

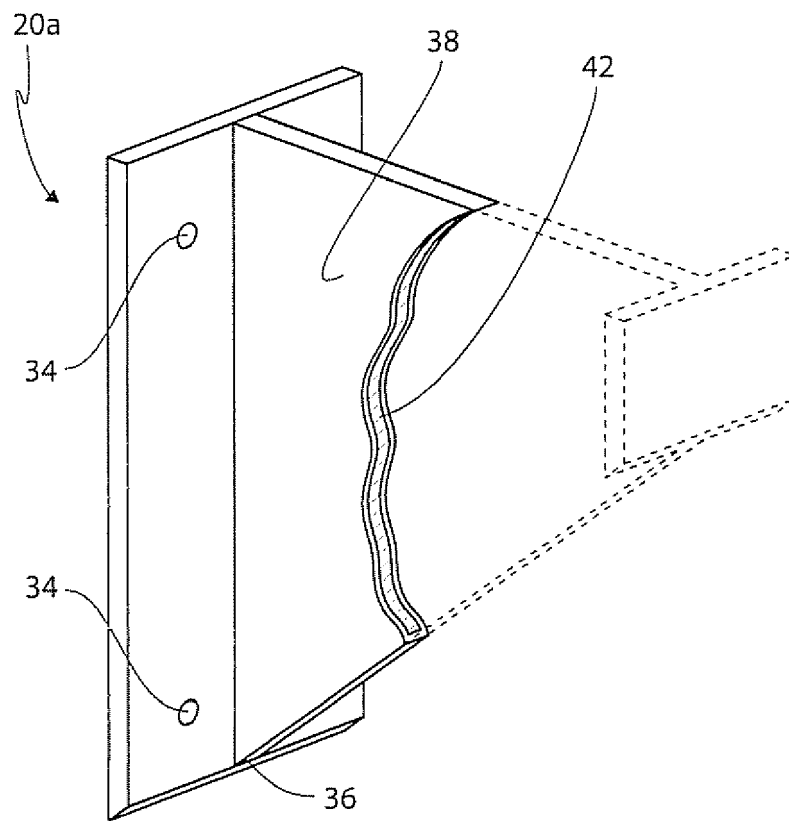


FIG. 3

Description

[0001] The present invention relates to a profiled element for supporting a frame, a method of supporting a frame and a building structure.

[0002] Buildings which are intended to be occupied by humans typically have an indoor temperature of about 15°C - 22 °C. In countries having a colder climate, such as the countries in northern Europe and North America, a significant portion of the total energy consumed by a typical building is used for heating the building, i.e. keeping the indoor environment in the above-mentioned temperature range. In recent years, the increasing energy prices have resulted in a need for energy efficient building methods both when constructing new buildings as well as when renovating existing buildings. Such energy efficient building methods typically involve reducing the amount of heat escaping from the building via the walls, windows, doors, roofs etc. Since the heating for buildings is very often obtained by the burning of fossil fuel or similar non-renewable energy sources, a reduction of the heating loss will, apart from reducing the operating cost of the building, also reduce the negative impact on the environment caused by the emission of CO₂.

[0003] Typically, a modern building structure which is constructed according to an energy efficient building method has a wall structure which is made up of an inner load-bearing structure made of e.g. wood, steel, concrete or other similar rigid and durable material. Load-bearing materials typically have low thermal insulation properties, i.e. high heat conducting properties. Thus, any load-bearing material which is located directly in-between a cold outdoor environment and a warm indoor environment so that a temperature gradient is established through the load-bearing material will contribute to conduct heat energy from the warm environment to the cold environment and thus result in increased energy used for heating, i.e. increased heating costs. Thus, in order to reduce the amount of energy conducted through e.g. an exterior wall of a building, the inner load-bearing structure is covered by an outer insulating structure made of e.g. mineral wool, foam or other similar insulating materials. Insulating materials have a low thermal conductivity and are thereby capable of defining a thermal gradient between a cold environment and a warm environment, i.e. between the inner and outer surfaces of the insulating structure. In other words, the insulating bearing material will prevent heat energy from being conducted from the warm environment to the cold environment. However, insulating materials are typically flexible and non-rigid and therefore typically non-load-bearing. The outer insulating structure is in turn covered by a facade of a substantially rigid material for protecting the insulating material from wind, rain and dust etc.

[0004] In all such buildings as described above, openings exist in the wall structure for allowing air, light, goods and people to enter and exit the building. Such openings may be covered by windows, panels and/or doors. Most

modern windows, e.g. 3 pane windows, and modern doors, such as security doors, have excellent thermal insulation capabilities. The insulation capability of windows and doors may in many cases be comparably to the insulation capability of the insulating structure of the wall.

[0005] The windows and doors are typically provided in frames which are mounted within the opening of the wall structure. However, in order to not compromise the insulation properties of the wall structure, the windows and doors must be mounted so that the frame is juxtaposing the insulating structure. The frame should not be located adjacent the load-bearing structure since it would result in the load-bearing structure being exposed in the vicinity of the opening. Such exposure of a non-insulating building part, i.e. the load-bearing structure, to the environment outside of the building is known as a thermal bridge since it will allow heat from the inside environment of the building to quickly escape to the outside environment of the building bypassing the insulating structure.

[0006] In the present context, it is well known in the art that even the slightest penetration by a heat conductive material through the insulating structure of the wall will result in large negative energy performance, i.e. a significant loss of heat energy resulting in increased operating costs of the building due to heating. Further, the existence of a thermal bridge will have an even worse effect on the total energy efficiency of the building structure if the insulating structure of the wall structure is very energy efficient. In other words, an improvement of the insulation capacities of the insulating structure, e.g. by adding more insulation to an already insulated wall structure, may result in a very small or even nonexistent reduction of the heating energy required by the building due to the existence of one or more thermal bridges. Thus, the frame of the window or door must not be located adjacent the load-bearing structure.

[0007] While it is crucial for the energy efficiency of the wall structure to mount the frame of the window or door within the opening of the wall structure at a location adjacent the insulating structure of the wall structure, it is not feasible to fix the frame onto the insulating structure since the insulating structure is typically non-rigid and therefore not load-bearing. Any frame which is fixed to the insulating structure will not be capable of supporting its own weight and thus the window or door will fall out of the opening. In order to both satisfy the thermal insulation requirement and avoid a thermal bridge, while at the same time allowing the frame to be properly supported and capable of holding its own weight, the frame must be fixed onto the load-bearing structure of the building structure while still being juxtaposing the insulating structure of the building structure. This calls for the use of support members which extend between the load-bearing structure and the insulating structure.

