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Remarks:
Amended claims in accordance with Rule 137(2) EPC.

(54) **Fire-resistant building element, frame construction thereof and method of manufacturing**

(57) An improved fire-resistant building element is used for assembling a frame construction suitable for windows, doors or framework walls. The building element comprises two extruded metal, preferably aluminum, profiles interconnected by two interconnecting elements. The interconnecting elements can be made of metal or polymer. The hollow space between the profiles and the interconnecting elements and/or within the extruded profiles themselves can be filled with a fibrous insulation material in a form of the insulation rod. The insulation rod due to its density is stiff enough to be inserted in the hollow spaces of the building element when assembled and/or into the extruded profiles hollow cavities for increasing a fire resistance of the building construction. Alternatively and additionally, a second and a third insulation materials with different properties can be involved.

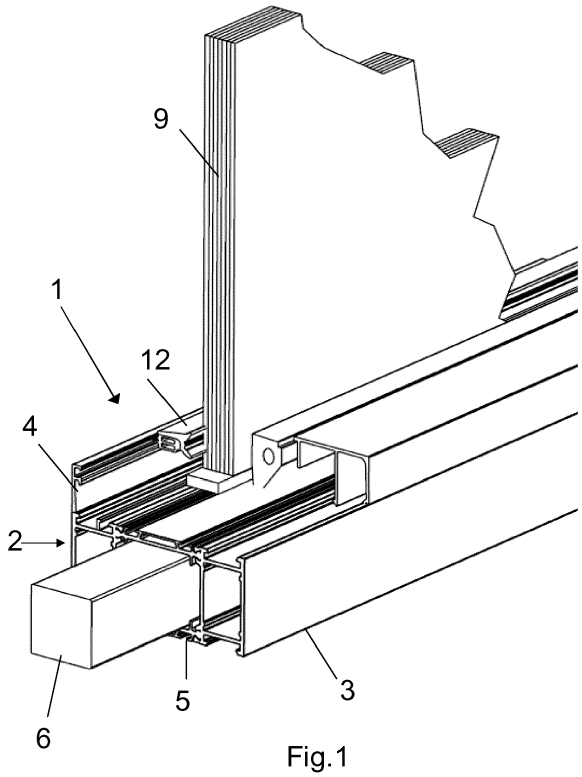

Fig.1

EP 2 784 260 A1

Description

Technical filed

[0001] The present invention relates to a fire resistant building element for a frame construction to be used for windows, doors, framework or glazed walls and made of extruded aluminium profiles, wherein the frame construction is assembled from building elements with the improved fire resistance. Each building element comprises two profiles with non-rigid insulation material there between. Alternatively, at least one heat-expandable material layer is placed between the aluminium profiles and the non-rigid insulation material.

Background of the Invention

[0002] Aluminium profiles are widely used as a building material, among others for frame constructions in buildings. By a proper construction and dimensioning the aluminium frames may be given the required stability and strength.

[0003] However, increasing demands with regard to fire resistance and fire isolation are put on building elements comprising aluminium, which itself melts already at about 650 C° and has very high heat conductivity. Based on the fact that normal fires often reach temperatures of about 850 C° and more, it is easy to understand that special measurements must be taken to meet the demands. Building elements containing the aluminium profiles shall be able to withstand the temperature increase on the fire side and prevent the heat conduction to another side opposite to the fire load. A thermal isolation and a reduction of the heat conduction from one side of the frame element to the other side of the frame element is obtained by use of insulation materials of different types such as gypsum, rock wool and the similar placed between the inner and the outer hollow frame elements, e g aluminium profiles. The building element shall be able to withstand fire from the either side.

[0004] Many different attempts to prevent heat conduction through the building constructions have been made. GB 2190125 teaches a steel frame having a fire resistant insulation of a rock wool fibre with fire resistance duration of at least 60 minutes. A heat swellable material is provided to prevent the passage of smoke and flame between two construction elements, such as the frame and the surrounding building construction, providing a sealing between those. The heat swellable material can be for example graphite-containing expanding substance with a binding means which seals the gaps between the building construction and the frame when it expands due to heat.

[0005] EP1582686 provides another solution for the frame made of the aluminium profiles which are thermally isolated. The layer of an intumescent material expanding when the temperature threshold exceeds 150-200C° moves special glass holders securing a fire-resistant glass and thus prevents the falling out of the glass and providing a sealing effect between the fire resistant glass and the metal frame.

[0006] Still another attempt to improve the fire resistance of the building elements is disclosed in EP0927809, wherein a fire isolating filling is provided between the aluminium profiles of the glass window frame. The filling of a density about 820-840 kg/m^3 has a prefabricated material consisting of a core layer of a hard board and two gypsum layers or strips on both sides facing the profiles. In the case of fire, this isolating material slows down the heat transfer through the frame.

[0007] EP1961905 discloses a hollow aluminium profile used in the fire protecting construction where the hollow spaces within each profile are filled with insulation materials with different properties and fire protective plates are situated between the profiles.

[0008] EP1327741 discloses also a fire protecting building element comprising hollow profiles filled with fire protecting filling material.

[0009] There is still a problem of prolonging the time required for a destruction of an aluminium profile frame when subjected to flames or fire. One problem is how to retain the insulation material into the hollow spaces of the profile or between the profiles from falling out even when the part of the aluminium profile is melted away and do not hold the insulation element any longer. As aluminium melting point is relatively low (650C°), it is necessary to slow down the heat transfer through the frame and prevent quick frame destruction due to the melting of the aluminium profile on the fire loaded side.

