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(54) **Edge beam, door and method for manufacturing an edge beam**

(57) The invention relates to an edge beam for a door, said edge beam comprising a laminate comprising a longitudinal extending layer of fire-resistant material interposed between two longitudinal extending layers of wood comprising material, wherein said layer of fire-resistant material is glued to each layer of wood comprising material over adjacent longitudinal edges thereof.

The invention further relates to a door, comprising two vertical edge beams and two horizontal edge beams according to the invention that are mutually connected to form a door frame.

The invention also relates to a method for manufacturing an edge beam for a door according to the invention.

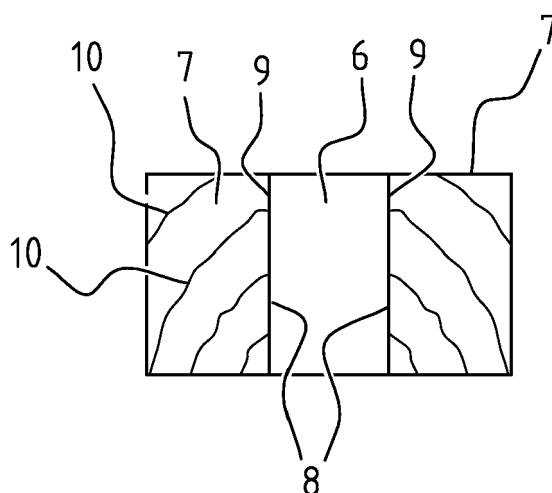


FIG. 2

Description

[0001] The invention relates to an edge beam for a door. Said edge beam is for example a (vertical) door stile, a (horizontal) door rail, or a glazing beam for receiving a glass panel. Said edge beam comprises a laminate comprising a longitudinal extending layer of fire-resistant material interposed between two longitudinal extending layers of wood comprising material.

[0002] Such an edge beam is known from Dutch patent with number NL-C2-1032436 and international patent application with number WO-A1-2008/030087. NL-C2-1032436 and WO-A1-2008/030087 describe a fire-retardant edge beam that is manufactured from a solid elongate body, in which at least one longitudinal groove is formed extending in the position of use in a direction parallel to the main plane of the door, in which longitudinal groove is received a fire-resistant material introduced in liquid state and subsequently cured.

[0003] A disadvantage of the edge beam known from NL-C2-1032436 is that it is relatively time consuming and/or relatively expensive to manufacture said edge beam.

[0004] It is an object of the invention to provide an edge beam according to the preamble that can be manufactured relatively fast and/or relatively cheap and/or with optionally less CO₂-production. It may also be an object of the invention to provide an edge beam according to the preamble that is relatively stable and/or that has an improved fire resistance and/or that is non toxic or harmful to the environment and living creatures.

[0005] This object is met by an edge beam according to the preamble, wherein said layer of fire-resistant material is glued to each layer of wood comprising material over adjacent longitudinal edges thereof.

[0006] Said layer of fire-resistant material is formed as a longitudinal extending plate or strip and is glued with two of its opposing surfaces to each layer of wood comprising material. Gluing the layer of fire-resistant material to the layers of wood comprising material may take place relatively fast and thereby relatively cheap, without having to cure the fire-resistant material. The applicant has found, that in comparison with the edge beam described in NL-C2-1032436 and WO-A1-2008/030087, less CO₂ may be produced during manufacturing said edge beam. After gluing said fire-resistant material to said layers of wood comprising material a stable edge beam is obtained, which edge beam is able provide stability to a door in which it will be included. Also, an improved fire resistance may be obtained, because the presence of air bubbles, which otherwise may be formed during pouring or curing of the liquid fire-resistant material in the groove, in the fire-resistant material is prevented or at least reduced. Said edge beam may form the horizontal door rail of a fire-resistant door and/or the vertical door stile of a fire-resistant door and/or a vertical or horizontal glazing beam for receiving a glass panel of a fire-resistant door.

[0007] In an embodiment of the edge beam according

to the invention, said fire-resistant material is a mineral bounded fibre-reinforced and/or filler-reinforced plate or strip like material. In particular, said mineral may be calcium silicate or magnesium. Such mineral, in particular calcium silicate or magnesium bounded fibre-reinforced plate or strip like material is not toxic and releases no harmful gasses when burnt. Such a non-toxic fire-resistant material is in particular advantageous in cases where water is used for extinguishing a fire. The water used for extinguishing the fire may comprise parts or pieces of said fire-resistant material and because of it being non-toxic the used water comprising said parts or pieces will not contaminate the soil. In addition, said described fire-resistant material is cheaper than the material described in NL-C2-1032436 and WO-A1-2008/030087. Said fire-resistant material substantially maintains its shape under influence of heat and is in particular not a "foam material".

