Description

Title of invention: Beam for constructing wood-framed buildings, construction element incorporating said beam and building constructed with at least one such element

Technical field

[0001] The present invention relates generally to the field of the construction of wood-framed buildings, and more particularly to a beam containing wood, as well as a construction element of “wall” type incorporating said beam, and to a construction produced with at least one such construction element.

[0002] The invention is applicable in wood-framed houses and buildings that conform, in France, to the provisions of French standard DTU 31.2, “Construction de maisons et bâtiments à ossature en bois” (Construction of wood-framed houses and buildings), in its May 2019 version which replaces the 2011 version and its 2014 amendment A1. It relates for example to constructions for domestic use such as individual houses or collective housing buildings, or else buildings for commercial or industrial use such as commercial premises, office premises, industrial buildings, or the like.

Prior art

[0003] The aim of controlling the air permeability of constructions is to ensure a good interior air quality through the control of the flows of air, as well as enhance the acoustic and thermal comfort by eliminating unwanted air entry. The control of air permeability, in particular, is a major issue in the context of the objectives to improve the energy efficiency of houses and buildings.

[0004] Through air-sealing techniques, the aim is to limit the flow of air between the inside and the outside of a building via its enclosure, that is to say via the construction elements that are the walls, the floors and the roofs. With the application of the most recent thermal regulation (namely the regulation RT 2020, in which the letters RT stand for “resistance thermique” (thermal resistance), notably, the treatment of the air-seal is now becoming mandatory for all residential buildings.

[0005] More particularly, in the context of RT 2020 and in the context of the approach known as “low-consumption” residences, the carcass of the envelope of the structure, that is also called framework or frame, must in itself be air-tight. This approach to the frame aims to make it possible to trace the leaks of air due to defects in the structure which are synonymous with reduced efficiency of the thermal insulation. To achieve a satisfactory energy efficiency level, the envelope of the structure must, in fact, be continuous and perfectly air-tight, from the floors to the roofs through the walls.

[0006] These days, the control of the air-tightness of the constructions is limited primarily to dedicated means which are arranged at the join between the walls of the frame and the external openings (windows, picture windows, doors, roller blind boxes, etc.).

[0007] However, the envelope of the houses and buildings itself generally does not have this, which is the case in all the wood-framed constructions (see DTU 31.2) hitherto proposed. Now, it is estimated that the thermal bridges are responsible for 65% of the heat loss in such a construction. The treatment thereof is essential for the guarantee provided by the builder, and critical for the quality of the works. It needs to be taken into account from the construction of the carcass of the envelope of the structure. The expenditure for heating the corresponding house or building is also a direct consequence thereof.

[0008] In the state of the art, it is common practice to apply by hand a mastic or a silicone seal, available as accessory, at the join between the construction elements belonging to the wood framework, for example the elements of wall type, on the one hand, and the concrete slab on which the wood frame is mounted, on the other hand, in order to ensure a tightening between the first and the second. This solution, which can be satisfactory for the slab-wall join, cannot however be generalized to all of the building. That would in fact be a second-best technique, offering little guarantee of efficiency and sustainability over time.

[0009] The beams forming construction elements that are currently used on work sites are wood beams, which are mostly solid, that is to say beams of raw wood directly obtained from a tree.

[0010] The document EP3255218A1 discloses a construction element of prefabricated “panel” type intended for the production of a construction and notably of a vertical flat wall, such as a wall of a wood-framed structure. The construction element can also cooperate with beams, for example to form the floor of the construction. Such a beam is illustrated in figure 11 of the document. The beam comprises two longitudinal members each having a T-shaped section and held at a distance from one another and parallel to one another by spacers. Each of the longitudinal members comprises an outer face, an inner face formed by the base of the T and two shoulders formed on either side of the sides of the T. The respective inner faces of the longitudinal members face one another. The beam is closed by the addition of closure panels which are fitted into the shoulders of the longitudinal members, for example by their longitudinal edges. The longitudinal members are, furthermore, held at a distance by spacers which are disposed between the closure panels and which rest by their ends in grooves formed on the inner faces of each of the longitudinal members. The spacers are disposed at intervals that are regular or not, so as to form cavities in which the insulation means are disposed. Preferably, the longitudinal members are made of solid wood and the panels comprise a material comprising wood and are preferably chosen from among medium-density wood-fiber panels or hard-wood-fiber panels transformed under high pressure or oriented wood particle panels, or plywood panels, or solid wood panels, composite wood panels comprising wood fibers and plastic resins, or the like.

[0011] The document WO9739204A1 discloses different variants of construction modules, which make it possible to construct, by hand and simply, without additional and dry transverse link means, that is to say without additional link and sealing means, bearing structures, such as walls.

[0012] The document CA2713657A1 discloses a modular construction system in which the outer layer of the outer wall of a composite element has, on its bottom face, an anti-drip device-forming groove. Also, the outer layer of the outer wall of the underlying element has, on its top face, a chamfer ensuring the rejection of water. These two devices cooperate to dispel rainwater by run-off.

[0013] The document WO2012114122A2 discloses the joining of the panels together via an elongate fixing member. The elongate fixing element has a core of thermal insulation material. And two outer panels sandwich the core between them.

Summary of the invention

[0014] The invention aims to make the carcass of the envelope of a wood-frame structure tight to air, water and noise, from construction of the work. Advantageously, the tightness to air, to water and to noise is produced simultaneously.

