e above the top surface **112**, **124** of the bottom flange elements **110**, **120**. Generally, the top surface of the top flange element is elevated above the top surface of the bottom flange elements at a distance of at least about 0.25 inches; however, this is not required.

[0067] Referring now to FIGS. **12**, **14** and **15**, one or both of the bottom flange elements **110**, **120** can optionally include one or more stiffener elements. The configuration of the one or more stiffener elements, when used, is non-limiting. As illustrated in FIG. **12**, each of the bottom flange elements includes a stiffener element in the form of a lip that angles upwardly from the top surface of the stiffener elements. The upward angle of the stiffener element is non-limiting. As illustrated in FIG. **12**, the two lips are oriented to be generally parallel to one another. As illustrated in FIG. **15**, the two lips are oriented to angle away from one another. As can be appreciated, the two lips can be oriented to angle toward one another. One function of the stiffener element is to provide the otherwise terminal edge of the bottom flange element with a structure that can stiffen, straighten, and/or strengthen the bottom flange element to resist buckling, waving, and/or other stresses.

[0068] Referring again to FIGS. **1**-**3**, the sub-structural wall construction component **100** is secured to the face of the insulation **70** by use of fasteners **50** and/or **90**. The openings **114**, **124** in bottom flange elements **110**, **120** can be for alignment and/or ease of installing the fasteners. The top flange element **130** of the sub-structural wall construction component is used as a mounting surface for the exterior cladding material **80**. Fasteners **82** are used to secure the cladding material to the top flange element. The type of fastener used is non-limiting. As illustrated in FIG. **1**, fastener **82** is in the form of a screw. Fastener **82** generally has a length so as to not contact building or building structure **30**. As illustrated in FIG. **1**, fastener **82** has a length so as to not contact insulation **70**. The manner in which the sheets of cladding material are connected together is non-limiting. The top flange element may optionally have punched holes for alignment and/or ease of installing fasteners **82**.

[0069] Referring now to FIGS. **103** and **17**-**19**, vertical strut **200** can optionally be positioned between two sub-structural wall construction component. The vertical strut, when used, can facilitate in the attachment of exterior cladding that may benefit from support along the vertical edges of the cladding panel. The size, length, width, shape and/or materials of the vertical strut are non-limiting. The number of vertical struts positioned between the two spaced apart sub-structural wall construction components and/or the spacing of the vertical struts from one another are non-limiting. As illustrated in FIGS. **1**-**3**, the length of the vertical strut is generally the same or substantially the same as the distance between the two spaced apart sub-structural wall construction components such that each end contacts or is positioned closely adjacent to a sub-structural wall construction component. The vertical strut includes first and second bottom flanges **210**, **220**, a top flange **230**, and first and second side flanges **240**, **250**. The first and second bottom flanges **210**, **220** can optionally include openings **212**, **222** to facilitate in inserting fastener **90** through the first and second bottom flanges when securing the vertical strut to the sub-structural wall construction component. The top surface of the top flange **230** generally lies parallel to and/or in the same plane as the top surface **132** of the top flange element **130** of the sub-structural wall construction component **100** when the sub-structural wall construction component is connected to the insulation and the vertical strut is connected to the sub-structural wall construction component; however, this is not required. One or both ends of the vertical strut can be cut (e.g., miter cut) or otherwise shaped or formed such that they nest within the space created by the two spaced apart sub-structural wall construction components and thereby facilitate in a flush sub-structural framing arrangement as illustrated in FIGS. **1-3**; however, this is not required.

[0070] It will thus be seen that the objects set forth above, among those made apparent from the preceding description, are efficiently attained, and since certain changes may be made in the constructions set forth without departing from the spirit and scope of the invention, it is intended that all matter contained in the above description and shown in the accompanying drawings shall be interpreted as illustrative and not in a limiting sense. The invention has been described with reference to preferred and alternate embodiments. Modifications and alterations will become apparent to those skilled in the art upon reading and understanding the detailed discussion of the invention provided herein. This invention is intended to include all such modifications and alterations insofar as they come within the scope of the present invention. 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.

What is claimed:

1. A sub-structural wall construction component that includes a) one or more bottom flange elements, b) a top flange element, and c) one or more vented web elements.

2. The sub-structural wall construction component as defined in claim **1**, including first and second bottom flange elements and first and second vented web elements, a first edge of said first vented web element is connected to a first edge of said top flange element, a second edge of said first vented web element is connected to a first edge of said first bottom flange element, a first edge of said second vented web element is connected to a second edge of said top flange element, and a second edge of said second vented web element is connected to a first edge of said second bottom flange element.