[0008] In the prior art, elements such as beams or the like are used for holding the window at an outwardly oriented position while still being fastened at the load-bearing

ing wall.

[0009] US 6,941,699 discloses a structural support for windows. The structure includes horizontal beams 46 for supporting the window and allowing the window to be moved outwardly.

[0010] US 4,850,168 discloses a frame assembly for windows etc. The frame assembly has an insulating core, however, it does not allow the window to be positioned in an outwardly oriented position.

[0011] US 6,922,958 discloses a window unit which does extend outwardly, however, the window unit is fastened by nails or screws to the outer surface of the wall.

[0012] US 6,182,405 discloses a window frame structure for a wall. The wall has an inner supporting wall structure and an outer non-supporting wall structure and the window frame is fastened directly onto the inner wall structure.

[0013] US 2003/0041537 discloses a window and wall assembly. The window frame is mounted on the exterior side of the exterior wall. The window is fastened by screws.

[0014] US 6,293,049 discloses a method for installing a window assembly. The window assembly is located at a junction between an inner wall and an outer wall.

[0015] EP 2096248, EP 1806469 and DK 176245 disclose a window structure with a mounting bracket for connecting the frame of the window to the wall opening. The bracket is made of metal.

[0016] WO 2006/004560 discloses a window frame. The window frame has an L shaped profile abutting against an insulation.

[0017] US 4,958,469 discloses a window flange. The flange seals between the wall and the frame of the window.

[0018] DE 20 2010 009 994 U1 discloses a connection profile element of thermoplastic material. The element is attached to a wall and has an L shape, however, the window is inwardly oriented.

[0019] DE 20 2008 004 201 U1 discloses a window sill.

[0020] DE 20 2009 016 152 U1 discloses a window bracket to be mounted in an opening in a wall. The frame is intended to position the window in an outwardly orientation.

[0021] The above-mentioned publications are hereby incorporated in the present description by reference.

[0022] In summary, metal seems to be the most commonly used material for the purpose of supporting window frames and door frames at an outwardly oriented position adjacent the insulating structure while still allowing the frame to be fastened to the load-bearing structure of the wall structure. However, all metals, such as aluminium and steel, have a high thermal conductivity and thus any use of metal within the insulating structure of a wall structure will establish a thermal bridge between the warm environment within the building structure and the cold environment outside the building structure.

[0023] Therefore, it is an object according to the present invention to provide an element and correspond-

ing methods for supporting a frame relative to an opening of a wall structure while avoiding the occurrence of a thermal bridge.

[0024] An advantage according to the present invention is that the absorbance of moisture by the element is avoided.

[0025] The above object, the above need and the above advantage together with numerous other objects, advantages and needs which will be evident from the below detailed description of the present invention are according to a first aspect of the present invention obtained by a profiled element for supporting a frame relative to an opening of a wall structure, said wall structure comprising:

a load-bearing structure defining an inwardly facing surface and an outwardly facing surface, and, an insulating structure defining an inner surface and an outer surface, said inner surface of said insulating structure covering said outwardly facing surface of said load-bearing structure, said insulating structure, defining a temperature gradient along a transverse direction extending between said inner surface and said outer surface, said opening of said wall structure extending between said inwardly facing surface of said load-bearing structure and said outer surface of said insulating structure,

said profiled element being made of an insulating polymeric material, said profiled element comprising:

a first flange adapted to be mounted to said outwardly facing surface of said load-bearing structure concealed behind said insulating structure and preferably below said opening, an interconnecting member connected to said first flange and extending a specific distance from first flange, said interconnecting member being concealed within said insulating structure, a second flange connected to said interconnecting member opposite said first flange, said second flange being exposed relative to said insulating structure and defining a support area for supporting said frame within said opening of said wall structure at a specific position along said transverse direction between said inner surface and said outer surface of said insulating structure.

[0026] The profiled element preferably has a shape resembling an I-beam. The profiled element is capable of supporting a frame. The frame is typically a rectangular structure capable of supporting its own weight and the weight of a panel or window pane enclosed within the frame. The frame is located within an opening of a wall structure. The opening extends completely through the wall structure.

[0027] The wall structure comprises the load-bearing

structure and the insulating structure. The inwardly facing surface of the wall structure is intended to face the interior of the building. Since the interior of the building is typically heated, the inner wall of the load-bearing structure faces a warm environment. The outwardly facing surface of the load-bearing structure faces the inner surface of the insulating structure and is thus also located within the warm environment. Thus no temperature gradient exists between the inwardly facing surface and the outwardly facing surface of the load-bearing structure. A small spacing in-between the outwardly facing surface of the load-bearing structure and the inner surface of the insulating structure may exist for allowing ventilation. Typically, a temperature gradient is present in the transverse direction between the inner surface and the outer surface of the insulating structure. The inner surface of the insulating structure, thereby defines the boundary of the warm environment, and the outer surface of the insulating structure thereby defines the boundary of the cold environment.

[0028] The profiled element is made of an insulating polymeric material which is substantially rigid and which is capable of supporting the total weight of the frame including any panels or window panes. By using polymeric materials instead of metals, no thermal bridge is created between the inner surface and the outer surface of the insulating structure. Polymeric materials have a significantly lower thermal conductivity than metal. Further, polymeric materials have, in contrast to wood, the advantage that they do not absorb any moisture. The absorbance of moisture into a wooden element will weaken the element and result in an increased risk of material degradation caused by decomposition and fungi. Further, the more insulation that is used in the insulating structure, the greater is the risk of moisture formation. Further, the moisture within the wooden element may contaminate the insulation structure.

[0029] Typically, two profiled elements are used for supporting one frame, however in some cases three, four or even more profiled elements are used for supporting one frame, depending on the structural stability of the frame. The profiled element comprises a first flange which is firmly mounted onto the outwardly facing surface of the load-bearing structure. The first flange may be fixed by e.g. bolts or screws to the load-bearing structure. The interconnecting member is connected to the first flange and extends in a direction away from the first flange and the outwardly facing surface. The interconnecting member is dimensioned to extend into the insulating structure to a position in-between the inner surface and the outer surface of the insulating structure.

[0030] The interconnecting member is thus intended to be concealed within the insulating structure so that it is at least partially invisible when the insulating structure covers the load-bearing structure and cannot be accessed at the opening without removing the insulating structure. The second flange is connected to the interconnecting member at a location opposite the first flange,

i.e. the first flange and the second flange are not directly connected. The second flange defines the support area which is indented to hold the frame. The frame may be loosely positioned on the support area or alternatively fixed by bolts, screws etc. The profiled element is dimensioned so that the support area is located between the inner surface and the outer surface of the insulating structure. The second flange is exposed relative to the insulating structure meaning that the support area is visible and accessible at the opening when the insulating structure covers the load-bearing structure.

