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(54) Curtain wall profile and system

(57) A profile (1) for a curtain wall, comprising two preferably symmetrical connected half profiles (2', 2''). The half profiles (2', 2'') comprise a portion comprising a closed, preferably a rectangular, cross-section. Inner walls (3', 3'') of the closed cross-sections of the portions are facing each other. Outer walls (4', 4'') of the cross

sections of the portions are arranged opposite the inner walls (3', 3'') facing outside the profile (1). Each half profile (2', 2'') comprises a carcass structure (5', 5'') between the inner wall (3', 3'') and the outer wall (4', 4'') of the closed cross-section.

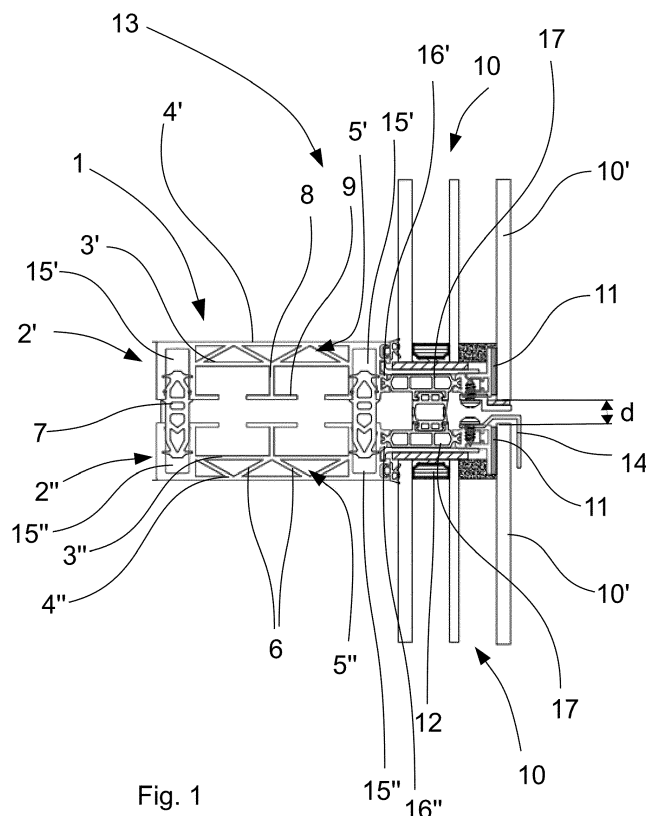


Fig. 1

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Description

[0001] The application concerns a profile for a curtain wall, a curtain wall system and methods of forming a profile for a curtain wall and a curtain wall system according to the independent claims.

[0002] Curtain walls are covering a building in which the outer walls are non-structural. The walls merely keep the weather out and the occupants in. Curtain walls do only carry their own weight and not any further dead weight from the rest of the building. Curtain walls may comprise aluminium profiles carrying glass panels. The curtain wall is designed to resist air and water infiltration and to isolate the building.

[0003] In order to carry the weight of the glasses, a certain strength of the aluminium profiles is favourable.

[0004] US 2005/0005543 A1 proposes to provide a curtain facade comprising a post section. The section is provided with a box formed of profiled strips. The box provides a high bearing capacity to the section.

[0005] EP 1 643 049 A2 proposes to provide a support profile consisting of two support profile elements. The elements comprise bridge elements to provide stability and rigidity to the profile elements.

[0006] The elements as proposed by these documents extend from one side of the profile to the other side in a perpendicular manner with respect to outer walls. The profile may be easily deformed if subject to non-perpendicular forces.

[0007] There exists a need for profiles suitable for easy manufacture of curtain walls which overcome the disadvantage of the known, in particular for profiles, which are simple to use, rigid and strong.

[0008] The object is achieved by profiles, systems and methods according to the independent claims.

[0009] In particular, the object is achieved with a profile for a curtain wall, comprising two preferably symmetrical half profiles connected or connectable to each other. The half profiles each comprise a portion having a closed, preferably a rectangular, cross-section. Inner walls of the closed cross-sections of the half profiles are facing towards each other. Outer walls of the cross sections of the half profiles are arranged opposite the inner walls and face outside the profile. Each half profile comprises a carcass structure between the inner wall and the outer wall of the closed cross-section.

[0010] Outer walls of the cross-section do not necessarily have to be the outermost walls of the cross-section. There might also be some further walls or surfaces such as e.g. an isolation layer. However, the outer walls might be the outermost walls.

