(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
21 July 2022 (21.07.2022)

WIPO | PCT

(10) International Publication Number
WO 2022/155513 A1

(51) International Patent Classification:
E04B 1/76 (2006.01) *E04F 13/09* (2006.01)
E04B 1/94 (2006.01) *E04F 13/26* (2006.01)
E04C 2/30 (2006.01)

(21) International Application Number:
PCT/US2022/012590

(22) International Filing Date:
14 January 2022 (14.01.2022)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
63/137,660 14 January 2021 (14.01.2021) US

(71) Applicant: **ADVANCED ARCHITECTURAL PRODUCTS, LLC** [US/US]; 959 Industrial Drive, Allegan, MI 49010 (US).

(72) Inventor: **KRAUSE, G., Matt**; 959 Industrial Drive, Allegan, MI 49010 (US).

(74) Agent: **JOVANOVIC, Jovan**; The Watson IP Group, PLC, 3133 Highland Drive, Suite 200, Hudsonville, MI 49426 (US).

(81) Designated States *(unless otherwise indicated, for every kind of national protection available)*: AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DJ, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IR, IS, IT, JO, JP, KE, KG, KH, KN, KP, KR, KW, KZ, LA, LC, LK, LR, LS, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, SC, SD, SE, SG, SK, SL, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, WS, ZA, ZM, ZW.

(84) Designated States *(unless otherwise indicated, for every kind of regional protection available)*: ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, ST, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, KM, ML, MR, NE, SN, TD, TG).

(54) Title: FIRE RETARDING POLYMER BRACKET

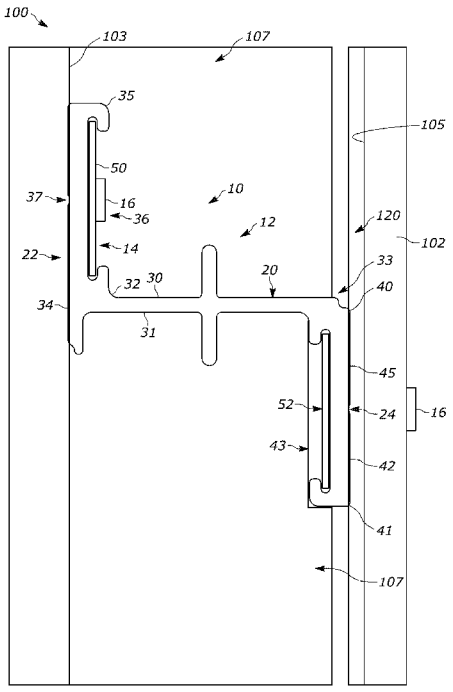

FIGURE 1

(57) Abstract: A bracket member for use in association with a building wall. The bracket member has a body wall, a first end wall, a second end wall and an intumescent coating. The body wall has a top surface and a bottom surface, as well as an inner end and an outer end. The first end wall extends from the inner end of the body wall, and is one of oblique and perpendicular to the body wall. The second end wall extends from the outer end of the body wall, and is one of oblique and perpendicular to the body wall. The second end wall has an inner surface and an outer surface, with the inner surface facing toward the first end wall, and the outer surface facing in a direction opposite thereto. The intumescent coating overlies the outer surface of the second end wall.

WO 2022/155513 A1

[Continued on next page]

Published:

— *with international search report (Art. 21(3))*

— *before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments (Rule 48.2(h))*

TITLE

FIRE RETARDING POLYMER BRACKET

CROSS-REFERENCE TO RELATED APPLICATION

[0001] This application claims priority from U.S. Provisional Patent Application Serial No. 63/137,660 filed on January 14, 2021, entitled "FIRE RETARDING POLYMER BRACKET", the entire disclosure of which is hereby incorporated by reference in its entirety.

BACKGROUND OF THE DISCLOSURE

[0002] 1. Field of the Disclosure

[0003] The disclosure relates in general to building products, and, more particularly, to a fire retarding polymer bracket along with a system or wall made with such a fire retarding polymer bracket, wherein the bracket can be utilized in an insulation system for use in buildings.

[0004] 2. Background Art

[0005] In the past, in order to provide a highly thermally efficient (metal) wall or (metal) roof assembly for a building enclosure, it has been necessary for metal materials, typically an exterior and interior metal skin, to be bonded to either side of an insulated panel core inside a factory thereby creating a foam panel. These metal skins are typically profiled and have offsets in them to prevent the exterior metal skin from contacting the interior metal skin. This is done in an effort to prevent metal to metal contact thereby reducing thermal conductivity from the outside of the building. Heat travels in the path of least resistance such that heat can invade a system and affect an interior atmosphere through relatively finite pathways such as fasteners and the like that have metal to metal contact with exterior conditions. Similarly, exterior exposure to cold temperatures can allow for infusion of cold temperatures into a wall construction along highly thermally conductive components. Among other products, polymer brackets, including fiber reinforced composite polymer brackets have begun to be used in such applications to provide improved insulation.

[0006] Building codes are replete with sections and requirements that are directed at fire prevention, fire retardation, and other manners in which to limit or stop the spread of fire through a building structure. One phenomenon that is encountered in building fires, is the chimney effect, which is the propagation of a fire in a vertical (i.e., upward direction) following voids between building components. The chimney effect can cause the rapid spread of a fire through a building. Even where fire retardant materials are utilized, the chimney effect can cause the quick spread of a fire.

SUMMARY OF THE DISCLOSURE

[0007] In an aspect of the disclosure, the disclosure is directed to a bracket member for use in association with a building wall. The bracket member comprises a body wall, a first end wall, a second end wall and an intumescent coating. The body wall has a top surface and a bottom surface, as well as an inner end and an outer end. The first end wall extends from the inner end of the body wall, and is one of oblique and perpendicular to the body wall. The second end wall extends from the outer end of the body wall, and is one of oblique and perpendicular to the body wall. The second end wall has an inner surface and an outer surface, with the inner surface facing toward the first end wall, and the outer surface facing in a direction opposite thereto. The intumescent coating overlies the outer surface of the second end wall.

[0008] In at least one configuration, an end wall support member overlies at least a portion of the inner surface of the second end wall.

[0009] In at least one configuration, an end wall support member overlying at least a portion of an outer surface of the first end wall.

[0010] In at least one configuration, the first end wall and the second end wall are parallel to each other.

[0011] In at least one configuration, the body wall is perpendicular to each of the first end wall and the second end wall.

[0012] In at least one configuration, the bracket member comprises a plurality of pultruded fibers within a resin matrix.