Summary of the Invention

[0010] The invention provides a first fire resistant thermo insulating fibrous material of e.g. rock wool fibre or another none-rigid material such as mineral wool, glass fibre wool, or glass wool mixed with a binding compound. The amount of binding compound in the thermo insulation material is chosen such that the fibres are interconnected to a bulky flexible compressible structure essentially in form of a sheet or a mat. The sheet can be easily cut by a knife in stripes, bars or rods of an appropriate size. The thermo insulation material should preferably have compressibility of at least 2% and up to 30% in this application. This material is used as an inner insulation element in form of a bar or a rod, where the rod is situated between the inner and the outer aluminium profiles forming the building element of the frame and insulating those profiles one from the other in the same way as known in the art. The thermo insulating material of this type shall have a particular density in the range of 80-250 kg/m^3 as a known parameter for e.g. a rock wool but preferably of about 140 kg/m^3 to enable forming a rod or a bar that is insertable between the interconnected extruded profiles, preferably of aluminium. If the density is too low, the material rod will be cranky and not possible to handle and insert into the narrow spaces. A too high density, more

than necessary for easy processing and insertion of the rods into the building element, is not necessary and only increases the cost.

[0011] The first object of the invention is to ensure that the thermo insulation material rod will not fall out when the outer part of the profile is melted out. This is achieved either due to a non-cracking property of the thermo insulation material rod, such as a rock wool thermo insulation material rod, as being not rigid but still flexible, not drying out and being relatively soft and flexible and at the heating not falling out in parts. Alternatively, this rock wool insulating rod inserted between the two aluminium profiles is provided with an extra layer of a second insulation thermo expandable or thermo swellable material at those sides of the inner insulating rod that face the aluminium profiles. Such location of the second insulation thermo-swellable material is particularly important as the function of this extra layer or layers is protecting the insulation rod from the heat and slowing down its destruction under the fire and also keeping it in place due to the expansion of the second swellable material when the outer aluminium profile is destroyed by the fire.

[0012] According to the present invention, a building element with an improved fire resistance for a frame construction comprises a first outer metal profile, preferably an extruded aluminum profile, a second inner metal profile, preferably an extruded aluminum profile, interconnecting composite elements of polymer preferably of polyamide connecting the profiles to build so called a thermal break between the profiles and forming a hollow space within the building element of the frame construction. The insulation material is situated within the hollow space of the building element between the first and the second profiles and the interconnecting elements.

[0013] The first insulation material is a non-rigid fibrous material chosen from a rock fiber wool, mineral fiber wool, glass fiber wool, wherein the fibers can be mixed with a binder or be interconnected in the other known in the art ways and formed as a insulation rod with a density of at least 80 kg/m^3 and preferably of 100 kg/m^3 or higher, the insulation rod while being flexible is essentially form stable and not requiring additionally any sheath or cover ,which provides a sufficient stiffness for the insertion into the hollow space of the building element without risk of disintegration.

[0014] The improved fire-resistant building element may preferably further comprise a second insulation material layer which might have a higher thermal resistance than the material of the profiles. The second insulation material layer is situated within the space between the insulation rod and the profiles. The second material is protecting the insulation rod from the heat during the fire and keeping it into the space within the building element due to the second material expansion under the heat, when the outer profile is destroyed by fire.

[0015] A further object of the invention is filling all other hollow spaces of the extruded profile also with a third thermally insulating material with a cooling function. The third material can emit crystalline water during heating and could be placed into the cavities of each profile or between the two extruded aluminium profiles forming the building element for further increasing the thermal insulation.

[0016] A still further object of the invention is a method of manufacturing of the fire-resistant building element by the steps of cutting the metal profiles, such as extruded aluminum profiles, in the required lengths, connecting the profiles by the interconnecting element forming the hollow building element, forming the first insulation material e.g. by cutting the strips or rods from a fibrous material sheet as a non-rigid compressible insulation rod without any sheath or cover for providing the sufficient stiffness for insertion and inserting the insulation rod into the building element space between the profiles and the interconnecting elements and/or in any hollow space of the profiles for improving the building element fire-resistance. Additionally, the second thermo expandable material layer can be added at the sides of the first insulation material facing the profiles where the fire load can appear. Furthermore, the third cooling material can be inserted either into the hollow spaces between the profiles and/or within the extruded aluminum profiles for an additional effect to slow down the building element fire destruction.

[0017] In the preferred embodiments, the building element is used for manufacturing frames for doors, windows or wall constructions.

[0018] An advantage of the invention is a much easier manufacturing and processing of the insulation material rods of the first insulation material, e.g. easy cut from the prefabricated panels or sheets by knife comparing to the sawing of gypsum plates. The insulation rods can be prefabricated in the standard dimensions, stored and assembled when needed, much more cost effectively. As the first insulation material rods are relatively soft and do not having a rigid structure, they are not drying, cracking and therefore not falling out at the fire load. As the material is relatively soft and flexible and can be compressed, it allows much easier insertion of cables, lock details and other elements that are usually spaced in this hollow space of the building element. The relative softness and compressibility of the insulation material rod allows easier assembling of the building elements, especially at the corners as the mounting does not require the same precision at cutting of the rods as when the thermo insulation material is rigid (e g when using an insulation material in the form of gypsum plates), and the material rod (if a bit longer than required) can be compressed into the hollow space between the profiles and the interconnecting building elements corners can be fixed one to the other easily.