[0031] The first flange, interconnecting member and second flange are typically manufactured in one piece. The support area is thus capable of holding the frame at a position adjacent the insulating structure and thus no thermal bridge will exist through the wall structure between the interior environment of the building and the outside of the building.

[0032] In the present context, insulation is construed to mean thermal insulation. Although the above element primarily concerns the prevention of a thermal bridge between a warm environment inside a building structure and a cold environment outside the building structure, it is contemplated that the same element may be used between a cold environment inside a building structure and a warm environment outside a building structure, e.g. in a temperature controlled building in a country having tropical heat.

[0033] According to a further embodiment of the first aspect, said interconnecting member and/or second flange is partially hollow or foam-filled for reducing the thermal conductivity of the second flange. Although polymeric materials typically have a very low thermal conductivity, the thermal conductivity may be even further reduced by making the interconnecting member and/or second flange partially hollow or foam-filled. The foam may be generated either by foaming of the polymeric material itself, e.g. by including a foam generator when producing the profiled element, or a piece of foam or hollow material may be included in the polymeric material. In order not to compromise the structural stability of the profiled element, the hollow or foam-filled portions of the interconnecting member are preferably located in the core of the interconnecting member.

[0034] According to a further embodiment of the first aspect, said profiled element is made of fibre reinforced composite material. Fibre reinforced composite material includes a mixture of polymeric material and high strength fibres. In this way the structural strength of the profiled element may be increased compared to using polymeric materials only.

[0035] According to a further embodiment of the first aspect, said profiled element is manufactured by using the pultrusion technology. By using the pultrusion technology, high strength fibre reinforced composite elements may be produced in a simple and efficient way. Pultrusion is a technique in which a fibre bundle is pulled through a die together with polymeric material preferably

in the form of a curable resin.

[0036] According to a further embodiment of the first aspect, said fibre reinforced composite material includes impregnation material being either polyurethane (PUR), polyisocyanurat (PIR) or epoxy. The above are examples of curable resins which may be used as the polymeric material.

[0037] According to a further embodiment of the first aspect, said fibre reinforced composite material includes reinforced fibres being either glass fibres, aramid fibres, natural fibres or thermoplastic fibres. The above are examples of high strength reinforcing fibres which may be used to increase the structural strength of the profiled element.

[0038] According to a further embodiment of the first aspect, said reinforced fibres are provided in the form of a woven or non-woven web. The web structure is preferably oriented in a direction which substantially coincides with the force which the profiled element is to be supporting between the support surface and the outwardly facing surface of the load-bearing structure.

[0039] According to a further embodiment of the first aspect, said structural element defines an overall heat transfer coefficient U between said second flange and said first flange of no more than $0.5 \text{ Wm}^{-2}\cdot\text{K}^{-1}$, preferably no more than $0.25 \text{ Wm}^{-2}\cdot\text{K}^{-1}$, more preferably no more than $0.15 \text{ Wm}^{-2}\cdot\text{K}^{-1}$, most preferably no more than $0.10 \text{ Wm}^{-2}\cdot\text{K}^{-1}$. The above are typical preferred values of the thermal conductivity of the profiled element for avoiding any thermal bridge and when using suitable polymeric materials.

[0040] According to a further embodiment of the first aspect, said interconnecting member has a tapered configuration from said first flange towards said second flange. A tapered configuration of the interconnecting member is preferred in order to translate the vertical load force from the frame onto the load-bearing structure which is positioned at a horizontally translated position rotative to the frame. Further, the tapered configuration reduces the torque force onto the load-bearing structure. Yet further, the tapered configuration reduces the total amount of materials needed for the interconnecting member.

[0041] According to a further embodiment of the first aspect, said specific distance between said first flange and said support area of said second flange is between 10mm and 1000mm, preferably between 50mm and 500mm, more preferably between 100mm and 200mm or 200mm and 300mm such as about 160 mm or about 240 mm. The above values correspond to the typical thickness of the insulation structure used in modern buildings.

[0042] The above, object, the above need and the above advantage together with numerous other objects, advantages and needs which will be evident from the below detailed description of the present invention are according to a second aspect of the present invention obtained by a method of supporting a frame relative to

an opening of a wall structure, said wall structure comprising;

a load-bearing structure defining an inwardly facing surface and an outwardly facing surface, and, an insulating structure defining an inner surface and an outer surface, said inner surface of said insulating structure covering said outwardly facing surface of said load-bearing structure, said insulating structure defining a temperature gradient along a transverse direction between said inner surface and said outer surface,

said opening of said wall structure extending between said inwardly facing surface of said load-bearing structure and said outer surface of said insulating structure, said method comprising the steps of:

providing a profiled element made of an insulating polymeric material, said profiled element comprising a first flange, an interconnecting member connected to said first flange and extending a specific distance from said first flange, and a second flange connected to said interconnecting member opposite said first flange and defining a support area, mounting said first flange onto said outwardly facing surface of said load-bearing structure concealed behind said insulating structure and preferably below said opening, and supporting said frame within said opening of said wall structure by said support surface of said second flange at a specific position along said transverse direction between said inner surface and said outer surface of said insulating structure, said interconnecting member being concealed within said insulating structure and said second flange being exposed in relation to said insulating structure.

[0043] It is evident that the method according to the second aspect of the present invention may be used together with the profiled element according to the first aspect of the present invention.

[0044] The above object, the above need and the above advantage together with numerous other objects, advantages and needs which will be evident from the below detailed description of the present invention are according to a third aspect of the present invention obtained by a building structure comprising a wall structure, said wall structure defining an opening and comprising:

a load-bearing structure defining an inwardly facing surface and an outwardly facing surface, an insulating structure defining an inner surface and an outer surface, said inner surface of said insulating structure covering said outwardly facing surface of said load-bearing structure, said insulating structure defining a temperature gradient along a transverse direction between said inner surface and said outer

surface, said opening of said wall structure extending between said inwardly facing surface of said load-bearing structure and said outer surface of said insulating structure,

a profiled element being made of an insulating polymeric material, said profiled element comprising a first flange being mounted to said outwardly facing surface of said load-bearing structure concealed behind said insulating structure and preferably below said opening, an interconnecting member connected to said first flange, concealed within said insulating structure and extending a specific distance from said first flange, and a second flange connected to said interconnecting member opposite said first flange, said second flange being exposed relative to said insulating structure and defining a support area, and a frame being supported within said opening of said wall structure by said support surface of said second flange at a specific position along said transversal direction between said inner surface and said outer surface of said insulating structure.