[0008] It is noted that it is difficult to glue said mineral layer to said two layers of wood comprising material, in particular with respect to the requirements of sufficient stability on the one hand and flexibility in case of a fire on the other hand, which flexibility must be provided with respect to expansion or shrinkage or bending of the wood comprising material which may occur due to the heat of the fire. In addition thereto, said mineral must be machineable, in particular it must be possible to mill or screw said mineral. It took the applicant a long time to find a suitable mineral and then a suitable method to make said laminated edge beam comprising said mineral and the two layers of wood comprising material, which edge beam fulfills all requirements.

[0009] Said two layers of wood comprising material are preferably formed as two separate layers of wood comprising material and in particular not from a solid piece of wood comprising material comprising a longitudinal groove in which said fire-resistant material is introduced. Such a configuration according to the invention comprising said two separate layers of wood comprising material that are mutually connected by said fire-resistant material provides a stable edge beam. In particular, under influence of heat as occurring under fire said two layers of wood comprising material may bend in a different direction, such that said bending forces substantially erase each other and said edge beam remains relatively straight. Said fire-resistant material bends minimally under influence of heat and holds the two layers of wood comprising material together, thereby providing additional stability to said edge beam in case of fire. Thus, as a result of said laminate structure comprising separate layers of wood comprising material and at least one layer of fire-resistant material provides a stable edge beam, in particular under fire. By including more layers of wood comprising material and/or fire-resistant material an even more stable edge beam may be obtained.

[0010] An even more stable edge beam is obtained when the structures of the two layers of wood comprising material are different. As a result of said structures being different said two layers of wood comprising material tend

to bent in a different direction under influence of heat, such that said bending forces substantially erase each other and said edge beam remains relatively straight, thus providing a stable edge beam. By providing even more layers of wood comprising material, an even more stable edge beam may be provided, because all layers may have different structures and therefore different bending properties.

[0011] In addition or alternatively the structures of the two layers of wood comprising material may be arranged in different directions. In such an arrangement, even when the structures are substantially the same, a stable edge beam is provided that remains relatively straight under fire due to different bending directions of the two layers of wood comprising material that result from the structures being arranged in different directions.

[0012] The edge beam according to the invention may comprise layers of any type of wood comprising material. In particular any type of hardwood is suitable, since hardwood is relatively stable. However, also softwoods such as firwood or pinewood may be used. Also, wood comprising plates, such as plywood or (medium density) fibreboard, may be used. The structure of the wood comprising material may comprise the grain of the wood, or any other structure of the wood comprising material, for example the structure of the fibres of a fibreboard.

[0013] The thickness of the layer of fire-resistant material may be chosen in dependence of the required level of fire resistance. By providing a thicker fire-resistant material a more fire-resistant edge beam is obtained. For example, said layer may be between 5 and 25 mm thick.

[0014] A plurality of layers of fire-resistant material may be provided, thereby improving the fire resistance of the edge beam. Said layers of fire-resistant material may be glued to each other or to additional layers of wood comprising material.

[0015] The invention further relates to a door, comprising two vertical edge beams and two horizontal edge beams according to the invention as described above that are mutually connected to form a door frame, wherein said edge beams are arranged such that one layer of the two layers of wood comprising material forms the peripheral edge of said door or wherein said edge beams are arranged such that both layers of wood comprising material and said layer of fire-resistant material form the peripheral edge of said door.

[0016] Said door is in particular an inner door of a building.

[0017] Said door may further comprise two vertical edge beams and two horizontal edge beams according to the invention as described above that are mutually connected to form a glass panel frame, wherein said edge beams are arranged such that one layer of the two layers of wood comprising material forms the peripheral edge of said glass panel frame or wherein said edge beams are arranged such that both layers of wood comprising material and said layer of fire-resistant material form the peripheral edge of said glass panel frame.

[0018] The invention further relates to a method for manufacturing an edge beam for a door according to the invention as described above, wherein said method comprises the steps of:

- (a) providing two longitudinal extending layers of wood comprising material;
- (b) providing a longitudinal extending layer of fire-resistant material; and
- (c) gluing said layer of fire-resistant material to each layer of wood comprising material over adjacent longitudinal edges thereof in order to form said edge beam.

[0019] By gluing the two layers of wood comprising material to the layer of fire-resistant material, a stable edge beam is manufactured relatively fast and/or cheap.