[0015] This aim is achieved, according to a first aspect of the invention, by virtue of a beam for a construction element of a wood-framed structure, the beam (P) comprising a first and a second longitudinal members (P1) extending longitudinally parallel to one another and at a distance from one another, each of said longitudinal members (P1) comprising an outer face (P2) and an inner face (P3), the respective inner faces (P3) of the longitudinal members (P1) facing one another, the beam (P) being closed by first and second closure panels (P5, P5') bearing on the transverse sides of the longitudinal members, the beam being characterized in that the outer face of at least one of the longitudinal members is provided with at least one longitudinal groove to receive a sealing strip which is suitable for ensuring the seal between the beam and another component of the construction element, for example a bracing panel or a cladding panel of the structure incorporating the beam.

[0016] According to the present invention, the terms joist and beam are used in an equivalent manner and the two terms are interchangeable given the requirements of the present invention. A joist is a structural prismatic convex form or envelope element designed to withstand flexing and the beam is a joist of small section (less than 20 cm of web).

[0017] According to a particularly preferential implementation of the beam according to the invention, the outer face of at least one of the longitudinal members, and preferably the outer face of each of the longitudinal members, is provided with at least one longitudinal groove to receive a sealing strip which is suitable for ensuring the seal between the beam and another component of the construction

element, for example a bracing panel or a cladding panel of the structure incorporating the beam.

[0018] In wood construction, four systems are primarily used. The oldest wood construction technique is the stacked solid wood technique, often called chalet, which is composed of walls made of solid wood by stacking lumber, logs or skirts. The kinds of wood most commonly used are Norway pine, seasoned wood or larch. There are also studding construction or frame construction, composed of a wood framework which consists of posts and plate beams in which the wood-to-wood assembly is achieved by tenons and mortices and are pegged together, and the studding which forms the walls and which has a filling and stiffener roll. There is also the beam post technique which is the evolution of studding construction. The bearing structure of the house is composed of post and beam made of glue-laminated wood or solid wood, assembled rigidly together, which gives it great indeformability. The assemblies are made wood against wood, they are said to be braced, with dual main or secondary beams. A glue-laminated beam is composed of sheets of wood glued together. Finally, wood-framed construction which is distinguished by the uprights of its structure which form only the height of the floor, between the framework uprights, a semi-rigid sheet insulation occupies all the available empty space. The invention is particularly useful and effective in wood-framed constructions which are not made of solid wood which can crack and whose seal-tightness is no longer assured.

[0019] It should be noted that the term longitudinal is understood here with reference to the geometry of the beam, which has a main axis of extension that is longitudinal. In the structure incorporating the beam, this longitudinal axis can correspond to the vertical axis if the beam is disposed vertically, or to the horizontal axis if the beam is disposed horizontally in said structure. Obviously, the beam can also be disposed in the frame of the structure inclined with respect to the horizontal by a determined angle, lying strictly between 0 and 90° (i.e. these two extreme values not included). Such is the case, for example, if it belongs to the frame or if it is used by a house with studding.

[0020] The combination of the abovementioned features makes it possible to produce a complete structure such as a house or a building for domestic, commercial or industrial use, this structure being advantageously modular and adaptable on demand, by ensuring a perfect air-tightness of the frame from construction.

[0021] Advantageously, the construction elements forming the carcass of the envelope of the building are thus, in themselves, provided with means to ensure the air and water-tightness. The acoustics of the building are also improved since the outside noises, impact noises, vibrations, resonances and reverberations of sounds, etc., are attenuated for a long time by virtue of the sealing strips.

[0022] Implementations, taken alone or in combination, further provide, in the beam according to the invention, for the first and second longitudinal members (P1) to be held at a distance from one another by spacers (P6) extending transversely, which are disposed between the closure panels (P5) and which rest by their ends (P61) in grooves (P31) formed on the respective inner faces (P3) of each of the longitudinal members (P1).

[0023] In another preferred embodiment of the beam according to the invention, the spacers (P6) are disposed at intervals that are regular or not so as to form cavities (P7) closed by the closure panels, said beam further comprising insulation means arranged in said cavities.

[0024] The insulation means according to the invention comprise all forms of so-called natural insulation, for example and in a nonlimiting manner, wood fiber and/or wood wool, wool and/or lining felt, cotton wool, animal wool and/or all forms of wools of straw, hemp, cork, textile, feather, cellulose cotton type. Other insulation means can also be used such as mineral insulations, for example of mineral wool, glass wool, rockwool, cellular glass, expanded clay type and/or all insulations based on minerals currently known. The insulation means of the invention can also be synthetic insulations, for example of polystyrene, polyurethane, phenolic foam type and/or all synthetic insulations currently known. The person skilled in the art is not limited as to the nature of the insulation that can be used.

[0025] In a particularly advantageous embodiment of the beam according to the invention, the longitudinal members have a T-shaped section, the inner face of the longitudinal members being formed by

the base of the T and the closure panels being fitted by their longitudinal edges (P51) in shoulders (P4) of the longitudinal members formed on either side of the sides of the T.

[0026] According to one embodiment, the section can advantageously and in a nonlimited way be U-shaped, or any other shape allowing the implementation of the invention; the person skilled in the art will not be limited by the shape and the design of the groove.

[0027] According to another embodiment of the beam according to the invention, at least the longitudinal member (P1) which is provided with a longitudinal groove is produced in solid wood panels, from panels with multiple layers, for example plywood or OSB, and the outer layer of a panel forming the outer face of said longitudinal member is a sheet of plywood in which the wood grain is oriented in the longitudinal direction X of the beam, or a ply of OSB in which the wood flakes are oriented in the longitudinal direction X of the beam, respectively.

[0028] In another embodiment of the beam according to the invention, the depth of the longitudinal groove corresponds substantially to the thickness of the outer layer of the panel forming the outer face of the longitudinal member.