[0013] In at least one configuration, a plurality of the plurality of pultruded fibers that form the second end wall proximate the outer surface thereof have an intumescent coating.

[0014] In at least one configuration, the resin matrix further includes a filler comprising a hydrate.

[0015] In at least one configuration, the intumescent coating is applied directly to the outer surface of the second end wall.

[0016] In at least one configuration, the intumescent coating is applied to a substrate which is then overlyingly attached to the outer surface of the second end wall.

[0017] In another aspect of the disclosure, the disclosure is directed to a wall construction comprising a wall structure, bracket members, and an outer cladding. The wall structure has a first side and a second side, a lower end and an upper end, and an outer surface. The plurality of substantially horizontal rows of bracket members extend between the first side and the second side of the wall structure. Additionally, the rows are spaced apart from each other between the lower end and the upper end thereof. Each of the bracket members comprises a body wall, a first end wall, a second end wall and an intumescent coating. The body wall has a top surface and a

bottom surface, as well as an inner end and an outer end. The first end wall extends from the inner end of the body wall, and is one of oblique and perpendicular to the body wall. The second end wall extends from the outer end of the body wall, and is one of oblique and perpendicular to the body wall. The second end wall has an inner surface and an outer surface, with the inner surface facing toward the first end wall, and the outer surface facing in a direction opposite thereto. The intumescent coating overlies the outer surface of the second end wall. The first end wall overlies the outer surface of the wall structure and is attached thereto. Finally, an outer cladding overlies the wall structure. The outer cladding overlying engages the outer surface of the plurality of substantially horizontal rows of bracket members, and is secured to the second end wall. A plurality of voids are defined between the cladding and the second end wall of at least some of the plurality of substantially horizontal rows of bracket members.

[0018] In at least one configuration, the second wall further includes an end wall support member overlying at least a portion of the inner surface of the second wall of at least some of the plurality of substantially horizontal rows of bracket members.

[0019] In at least one configuration, the plurality of substantially horizontal rows extend from the first side to the second side of the wall structure.

[0020] In at least one configuration, the outer cladding comprises a corrugated cross-sectional configuration.

[0021] In at least one configuration, insulation is positioned between at least some of the adjacent ones of the plurality of substantially horizontal rows of bracket members.

[0022] In yet another aspect of the disclosure, the disclosure is directed to a bracket member for use in association with a building wall. The bracket member comprises a body wall, a first end wall, a second end wall and an intumescent coating. The body wall has a top surface and a bottom surface, as well as an inner end and an outer end. The first end wall extends from the inner end of the body wall, and is one of oblique and perpendicular to the body wall. The second end wall extends from the outer end of the body wall, and is one of oblique and perpendicular to the body wall. The second end wall has an inner surface and an outer surface, with the inner surface facing toward the first end wall, and the outer surface facing in a direction opposite thereto. The bracket member comprises a plurality of pultruded fibers within a resin matrix, and wherein at least some of the pultruded fibers that form the second end wall proximate the outer surface thereof have an intumescent coating.

[0023] In at least one configuration, the resin matrix further includes a filler comprising a hydrate.

[0024] In at least one configuration, the resin matrix for at least the portion forming the second end wall proximate the outer surface thereof further comprises an intumescent material.

[0025] The disclosure is also directed to a method of controlling a fire, the method comprises the step of providing a wall construction; having the temperature proximate at least one of the plurality of horizontal rows of bracket members rise to a level sufficient to cause a chemical reaction in an intumescent coating on the bracket member; expanding the intumescent coating to fill voids between a cladding and the bracket member, to, in turn, one of inhibit, delay and/or stop the passage of a fire beyond the bracket member having the reacted intumescent coating.

BRIEF DESCRIPTION OF THE DRAWINGS

[0026] The disclosure will now be described with reference to the drawings wherein:

[0027] FIG. 1 illustrates a cross-sectional schematic configuration of a bracket assembly in a building environment coupled to an inner wall structure and an outer cladding, and having insulation therebetween, in accordance with at least one configuration disclosed herein;

[0028] FIG. 2 illustrates a perspective view of a wall assembly showing an inner wall structure having a number of bracket assemblies coupled thereto, with insulation therebetween, with the understanding that a cladding would be placed thereover and coupled to the bracket assemblies, in accordance with at least one configuration disclosed herein;

[0029] FIG. 2 illustrates a perspective view of one configuration of a bracket member of the bracket assembly, in accordance with at least one configuration disclosed herein;

[0030] FIG. 3 illustrates a cross-sectional view of one configuration of a bracket member and end wall support members of the bracket assembly, in accordance with at least one configuration disclosed herein;

[0031] FIG. 4 illustrates a cross-sectional view of one configuration of a bracket member and end wall support members of the bracket assembly of the present disclosure, showing, in particular, fibers that can be coated with an intumescent material and a matrix which may have an intumescent material incorporate therein, and/or which may have a hydrate or other fire retardant therein, in accordance with at least one configuration disclosed herein; and

[0032] FIG. 5 illustrates a detailed view of the bracket member shown in FIG. 4, in accordance with at least one configuration disclosed herein.

DETAILED DESCRIPTION OF THE DISCLOSURE

[0033] While this disclosure is susceptible of embodiment in many different forms, there is shown in the drawings and described herein in detail a specific embodiment(s) with the understanding that the present disclosure is to be considered as an exemplification and is not intended to be limited to the embodiment(s) illustrated.

[0034] It will be understood that like or analogous elements and/or components, referred to herein, may be identified throughout the drawings by like reference characters. In addition, it will be understood that the drawings are merely schematic representations of the invention, and

some of the components may have been distorted from actual scale for purposes of pictorial clarity.

[0035] Referring now to the drawings and in particular to FIG. 1, the disclosure is directed to a bracket assembly 10, and more specifically, to the internal composition of a bracket member, such as bracket member 12, as well as structures associated with the bracket member. Amongst other advantages, the bracket member has an internal composition that precludes or actively assists with the reduction in spreading of a fire through, for example, the blocking of passageways to preclude the chimney effect that occurs in building fires. Of course, the advantages of such a configuration shown in the present disclosure extends beyond utility in the case of a fire and in normal usage, likewise provides advantages.

[0036] As to the overall structure, and with reference to FIG.s 1 and 1a (showing multiple bracket assemblies coupled to an inner wall structure), it will be understood that typically, the bracket assembly 10 is positioned between, and coupled to each of an inner wall structure, such as inner wall structure 100, and in particular, to the outer surface 103 thereof, as well as to outer cladding 102, and in particular, to the inner surface 105 thereof. Typically, the cladding will involve a corrugation or the like, and, in many instances, there are voids 120 between the bracket 10 and the cladding.