[0019] The building element according to the invention fulfils the standard demand for EI 30 applications, which means 30 minutes insulation effect without any additional cooling into the construction under the fire load. In EI 60 applications (60 minutes insulation at the fire load), usu-

ally a cooling material is used between the profiles. In the building element according to the invention having the insulation material rod inserted into the space between the profiles, the cooling material can be additionally placed in the outer hollow spaces of the extruded profiles improving the fire resistance of the profiles and prolonging the time of the building element destruction.

[0020] The invention will be described in further detail below with reference to the accompanying drawings. All advantages embodiments are described by the attached dependent claims.

Brief Description of the Drawings:

[0021]

Figure 1 illustrates a perspective view of an improved fire-resistant frame with an inserted glass and a thermo insulating rod of rock wool fibres material between two aluminium extruded profiles;

Figure 2 illustrates a glassed aluminium wall construction with an improved fire-resistant building element according to the invention;

Figure 3 is a cross section of the building element of the first embodiment comprising two extruded hollow profiles interconnected by two thermo insulating composite elements providing a thermal break with inserted therebetween an insulation rod of non-rigid material according to the invention;

Figure 4A is a cross-section of the building element of the second embodiment, where the building element as in Fig.3 is further provided with thermo-swellable material layers on the sides facing the profiles;

Figure 4B is a cross section of the building element according to the third embodiment, where the building element of the first embodiment as in Fig.3 further comprises two elements of cooling material;

Figure 4C is a cross section of the building element of the third embodiment according to the invention, where the building element of the second embodiment as illustrated in Fig. 4A is further provided with two layers of the cooling material.

Detailed Description of the Invention

[0022] It is known in the art to use aluminium extruded profiles for building elements. From the building elements can be formed windows or doors frames or any other building construction such as glassed or panelled walls. The present standards for fire resistance have high demands to such building elements that shall withstand fire load for 30 minutes and for 60 minutes for different applications. It is known that aluminium melts at lower temperatures than steel, at about 650 C° and has very high heat conductivity. Based on the fact that normal fires often reach temperatures of about 850 C° it is necessary to insulate the building elements and prevent the heat transfer from one side of the aluminium profile exposed to the fire to the other side.

[0023] The sintering temperature of the rock wool fibre material is above 1000C°, which makes this material very advantageous for thermo insulating of aluminium profiles in building elements compared to other insulating materials. As the rock wool fibres can be mixed with the binder compound, the result is a non-rigid soft squeezing insulation material that can be provided in a range of different densities. When the rock wool based material has density sufficient to form a plate, a sheet or a slab or any other shape such as a bar, strip or a rod of at least about 80 kg/m^3, and preferably of about 100 kg/m^3 or higher e.g. about 140 kg/m^3 but still remaining compressibility and being non rigid, it becomes possible to use it as an insert in any elongated hollow space within the profile and/or between the extruded profiles in the building element 2. The first insulation material rod 6 as illustrated in Fig.1 is inserted between the two extruded aluminium profiles 3, 4. The metal profiles 3, 4 are interconnected on two opposite sides by the composite interconnecting elements 5, forming a hollow space 11 between the profiles 3, 4 within the building element 2. The glass 9 or any other panel is placed on the interconnecting element 5 and sealed tightly by flexible seals 12. The interconnecting elements 5 are preferably made of polymer e.g. of polyamide and provide a so called thermal break into the building element 2 so that the heating or cooling on the one side of the element 2, e.g. of the frame 1, is not transmitted to the other side. The interconnecting elements 5 might have a pair of extensions 51 extending into the space 11. Those extensions 51 can be of different shape and dimensions and work as a guiding means for the rod 6 to be inserted. The extensions also help to fix the rod 6 into the space 11. Alternatively, the profiles 3, 4 inner surfaces facing the space 11 can be provided with the extensions for the same reasons. The thermo insulating rod 6 withstands a higher temperature than the melting temperature of the profiles 3, 4 and is inserted into the space 11 for increasing the fire-resistance of the building elements 2 by reducing heat transfer from one side (e g profile 4) to the other side (e g profile 3) of the building element 2. Alternatively, the first insulation material rod or strip can be additionally inserted into the side hollow spaces 8 into the each extruded profiles 3, 4 (not shown).

[0024] When the fire starts, the binder in the rod material decomposes at about 200 C°, one of the profiles 3 of the building element 2 is melted out at about 650C°, but it was surprisingly found that the rock wool material rod 6 is retained into the space 11 as due to its material mechanical properties does not crack and is therefore not falling out in parts as any other known rigid thermo