[0045] It is evident that the building structure according to the third aspect of the present invention may be constructed by using the method according to the second aspect of the present invention together with the profiled element according to the first aspect of the present invention. The building structure may be any building which is intended for human habitation.

[0046] According to a further embodiment of the third aspect, said frame being a window frame or a door frame, said frame preferably including a glazing sheet or a panel. The panel/glazing sheets are preferably insulated. More preferably, multiple panels and/or glazing sheets are used with insulating material/vacuum in-between each of the panels/sheets.

[0047] According to a further embodiment of the third aspect, said frame defines a top edge, a bottom edge and two oppositely located side edges, and wherein said support surface of said second flange is supporting said frame at said bottom edge and/or at said top edge and/or at said side edges. Typically, the frame is supported at the bottom edge onto which the gravity force is acting. However, in order to stabilize the frame and hold it in a securely fixed position, the frame may also be fastened at its side edges or top edge. Alternatively, the side or top edges may also be held by significantly smaller and non-load-bearing brackets or supports, preferably made of polymeric material. Nevertheless, it is also feasible to support the frame at its side and/or top edges only using the profiled elements according to the present invention.

[0048] According to a further embodiment of the third aspect, said first flange or said profiled element is mounted by and/or screws onto the outer surface of the load-bearing structure. In this way the profiled element may be securely fastened onto the load-bearing structure.

Brief description of the drawings

[0049]

Fig 1 shows a perspective view of a wall structure according to the present invention

Fig 2 shows a perspective view of a profiled element according to the present invention

Fig 3 shows a perspective view of a profiled element having a foam filled core according to the present invention,

Detailed description of the drawings

[0050] Fig 1A shows a perspective view of a wall structure 10 according to the present invention. The wall structure 10 forms of a building structure (not shown in its entirety). The building structure is intended to be occupied by humans and may be e.g. a house or similar building used for residential purposes, industrial purposes, commercial purposes etc. The wall structure 10 includes a load-bearing structure 12. The load-bearing structure 12 and the wall structure 10 define an opening 14. The load-bearing structure 12 further defines an outwardly facing surface 16 intended to face the outside environment of the building and an inwardly facing surface 18 intended to face the inside environment of the building. The load-bearing structure 12 may be divided into a bottom load-bearing structure part 12a, a top load-bearing structure part 12c and two oppositely located side load-bearing structure parts 12b, 12d.

[0051] The load-bearing structure 12 is typically made of substantially non-insulating but rigid materials such as concrete, brick, wood, metal, or fibre reinforced composite material. The load-bearing structure 12 is directly or indirectly in contact with the ground (not shown) e.g. by being fixed to a foundation (not shown) or to an underlying floor (not shown) of the building structure. The wall structure, 10 may carry a roof (not shown) or any overlying floors (not shown) of the building structure. A multitude of wall structures 10, such as e.g. four wall structures forming a block structure, together with a roof (not shown) and a floor (not shown) may make up one level of the building structure. The building structure may be a single level or multi level building structure.

[0052] Fig 1B shows a perspective view of a wall structure 10' according to the present invention. The wall structure 10' further comprises three profiled elements 20 located below the opening 14 of the wall structure 10'. The profiled elements 20 are securely mounted onto the outwardly facing surface 16 of the bottom load-bearing structure 12a and extend a specific distance in an outwardly direction from the outwardly facing surface 16 of the load-bearing structure 12. The profiled elements 20, which will be explained in more detail below, are made of fibre reinforced material.

[0053] Fig 1C shows a perspective view of a wall structure 10'' according to the present invention. The wall

structure 10" further comprises a frame 22 being supported by the three profiled elements 20. The number of profiled elements may vary, e.g. two, three, four or more, depending on the width of the opening 14 and the properties, e.g. weight and structural stability, of the frame 22. The frame 22 is located outside the outwardly facing surface 16 of the load-bearing structure 12 and surrounds the opening of the load-bearing structure 12.

[0054] The frame 22 includes a window 24. The window 24 may be openable, i.e. movable in relation to the frame by means of hinges (not shown) for allowing light and air to enter the building. Alternatively, the window 24 may be non-openable. The frame 22 may alternatively include other covering structures such as a door for allowing persons and goods to enter the building or a panel such as a glass panel for a glass facade. The frame 22 may optionally be fastened by screws onto the profiled elements 20 in order to fix the frame 22 to the load-bearing structure 12. Preferably, the frame 22 is fixed to the side and top load-bearing structure parts 12b-d by means of either further profiled elements (not shown) or by brackets (not shown) which may be structurally weaker than the profiled element and constitute non-load-bearing brackets, i.e. not capable of supporting the entire frame 22 but merely serving to stabilize the frame 22 in a sideways or lateral direction.

[0055] Fig 1D shows a perspective view of a wall structure 10" according to the present invention. The wall structure 10" further comprises an insulating structure 26 covering the outwardly facing surface 16 of the load-bearing structure 12. The insulating structure 26 is made of insulating and substantially non-load-bearing materials such as Rockwool or foam. The insulating structure defines an inner surface 28 juxtaposing the outwardly facing surface 16 of the load-bearing structure 12. A small gap may be provided between the outwardly facing surface 16 of the load-bearing structure 12 and the inner surface 28 of the insulating structure to allow for ventilation. The insulating structure 26 further defines an outer surface 30. The outer surface 30 is typically covered by a substantially rigid facade made of brick, concrete etc. which will protect the insulating structures from rain, dust, fire etc.

[0056] In order to avoid a thermal bridge between the outside of the wall structure 10" and the load-bearing structure 12 at the opening 14, the frame 22 is located between the inner surface 28 and the outer surface 30 of the insulating structure 26. In this way, the frame is located adjacent the insulating structure 26 and there is no direct connection between the outside of the wall structure 10" and the load-bearing structure 12. Modern windows, doors and glass panels have very good insulation properties due to the use of two or three pane windows and insulated doors. The weight of the frame 22, which may range from of several kilograms up to few hundred, kilograms for a large glass facade, cannot be supported by the insulating structure 26 and is thus supported by the profiled element 20 which in turn is sup-

ported by the load-bearing structure 12 of the wall structure 10". The profiled element 20 extends between the inner surface 28 and the outer surface 30 of the insulating structure 26 and may thus potentially cause a thermal bridge, however, being made of composite fibre reinforced materials it will have a low thermal conductivity in comparison with other rigid materials e.g. metal or concrete. Further, due to the high structural capabilities of composite fibre reinforced material, the profiled element 20 can be made thin thus reducing the effective heat conductive surface. Yet further, the composite fibre reinforced material is non-organic and thus not affected by decomposition and fungus like wood.