[0011] The carcass-structure provides rigidity and strength to each half profile, and therefore to the profile, in multiple directions. Further, two symmetrical half profiles can easily be provided with such a carcass structure.

[0012] The half profiles are connected to each other with connection elements. The connection elements may be arranged in one of three main forms:

1. Corner cleats, where the horizontal and the vertical profiles of each panel are cut at a 45-degree and the corner cleat is inserted to join the corners where the profiles shall connect together.

2. Clips or gaskets, which are clipped in both half profiles, to connect the panels with each other in a flexible way. This is to close all gaps and to ensure a proper insulation between the inside and the outside of the building.

The connection elements preferably comprise or are formed of a deformable material. The clips provide preferably a form fit or a frictional connection between the half profiles.

3. Steel or similar structural material sleeve along a vertical line to connect the panels with each other by connecting the half profiles through this vertical sleeve. Therewith, the curtain wall is connected from a bottom to a top of a building to act as one unit.

[0013] Alternatively, a combination of any of the three forms with one or both further forms is possible.

[0014] The connection elements are preferably arranged in openings arranged on at least one, preferably on both, of the shorter side(s) of the cross-section of the half profiles.

[0015] In the connected state, the profile has a cross-section with a length of about 20 to 400 mm, preferably 100 mm and a width of about 40 to 150 mm, preferably 59 mm.

[0016] Such dimensions are in the range of standard profiles. Therefore, profiles according to the invention might be used to replace other profiles in curtain walls.

[0017] The carcass structure preferably comprises at least two, preferably three, four, or five, bridging elements extending from the outer wall to the inner wall in an angle of less than 90°. The bridging elements are preferably extending in a zig-zag structure between the inner wall and the outer wall. Preferably, the bridging elements extend in an angle of about 20° to 45°, preferably about 30° or exactly 30°. Such a construction provides an angle of about 140° to 90°, preferably about 120° or exactly 120° between two bridging elements.

[0018] A construction with such an arrangement of bridging elements improves the rigidity and strength of the profile. Especially a zig-zag structure with parallel zig bridging elements and parallel zag bridging elements has been shown to increase the rigidity and the strength significantly. The carcass structure might for example be constructed with two zig-zag bridging elements.

[0019] Alternatively, the bridging elements might also be arranged as crossing bridging elements or distanced bridging elements. The angle of less than 90° of the bars with respect to the inner and outer walls also provides rigidity and strength in multiple directions in such an alternative construction.

[0020] Preferably, the inner walls of the two half profiles

are spaced from each other. Preferably the inner walls are spaced by a distance of about 30 to 40 mm, preferably 38 mm, since the end point of each half profile shall be distant from the other half profile by about 0 to 20 mm, preferably 10 mm.

[0021] The space between the inner walls of the half profiles provides space for the arrangement of other elements such as e.g., attachment element for further profiles. Further, by creating the space, the width of the closed cross-section is reduced and the carcass structure is arranged over less space. This reduces the amount of material and hence costs needed without losing rigidity.

[0022] Alternatively, there is no space between the inner walls, i.e., the inner walls are directly adjoining. In a construction without a space, there might be only one wall forming a common wall of the half profiles.

[0023] The profile preferably comprises at least one, preferably two, four, or six, attachment element(s) formed integrally with either one or both of the half profiles, and arranged in the space between the inner walls. Therewith, there are no proturbanced elements on the outside of the profile, which might interfere with the construction. The attachment elements comprise an attachment surface, which runs preferably parallel to the inner walls and/or outer walls of the half profiles.

[0024] The attachment element(s) allows attachment of a further profile by means of an additional element such as a clip attached to and connecting both surfaces. By attaching a further profile, in particular in a degree of about 90° or exactly 90°, a frame or a part of a frame is formed. The attachment elements are arranged in the space between the inner walls.

[0025] The further profile is attached to the attachment surface of the attachment element(s) preferably with clips. Such a surface runs preferably basically parallel to the inner and/or outer wall. A parallel orientation allows the attachment of further profiles in an angle of 45°.

[0026] Alternatively, the attachment element has an attachment surface not running parallel to the inner and/or outer wall.

[0027] Preferably, the profile comprises an even number of attachment elements, wherein the attachment elements are arranged opposite each other with the attachment surfaces facing each other.