insulating material, when one of the profiles 3, 4 of the building element 2 is destroyed by the fire. The thermo insulation rod 6 is kept in place due to its properties such as softness, compressibility and flexibility and continues to prevent heat transfer to the other side profile 4 until the temperature is exceeds 1000C°. The normal temperature of use of such rock wool material is about 700 C°, far above the melting temperature of the aluminium profile 3. This material is manufactured in plates or slabs shape in a range of thicknesses from 30 to 100mm and they can be easily cut by a knife into suitable dimensions which match the dimension of the hollow spaces into the building element 2. Conventionally such material is sold in plates or sheets and can be cut into the strips or rods. One of the important parameters' of this kind of the insulation material is its density, which shall be from 80 kg/m^3 and preferably 100 kg/m^3 as the stiffness of the insulation element as the rod 6 depends on the density of the used material. The plates or sheets of insulation material shall have enough stiffness to carry its own weight, even when cut in strips or rods down to 15 mm wide. The sufficient stiff insulation rock wool material plate is to be cut into the rods or strips which are keeping its shape so that it is enable its insertion into the hollow space 11 and/or space 8. At the same time, the thermo insulation material rod 6 shall be soft, compressible and flexible enough to allow the placement of cables or locks or other elements that are usually situated between the extruded profiles 3, 4 into the building element 2. As an example, the rock wool material of PAROC Fire Slab 140 type had been tested.

[0025] Fig.2 schematically illustrates the building construction such as a wall with inserted glass 9 or panels of the other materials, where the glass 9 or panels are inserted into the frames 1 by base clips which are connecting profiles 3 and 4, and glass clips fixedly connected to the base clips and holding the glass 9 or the panel in the place. The frame 1 is assembled from the building elements 2 which are additionally thermally insulated by an insertion of the insulation rods 6 according to the invention between the profiles 3, 4 as illustrated in Fig.3. The outer hollow spaces 8 can be either empty or alternatively filled with a similar insulation material as the rods 6 or the other types of conventionally known insulations materials.

[0026] The second material layer 7 can be made of a heat resistant expandable or heat-swellable material (as in Fig. 4A) which expands when the temperature threshold is exceeded and fills in the air gaps forming a barrier which prevents direct exposure of the building elements to flames and melting of the profile. This material is flexible graphite based intumescent sealing material in the form of a strip with a starting temperature of swelling of approximately 190C°. The material thickness is about 1,0-3,0 mm including a self adhesive foil and with a width of 10-200 mm. The second material 7 withstands a higher temperature of about 600-1000 C° or higher than the melting point of the aluminium of about 650 C° and it protects the inner insulation rod 6 made of rock wool fibres preventing in its turn heat transfer to the other (none-heated) side of the frame 1 and thus slows down the further frame 1 destruction. The second insulation material have an expansion ratio is of 1:15 during 30 minutes, and its expansion pressure is of 0,4N/mm^2 (at 300C°). The expansion shall be from about 1:15 to 1:300, and the expansion pressure shall not exceed of about 0,5-0,8 N/mm^2, so that the insulation rod 6 is not pressed out of the hollow space 11 of the building element 2.

[0027] Furthermore, when the outer side aluminium profile is melted away due to the flames, the swelling of this material 7 takes up the heat and keeps the insulation material 6 protected from a direct fire into the frame 1 preventing its falling out and thus keeping its insulation function. The amount of the insulation material 6 and the extra layer of expandable or heat-swellable material 7 are carefully chosen to avoid a possible displacement of the insulation material rod 6 from the profile by the swelling extra layer 7. This invention provides also a better sound insulation according to the performed texts. The use of fibrous insulation material within the profiles of the building element according to the invention provides even better thermo insulation at a normal (20C) temperature between the profiles forming the inside and outside parts comparing to known in the art insulations such as gypsum or calcium silicate materials.

[0028] Fig. 4B illustrate a further alternative embodiment of the invention, where the first insulation material rod 6 is inserted between the profiles 3, 4 and an additional third cooling material 10 is inserted into the hollow spaces into the extruded profiles 3, 4. As the cooling material can be used conventionally known types of the fire resistant insulation materials emitting the crystalline water under the heating.

[0029] Fig. 4C illustrates the further embodiment of the building element 2, where all insulation materials are combined. The first rock wool material rod 6 spaced between the profiles 3, 4 and the second expandable insulation material 7 spaced between the first insulation material rod 6 and the neighbouring profiles 3, 4. The thermo expandable material layer 7 is situated on the sides of the rod, which sides are facing the profiles, which could be subjected to the fire load. Additionally, the hollow spaces 8 within the profiles 3, 4 are filled with the cooling material 10. Alternatively, the spaces 8 can be filled with the first material 6 (not shown) depending on the fire-resistant requirements to the building element 2.

[0030] It is to be understood that invention provides a use of the building element 2 in the frame construction 1 suitable for manufacturing such products like a window, a door or a frame work wall.

[0031] A method of manufacturing of the building element 2 with improved fire resistance according to the invention comprises the following steps. The extruded aluminum profiles are cut in the required lengths and the profiles 3, 4 are connected by the interconnecting element 5 forming the hollow building element 2. The first

insulation material is formed as an insulation rod 6 by e.g. cutting a fibrous material sheet into the strips of the desired dimensions. The fibrous material insulation rod 6 is inserted into the building element 2 hollow space 11 between the two profiles 3,4 and the two interconnecting elements 5. The insertion process is assisted by the extensions 51 formed onto the surfaces facing the space 11 there between of the extruded profiles 3, 4 or the interconnecting elements 5 as a guiding and/or fixing means. Alternatively, a second insulation thermally swellable or expandable material layer 7 is provided on the two sides of the first insulation material rod 6 facing the profiles 3, 4, where the fire load can appear. Furthermore, the third thermo insulation layer 10 with a cooling effect emitting the crystalline water under the heat can be inserted into the hollow spaces 8 within the profiles 3, 4 or within the building element 2 between the profiles. It is to be understood that all possible combinations of all three types mentioned above insulation materials in the different locations within the building element can be used for the improving the fire resistance of the building element within the scope of this invention.