[0057] Fig 2A shows a front cut-out view of a profiled element 20 according to the present invention. The profiled element 20 is preferably manufactured according to the pultrusion technique. The profiled element 20 comprises a first flange 32 defining a substantially flat rectangular surface having a height A to A' of about 280mm and a width B to B' of about 120mm. The first flange 32 has four holes 34 each located about 30mm from a longitudinal edge and 40mm from a transverse edge of the first flange 32. The holes 34 are used for fastening the first flange 32 and thereby the profiled element 20 onto the outward surface of the load-bearing structure. The first flange 32 further a slope 36 at the lower edge near A' of the first flange 32.

[0058] Fig 2B shows a side view of a profiled element 20 according to the present invention. The profiled element 20 further comprises an interconnecting member 38 extending outwardly from the first flange 32 perpendicular to the flat rectangular surface of the first flange 32. The interconnecting member 38 defines a slope between reference numerals 36 and 36' at the lower edge of the interconnecting member 38. The interconnecting member thus defines a tapered configuration in order to optimise the amount of materials used versus the structural stability of the profiled element 20. The length of the interconnecting member 38 depends on the thickness of the insulation structure and typically ranges from 10mm to 1000mm, typically between 50mm and 500mm, more typically between 100mm and 200mm or 200mm and 300mm. The presently preferred embodiments are 160 mm and 240 mm. The thickness of the interconnecting member 38 should be chosen depending on the structural requirement of the profiled element 20, however, typically a thickness between a few mm up to a few cm is used.

[0059] The profiled element 20 further comprises a second flange 40 connected to the interconnecting member and located opposite the first flange 32. The second flange defines a substantially flat rectangular surface having a height of about 60mm and a width of about 120mm. The second flange further defines a slope 36' at the lower edge of the second flange 40.

[0060] Fig 2C shows a perspective view of a profiled element 20 according to the present invention. The profiled element 20 may e.g. be produced by first making a

pultruded I-beam and then making a non-perpendicular cut across the I-beam.

[0061] Fig 3 shows a perspective view of a profiled element 20a according to the present invention. In order to achieve improved insulation capabilities, the interconnecting member 38 may include a foamed core 42 in-between the fibre reinforced material. The foamed core 42 may consist of e.g. polymeric foam having high insulation capabilities. The interconnecting member 38 thus forms a sandwich structure having both high structural strength and high insulation capabilities.

List of parts with reference to the figures

[0062]

- 10. Wall structure
- 12. Load-bearing structure
- 14. Opening
- 16. Outwardly facing surface
- 18. Inwardly facing surface
- 20. Profiled element
- 22. Frame
- 24. Window
- 26. Insulating structure
- 28. Inner surface
- 30. Outer surface
- 32. First flange
- 34. Hole
- 36. Slope
- 38. Interconnecting member
- 40. Second flange
- 42. Foamed core

Claims

1. A profiled element for supporting a frame relative to an opening of a wall structure, said wall structure comprising:

a load-bearing structure defining an inwardly facing surface and an outwardly facing surface, and,
an insulating structure defining an inner surface and an outer surface, said inner surface of said insulating structure covering said outwardly facing surface of said load-bearing structure, said insulating structure defining a temperature gradient along a transverse direction extending between said inner surface and said outer surface, said opening of said wall structure extending between said inwardly facing surface of said load-bearing structure and said outer surface of said insulating structure,

said profiled element being made of an insulating polymeric material, said profiled element compris-

ing:

a first flange adapted to be mounted to said outwardly facing surface of said load-bearing structure concealed behind said insulating structure and preferably below said opening,
an interconnecting member connected to said first flange and extending a specific distance from said first flange, said interconnecting member being concealed within said insulating structure,
a second flange connected to said interconnecting member opposite said first flange, said second flange being exposed relative to said insulating structure and defining a support area for supporting said frame within said opening of said wall structure at a specific position along said transverse direction between said inner surface and said outer surface of said insulating structure.

2. The profiled element according to claim 1, wherein said interconnecting member and/or second flange is partially hollow or foam filled for reducing the thermal conductivity of the second flange.

3. The profiled element according to any of the preceding claims, wherein said profiled element is made of fibre reinforced composite material.

4. The profiled element according to claim 3, wherein said profiled element is manufactured by using the pultrusion technology.

5. The profiled element according to any of the claims 3-4, wherein said fibre reinforced composite material includes impregnation material being either polyurethane (PUR), polyisocyanurate (PIR) or epoxy.

6. The profiled element according to any of the claims 3-5, wherein said fibre reinforced composite material includes reinforced fibres being either glass fibres, aramid fibres, natural fibres or thermoplastic fibres.

7. The profiled element according to claim 6, wherein said reinforced fibres are provided in the form of a woven or non-woven web.

8. The profiled element according to any of the preceding claims, wherein said structural element defines an overall heat transfer coefficient U between said second flange and said first flange of no more than $0.5 \text{ W} \cdot \text{m}^{-2} \cdot \text{K}^{-1}$, preferably no more than $0.25 \text{ W} \cdot \text{m}^{-2} \cdot \text{K}^{-1}$, more preferably no more than $0.15 \text{ W} \cdot \text{m}^{-2} \cdot \text{K}^{-1}$, most preferably no more than $0.10 \text{ W} \cdot \text{m}^{-2} \cdot \text{K}^{-1}$.

9. The profiled element according to any of the preceding

ing claims, wherein said interconnecting member has a tapered configuration from said first flange towards said second flange.

10. The profiled element according to any of the preceding claims, wherein said specific distance between said first flange and said support area of said second flange is between 10mm and 1000mm, preferably between 50mm and 500mm, more preferably between 100mm and 200mm or 200mm and 300mm such as about 160 mm or about 240 mm.

11. A method of supporting a frame relative to an opening of a wall structure, said wall structure comprising:

a load-bearing structure defining an inwardly facing surface and an outwardly facing surface, and,
an insulating structure defining an inner surface and an outer surface, said inner surface of said insulating structure covering said outwardly facing surface of said load-bearing structure, said insulating structure defining a temperature gradient along a transverse direction between said inner surface and said outer surface, said opening of said wall structure extending between said inwardly facing surface of said load-bearing structure and said outer surface of said insulating structure, said method comprising the steps of:

providing a profiled element made of an insulating polymeric material, said profiled element comprising a first flange, an interconnecting member connected to said first flange and extending a specific distance from said first flange, and a second flange connected to said interconnecting member opposite said first flange and defining a support area,
mounting said first flange onto said outwardly facing surface of said load-bearing structure concealed behind said insulating structure and preferably below said opening, and
supporting said frame within said opening of said wall structure by said support surface of said second flange at a specific position along said transverse direction between said inner surface and said outer surface of said insulating structure, said interconnecting member being concealed within said insulating structure and said second flange being exposed in relation to said insulating structure.