[0028] An arrangement with an even number of attachment elements arranged opposite each other allows the construction of symmetrical half profiles. Further, as both half profiles comprise at least one attachment element, a further profile might be attached on either end of the profile to form a frame.

[0029] Alternatively, the profile comprises an uneven number of attachment elements.

[0030] The attachment element(s) preferably has a cross-section with a T-structure or inverted L-structure extending from the inner wall(s).

[0031] The attachment elements are preferably integrally formed with the inner wall and extend therefrom in

a T- or inverted L-structure such that the attachment surface is parallel to the inner wall. An integral arrangement allows the extrusion of the half profile including the attachment elements.

[0032] Alternatively, the attachment elements are attached to the inner wall, e.g. by welding, bonding or with screws.

[0033] The attachment element(s) might also be attached to or integrally formed with a side wall of the half profile.

[0034] The half profiles are preferably made by extrusion and of aluminium. Aluminium profiles are solid but lightweight. Lightweight profiles can be easier transported than heavy profiles. Further, aluminium is rather inexpensive. Aluminium profiles can be extruded, which simplifies the production process.

[0035] Alternatively, other materials such as steel might be used for the profile.

[0036] The invention further relates to a method of forming a profile for a curtain wall, preferably a method of forming a profile as described above. The profile comprises two preferably symmetrical aluminium half profiles having a portion comprising a closed, preferably a rectangular, cross-section. Inner walls of the closed cross-sections of the portions are facing each other. Outer walls of the cross sections of the portions are arranged opposite the inner walls facing outside the profile. Each half profile comprises a carcass structure between the inner wall and the outer wall of the cross-section. According to the method, the aluminium half profiles are extruded and attached to each other.

[0037] Extrusion provides a fast and simple method of forming the half profiles. In an extrusion process, the whole half profile is integrally formed. Therewith, there is no complicated assembling of the half profile.

[0038] After the extrusion process, the half profiles are attached to each other. The profiles are preferably attached with connection elements. The connection elements are preferably formed of EPDM Gaskets, or similar Material gaskets. The connection elements provide a secure assembling of the profile, and weathering tightness and insulation to the building.

[0039] The invention further relates to a curtain wall system comprising a profile, preferably a system comprising a profile as described above. The profile comprises two preferably symmetrical half profiles comprising portion comprising a closed, preferably a rectangular, cross-section. Inner walls of the closed cross-sections of the portions are facing each other. Outer walls of the cross sections of the portions are arranged opposite the inner walls facing outside the profile. Each half profile comprises a carcass structure between the inner wall and the outer wall of the cross-section, and a triple or double glazing.

[0040] A curtain wall system is meant to provide isolation or insulation for the building. The triple glazing provides a reliable and good isolation. The profile according to the invention provides enough strength and rigidity to

carry the triple glazing.

[0041] Preferably, the triple glazing comprises spacer comprising a desiccant at least between the two inner glasses. The spacer secures a distance between the glass panels. The desiccant of the spacer makes sure that there will be no condensation between the glass panels.

[0042] Preferably one of the glasses, preferably the outermost glass, has an edge extending beyond the edges of the other glasses, such as to provide a step.

[0043] Therewith, a distance between the stepped glasses between neighbouring glazing units is reduced. Such a reduction in distance aids in increasing the insulation. Preferably, a distance between the displaced glasses is about 6 to 12 mm, preferably 10 mm.

[0044] A stepped outer most glass panels provides the most efficient insulation. However, it is also possible to extend an edge of one of the other two glass panels.

[0045] Alternatively, there is no stepped glass panel and the outer edges of the three glass panels are arranged substantially in line.

[0046] Preferably the outermost glass of the glazing is attached to the profile by bonding with a double face tape.

[0047] A double face tape provides an easy and secure attachment. The outermost glass, which is preferably stepped, might be attached with such a double face tape directly or indirectly to the profile. Therewith, the glass panel can be attached to the profile during installation of the curtain wall.

[0048] Alternatively, the glass is attached with other attachment means such as a mechanical clamp.

[0049] Traditional bonding technologies needing silicone are, however, also possible, with profiles according to the invention.

[0050] The half profiles are preferably spaced apart. The half profiles further preferably comprise at least one attachment element, preferably at least one attachment element as described above. The attachment elements are preferably arranged in the space between the inner walls.

[0051] As described above, the attachment elements provide an option to attach a further profile to form a frame or other elements.