[0037] Insulation, such as insulation 107 can be placed between the inner walls structure and outer cladding. The two structures can form the outside of a building, and the particular materials from which the inner and outer wall structures are formed, are not to be deemed as being limited. Additionally, in the configuration shown, the bracket member is shown as extending substantially horizontally. Generally, a number of bracket members will span across one of horizontally, wherein the bracket members are spaced apart from each other a nominal distance (often times 16" or 24" on center), although other spacings are known to those of skill in the art, and the disclosure is not limited to any particular configuration.

[0038] With reference to FIG. 4, the bracket assembly is shown generally at 10 as including bracket member 12 (which is elongated and may be referred to as an elongated bracket member, See also FIG. 3), end wall support members 14 and fastener 16. A number of different constructions of the bracket member are contemplated, as well as a number of shapes thereof, having different features. Some of such different constructions are shown in U.S. Pat. No. 9,580,904 issued to Krause. Other constructions are shown in, among other references, U.S. Pat. Nos. 8,826,620 issued to Krause; and 8,833,025 issued to Krause. as the disclosure of each one of the foregoing is expressly incorporated by reference in their entirety herewith, as if they are part of the specification hereof. It will be understood that the bracket shown herein is merely exemplary, and the same principles can be applied to the brackets shown in the incorporated

references, as well as to other brackets of similar configuration. The brackets shown and incorporated herein are not to be deemed limiting.

[0039] With reference to FIG. 3 (showing one configuration), the bracket member 12 includes body wall 20, first end wall 22 and second end wall 24. In the configuration shown, the body wall 20 is generally perpendicular to each of the first end wall and the second end wall (both of which are generally parallel to each other). It will be understood that the structures may be other than perpendicular and parallel to each other (i.e., oblique to each other) in some embodiments. Generally, such a configuration is utilized wherein the inner wall structure and outer cladding are generally parallel to each other. The structure is not limited to the parallel and perpendicular relationship between the component wall portions.

[0040] In the configuration shown, the body wall 20 includes top surface 30, bottom surface 31, inner end 32 and outer end 33. The top surface 30 is opposite the bottom surface 31 and the inner end 32 is positioned proximate the first end wall with the outer end 33 positioned proximate the second end wall at an opposite end thereof. The bracket member 12 generally comprises a substantially uniform pultrusion that has a generally uniform cross-sectional shape, or configuration. Variations may be introduced along the length thereof through post extrusion operations, or other pultrusion manufacturing techniques. It will be understood that the principles of the present disclosure are not limited to uniform pultruded bracket members having such uniform pultruded cross-sectional shapes and configurations.

[0041] Generally, the first end wall 22 extends in a perpendicular manner upwardly from the inner end 32 of the body wall 20. The first end wall includes proximal end 34 and distal end 35 as well as outer surface 36 and inner surface 37. It will be understood that the proximal end 34 meets the inner end 32 of the body wall 20, extending upwardly therefrom. It will further be understood that in other configurations, a portion of the first end wall may be directed in a downward direction, that is extending away from the bottom surface 31 of the body wall. In such a configuration, the first end wall may be bisected, or intersected by the body wall, and the downward portion that extends from the bottom surface 31 may comprise a lower distal end. In at least one configuration, the portion of the first end wall that extends in a downward direction may be shorter or longer than the portion that extends in an upward direction. It will be understood that upward and downward are directions that refer to the cross-sectional drawing shown in the FIG., and generally correspond to the structure when the structure is mounted in a horizontal manner onto a building. It will be understood that in other configurations, a different mounting structure is contemplated. The principles may be utilized of the present disclosure regardless of vertical and/or horizontal (or oblique) mounting of the bracket member relative to a building.

[0042] The second end wall 24 extends in a perpendicular manner downwardly from the outer end 33 of the body wall 20. The second end wall includes proximal end 40, distal end 41 as well as outer surface 42, inner surface 43 and intumescent 45. It will be understood that the proximal end 40 meets the outer end 33 of the body wall, with the distal end extending in a downward direction away from the bottom surface 31 of the body wall 20. It will be understood that a portion of the second end wall 24 may extend above the body wall and may extend away from the top surface of the body wall.

[0043] The outer surface 42 of the end wall may have a coating of intumescent material 45 positioned on the surface thereof. Preferably, the intumescent material is applied as a paint or coating to the outer surface 42 Alternatively, the coating may be applied to a film having an adhesive layer that is then bound to the outer surface 42. The intumescent coating is preferably a soft char type of intumescent coating, while others are contemplated. Alternatively, and as will be explained below, a portion of the matrix may include intumescent material that is introduced into the matrix as a filler prior to pultrusion. In still other configurations, the underlying fibers for the pultrusion, may have an intumescent coating. Such fibers can be used in the pultrusion process for the portions that make the second end wall, and preferably the outer surface thereof.

[0044] A number of other structures may be formed into the body wall, the first end wall and/or the second end wall. For example, ribs may be positioned on either one or both of the top and bottom surfaces of the body wall. Additionally, other structures may be positioned on any one of the different surfaces, or interfaces with the surfaces, including channels, ribs, nubs, protrusions and the like. Further still, the end walls may include different structures which extend above or below the top wall.

[0045] The end wall support members 14 are shown in FIG. 4 as comprising first end wall strip 50 and second end wall strip 52. The first end wall strip 50 is positioned to overlie the outer surface 36 of the first end wall with the outer surface 53 facing outwardly configured to receive a fastener. It will be understood that the first end wall strip may include a plurality of openings, or the like to facilitate the receipt of fasteners. In at least one configuration, such as in the configuration of FIG. 4 the outer surface of the first end wall may include a channel, with the first end wall strip 50 being substantially planar, and slidably positioned within that channel. In other configurations, the end wall strips may be adhered or otherwise mounted to substantially flat surfaces of the end walls.

[0046] Preferably the first end wall strip comprises a metal member, such as a steel member, or a stainless-steel member. Other materials are contemplated including titanium members and alloys that have sufficiently high strength at elevated temperatures. It is contemplated that non-metal members may be utilized as long as such members have a

sufficiently high transition temperature, melting point and integrity. The foregoing materials are exemplary and not to be deemed limiting.