Claims

1. A fire-resistant building element (2) for a frame construction (1), the building element (2) comprising :

   - a first outer metal profile (3);
   - a second inner metal profile (4);
   - an interconnecting element (5) connecting the profiles (3, 4) and forming a hollow space (11) within the building element (2),
   - a first insulation material (6) for a thermal insulation of the inner and outer profiles (3, 4) from each other, the insulation material (6) being situated between the first and the second profiles (3, 4) and the interconnecting elements (5) within the space (11), **characterized in that** the first insulation material (6) is a non- rigid fibrous material capable of withstanding a higher temperature than the melting temperature of the profiles (3, 4) and having a density of at least 80 kg/m^3.

2. The fire-resistant building element (2) according to Claim 1, **characterized in that** the first insulation material (6) is one of a rock fiber wool, mineral fiber wool, glass fiber wool based material and formed as a insulation rod (6).

3. The fire-resistant building element (2) according to Claims 1-2, **characterized in that** further comprises:

   - a second insulation material layer (7) with a higher thermal resistance than the material of the profiles (3,4), the second insulation material layer (7) is situated within the space (11) between the insulation rod (6) and the profiles (3, 4).

4. The fire-resistant building element (2) according to Claim 3, **characterized in that** the second material layer is a thermally expandable material layer (7).

5. The fire-resistant building element (2) according to Claims 3-4, **characterized in that** the thermally expandable material layer (7) when heated up to 140C° expands not less than 1:15 with a thermal expansion pressure not exceeding 0,5 N/mm^2.

6. The fire-resistant building element (2) according to Claims 3-5, **characterized in that** the thermally expandable material layer (7) is graphite based material.

7. The fire-resistant building element (2) according to any of Claims 1-6, **characterized in that** it further comprises a third cooling material layer (10) which emits crystalline water when heated.

8. The fire-resistant building element (2) according to any of Claims 1-7 is used for forming a frame construction (1).

9. A frame construction (1) comprising the building elements (2) according to any of Claims 1-7.

10. A window frame (1) comprising the building element (2) according to any of Claims 1-7.

11. Use of a non- rigid fibrous first insulation material (6) as a thermal insulation in a fire resistant building element (2), the non- rigid fibrous first insulation material (6) having a density of at least 80 kg/m^3 and being capable of withstanding a higher temperature than the melting temperature of the metal profiles (3, 4) of the building element (2)..

12. Method of manufacturing a building element (2) according to any of claims 1- 8 with improved fire-resistance comprises steps of:

    - cutting the profiles (3, 4) in the required lengths;
    - connecting the profiles (3, 4) by the interconnecting element (5) forming a hollow building element (2) with a hollow space (11) **characterized by**
    - inserting a first non- rigid insulation fibrous material (6) in a rod form into the building element (2) hollow space (11) between the two profiles (3,4) and the two interconnecting elements (5).

13. The method according to claim 12, **characterized by** providing a second insulation thermally expandable material layer (7) on the two sides of the first

fibrous insulation material (6) rod facing the profiles (3, 4).

14. The method according to claims 12 and 13, **characterized by** insertion a third thermo insulation layer (10) with a cooling effect into the hollow spaces (8) within the profiles (3, 4) and/or the hollow space (11) within the building element (2) between the profiles (3, 4).

Amended claims in accordance with Rule 137(2) EPC.

1. A fire-resistant building element (2) for a frame construction (1), the building element (2) comprising :

- a first outer metal profile (3);
- a second inner metal profile (4);
- an interconnecting element (5) connecting the profiles (3, 4) and forming a hollow space (11) within the building element (2),
- a first insulation material (6) for a thermal insulation of the inner and outer profiles (3, 4) from each other, the insulation material (6) being situated between the first and the second profiles (3, 4) and the interconnecting elements (5) within the space (11), **characterized in that** the first insulation material (6) is one of a rock fiber wool, mineral fiber wool, or glass fiber wool based material and formed as a non-expandable insulation rod (6) from a non-rigid fibrous material capable of withstanding a higher temperature than the melting temperature of the profiles (3, 4) and having a density of at least 80 kg/m^3.

2. The fire-resistant building element (2) according to Claim 1, **characterized in that** further comprises:

- a second insulation material layer (7) with a higher thermal resistance than the material of the profiles (3,4), the second insulation material layer (7) is situated within the space (11) between the insulation rod (6) and the profiles (3, 4).

3. The fire-resistant building element (2) according to Claim 2, **characterized in that** the second material layer is a thermally expandable material layer (7).

4. The fire-resistant building element (2) according to Claim 2, **characterized in that** the thermally expandable material layer (7) when heated up to 140C° expands not less than 1:15 with a thermal expansion pressure not exceeding 0,5 N/mm^2.

5. The fire-resistant building element (2) according to Claims 2-4, **characterized in that** the thermally expandable material layer (7) is graphite based material.

6. The fire-resistant building element (2) according to any of Claims 1-5, **characterized in that** it further comprises a third cooling material layer (10) which emits crystalline water when heated.