[0052] Preferably, a further profile is connected with the attachment elements in a miter joint, preferably having an angle of about 45°, preferably exactly 45°.

[0053] The angle of 45° allows the attachment of a profile around the corner. As the miter joint profile is arranged at 45°, the angle between the profiles is 90°, hence, forming a frame.

[0054] A frame preferably comprises four profiles arranged at an angle of 90° between the profiles. Alternatively, more or less than four profiles arranged at different angles than 90° are possible to form frames with other shapes.

[0055] It is also possible to attach the further profile at another angle, if the angle between the profiles is preferred to be more or less than 90°.

[0056] The invention further relates to a method of forming a curtain wall system, comprising the steps of:

- Providing a profile, preferably a profile as described above. The profile has two preferably symmetrical half profiles comprising a portion comprising closed, preferably a rectangular, cross-section. Inner walls of the closed cross-sections of the portions are facing each other. Outer walls of the cross sections of the portions are arranged opposite the inner walls facing outside the profile. Each half profile comprises a carcass structure between the inner wall and the outer wall of the cross-section
- providing a triple glazing, or double glazing
- Attaching the glazing to the profile, wherein at least the outermost glass of the glazing is preferably attached by bonding.

[0057] The glazing are attached to the profile with different elements and different structures. In a preferred form, a female aluminium profile is attached to the outermost glass panel e.g. by double face tape or by structural silicon. A spacer between the further two glass panels is then attached to the female aluminium panel e.g. by structural silicon or double face tape. The female aluminium profile together with the glazing is then attached mechanically to a male crimped aluminium profile in the profile.

[0058] Alternatively, the outermost glass panel is attached to a U-shaped aluminium profile e.g. by double face tape or structural silicon. A spacer between the further two glass panels is then attached to the U-shaped profile preferably by structural silicon. An aluminium clamp is mechanically fixed to the male crimped aluminium profile and manually pushed to an inside of the U-shaped bonded aluminium profile.

[0059] Alternatively, a U-shaped spacer is bonded to the glass panels preferably by structural silicon. An aluminium clamp is mechanically fixed to the male crimped aluminium profile and manually pushed to an inside of the U-shaped bonded aluminium profile.

[0060] The method provides a stable and well isolated curtain wall system. The advantages of the different elements are the same as described above for the profile or the curtain wall system, respectively.

[0061] The half profiles of the method are preferably spaced apart and further comprise at least one attachment element, preferably an attachment element as described above. The attachment element(s) is preferably arranged in the space between the inner walls. As described above, the half profiles might comprise more than one attachment element.

[0062] As described above, the attachment elements provide an option to attach a further profile or other elements.

[0063] The method preferably comprises the step of attaching a further profile in a miter joint in an angle of about 45°, preferably exactly 45° to form a frame.

[0064] As described above, the angle of 45° allows the attachment of a profile around the corner. As the profile is attached at 45°, the angle between the profiles is 90°.

[0065] The invention is in the following described with reference to schematic drawings, which show non-limiting examples of the invention.

[0066] The figures show:

Fig 1: a schematic vertical cross-section of a curtain wall system according to the invention,

Fig 2: a schematic horizontal cross-section of the same curtain wall system according to the invention.

[0067] Figure 1 shows a first schematic vertical cross-section of a curtain wall system 13. The curtain wall system 13 comprises a profile 1. The profile 1 comprises two symmetric half profiles 2', 2" which are made of aluminium. The half profiles 2', 2" are formed in an extrusion process. The half profiles 2', 2" are connected with connection elements 7. The connection elements are made of EPDM gasket material or similar elastic material. The connection elements 7 are providing a form fit between the half profiles 2', 2". The connection elements 7 are arranged in openings 15', 15" at both shorter sides of the cross section of the half profiles 2', 2". Therewith, the connection elements 7 do not interfere with the carcass-structure 5', 5". The connection elements 7 are deformable to be easily arrangeable in the openings 15', 15".

[0068] Each half element comprises an inner wall 3', 3" and an outer wall 4', 4". The inner walls 3', 3" are distanced and face each other. The profile further comprises six attachment elements 8 in the space between the inner walls 2', 2". The half profile 2' comprises three attachment elements 8, which are arranged opposite the three attachment elements 8 of the other half profile 2". The attachment elements 8 are formed integrally with the inner wall 2', 2" and extend therefrom in a T- or inverted L-shape. The central attachment element 8 is in a T-shape; the outer two attachment elements 8 are in an inverted L-shape. Attachment surfaces 9 formed by the top of the T or inverted L are arranged parallel to the inner 3', 3" and outer wall 4', 4". The attachment elements 8 allow an attachment to a another profile (not shown) for example in an angle of 45° by means of a corner cleat.