3. The sub-structural wall construction component as defined in claim **1**, wherein a majority of a top surface of at least one of said bottom flange elements is located in a plane that is generally parallel to a top surface of said top flange element.

4. The sub-structural wall construction component as defined in claim **1**, wherein at least one of said bottom flange elements includes a plurality of holes.

5. The sub-structural wall construction component as defined in claim **1**, wherein said top flange element is generally a flat structure wherein a top surface generally lies in a single plane.

6. The sub-structural wall construction component as defined in claim **1**, wherein at least a portion of a top surface of at least one of said vented web elements lies in a plane that is non-parallel to a plane of a top surface of said top flange element and/or a top surface of at least one of said bottom flange elements.

7. The sub-structural wall construction component as defined in claim **1**, wherein at least a portion of a top surface of at least one of said vented web elements angles upwardly from a top surface of at least one of said bottom flange elements at an angle of about 5°-185°.

8. The sub-structural wall construction component as defined in claim **7**, including first and second vented web elements, at least a portion of a top surface of each of said vented web elements are parallel to one another and/or angle toward one another.

9. The sub-structural wall construction component as defined in claim **1**, wherein at least one of said vented web elements includes a plurality of openings.

10. The sub-structural wall construction component as defined in claim **9**, wherein a surface area of said openings on said vented web elements is less than 70% of a total surface area of a top surface of said vented web element.

11. The sub-structural wall construction component as defined in claim **1**, wherein a top surface of said top flange element has a width that is greater than a width of a top surface of at least one of said vented web elements.

12. The sub-structural wall construction component as defined in claim **1**, wherein a top surface of said top flange element has a width that is greater than a width of a top surface of at least one of said bottom flange elements.

13. The sub-structural wall construction component as defined in claim **1**, wherein a top surface of said top flange element has a width that is greater than a combined width of a top surface of at least one of said bottom flange elements and a top surface of at least one of said vented web elements.

14. The sub-structural wall construction component as defined in claim **1**, wherein a top surface of at least one of said bottom flange elements has a width that is generally greater than a width of a top surface of at least one of said vented web elements.

15. The sub-structural wall construction component as defined in claim **1**, wherein a top surface of the top flange element is elevated above a top surface of at least one of said bottom flange elements.

16. The sub-structural wall construction component as defined in claim **1**, including a stiffener element on one or more of said bottom flange elements.

17. A sub-structural wall construction component that includes first and second bottom flange elements, a top flange element, and first and second vented web elements, a first edge of said first vented web element is connected to a first edge of said top flange element, a second edge of said first vented web element is connected to a first edge of said first bottom flange element, a first edge of said second vented web element is connected to a second edge of said top flange element, and a second edge of said second vented web element is connected to a first edge of said second bottom flange element, a majority of a top surface of said first and second vented web elements lies in a plane that is non-parallel to a plane of a top surface of said top flange element, a majority of a top surface of said first and second vented web elements lies in a plane that is non-parallel to a plane of a top surface of said first and second bottom flange elements, a majority of said top surface of said first vented web element angles upwardly from said top surface of said first bottom flange element at an angle of about 50°-80°, a majority of said top surface of said second vented web element angles upwardly from said top surface of said second bottom flange element at an angle of about 50°-80°, a majority of said top surface of each of said vented web elements angle toward one another, said first and second vented web elements each include a plurality of openings, a surface area of said openings on said first vented web element is less than 50% of a total surface area of said top surface of said first vented web element, a surface area of said openings on said second vented web element is less than 50% of a total surface area of said top surface of said second vented web element.

18. The sub-structural wall construction component as defined in claim **17**, wherein said top surface of said top flange element has a width that is greater than a width of said top surface of at least one of said vented web elements, said top surface of said top flange element has a width that is greater than a width of said top surface of at least one of said bottom flange elements.

19. The sub-structural wall construction component as defined in claim **17**, including a stiffener element on one or more of said bottom flange elements.

20. A method providing support for exterior building cladding materials and to allow for air ventilation to aid in drying of an exterior wall cavity and to allow for drainage of incidental moisture that may infiltrate into the exterior wall cavity that is formed between the cladding materials and the exterior surface of the building comprising:

a. providing cladding material;

b. providing a sub-structural wall construction component, said sub-structural wall construction component including a) one or more bottom flange elements, b) a top flange element, and c) one or more vented web elements;

c. securing said sub-structural wall construction component so said exterior surface of the building by inserting at least one fastener through said one or more bottom flange elements; and,

d. securing said cladding materials to said top flange element of said sub-structural wall construction component such that an interior surface of said cladding materials are caused to be spaced from said exterior surface of the building by said sub-structural wall construction component.

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