12. A building structure comprising a wall structure, said wall structure defining an opening and comprising:

a load-bearing structure defining an inwardly facing surface and an outwardly facing surface, an insulating structure defining an inner surface and an outer surface, said inner surface of said insulating structure covering said outwardly facing surface of said load-bearing structure, said insulating structure defining a temperature gradient along a transverse direction between said inner surface and said outer surface, said opening of said wall structure extending between said inwardly facing surface of said load-bearing structure and said outer surface of said insulating structure,
a profiled element being made of an insulating polymeric material, said profiled element comprising a first flange being mounted to said outwardly facing surface of said load-bearing structure concealed behind said insulating structure and preferably below said opening, an interconnecting member connected to said first flange, concealed within said insulating structure and extending a specific distance from said first flange, and a second flange connected to said interconnecting member opposite first flange, said second flange being exposed to said insulating structure and defining a support area, and a frame supported within said opening of said wall structure by said support surface of said second flange at a specific position along said transverse direction between said inner surface and said outer surface of said insulating structure.

13. The building structure according to claim 12, wherein said frame being a window frame or a door frame, said frame preferably including a glazing sheet or a panel.
14. The building structure according to any of the claims 12-13, wherein said frame defines a top edge, a bottom edge and two oppositely located side edges, and wherein said support surface of said second flange is supporting said frame at said bottom edge and/or at said top edge and/or at said side edges.
15. The building structure according to any of the claims 12-14, wherein said first flange or said profiled element is mounted by bolts and/or screws onto the outer surface of the load-bearing structure.