[0029] In another preferred embodiment of the beam according to the invention, the closure panels (P5) comprise a material comprising wood, and are preferably chosen from among medium-density wood-fiber panels or hard-wood-fiber panels transformed under high pressure or oriented wood particle panels, or plywood panels, or solid wood panels, composite wood panels comprising wood fibers and plastic resins or the like.

[0030] According to a preferred embodiment of the beam according to the invention, the beam comprises a sealing strip disposed in the longitudinal groove, said sealing strip being suitable for ensuring the seal between the beam and another component of the construction element, for example a bracing panel or a cladding panel of the structure incorporating the beam.

[0031] According to a preferred embodiment of the beam according to the invention, the sealing strip is a compression strip kept compressed by a capping such that, as long as the capping is in place, the sealing strip and the capping are entirely contained in the groove, whereas,

when the capping is removed, the sealing strip inflates toward the outside beyond the edges of the longitudinal groove.

[0032] According to another embodiment of the beam according to the invention, the beam further comprises at least one intermediate longitudinal member (P9) of the same thickness as the first and second longitudinal members (P1, [fig. 6]) in the direction of the vertical axis Z of the beam, extending longitudinally parallel to said longitudinal members between the inner faces of said longitudinal members (P1) which face one another, said intermediate longitudinal member being preferably disposed equidistant from the first and second longitudinal members in the direction of the transverse axis Y.

[0033] In a preferred embodiment of the beam according to the invention, the beam further comprises: above the first and second longitudinal members (P1, [fig. 7]) and the intermediate longitudinal member (P9, [fig. 7]) in the direction of the vertical axis Z of the beam, an intermediate panel (P5'') extending longitudinally and parallel to the first closure panel (P5), symmetrical with said first intermediate panel with respect to said longitudinal members and said intermediate longitudinal member, said intermediate panel (P5'') being of the same length and the same width as the first and second closure panels (P5, P5');

- other longitudinal members (P1') and another intermediate longitudinal member (P9') extending longitudinally and parallel to the intermediate panel (P5'') symmetrical with the first and second longitudinal members (P1) and the intermediate longitudinal member (P9), respectively, with respect to said intermediate panel (P5''),

the second closure panel (P5') being arranged to close the beam by bearing against the top face of the other longitudinal members (P1') and the other intermediate longitudinal member (P9'), symmetrical with the intermediate panel (P5'') with respect to said other longitudinal members (P1') and said other intermediate longitudinal member (P9').

[0034] In a second aspect, also a subject of the invention is a construction element, chosen from the group including for example the "wall", "floor" or "frame" type, of a wood-framed structure, the construction element comprising a beam according to the first aspect

above. It can be a wall, for example, with or without openings for doors, windows, or French windows.

[0035] As a third and last aspect, the invention relates also to a wood-framed structure, for example a house or a building, comprising a construction element according to the above second aspect.

Brief description of the drawings

[0036] Other features and advantages of the invention will become more apparent on reading the following description. The latter is purely illustrative and should be read in light of the attached drawings in which:

[Fig. 1] [Fig. 1] is a perspective view of a frame of a construction element, in this case a wood-framed building wall, in which beams according to embodiments of the invention can be used;

[Fig. 2] [Fig. 2] is a perspective view of a portion of a building wall formed from the frame of [fig. 1] coated with insulation cladding elements both inside and outside;

[Fig. 3] [Fig. 3] is a perspective view according to the prior art of a portion of a raw wood frame upright;

[Fig. 4] [Fig. 4] is a perspective view of a portion of a beam according to the prior art, that can replace the upright of [Fig. 3];

[Fig. 5] [Fig. 5] is a perspective view of a portion of a beam according to a first embodiment;

[Fig. 6] [Fig. 6] is a perspective view of a portion of a beam according to a second embodiment;

[Fig. 7] [Fig. 7] is a perspective view of a portion of a beam according to a third embodiment, particularly suitable for use as wall plate and which is reinforced with respect to [fig. 6];

[Fig. 8] [Fig. 8] is a perspective view of a portion of a longitudinal member made of solid wood panels with multiple layers provided with a longitudinal groove forming a constituent part of a beam according to the embodiments of figures 4, 5, 6 and 7;

[Fig. 9] [Fig. 9] is a perspective view, from another viewing angle, of the portion of longitudinal member of [fig. 8] equipped also with a sealing strip housed in the longitudinal groove.

Description of the embodiments

[0037] In the description of embodiments which follows and in the figures of the attached drawings, the same elements or similar elements bear the same numeric references in the drawings.

[0038] [Fig. 1] schematically shows a portion of the frame OB of a wood-framed structure, for example a wood-framed house (MOB), in which the invention can be applied. In the nonlimiting example of [fig. 1], the portion of the frame OB represented is a wall. It is however understood that the invention applies to any other elements of the frame of a wood-framed structure comprising framework uprights, for example a floor, a ceiling, a roofing element, etc.

[0039] In [fig. 1], the wall is represented vertical, as it is assembled on site from a plurality of separate uprights which are brought to the construction location. As a variant, the wall can be installed in situ, in the destination structure, after assembly off-site, for example in the workshop, then transported to the place of construction for it to be put in place in the structure being constructed.

[0040] The reference frame bottom right of [fig. 1] represents the longitudinal direction X1 of the wall along which its length is measured, the transverse direction Y1 of the wall along which its width is measured (also called its thickness), and the vertical direction Z1 of the wall along which its height is measured.