[0047] The second end walls strip is substantially similar in construction as the first end wall strip. That is, not that they are required to be identical, but that they can both be selected from a number of different configurations, some of which are described above. The second strip is positioned on the inner surface 43 of the second end wall 24 with the outer surface 54 facing away therefrom. As with the first end wall strip, the second end wall strip is configured to receive a fastener therethrough, however, in the configuration shown, after the fastener has passed through the corresponding second end wall. It will be understood that as with the first end wall strip, the end wall strip may be coupled to either one of the outer surface and the inner surface, and the configuration shown is merely exemplary. In other words, the manner in which the first and the second end wall strips are coupled or mated with the respective one of the end walls does not have to be the same on a particular bracket assembly. That is, the first end wall strip can be mated to the first end wall in a manner that is different than the manner in which the second end wall strip is mated to the second end wall.

[0048] In the configurations shown, the end wall support members are spaced apart from either one of the proximal and distal ends of the respective first and second end walls. As such, it is contemplated that the fastener will be located in a configuration that extends generally centrally within the first end wall or the second end wall strip, or in an offset configuration, however, generally spaced apart from either of the distal end or the proximal end.

[0049] The fastener 16 comprises a screw. Typically, the screw may be one of a number of different types of screws and fasteners. Typically, the screw is utilized to couple the outer cladding to the second end wall and the first end wall to the inside wall structure of the building. Preferably, the fastener 16 comprises a steel or stainless-steel structure, while other structures are likewise contemplated.

[0050] With reference to FIG. 5, the bracket member is formed, preferably, through a pultrusion process utilizing a plurality of independent fibers, bundles (or rovings) as well as fabrics that may be stitched or that may be woven. A typical construction of the present disclosure is shown, wherein the bracket member is formed from a plurality of fibers, rovings and/or fabrics (collectively fibers) 70 all of which is captured within a resin matrix, such as resin matrix 72. As will be understood the fibers 70 are wetted out, or otherwise placed in a resin bath prior to pultrusion through a die. The resin matrix 72 represents the cured resin that was pultruded through the die. It will be understood that some configurations may be formed entirely from fabrics and no rovings may be utilized. It will be understood that one or more resin systems may be utilized, and that different configurations may have different requirements. Additionally,

the resin matrix may include fillers, including fire retardant fillers, such as, for example, vermiculite, and various hydrates, such as, without limitation, aluminum trihydrate, calcium sulfate dihydrate among others.

[0051] Among other fibers, glass fibers, such as e-glass, s-glass and others, carbon fibers, cellulose fibers, nylon fibers, aramid fibers, Kevlar fibers, as well as other reinforcing type fibers may be utilized for both the rovings and the fiber fabrics. These are merely exemplary and the structure is not limited thereto.

[0052] It is contemplated that the fibers may have an intumescent coating applied thereto prior to the pultrusion process.

[0053] In operation, an assembled wall is shown with reference again to FIG. 1. In such a configuration horizontal rows of brackets are attached to the outer surface of the wall structure in a spaced apart configuration. For example, the brackets may extend horizontally across the building successively wherein the rows are spaced apart from each other and generally parallel to each other. In at least one configuration, the spacing may be 12 inches, whereas in other configurations, the spacing may be 16 inches, 20 inches, 24 inches, 36 inches, or another variation which may be greater or lesser than the foregoing.

[0054] With respect to each bracket, the first end wall is attached to the outer wall of the wall structure in an overlying fashion through fasteners. Due to the construction of the bracket assembly, the second end wall extends parallel to the first end wall but spaced apart therefrom due to the body wall extending therebetween. The outer cladding 102 is attached to the second end wall.

[0055] In the end, a number of brackets extend horizontally at spaced intervals that are substantially parallel to each other. These brackets span between the inner wall structure and the cladding. In many instances, there are variations in the cladding (i.e., corrugations, or other voids undulations or the like) such that voids are created between the second end wall of the respective brackets and the cladding.

[0056] In the event of a fire, the fire due to the chimney effect, such a fire can, with relative ease, propagate and rise upwardly between the cladding and the second end wall by way of the voids.

[0057] To preclude the chimney effect, as the fire reaches a bracket, the bracket first off gasses water vapor outwardly (due to the above-described fillers introduced into the matrix during the pultrusion process). Due to the position of the support member on the inner surface 43 of the second end wall, the off gassing of water (due to the fillers) generally occurs in an outward direction which inhibits the fire and the spread thereof.

[0058] As the temperature increases, eventually, a temperature is reached that causes the constituents of the intumescent coating to react (while not bound thereto, in many instances, intumescent material expansion is the result of a chemical reaction between ammonium polyphosphate, pentaerythritol and melamine). As the reaction occurs due to the temperature, a soft char (or In at least one configuration, a hard char) is formed which fills the voids between the outer surface 42 of the bracket member and the cladding, thereby sealing across the bracket member. This inhibits, delays and/or stops the passage of the fire beyond the bracket member in an upward direction.

[0059] As the bracket members extend across a wall in successive horizontal rows, typically from end to end, as a fire spreads, over time, if one horizontal row of the brackets is compromised by the fire, and the fire passes beyond, the intumescent coating in the next row can be activated as the heat rises, again effectively inhibiting, delaying and/or stopping the passage of fire beyond the bracket member.

[0060] The foregoing description merely explains and illustrates the disclosure and the disclosure is not limited thereto except insofar as the appended claims are so limited, as those skilled in the art who have the disclosure before them will be able to make modifications without departing from the scope of the disclosure.

CLAIMS

1. A bracket member for use in association with a building wall, the bracket member comprising:

- a body wall, the body wall having a top surface and a bottom surface, as well as an inner end and an outer end;

- a first end wall extending from the inner end of the body wall, the first end wall being one of oblique and perpendicular to the body wall;

- a second end wall extending from the outer end of the body wall, the second end wall being one of oblique and perpendicular to the body wall, the second end wall having an inner surface and an outer surface, with the inner surface facing toward the first end wall, and the outer surface facing in a direction opposite thereto; and

- an intumescent coating overlying the outer surface of the second end wall.

2. The bracket member of claim 1 further comprising an end wall support member overlying at least a portion of the inner surface of the second end wall.

3. The bracket member of claim 2 further comprising an end wall support member overlying at least a portion of an outer surface of the first end wall.

4. The bracket member of claim 2 wherein the first end wall and the second end wall are parallel to each other.

5. The bracket member of claim 4 wherein the body wall is perpendicular to each of the first end wall and the second end wall.

6. The bracket member of claim 1 wherein the bracket member comprises a plurality of pultruded fibers within a resin matrix.