[0020] In order to enhance the stability of the edge beam, said method comprises the step, to be performed after step (c), of:

- (d) compressing said layers in order to strengthen the glue bond therebetween.

[0021] Compressing may take place in any suitable type of press machine. For example, said press machine may be, but not limited thereto, a high frequency press machine, a plate press machine or a vacuum press machine. In particular a high frequency press machine is suitable if hardwood is used for the layers of wood comprising material, because hardwood is difficult to compress due to its hardness and such a vacuum press machine has high compressing power, in particular of at least 200 kg/cm².

[0022] In an embodiment of the method according to the invention said fire-resistant material is a mineral bounded fibre-reinforced plate or strip like material. In particular, said mineral may be calcium silicate or magnesium. Such a fire-resistant material is described above in more detail.

[0023] In another embodiment of the method according to the invention, said two layers of wood comprising material provided in step (a) are formed as two separate layers.

[0024] In even another embodiment of the method according to the invention, the structures of the two layers of wood comprising material are different.

[0025] In yet even another embodiment of the method according to the invention, steps (a) and (c) are performed such that said two layers of wood comprising material are provided such and glued to said layer of fire-resistant material such that the structures of the two layers of wood comprising material are arranged in different directions.

[0026] As described above, such two separate layers of wood comprising material, optionally with different structures or different arranged structures, provide a stable edge beam.

[0027] The invention will now be explained in more detail with reference to figures illustrated in a drawing, wherein:

- figure 1 is a schematic view of a door according to the invention;
- figures 2 and 3 are cross sections of the door of figure 1, wherein figure 2 is a cross section of a door stile of the door and figure 3 is a cross section of a glazing beam of the door; and
- figure 4 is a side view of a door according to a second embodiment of the invention.

[0028] Figure 1 shows a fire-resistant door 1. Said door 1 comprises a door frame comprising two vertical edge beams or door stiles 2 and two horizontal edge beams or door rails 3 that are mutually connected to form said door frame. Said door 1 further comprises a glass panel frame comprising two vertical edge beams or glazing beams 4 and two horizontal edge beams or glazing beams 5 that are mutually connected to form said glass panel frame.

[0029] As is shown in figures 2 and 3, each of said edge beams 2 - 5 comprises a laminate comprising a longitudinal extending layer of fire-resistant material 6 interposed between two longitudinal extending layers of wood 7. The longitudinal direction is defined here as the longitudinal direction of each edge beam 2 - 5, which is vertical for the vertical edge beams 2 and 4, and horizontal for the horizontal edge beams 3 and 5. Said fire-resistant material 6 is for example a calcium silicate or magnesium bounded fibre-reinforced plate or strip like material. It is noted that instead of wood, said layers 7 may be composed of any wood comprising material, as described above. Said wood layers 7 are separate layers of wood. Said edge beams 2 and 3 are arranged such that one layer 7 of the two layers of wood 7 forms the peripheral edge of said door 1. In figure 2 this is the layer 7 shown on the right. As such, the door 1 has the appearance of being made from wood. Said edge beams 4 and 5 are arranged such that one layer 7 of the two layers of wood 7 forms the peripheral edge of said glass panel frame. In figures 3 this is the layer 7 shown on the left. As such, the door 1, in particular the glass panel frame, has the appearance of being made from wood.

[0030] As is further shown in figure 2, the grains 10 of the wood layers 7 are arranged in opposing directions. As is further shown in figure 3, the grains 10 of the wood layers 7 are different.

[0031] The longitudinal extending layer of fire-resistant material 6 is glued with its longitudinal edges 8 to longitudinal edges 9 of the wood layers 7. Preferably, said layers 6 and 7 are compressed in a press machine after gluing, such that the glue bond there between is enhanced.

[0032] Figure 4 shows a side view of a door 101 according to a second embodiment of the invention. In this figure 4 similar elements are denoted by similar reference

numerals. The door 1 of figure 4 differs from the door 1 of figures 1 and 2 in that the edge beams 2, 3 are arranged such that all layers of the laminate, i.e. the two wood layers 7 and the fire-resistant material 6, form the peripheral edge of said door 1. Figure 4 further shows two hinges 11 for mounting said door 1 to a frame (not shown). Said hinges 11 are screwed to said edge beam 2 by means of screws 12. Said layer 6 is chosen from a suitable mineral such that it is possible to screw said screws 12 therein, without the need for a plug or the like.

[0033] It is noted that optionally an esthetical cover layer may be provided over said edge beams 2, 3 to cover said laminate.