[0069] Both half profiles comprise a carcass structure 5 between the inner 3', 3" and outer walls 4', 4". Each carcass structure 5 comprises four bridging elements 6 arranged in a zig-zag structure extending between the inner 3', 3" and the outer walls 4', 4". The carcass structure 5 provides stability to the profile 1 and therefore the system 13. The bridging elements 6 extend in an angle of 30° from the outer wall 4 to the inner wall 3 and vice-versa, such that the bridging elements 6 form an angle of 120° in between them.

[0070] The system 13 further comprises a triple glazing 10. The triple glazing is attached to the profile 1 with

different attachment structures. The triple glazing 10 provides the insulation of the curtain wall system 13.

[0071] The outermost glasses 10' are aligned or stepped with respect to the inner four glasses in order to reduce the distance d between the two outermost glasses 10' to ten millimetres. The reduced distance between the outermost glasses 10' further increases the insulation.

[0072] The inner two inner glasses on both sides are spaced to each other with a spacer 12 comprising a desiccant. The outermost glasses 10' of the triple glazing 10 are attached to the profile 1 through the attachment structures by bonding with a double face tape 11. Further, a hanger 14 is arranged to extend between the two outermost glasses 10' and along two centimeters of an outer surface one outermost glass 10'.

[0073] For fixing the triple glazing 10, both half profiles 2', 2" comprise an extension 16', 16" for receiving a hanger 17. The glass panels of the triple glazing 10 are attached indirectly by bonding to the hanger 17.

The outermost glasses 10' are attached to a U-shaped aluminium profile by structural silicon. A spacer between the further two glass panels is then attached to the U-shaped profile by structural silicon. An aluminium clamp is mechanically fixed to the male crimped aluminium profile and manually pushed to an inside of the U-shaped bonded aluminium profile 1.

[0074] Alternatively, the outermost glasses 10' are attached to a female aluminium profile by double face tape. The female profile is then attached to the further two glass panels by a spacer and structural silicon. The female profile is also attached to the receiving hanger 17 by means of inserting the male profile crimped to the top of hanger 17 into the female profile.

[0075] The profile 2' or 2" has a width of 24.5 mm and when joined together they make a 59 mm, and a length of 100 mm. the triple glazing adds another 52 mm to the length. Inner walls 3', 3", outer walls 4', 4" as well as bridging elements are 2 mm in thickness or as per the structural requirement. The distance between the inner 3' 3" and outer walls 4', 4" is 9 mm. Walls on the shorter side opposite the triple glazing 10 have a thickness of 3 mm or as per the structural requirement. The openings 15', 15" have a width of 10 mm and a length of 22 mm. The attachment elements 8 have a length of 12 mm and the attachment surfaces 9 have a thickness of 2 mm. The attachment elements 8 of one half profile 2' 2" are distanced by 32 mm.

[0076] The triple glazing has a width of 48 mm, wherein the innermost glasses and the outermost glasses 10' each have a thickness of 6 mm or as per the structural requirement and the middle glass has a thickness of 4 mm. The spacer 12 between the inner glasses has a width of 16 mm or as per the structural requirement. The distance between the outermost glasses 10' and the middle glasses is also 16 mm or as per the structural requirement.

[0077] Figure 2 shows a schematic Horizontal cross-section of the system 13. The system 13 is extensively

identical to the system 13 shown in figure 1. However, contrary to the system 13 shown in figure 1, in the system 13 of figure 2, two hangers 14 are arranged such as to extend between the outermost glasses 10' and along two centimetres of the outer surfaces of both outermost glasses 10'.