7. The bracket member of claim 6 wherein a plurality of the plurality of pultruded fibers that form the second end wall proximate the outer surface thereof have an intumescent coating.

8. The bracket member of claim 7 wherein the resin matrix further includes a filler comprising a hydrate.

9. The bracket member of claim 1 wherein the intumescent coating is applied directly to the outer surface of the second end wall.

10. The bracket member of claim 1 wherein the intumescent coating is applied to a substrate which is then overlyingly attached to the outer surface of the second end wall.

11. A wall construction comprising:

- a wall structure having a first side and a second side, a lower end and an upper end, and an outer surface;

- a plurality of substantially horizontal rows of bracket members extending between the first side and the second side of the wall structure, wherein the rows are spaced apart from each other between the lower end and the upper end thereof, each of the bracket members having:

- a body wall, the body wall having a top surface and a bottom surface, as well as an inner end and an outer end;

- a first end wall extending from the inner end of the body wall, the first end wall being one of oblique and perpendicular to the body wall;

- a second end wall extending from the outer end of the body wall, the second end wall being one of oblique and perpendicular to the body wall, the second end wall having an inner surface and an outer surface, with the inner surface facing toward the first end wall, and the outer surface facing in a direction opposite thereto; and

- an intumescent coating overlying the outer surface of the second end wall;

- wherein the first end wall overlies the outer surface of the wall structure and is attached thereto;

- an outer cladding overlying the wall structure, with the outer cladding overlying engaging the outer surface of the plurality of substantially horizontal rows of bracket members, and secured to the second end wall, wherein a plurality of voids are defined between the cladding and the second end wall of at least some of the plurality of substantially horizontal rows of bracket members.

12. The wall construction of claim 11 wherein the second wall further includes an end wall support member overlying at least a portion of the inner surface of the second wall of at least some of the plurality of substantially horizontal rows of bracket members.

13. The wall construction of claim 11 wherein the plurality of substantially horizontal rows extend from the first side to the second side of the wall structure.

14. The wall construction of claim 11 wherein the outer cladding comprises a corrugated cross-sectional configuration.

15. The wall construction of claim 11 wherein insulation is positioned between at least some of the adjacent ones of the plurality of substantially horizontal rows of bracket members.

16. The wall construction of claim 11 further comprising an end wall support member overlying at least a portion of an outer surface of the first end wall.

17. The wall construction of claim 11 wherein the first end wall and the second end wall are parallel to each other.

18. The wall construction of claim 11 wherein the body wall is perpendicular to each of the first end wall and the second end wall.

19. The wall construction of claim 11 wherein the bracket members comprise a plurality of pultruded fibers within a resin matrix.

20. The wall construction of claim 19 wherein the plurality of pultruded fibers form the second end wall proximate the outer surface thereof have an intumescent coating.

21. The wall construction of claim 19 wherein the resin matrix further includes a filler comprising a hydrate.

22. The wall construction of claim 11 wherein the intumescent coating is applied directly to the outer surface of the second end wall.

23. The wall construction of claim 11 wherein the intumescent coating is applied to a substrate which is then overlyingly attached to the outer surface of the second end wall.

24. A bracket member for use in association with a building wall, the bracket member comprising:

- a body wall, the body wall having a top surface and a bottom surface, as well as an inner end and an outer end;

- a first end wall extending from the inner end of the body wall, the first end wall being one of oblique and perpendicular to the body wall;

- a second end wall extending from the outer end of the body wall, the second end wall being one of oblique and perpendicular to the body wall, the second end wall having an inner surface and an outer surface, with the inner surface facing toward the first end wall, and the outer surface facing in a direction opposite thereto; and

- wherein the bracket member comprises a plurality of pultruded fibers within a resin matrix, and wherein at least some of the pultruded fibers that form the second end wall proximate the outer surface thereof have an intumescent coating.

25. The bracket member of claim 24 wherein the resin matrix further includes a filler comprising a hydrate.

26. The bracket member of claim 24 wherein the resin matrix for at least the portion forming the second end wall proximate the outer surface thereof further comprises an intumescent material.

27. The bracket member of claim 24 further comprising an end wall support member overlying at least a portion of the inner surface of the second end wall.

28. The bracket member of claim 27 further comprising an end wall support member overlying at least a portion of an outer surface of the first end wall.

29. The bracket member of claim 27 wherein the first end wall and the second end wall are parallel to each other.

30. The bracket member of claim 30 wherein the body wall is perpendicular to each of the first end wall and the second end wall.

31. The bracket member of claim 24 wherein the bracket member comprises a plurality of pultruded fibers within a resin matrix.

32. The bracket member of claim 31 wherein a plurality of the plurality of pultruded fibers that form the second end wall proximate the outer surface thereof have an intumescent coating.

33. The bracket member of claim 24 wherein the intumescent coating is applied directly to the outer surface of the second end wall.

34. The bracket member of claim 24 wherein the intumescent coating is applied to a substrate which is then overlyingly attached to the outer surface of the second end wall.