[0034] It is further noted that the invention is not limited to the above discussed exemplary embodiments but also extends to other variants within the scope of the appended claims.

[0035] For example, instead of two layers of wood comprising material and one layer of fire-resistant material any number of layers may be provided, wherein additional layers may improve the stability of the edge beams. For example, said edge beam may comprise three layers of wood comprising material and two layers of fire-resistant material, which are alternatingly arranged.

Claims

1. Edge beam for a door, said edge beam comprising a laminate comprising a longitudinal extending layer of fire-resistant material interposed between two longitudinal extending layers of wood comprising material, **characterized in that** said layer of fire-resistant material is glued to each layer of wood comprising material over adjacent longitudinal edges thereof.
2. Edge beam according to claim 1, wherein said fire-resistant material is a mineral bounded fibre-reinforced plate or strip like material.
3. Edge beam according to claim 2, wherein said mineral is calcium silicate or magnesium
4. Edge beam according to any of the preceding claims, wherein said two layers of wood comprising material are formed as two separate layers of wood comprising material that are mutually connected by said fire-resistant material.
5. Edge beam according to claim 4, wherein the structures of the two layers of wood comprising material are different.
6. Edge beam according to claim 4 or 5, wherein the structures of the two layers of wood comprising material are arranged in different directions.

7. Door, comprising two vertical edge beams and two horizontal edge beams according to any of the preceding claims 1 - 6 that are mutually connected to form a door frame, wherein said edge beams are arranged such that one layer of the two layers of wood comprising material forms the peripheral edge of said door or wherein said edge beams are arranged such that both layers of wood comprising material and said layer of fire-resistant material form the peripheral edge of said door. 5 10
8. Door according to claim 7, further comprising two vertical edge beams and two horizontal edge beams according to any of the preceding claims 1 - 6 that are mutually connected to form a glass panel frame, wherein said edge beams are arranged such that one layer of the two layers of wood comprising material forms the peripheral edge of said glass panel frame or wherein said edge beams are arranged such that both layers of wood comprising material and said layer of fire-resistant material form the peripheral edge of said glass panel frame. 15 20
9. Method for manufacturing an edge beam for a door according to any of the claims 1 - 6, wherein said method comprises the steps of: 25
- (a) providing two longitudinal extending layers of wood comprising material;
 - (b) providing a longitudinal extending layer of fire-resistant material; and 30
 - (c) gluing said layer of fire-resistant material to each layer of wood comprising material over adjacent longitudinal edges thereof in order to form said edge beam. 35
10. Method according to claim 9, comprising the step, to be performed after step (c), of: 40
- (d) compressing said layers in order to strengthen the glue bond there between. 40
11. Method according to claim 9 or 10, wherein said fire-resistant material is a mineral bounded fibre-reinforced plate or strip like material. 45
12. Method according to claim 11, wherein said mineral is calcium silicate or magnesium
13. Method according to any of the preceding claims, wherein said two layers of wood comprising material provided in step (a) are formed as two separate layers. 50
14. Method according to claim 13, wherein the structures of the two layers of wood comprising material are different. 55
15. Method according to claim 13 or 14, wherein steps (a) and (c) are performed such that said two layers of wood comprising material are provided such and glued to said layer of fire-resistant material such that the structures of the two layers of wood comprising material are arranged in different directions.