[0041] The portion of the frame represented in [fig. 1] comprises two different types of uprights. The uprights MA of the first type are suitable for a bottom wall plate, top wall plate (or wall tie), window or door or French door lintel, sub-window course upright type, or even of wall end vertical upright or window or door or French door frame type. The uprights MB of the second type are suitable for the production of all other uprights of the frame OB, which contribute to the wood framework completing the uprights MA of the first type. They provide the function of framework elements to make the wall (or more generally the structure) more rigid and to support the air and/or water insulation elements, and wall panel (or cladding) elements inside or outside the structure.

[0042] To fulfil their functions as enumerated above, the beams according to the embodiments that are intended to serve as uprights MA of the first type can be structurally reinforced with respect to the

beams intended to serve as uprights of the second type MB. This reinforced structure for example allows a beam of the second type to support greater loads (exerted in the vertical direction, downward) or greater mechanical forces (in any other direction) without the risk of the beam breaking or buckling. Later, structural variants of the beam will be described according to embodiments which make it possible to offer two such types of beam which are distinguished by their respective characteristics of resistance to the load and to the mechanical forces.

[0043] The construction of a wood-framed wall is very simple. Framework uprights or framework beams PO are used according to the embodiments which will be detailed later, that are of standardized section. The framework uprights are assembled together by nailing or screwing, to from a frame. The center-to-center distance between two vertical uprights extending parallel to one another and adjacent to one another is calculated as a function of the rigidity desired for the wall, but also as a function of the type of insulation provided. Indeed, the center-to-center distance between the uprights can correspond to the width of strips of insulation material MI, for example 0.365 m, which strips are then disposed between said vertical uprights of the framework. The industry and manufacturers of traditional insulations of rockwool or glass wool type have developed specific ranges for the insulation of MOBs, for example based on hemp, the detailed explanation of which would fall outside the scope of the present description.

[0044] Referring now to [fig. 2], the maintaining of the squareness of the frame (called the “bracing”) is ensured by the nailing onto the framework of a “working shell” or bracing shell, composed for example of rigid bracing panels PC. They can be, for example, OSB panels, agglomerate panels, etc. The framework uprights PO which are visible in [fig. 2] are vertical uprights.

[0045] The bracing panels PC are generally disposed on the outer side (designated “Ext1” in the figure) of the construction, directly bearing against the face of the framework uprights PO turned toward the outside of the construction, and called outer face hereinbelow. As a variant, they can also be disposed on the inner side (designated “Int1” in the figure) of the construction, against the face of the upright which

is turned towards the inside of the construction, and called inner face of the longitudinal member hereinbelow.

[0046] The thickness of the uprights, measured in the longitudinal direction X1 of the wall, is in principle 45 mm. And their width, measured in the direction Y1 orthogonal to the surface of the wall, depends on the use: for example 120 mm, 145 mm or 200 mm for the walls of a structure, depending on its destination, or 220 mm for a floor.

[0047] Strips of insulation material MI, for example 0.365 m wide in the longitudinal direction X1 of the wall, are then disposed between the vertical uprights of the framework. The thickness of these strips MI, measured in the direction Y1 orthogonal to the plane of the wall, is equivalent and at most equal to the width of the framework uprights or beams POs.

[0048] On the outside Ext1 of the structure, a rain-screen is added against the bracing shell PC, formed for example by rigid insulation panels PI of wood fibers, which is resistant to wind and rain. In some embodiments, it is possible to substitute or add, in addition to this rigid rain-screen, a flexible rain-screen shell. An outer battening LE is then put in place, which is for example formed by vertical battens nailed or screwed into the framework beams through the insulation panels PI and the bracing panels PC. This battening LE makes it possible to attach the siding elements which form the outer covering of the wall, for example a wood siding.

[0049] On the inside Int1 of the structure, an internal battening LI is put in place that is formed for example by horizontal battens nailed or screwed into the framework beams through a vapor-screen shell PV. This battening LI is used to fix the internal wall panel VI of the wall, for example sheets of plaster of BA13 or similar type.

[0050] In the existing art, the framework uprights are made of raw wood, for example spruce, like the upright M represented schematically in [fig. 3]. The builders use uprights that are very straight, very dry and of high quality.

[0051] Nevertheless, because of such selection criteria, these raw wood uprights are expensive. Their production also generates a significant scrap ratio and a significant wood waste volume. That results in a

consumption of wood which runs contrary to the interests of defense of the environment since it increases deforestation.

[0052] It is also found that uprights of this type are the source of thermal bridges between the internal wall panel elements and the external wall panel elements of the building.

[0053] [Fig. 4] shows an example of a beam conforming to the document EP3255218A1 of the prior art, suitable for being advantageously substituted for a raw wood upright as shown in [fig. 3]. This beam in fact makes it possible to eliminate the abovementioned thermal bridges. Furthermore, it makes it possible to reduce the consumption of natural wood very significantly compared to a raw wood upright.

[0054] As can be seen in figures 3 and 4, the upright M and the beam P are of parallelepipedal volumes, of rectangular section. Section, within the context of the present description and unless stipulated otherwise, is understood to mean a section in a plane orthogonal to the longitudinal direction X of the upright M or of the beam P. In [fig. 3] and in [fig. 4], in fact, the upright M made of raw wood and the beam P according to the document EP3255218A1 are represented, respectively, in a reference frame formed by orthogonal axes X, Y and Z linked to said upright and to said beam, respectively.