7. The fire-resistant building element (2) according to any of Claims 1-6 is used for forming a frame construction (1).

8. A frame construction (1) comprising the building elements (2) according to any of Claims 1-7.

9. A window frame (1) comprising the building element (2) according to any of Claims 1-7.

10. Use of a non- rigid and non-expandable fibrous first insulation material (6) as a thermal insulation in a fire resistant building element (2), the non- rigid fibrous first insulation material (6) having a density of at least 80 kg/m^3, being one of a rock fiber wool, mineral fiber wool, or glass fiber wool based material, and being capable of withstanding a higher temperature than the melting temperature of the metal profiles (3, 4) of the building element (2).

11. Method of manufacturing a building element (2) according to any of claims 1- 7 with improved fire-resistance comprises steps of:

- cutting the profiles (3, 4) in the required lengths;
- connecting the profiles (3, 4) by the interconnecting element (5) forming a hollow building element (2) with a hollow space (11) **characterized by**
- inserting a first non- rigid and non-expandable insulation fibrous material (6), being one of a rock fiber wool, mineral fiber wool, or glass fiber wool based material, in a rod form into the building element (2) hollow space (11) between the two profiles (3,4) and the two interconnecting elements (5).

12. The method according to claim 11, **characterized by** providing a second insulation thermally expandable material layer (7) on the two sides of the first fibrous insulation material (6) rod facing the profiles (3, 4).

13. The method according to claims 11 and 12, **characterized by** insertion a third thermo insulation layer (10) with a cooling effect into the hollow spaces (8) within the profiles (3, 4) and/or the hollow space (11) within the building element (2) between the profiles (3, 4).