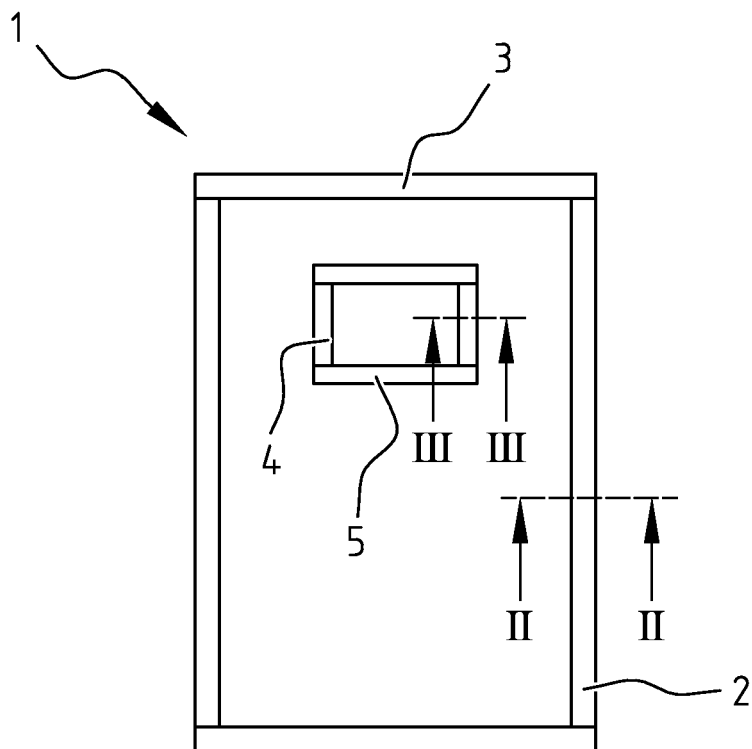


FIG. 1

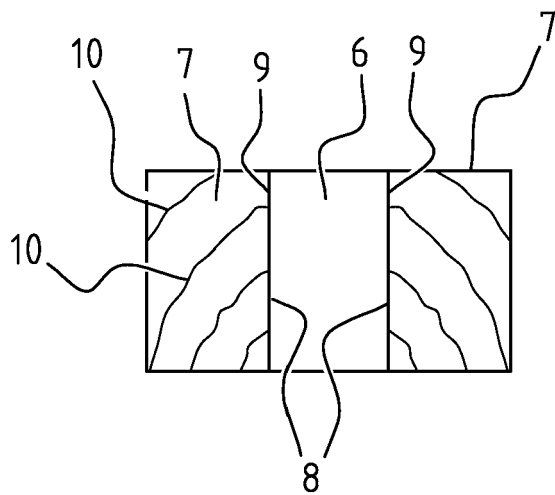


FIG. 2

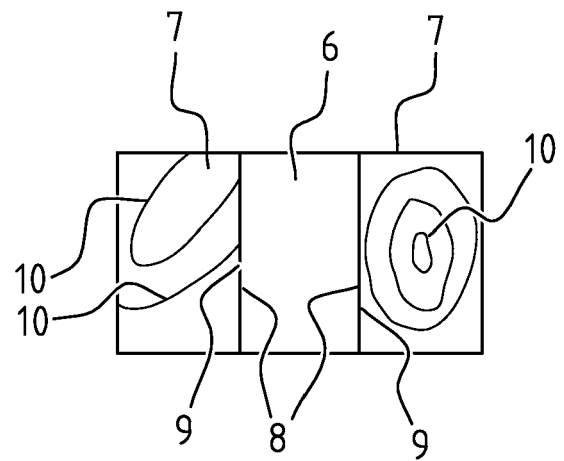


FIG. 3

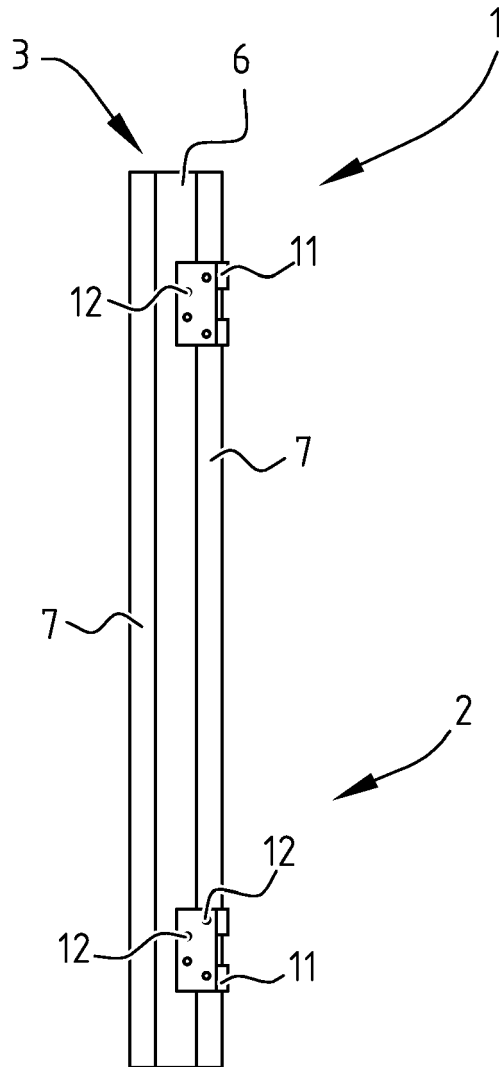


FIG. 4



EUROPEAN SEARCH REPORT

Application Number
EP 13 19 9430

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			TECHNICAL FIELDS SEARCHED (IPC)
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The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 15 April 2014	Examiner Verdonck, Benoit
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**ANNEX TO THE EUROPEAN SEARCH REPORT
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