[0055] This reference frame is distinguished from the reference frame formed by the orthogonal axes X1, Y1 and Z1 linked to the wall of [fig. 1] and to the portion of wall of [fig. 2], as specified hereinbelow with reference to the beam P of [fig. 4]:

- the longitudinal axis X linked to the beam P of [fig. 4] is the axis of longitudinal extension of said beam P, that is to say the axis along which the beam P extends longitudinally, and along which the length of the beam is generally measured. The longitudinal axis X of the beam P corresponds to the longitudinal axis X1 of the wall only for the horizontal beams of the framework OB of [fig. 1]. For the vertical beams of the framework OB, the longitudinal axis X of the beam P of [fig. 4] corresponds to the vertical axis Z1 of the wall of [fig. 1] and of the portion of wall of [fig. 2];
- the transverse axis Y of the beam P of [fig. 4] is the axis of transverse extension of the beam, that is to say the axis along which the beam P extends transversely to its longitudinal axis X, and along which the width of the beam is generally measured. The plane formed by the

axes X and Y is the plane of the largest faces of the beam P; and, finally,

- the vertical axis Z of the beam P of [fig. 4] is the axis orthogonal to the largest faces of the beam, along which the thickness of the beam is generally measured. The plane formed by the axes X and Z corresponds to the plane of the smallest surfaces of the beam, and to the cutting plane of the beam represented in cross-section in [fig. 4]. The vertical axis Z of the beam P corresponds to the vertical axis Z1 of the reference frame linked to the wall of [fig. 1] and to the portion of wall of [fig. 2] only for the horizontal beams of the framework OB of [fig. 1].

[0056] Hereinafter in the present explanation, and unless otherwise disposed, the terms “above” and “below”, and the derivatives thereof, the terms “high” and “low” and the indications relative to the thickness of the beam P, are used to designate a relative positioning of two elements and a dimension of the beam P, respectively, on the vertical axis Z of said beam. Similarly, the term “lateral” and the derivatives thereof, as well as the indications relative to the width of the beam P, are used with reference to the transverse axis Y of said beam. Finally, the term “longitudinal” and the derivatives thereof, as well as the indications relative to the length of the beam P, are used with reference to the longitudinal axis X of said beam.

[0057] The beam P of [fig. 4] comprises two longitudinal members P1 having a T-shaped section, parallel to one another in the longitudinal direction X, and held at a distance from one another in the transverse direction Y, by spacers P6.

[0058] In the embodiment as represented, each of the longitudinal members comprises an outer face P2 formed by the bar of the T, an inner face P3 formed by the base of the T and two shoulders P4 formed on either side of the sides of the T. The respective inner faces P3 of the longitudinal members P1 face one another. The beam P is closed by the addition of closure panels P5 and P5’ opposite one another in the vertical direction Z, which bear on the respective transverse sides of the longitudinal members, in the direction of the transverse axis Y. In the example shown, the closure panels P5 and P5’ are fitted into the shoulders P4 of the longitudinal members, by their longitudinal edges P51.

[0059] The longitudinal members P1 of the beam P of [fig. 4] are said to be “angle longitudinal members” of the beam in that their outer angles form the outer angles of the beam P.

[0060] The spacers P6 which hold the angle longitudinal members P1 at a distance from one another are disposed between the closure panels P5 and P5’, and rest by their ends P61 in grooves P31 formed on the inner faces P3 of each of the longitudinal members P1. The spacers P6 are disposed at intervals that are regular or not so as to form cavities P7 in which insulation means are disposed.

[0061] In embodiments, the angle longitudinal members P1 are made of solid wood as shown in [fig. 4]. The closure panels P5 and P5’ can advantageously be made of a material comprising wood, and they are preferably chosen from among the panels made of medium-density wood fibers or panels made of hard-wood fibers transformed under high pressure, or panels of oriented wood particles, or plywood panels, or solid wood panels, composite wood panels comprising wood fibers and plastic resins, or the like.

[0062] [Fig. 5] shows a first embodiment of a beam according to the invention. This embodiment relates to a beam which can advantageously be substituted for an upright of the first type MA of the wood framework OB of [fig. 1].

[0063] Primarily, the beam P of [fig. 5] is identical to the beam P of [fig. 4], and thus makes it possible to eliminate the thermal bridges in the wood-framed structure OB of [fig. 1]. However, the beam P of [fig. 5] further comprises a longitudinal groove P8 provided on the outer face P2 of at least one of the two longitudinal members P1 of the beam, and preferably one such groove P8 on the outer face P2 of each of said opposite longitudinal members P1.

[0064] The longitudinal grooves P8 are adapted to receive a sealing strip which is suitable for ensuring the seal between the longitudinal member and another element of the structure incorporating the beam. It can be a bracing shell, or a cladding element of the wood framework incorporating the beam. Thus disposed, the sealing strip can ensure the tightness to air and to water at the interface between the corresponding longitudinal member of the beam P, on the one hand, and, for example, the bracing shell formed by the bracing panels PC of [fig. 2], on the other hand. This makes it possible to render the

wood-framed structure tight to air and to water from the assembly thereof.

[0065] The sealing strip can for example be a strip of elastic foam with a thickness, in the compressed state, equal to 1 mm for example. The depth of the groove, measured in the transverse direction Y of the beam, is then preferentially at least 1 mm, in order for the compression strip to be entirely contained in the groove, in its compressed state. Thus, the compression strip is protected in the groove as long as it remains compressed. Conversely, the depth of the groove is less than the height of the compression strip, measured from the bottom of the groove, in the uncompressed state of the strip. Thus, the strip extends above the edges of the groove and can be crushed when the beam is assembled with the other construction element of the structure coming against the outer face (or the outer face, if appropriate), bearing against the edges of the groove. This crushing makes it possible to ensure the sealing function sought.

[0066] In a first mode of implementation, the compression strip can be pre-installed in the groove P8 of the beam P. In other words, the beam can be supplied with the compression strip housed in the groove P8 by being kept compressed by a capping, in order not to extend above the edges of the groove and therefore not risk being damaged or torn during transportation and the handling of the beam until it is assembled.