Claims

1. A profile (1) for a curtain wall, comprising two preferably symmetrical connected half profiles (2', 2'') each comprising a portion having a closed, preferably a rectangular, cross-section, wherein inner walls (3', 3'') of the closed cross-sections of the portions are facing each other, and outer walls (4', 4'') of the cross sections of the portions are arranged opposite the inner walls (3', 3'') facing outside the profile (1), **characterized in that** each half profile (2', 2'') comprises a carcass structure (5', 5'') between the inner wall (3', 3'') and the outer wall (4', 4'') of the closed cross-section.
2. The profile (1) according to claim 1, wherein the carcass structure comprises at least two, preferably three, four, five, or more bridging elements (6) extending from the outer (4', 4'') to the inner wall (3', 3'') at an angle of less than 90°, preferably in a zig-zag structure extending between the inner wall (3', 3'') and the outer wall (4', 4'').
3. The profile (1) according to claim 1 or 2, wherein the inner walls (3', 3'') of the two half profiles (2', 2'') are spaced from each other, preferably by a distance of about 30 to 40 mm, preferably 38 mm.
4. The profile (1) according to claim 3, wherein the profile (1) further comprises at least one, preferably two, four, or six, attachment element (8) formed integrally with either one of the half profiles (2', 2''), and arranged in the space between the inner walls (3', 3''), comprising an attachment surface (9), preferably running parallel to the inner walls (3', 3'') and/or outer walls (4', 4'') of the half profiles (2', 2'').
5. The profile (1) according to claim 4, comprising an even number of attachment elements (8), wherein the attachment elements (8) are arranged opposite each other with the attachment surfaces (9) facing each other.
6. The profile (1) according to claim 4 or 5, wherein the at least one attachment element (8) have a cross-section with a T-structure or inverted L-structure extending from the inner wall(s) (3', 3'').
7. The profile (1) according to one of the previous claims, wherein the half profiles (2', 2'') are made of

aluminium.

8. A method for forming a profile (1) for a curtain wall, preferably a profile (1) according to one of the claims 1 to 3, wherein the profile (1) comprises two preferably symmetrical aluminium half profiles (2', 2'') comprising a portion comprising a closed, preferably a rectangular, cross-section, wherein inner walls (3', 3'') of the closed cross-sections of the portions are facing each other, and outer walls (4', 4'') of the cross sections of the portions are arranged opposite the inner walls (3', 3'') facing outside the profile (1), and wherein each half profile (2', 2'') comprises a carcass structure (5', 5'') between the inner wall (3', 3'') and the outer wall (4', 4'') of the cross-section, the method comprising the steps of extruding the aluminium half profiles (2', 2'') and attaching the half profiles (2', 2'') to each other.
9. A curtain wall system comprising a profile (1), preferably a profile (1) according to one of the claims 1 to 7, wherein the profile (1) comprises two preferably symmetrical half profiles (2', 2'') having a portion with a closed, preferably a rectangular, cross-section, wherein inner walls (3', 3'') of the closed cross-sections of the portions are facing each other, and outer walls (4', 4'') of the cross sections of the portions are arranged opposite the inner walls (3', 3'') facing outside the profile (1), and wherein each half profile (2', 2'') comprises a carcass structure between the inner wall (3', 3'') and the outer wall (4', 4'') of the cross-section, and a triple or double glazing (10).
10. The system according to claim 9, wherein one of the glasses, preferably the outermost glass (10'), is aligned or stepped with respect to the other two glasses.
11. The system according to one of the claims 9 and 10, wherein at least the outermost glass (10') of the glazing is attached to the profile by bonding with a double face tape (11).
12. The system according to one of the claims 9 to 11, wherein the half profiles (2', 2'') are spaced apart and further comprising at least one attachment element (8), preferably at least one attachment element (8) according to one of the claims 3 to 6, arranged in the space between the inner walls (3', 3'').
13. The system according to one of the claim 12, wherein a further profile is connected with the attachment elements (8), preferably in a miter joint at an angle of about 45°, preferably exactly 45°, preferably to form a frame with 4 profiles (1).
14. A method of forming a curtain wall system, comprising the steps of:

- providing a profile (1), preferably a profile (1) according to one of the claims 1 to 7, wherein the profile (1) has two preferably symmetrical half profiles (2', 2'') with a portion comprising a closed, preferably a rectangular, cross-section, wherein inner walls (3', 3'') of the closed cross-sections of the portions are facing each other, and outer walls (4', 4'') of the cross sections of the profiles are arranged opposite the inner walls (3', 3'') facing outside the profile (1), and wherein each half profile (2', 2'') comprises a carcass structure between the inner wall (3', 3'') and the outer wall (4', 4'') of the cross-section, and
- providing a triple or double glazing (10),
- attaching the glazing (10) to the profile, wherein at least the outermost glass (10') of the triple glazing (10) is preferably attached by bonding directly or indirectly to the profile (1).