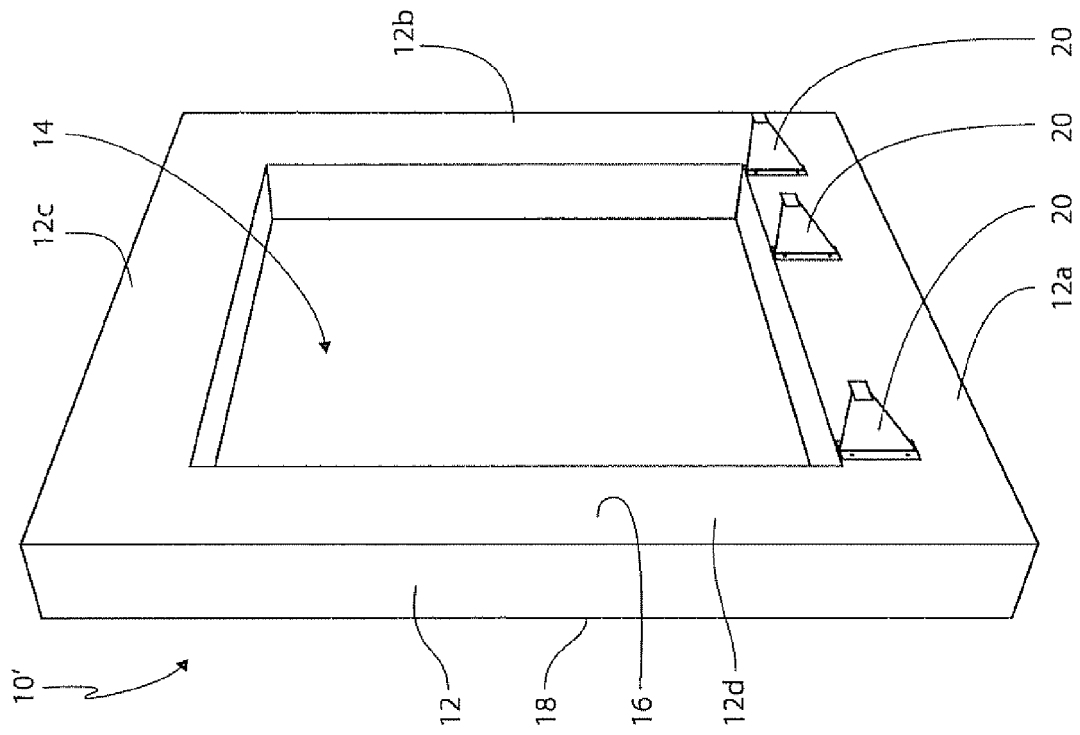


FIG. 1B

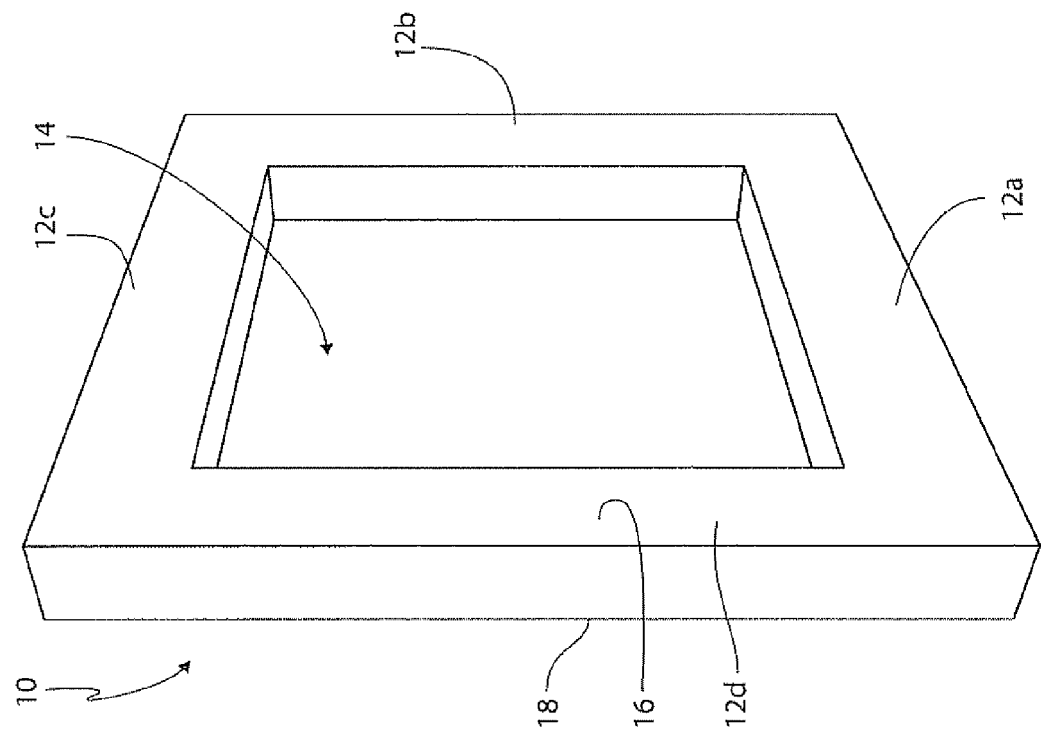
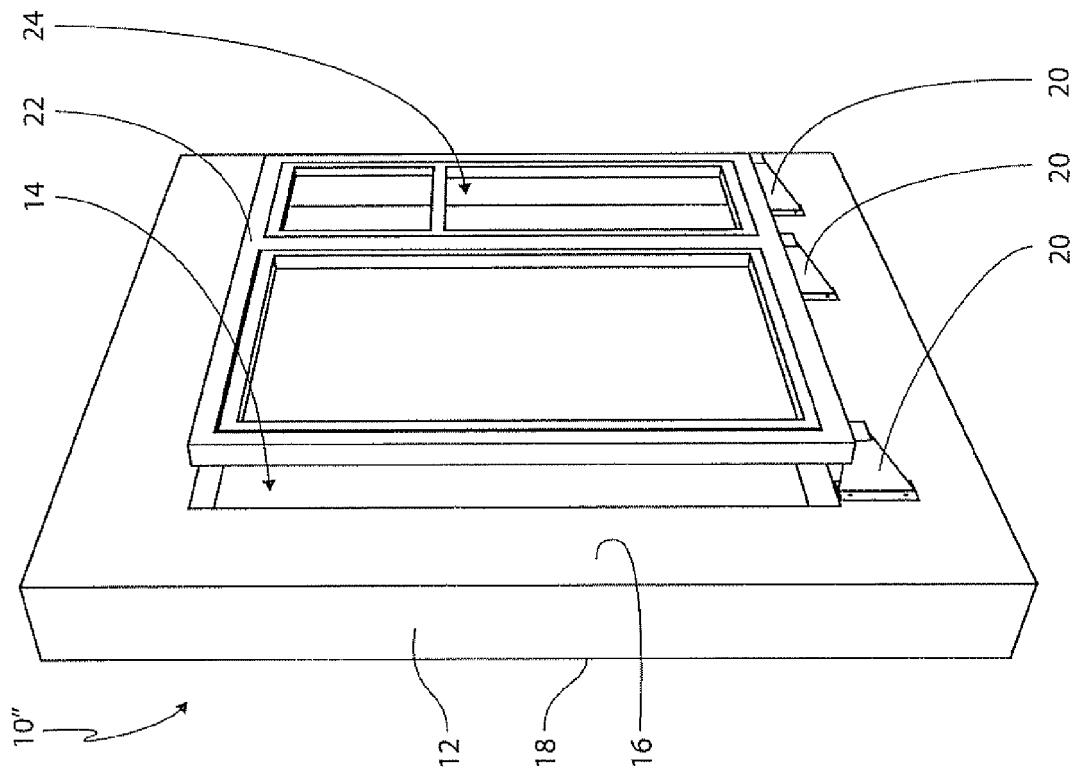
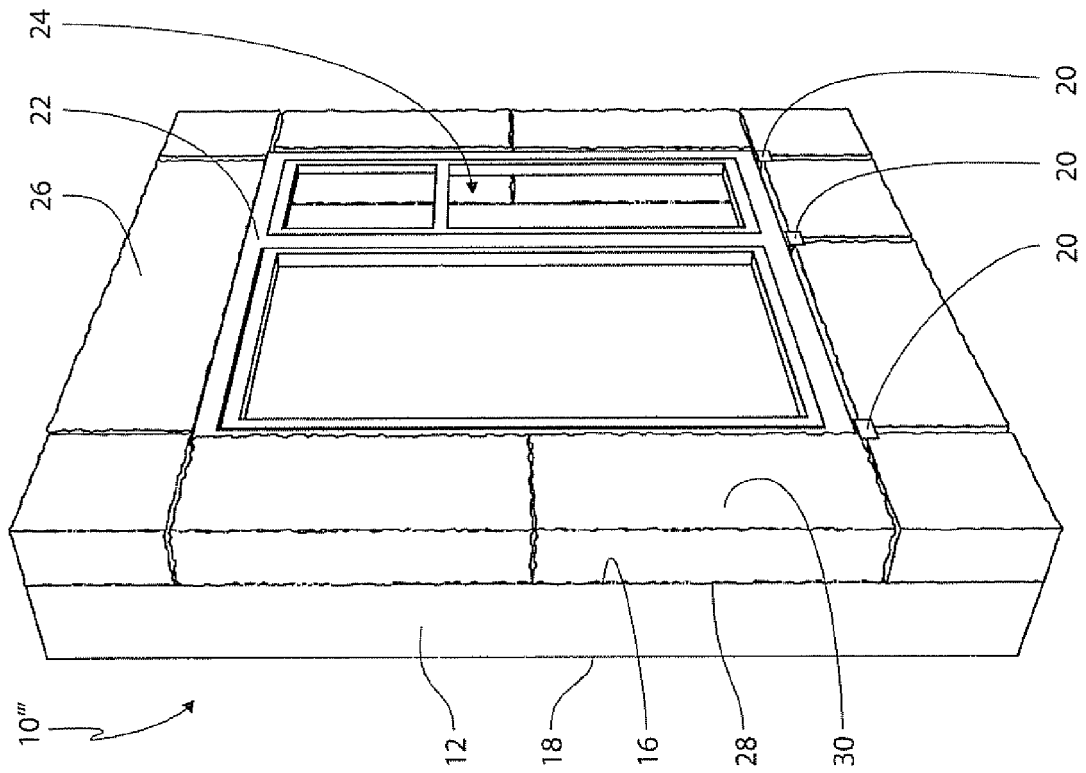