[0067] In one embodiment, the capping can have the same dimensions as the compression strip in the vertical direction Z, and be thus entirely contained in the groove like said strip. Advantageously, the foam of the compression strip and its capping for keeping it in the compressed state can thus be entirely housed in the groove P8. They are thus protected during the handling of the beam P, notably for the storage and the transportation of the beam.

[0068] To sum up, the sealing strip can be a compression strip kept compressed by a capping such that, as long as the capping is in place, the sealing strip and the capping are entirely housed in the groove, while, when the capping is removed, the sealing strip inflates outward beyond the edges of the longitudinal groove.

[0069] As a variant, this capping can be replaced or complemented by an adhesive film that can adhere, by any appropriate means, for

example a glue, to the outer surface P2 of the longitudinal member P1, covering all of the groove P8. The dimension in the direction of the vertical axis Z of such an adhesive strip is then greater than the corresponding dimension of the groove by being at most equal to the corresponding dimension of the outer face of the longitudinal member comprising the longitudinal groove P8.

[0070] In another mode of implementation, the sealing strip can be put in place by the operative worker, on the construction site during the assembly of the structure, for example after the assembly of the wood framework, at the time of fixing of the bracing panels PC, for example. If it is a compression strip, its capping ensuring the compression of the insulating foam is arranged so that it can be removed when the strip has been put in place in the groove.

[0071] Once put in place in the groove P8, and/or once the capping which holds the sealing strip compressed in the groove has been removed, if necessary, the latter inflates slowly for approximately 15 to 20 minutes. This provides the operative worker with the time required to put in place and fix the bracing panels PC, against the corresponding part of the wood framework which comprises the beam. When the inflation of the compression strip is totally completed, the tightness to air and to water at the interface between the beam P and the bracing panels PC thus installed is total.

[0072] As in the beam P of the prior art shown in [fig. 4], the space included between the inner faces of the longitudinal members P1 forms a cavity P7 which is advantageously filled with a sealing material, preferably a material comprising wood. This cavity P7 can be segmented into several respective cavities, in the longitudinal direction X, by spacers (not represented in [fig. 5]) that are identical to the spacers P6 of the beam P of [fig. 4].

[0073] [Fig. 6] shows a first variant embodiment of the beam P of [figure 5]. This variant embodiment relates to a beam P which can advantageously be substituted for an upright of the second type MB of the wood framework OB of [fig. 1]. Indeed, this variant gives the beam a greater rigidity, compared to the beam P of [fig. 5].

[0074] In the beam P of [fig. 6], the longitudinal members P1 do not have a T-shaped section (it being recalled that the term “section” is understood to mean a cross-section in a plane orthogonal to the

direction of the longitudinal axis X). They have a square or rectangular section. Their respective outer face P2 is still provided with the longitudinal groove P8 intended to receive the sealing strip. Nevertheless, the closure panels P5 and P5' come to bear, by their respective inner face, against the respective faces of the longitudinal members P1 which are turned downward and upward from the beam P, respectively (in the direction of the vertical axis Z). The longitudinal edges P51 of the closure panels P5 and P5' arrive in line, in the direction of the vertical axis Z, with the outer faces P2 of the longitudinal members P1. The closure panels P5 and P5' of the beam P of [fig. 6] can thus be thicker than the corresponding panels of the beam P of [fig. 5]. Furthermore, the longitudinal members P1 are more robust in the embodiment of the beam P of [fig. 6] than the corresponding longitudinal members of the beam P of [fig. 5], which are machined to give them the T-shaped form, and which are therefore weakened by the corresponding removal of material.

[0075] The longitudinal members P1 of the beam P of [fig. 6] are no longer strictly speaking "angled longitudinal members" of the beam, given that the outer angles of the beam P are here formed by the outer angles of the longitudinal edges P51 of the closure panels P5 and P5'.

[0076] In order to further reinforce the rigidity of the beam P of [fig. 6], embodiments provide for the insertion of one (or more) intermediate longitudinal members of the same thickness as the longitudinal members P1, extending longitudinally parallel to the longitudinal members P1, between the lateral faces of said longitudinal members P1 which face one another. Preferably, the intermediate longitudinal member P9 is disposed equidistantly from the longitudinal members P1 in the direction of the transverse axis Y. As will be appreciated by the person skilled in the art, the intermediate longitudinal member P9 creates two cavities P7 of longitudinal extension, between said intermediate longitudinal member P9 and each of the two longitudinal members P1, respectively. These two cavities P7 can be segmented into several respective cavities, adjacent pairwise in the longitudinal direction X, by spacers (not represented) that are identical to the spacers P6 of the beam P of [fig. 4].

[0077] The person skilled in the art will appreciate that one or more intermediate longitudinal members like the intermediate longitudinal

member P9 of [fig. 6] can also be provided in a beam P according to the embodiment of [fig. 5].

[0078] [Fig. 7] shows a second variant embodiment of the beam P of [fig. 5]. This variant embodiment relates to a beam P which can advantageously be substituted for an upright of the second type MB of the wood framework OB of [fig. 1], which exhibits an even more reinforced rigidity than the beam P of [fig. 6].