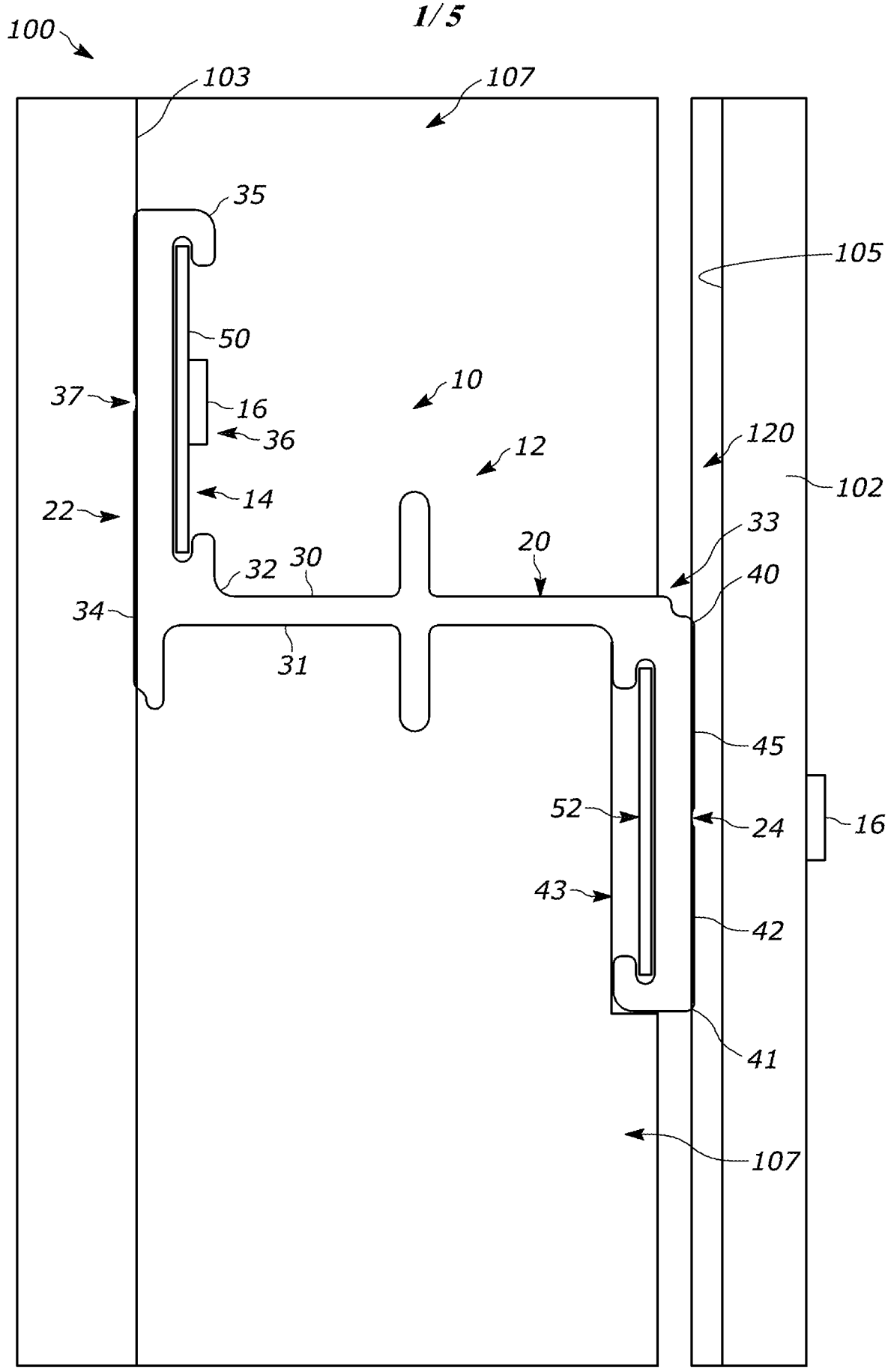
100
103
107
35
105
50
37
10
16
36
120
12
102
22
14
33
20
32
30
40
34
31
45
52
24
16
43
42
41
107