FIG. 1A



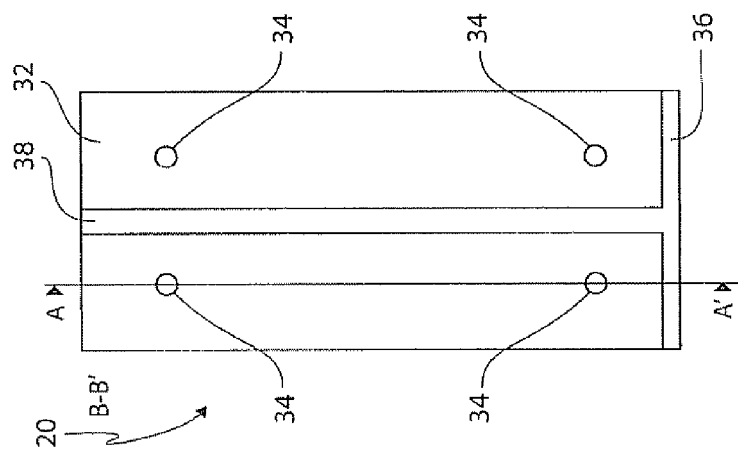


FIG. 2A

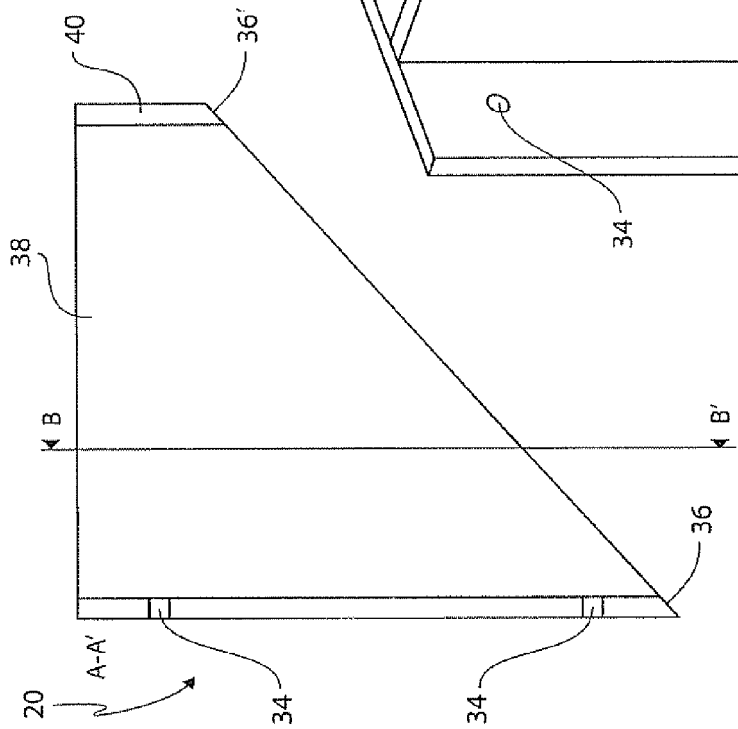


FIG. 2B

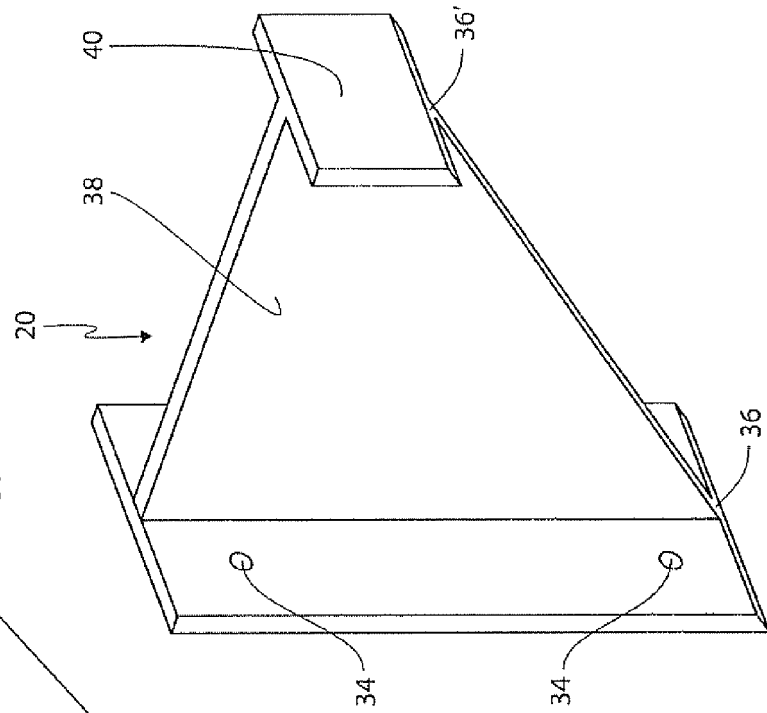


FIG. 2C

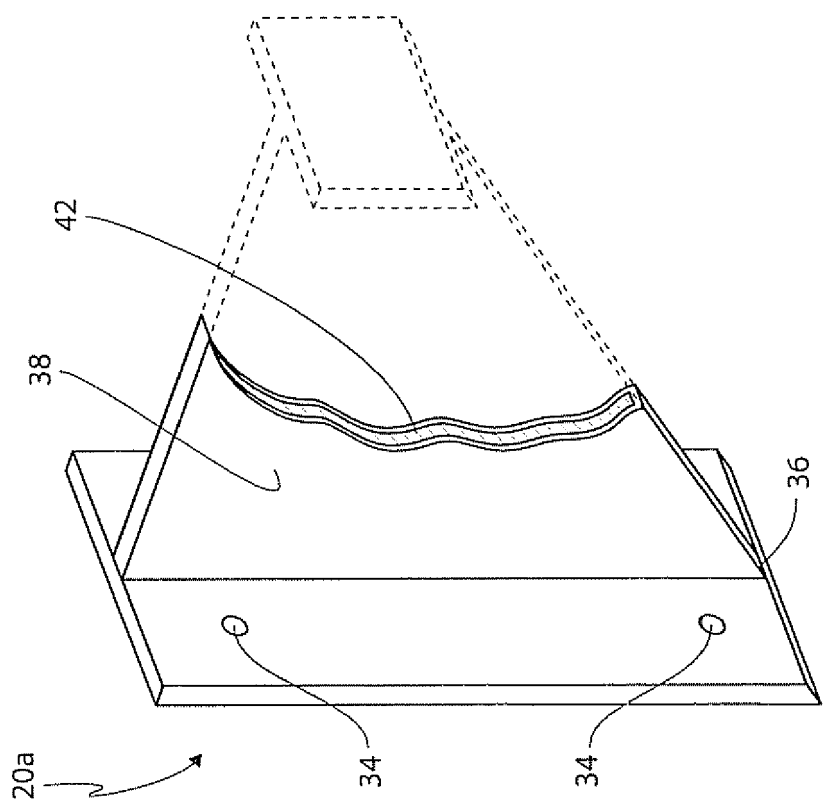


FIG. 3



EUROPEAN SEARCH REPORT

Application Number
EP 13 15 0292

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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			TECHNICAL FIELDS SEARCHED (IPC)
			E06B
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 22 July 2013	Examiner Merz, Wolfgang
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	

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22-07-2013

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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

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