[0079] The beam P of [fig. 7] is identical to that of [fig. 6], apart from the fact that it comprises, above the longitudinal members P1 and the intermediate longitudinal member P9, an intermediate panel P5'', extending longitudinally and parallel to the first closure panel P5, symmetrical to said first panel P5 with respect to the longitudinal members P1 and P9. Furthermore, the beam comprises other longitudinal members P1' and another intermediate longitudinal member P9' extending longitudinally and parallel to the intermediate panel P5'' symmetrically with the longitudinal members P1 and the intermediate longitudinal member P9 with respect to said intermediate panel P5''. Finally, the second closure panel P5' closes the beam P by coming to bear against the top face of the longitudinal members P1' and of the intermediate longitudinal member P9', symmetrically with the intermediate panel P5'' with respect to said longitudinal members P1' and said intermediate longitudinal member P9'. The intermediate panel P5'' is of the same length and of the same width as the closure panels P5 and P5', in order to conserve the paralepidid form of the beam P. The parallelepiped of [fig. 7] is simply thicker (in the direction of the vertical axis Z) than that of figures 5 and 6, which contributes to conferring a greater rigidity upon it. This greater rigidity is thus obtained without the need for a raw wood beam of greater thickness in the direction of the vertical axis Z, and therefore at lesser cost and with, overall, a lesser quantity of wood.

[0080] In one embodiment, the other longitudinal members P1' comprise, like the longitudinal members P1, a longitudinal groove P8' on their respective outer face. This other longitudinal groove P8' is structurally and functionally identical to the longitudinal groove P8 of the longitudinal members P1. In other words, this groove P8' can receive an additional sealing strip, which makes it possible to further

enhance the tightness to air and to water of the structure incorporating the beam P of [fig. 7].

[0081] The person skilled in the art will appreciate that a “sandwich” structure as described above with reference to [fig. 7], comprising the addition of the longitudinal members P1’, of the intermediate longitudinal member P9’ and of the inner panel P5’’, can also be provided in a beam P according to the embodiment of [fig. 5]. In this case, the longitudinal members P1’ preferably have a T-shaped section, like the longitudinal members P1.

[0082] In an embodiment illustrated by [fig. 8] and [fig. 9], the longitudinal members P1 and/or P1’ can be produced in solid wood panels, from panels with several layers (“multi-ply” panels), for example of ordinary plywood as shown in the figures, or of OSB (acronym for “*Oriented Strand Board*”). In this latter case, the panels are preferably of OSB 4, which can be used outside (under shelter).

[0083] As its name indicates, OSB is a panel of strands of wood that are thin, long and oriented. The latter are glued then distributed in multiple layers, oriented differently to optimize the strength of the stability of the panel. The mat of flakes is then baked at high temperatures and pressures.

[0084] Furthermore, one advantage of the production of the uprights from panels made of OSB is a saving on the quality of wood required, which is 83% of solid wood less for a passive construction, and up to 65% of wood less for a construction that conforms to the RT 2020 standard. This embodiment therefore makes it possible to limit the impact of the construction of wood-framed structures on deforestation.

[0085] Contrary to the panels made of wood fibers, particles or flakes, an ordinary plywood sheet is composed of wood sheets that have unwound. These “plies” are supported by crossing the direction of the grain of the wood in order to ensure a good resistance to twisting and to the load. They are then glued under pressure.

[0086] Evolving from the abovementioned methods for manufacturing panels of OSB or plywood sheets, are characteristics such as a strong mechanical strength, great dimensional stability and high density of the material. The longitudinal members manufactured from such

panels or such sheets, and therefore the beam incorporated in them, inherent these excellent properties.

[0087] As shown in figures 8 and 9, a longitudinal member P1 can thus comprise four plywood panels of longitudinal extension, that is to say extended on the longitudinal axis X of the beam. Of these four panels, two first panels parallel to one another and opposite on the vertical axis Z of the beam extend also along the transverse axis Y of the beam, and two second panels that are parallel to one another and opposite on the transverse axis Y of the beam extend also along the vertical axis Z of the beam. These four pairwise opposite panels form a hollow tube of rectangular or square section. The internal space contained in this tube can be filled with agglomerated wood fibers, in order to reinforce the rigidity of the longitudinal member.

[0088] Furthermore, one advantage of the production of the uprights from panels of OSB is a saving on the quantity of wood required, which is 83% of solid wood less for a passive construction, and up to 65% of wood less for an RT 2020 construction. This embodiment therefore makes it possible to limit the impact of the construction of wood-framed structures on deforestation.

[0089] In one embodiment, when the longitudinal member P1 is manufactured from panels made of plywood as represented in figures 8 and 9, the outer layer of the panel forming the outer face P2 of the longitudinal member is a plywood sheet in which the wood grain is oriented in the longitudinal direction X of the beam. When the longitudinal member P1 is manufactured from panels of OSB, the outer layer of the panel forming the outer face P2 of the longitudinal member is a ply of OSB in which the wood flakes are oriented in the longitudinal direction X of the beam. Thus, the formation of the groove by removal of material is facilitated. Indeed, the non-machined beam simply has to be advanced along its longitudinal axis against a tool such as a wood chisel, a milling machine or the like, to hollow out the longitudinal groove.

[0090] Ideally, the depth of the longitudinal groove can correspond substantially to the thickness of the outer layer of the panel forming the outer face of the longitudinal member. Thus, the formation of the groove as described above amounts to removing all the outer layer of the panel, which is easy because the underlying layer is more

resistant given that it is formed by a sheet of wood with ribs oriented differently, or of a ply of OSB with wood flakes oriented differently, respectively.

[0091] The present invention has been described and illustrated in the present detailed description and in the figures of the attached drawings, in possible embodiments. The present invention is not however limited to the embodiments presented. Other variants and embodiments can be deduced and implemented by the person skilled in the art on reading the present description and the attached drawings.

[0092] For example, and in order to reinforce the air and water insulation power, it is possible to provide two longitudinal grooves parallel to one another, or more, on the outer face of at least one longitudinal member of the beam, for example one and/or the other of the longitudinal members P1 of the beam P of [fig. 5] or of [fig. 6]. In other words, the outer face P2 of each longitudinal member P1 can comprise a plurality of longitudinal grooves parallel to one another, and each adapted to receive a respective sealing strip.