FIGURE 1

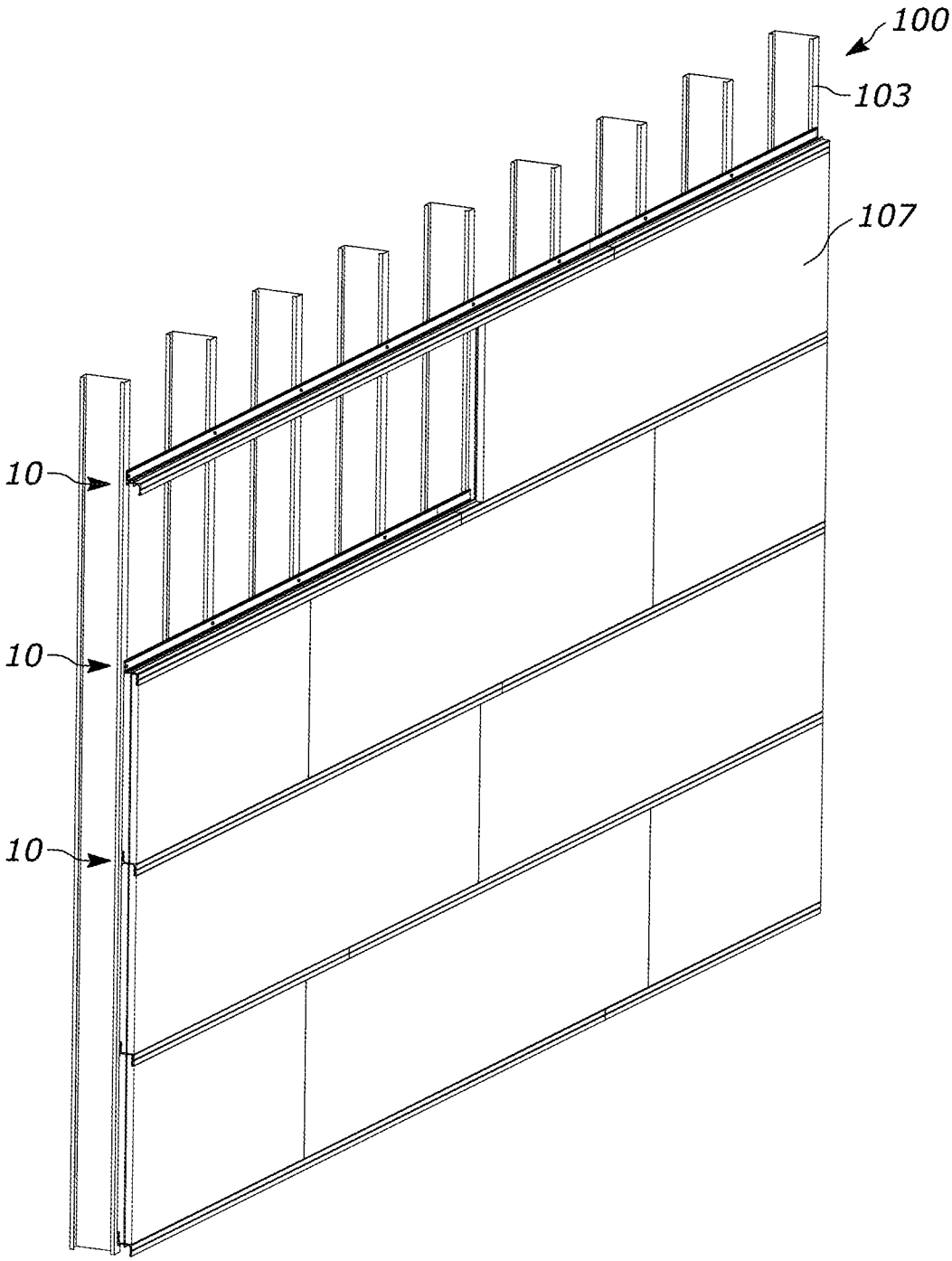

FIGURE 2

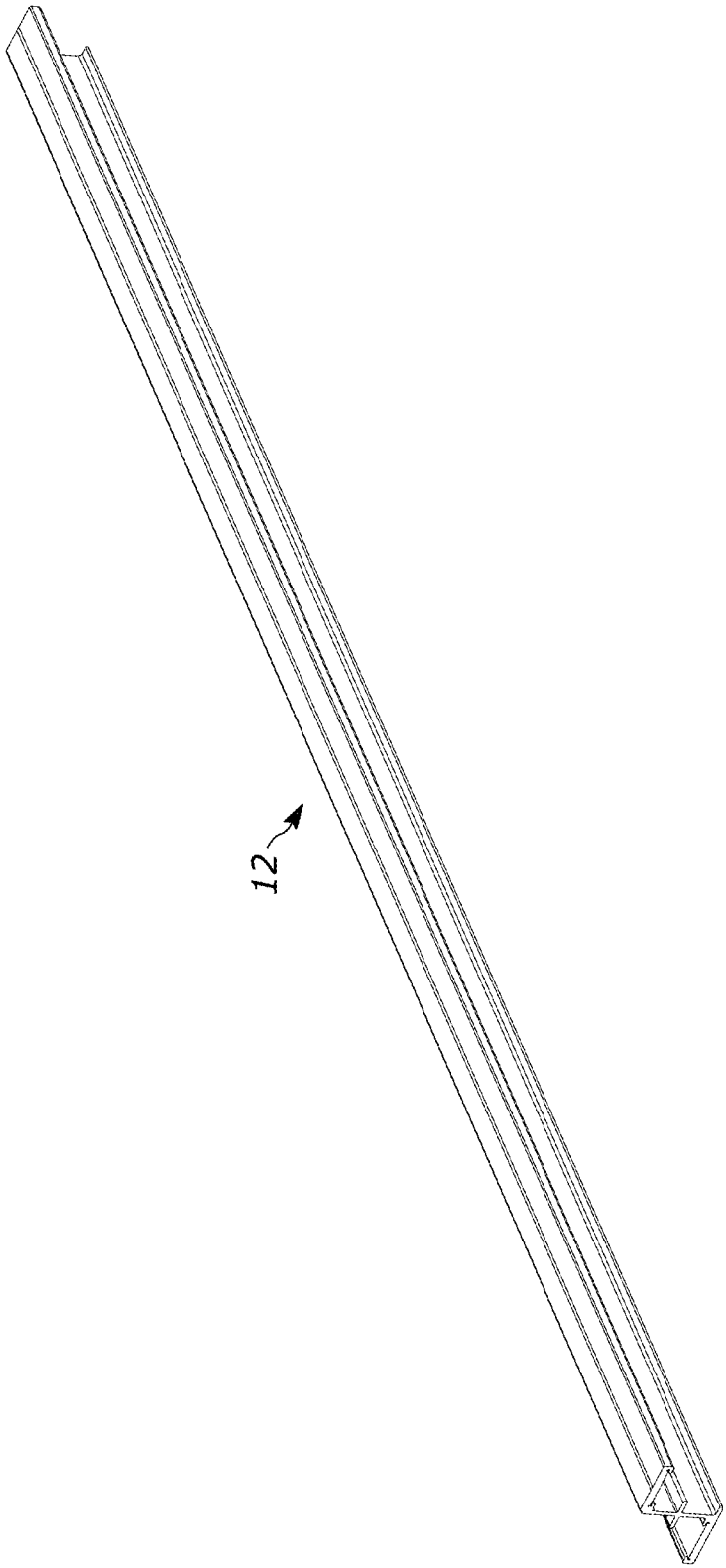

FIGURE 3

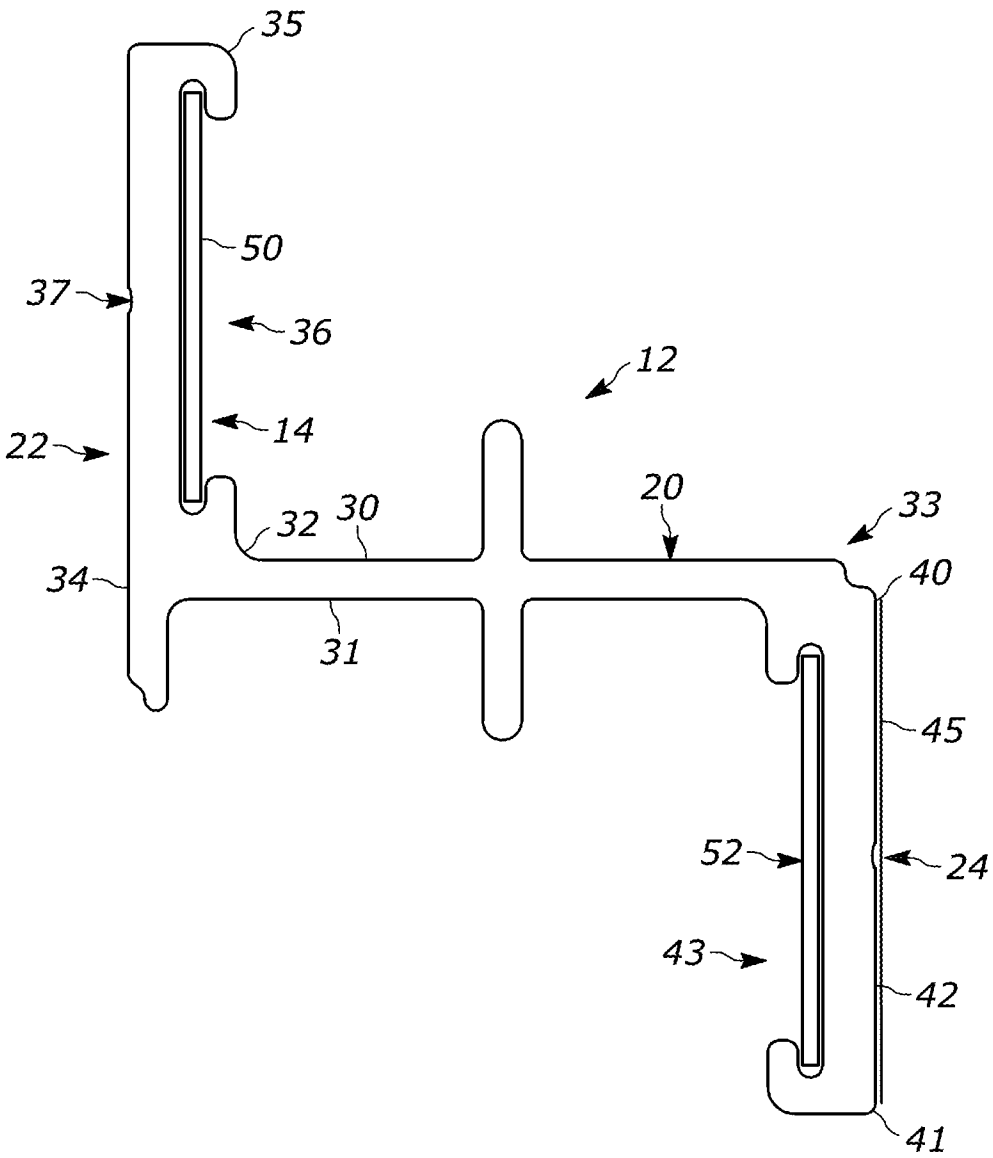

FIGURE 4

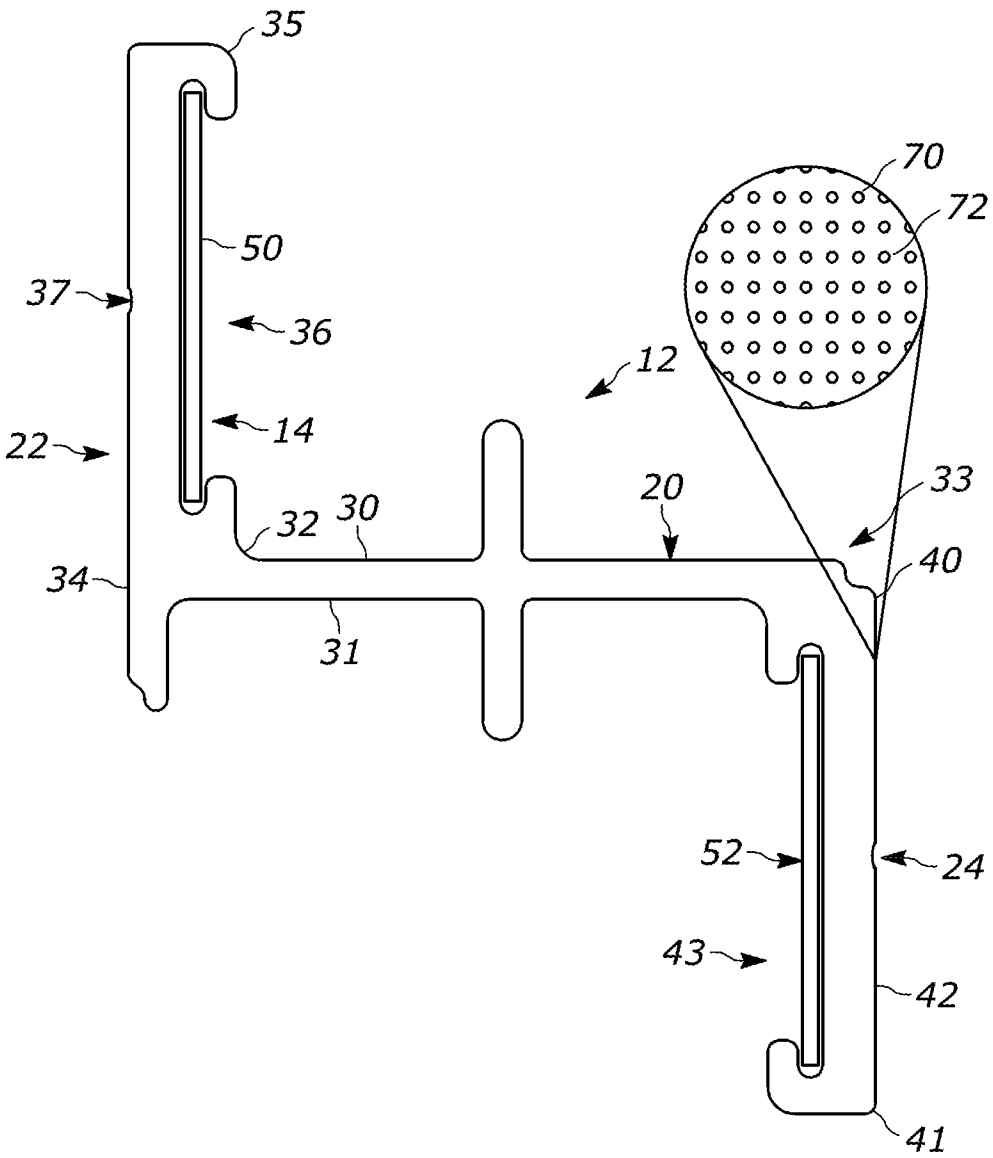

FIGURE 5

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US 2022/012590

A. CLASSIFICATION OF SUBJECT MATTER

(see extra sheet)

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

E04B 1/00, 1/38, 1/41, 1/61, 1/76, 1/78, 1/80, 1/94, 2/00, 2/74, 2/92, 2/96, E04C 2/30, E04F 13/072, 13/07, 13/09, 13/21, 13/26, C09D 5/18

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

PatSearch (RUPTO internal), USPTO, PAJ, K-PION, Esp@cenet, Information Retrieval System of FIPS

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 2020/0284043 A1 (ADVANCED ARCHITECTURAL PRODUCTS LLC) 10.09.2020	1-34
A	US 3553915 A (MODULEX INC) 12.01.1971	1-34
A	KR20200099244 A (SEWONKOREA CO LTD) 24.08.2020	1-34
A	US 2012/0198784 A1 (FIRELINE 520 LLC) 09.08.2012	1-34
A	RU 2580132 C2 (ZABEGAEV VLADIMIR IVANOVICH) 10.04.2016	1-34

☐ Further documents are listed in the continuation of Box C.

☐ See patent family annex.

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"D" document cited by the applicant in the international application

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
08 April 2022 (08.04.2022)	12 May 2022 (12.05.2022)
Name and mailing address of the ISA/RU: Federal Institute of Industrial Property, Berezhkovskaya nab., 30-1, Moscow, G-59, GSP-3, Russia, 125993 Facsimile No: (8-495) 531-63-18, (8-499) 243-33-37	Authorized officer E. Tsymbal Telephone No. 499-240-60-15

E04B 1/76 *(2006.01)*
E04B 1/94 *(2006.01)*
E04C 2/30 *(2006.01)*
E04F 13/09 *(2006.01)*
E04F 13/26 *(2006.01)*
E04B 1/94 (2006.01)