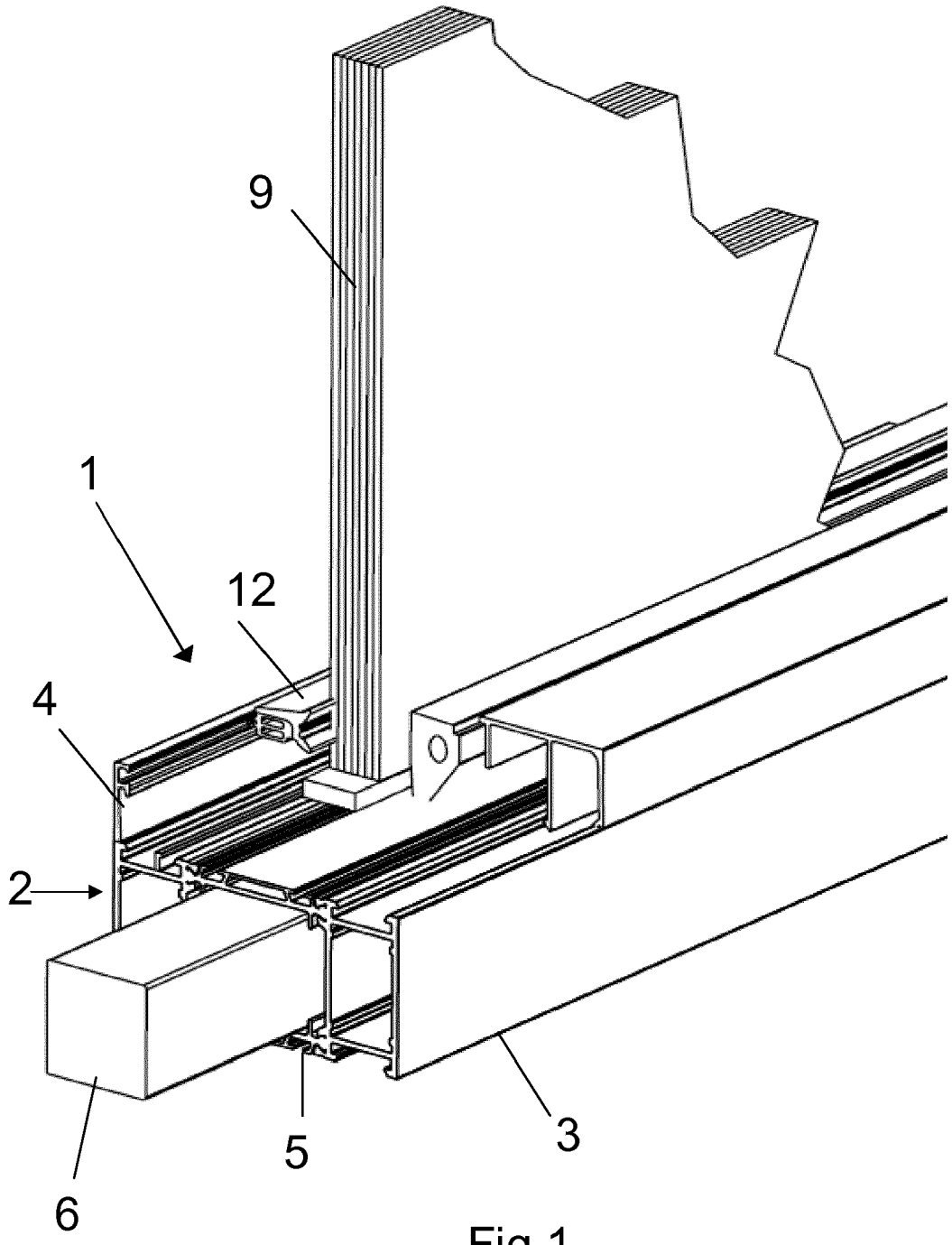

Fig.1

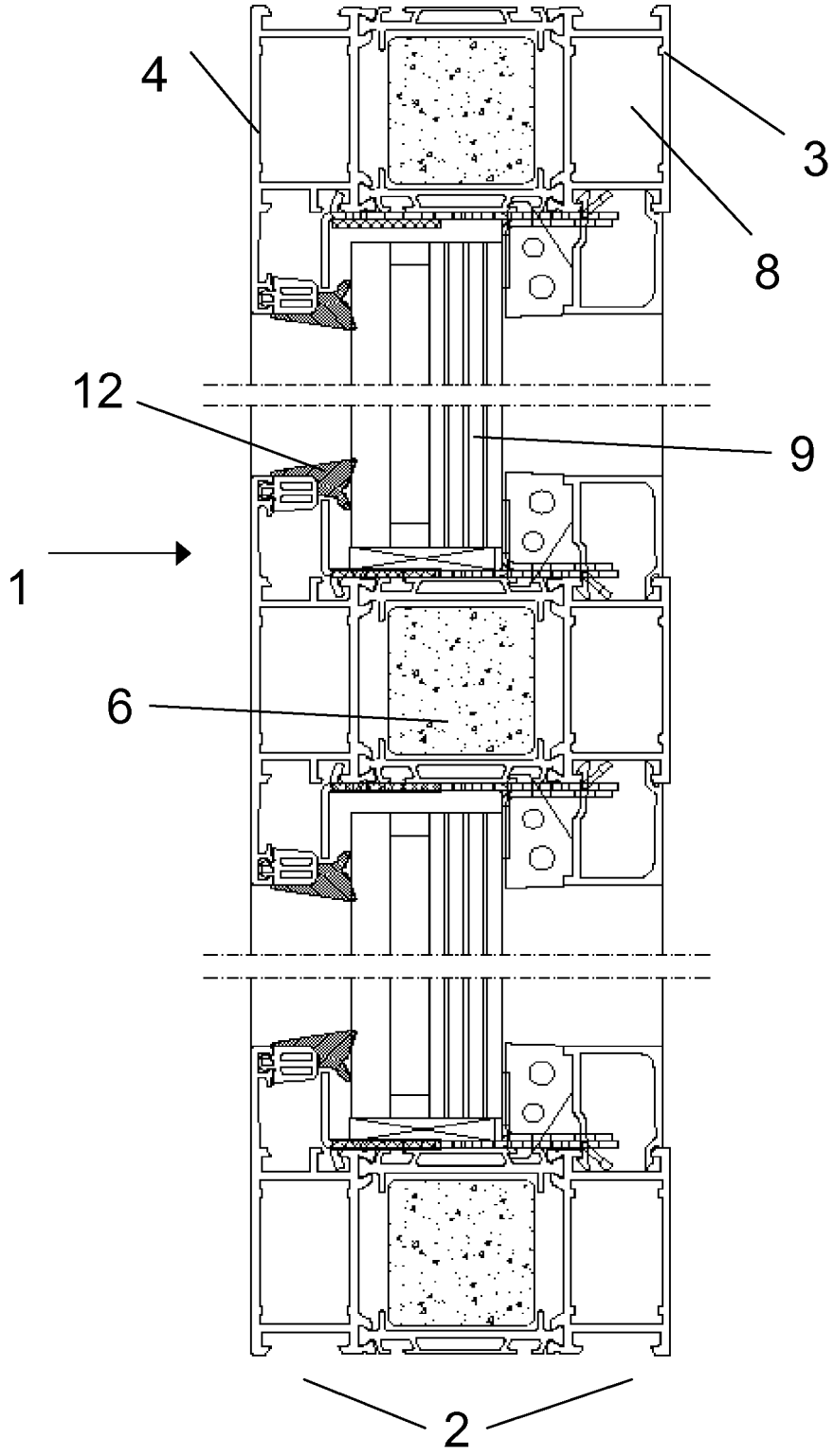

Fig.2

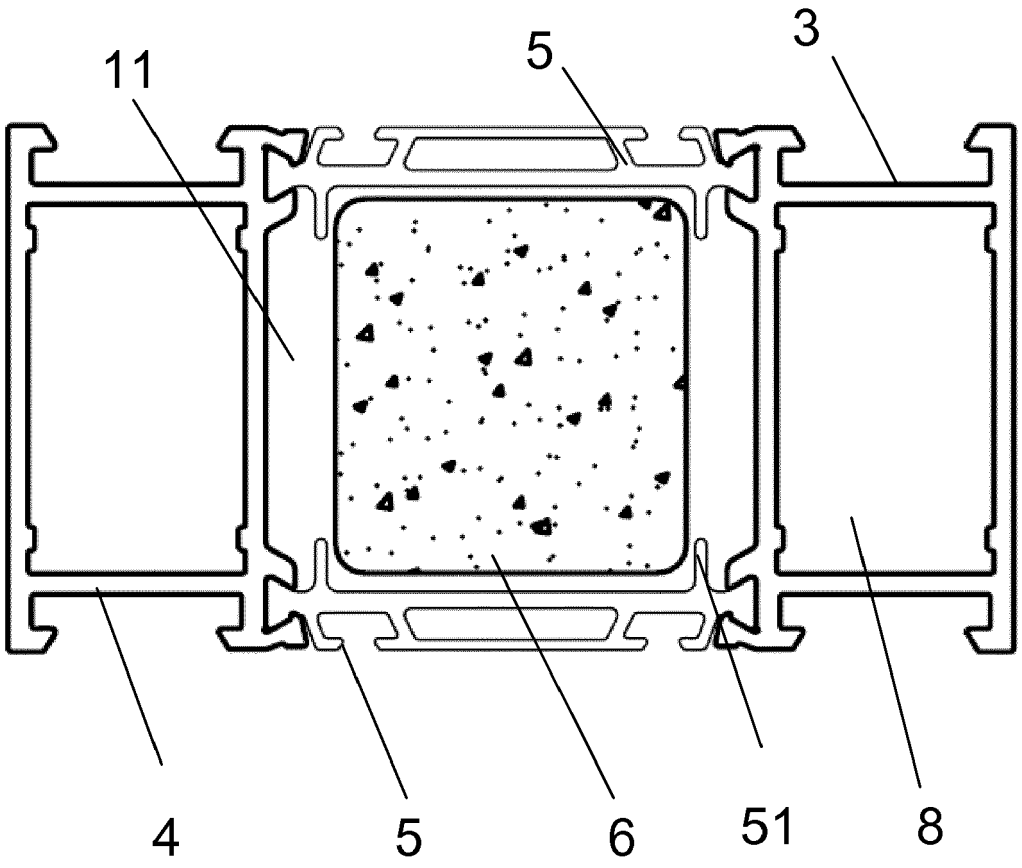

Fig.3

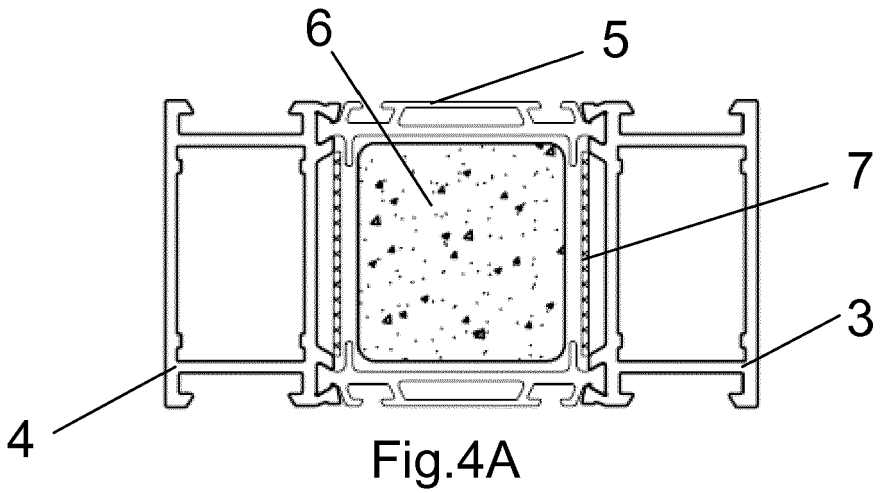

Fig.4A

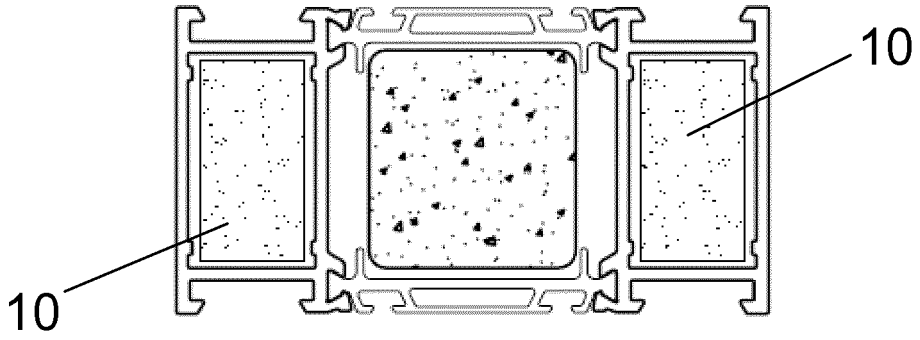

Fig.4B

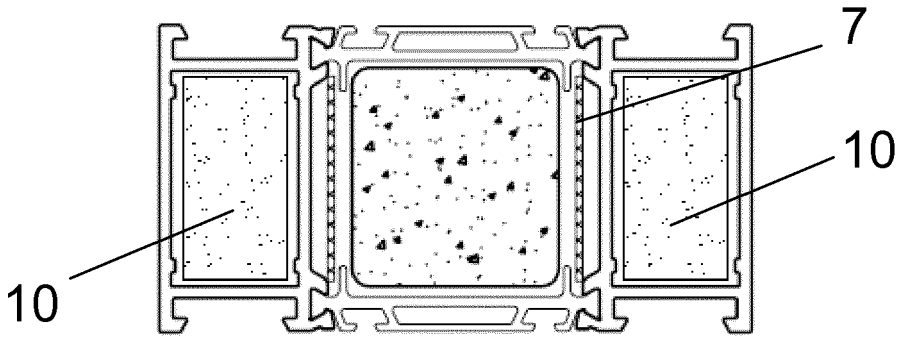

Fig.4C

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EUROPEAN SEARCH REPORT

Application Number
EP 14 15 0271

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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	Date of completion of the search	Examiner
The Hague	11 February 2014	Blancquaert, Katleen

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