[0093] In the claims, the term “comprise” or “include” does not preclude other elements or other steps. A single processor or other units can be used to implement the invention. The various features presented and/or claimed can advantageously be combined. Their presence in the description or in the different dependent claims does not exclude this possibility. The reference symbols should not be understood as limiting the scope of the invention.

Claims

[Claim 1] A beam for a construction element of a wood-framed structure, the beam (P) comprising a first and a second longitudinal members (P1) extending longitudinally parallel to one another and at a distance from one another, each of said longitudinal members (P1) comprising an outer face (P2) and an inner face (P3), the respective inner faces (P3) of the longitudinal members (P1) facing one another, the beam (P) being closed by first and second closure panels (P5, P5') bearing on the transverse sides of the longitudinal members, the beam being characterized in that the outer face of at least one of the longitudinal members is provided with at least one longitudinal groove to receive a sealing strip which is suitable for ensuring the seal between the beam and another component of the construction element, for example a bracing panel or a cladding panel of the structure incorporating the beam.

[Claim 2] The beam as claimed in claim 1, characterized in that the outer face of at least one of the longitudinal members, and preferably the outer face of each of the longitudinal members, is provided with at least one longitudinal groove for receiving a sealing strip which is suitable for ensuring the seal between the beam and another component of the construction element, for example a bracing panel or a cladding panel of the structure incorporating the beam.

[Claim 3] The beam as claimed in either one of claims 1 and 2, wherein the first and second longitudinal members (P1) are maintained at a distance from one another by spacers (P6) extending transversely, which are disposed between the closure panels (P5) and which rest by their ends (P61) in grooves (P31) formed on the respective inner faces (P3) of each of the longitudinal members (P1).

[Claim 4] The beam as claimed in claim 3, wherein the spacers (P6) are disposed at intervals that are regular or not so as to form cavities

(P7) closed by the closure panels, said beam further comprising insulation means arranged in said cavities.

[Claim 5] The beam as claimed in any one of claims 1 to 4, wherein the longitudinal members have a T-shaped section, the inner face of the longitudinal members being formed by the base of the T and the closure panels being fitted by their longitudinal edges (P51) in shoulders (P4) of the longitudinal members formed on either side of the sides of the T.

[Claim 6] The beam as claimed in any one of claims 1 to 5, wherein at least the longitudinal member (P1) which is provided with a longitudinal groove is made of solid wood panels, from panels with multiple layers, for example plywood or OSB, and wherein the outer layer of a panel forming the outer face of said longitudinal member is a sheet of plywood in which the wood grain is oriented in the longitudinal direction X of the beam, or a ply of OSB in which the flakes of wood are oriented in the longitudinal direction X of the beam, respectively.

[Claim 7] The beam as claimed in claim 6, wherein the depth of the longitudinal groove corresponds substantially to the thickness of the outer layer of the panel forming the outer face of the longitudinal member.

[Claim 8] The beam as claimed in any one of claims 1 to 7, wherein the closure panels (P5) comprise a material comprising wood, and are preferably chosen from among medium-density wood fiber panels or panels made of hard-wood fibers transformed under high pressure or oriented wood particle panels, or plywood panels, or solid wood panels, composite wood panels comprising wood fibers and plastic resins, or the like.

[Claim 9] The beam as claimed in any one of claims 1 to 8, comprising a sealing strip disposed in the longitudinal groove, said sealing strip being suitable for ensuring the seal between the beam and another component of the construction element, for example a

bracing panel or a cladding panel of the structure incorporating the beam.

[Claim 10] The beam as claimed in claim 9, wherein the sealing strip is a compression strip held compressed by a capping such that, as long as the capping is in place, the sealing strip and the capping are entirely contained in the groove whereas, when the capping is removed, the sealing strip inflates outward beyond the edges of the longitudinal groove.

[Claim 11] The beam as claimed in any one of claims 1 to 10, further comprising at least one intermediate longitudinal member (P9) of the same thickness as the first and second longitudinal members (P1, figure 6) in the direction of vertical axis Z of the beam, extending longitudinally parallel to said longitudinal members between the inner faces of said longitudinal members (P1) which are turned toward one another, said intermediate longitudinal member being preferably disposed equidistant between the first and second longitudinal members in the direction of the longitudinal axis Y.

[Claim 12] The beam as claimed in any one of claims 1 to 11, further comprising:

- above the first and second longitudinal members (P1, figure 7) and the intermediate longitudinal member (P9, figure 7) in the direction of the vertical axis Z of the beam, an intermediate panel (P5'') extending longitudinally and parallel to the first closure panel (P5), symmetrically with said first closure panel with respect to said longitudinal members and said intermediate longitudinal member, said intermediate panel (P5'') being of the same length and of the same width as the first and second closure panels (P5, P5');
- other longitudinal members (P1') and another intermediate longitudinal member (P9') extending longitudinally and parallel to the intermediate panel (P5'') and symmetrically with the first and second longitudinal members (P1) and the intermediate

longitudinal member (P9), respectively, with respect to said intermediate panel (P5''),

- the second closure panel (P5') being arranged to close the beam by bearing against the top face of the other longitudinal members (P1') and of the other intermediate longitudinal member (P9'), symmetrically with the intermediate panel (P5'') with respect to said other longitudinal members (P1') and said other intermediate longitudinal member (P9').

[Claim 13] A construction element chosen from the group comprising wall, frame or a wood-framed structure, the construction element comprising a beam as claimed in any one of claims 1 to 12.

[Claim 14] A wood-framed structure, for example a house or a building, the structure comprising a construction element as claimed in claim 13.