15. The method according to claim 14, wherein the half profiles (2', 2'') are spaced apart and further have at least one attachment element (8), preferably at least one attachment element (8) according to one of the claims 3 to 6, arranged in the space between the inner walls (3', 3'') and comprising the step of attaching a further profile in a miter joint the attachment elements at an angle of about 45°, preferably exactly 45°.

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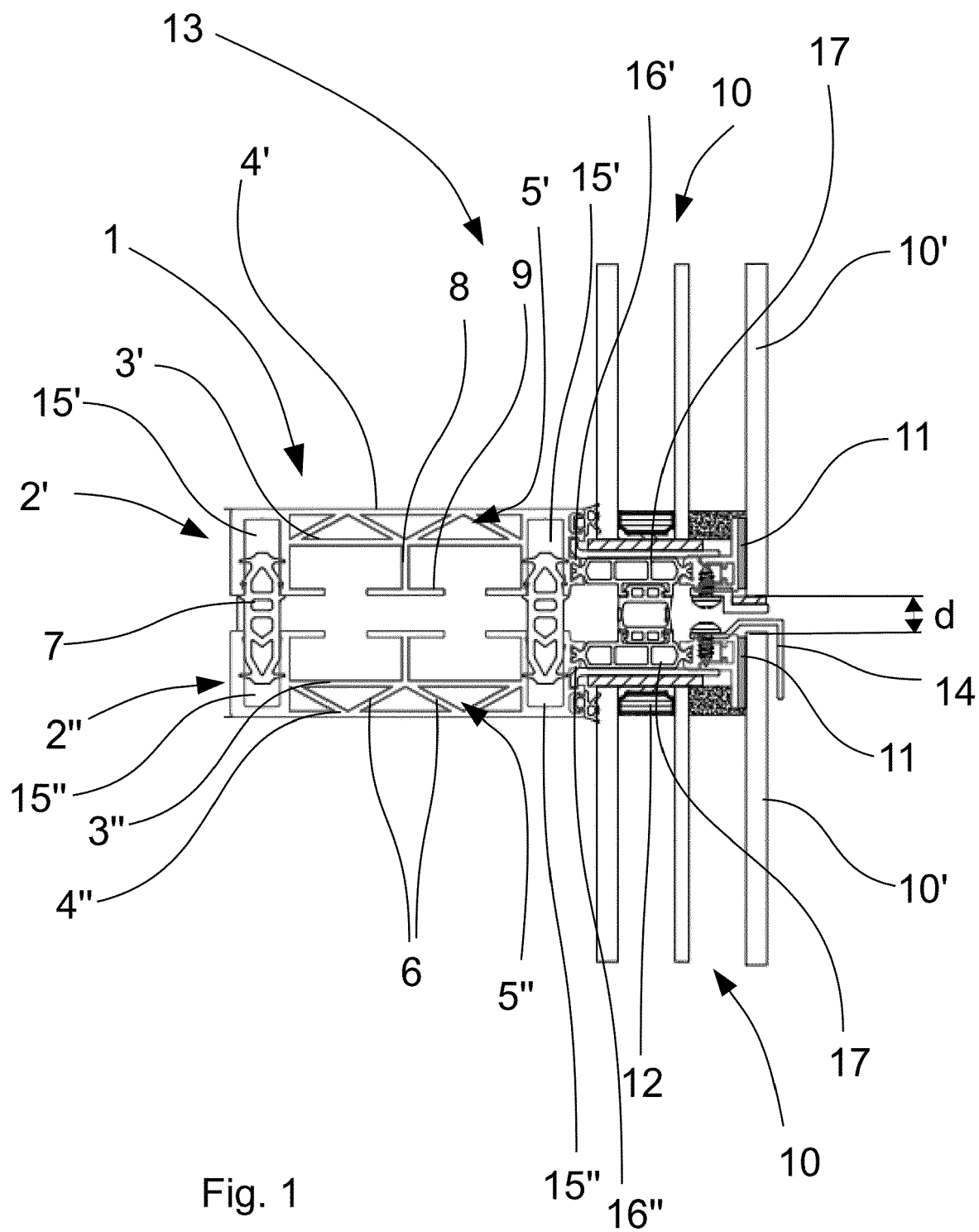
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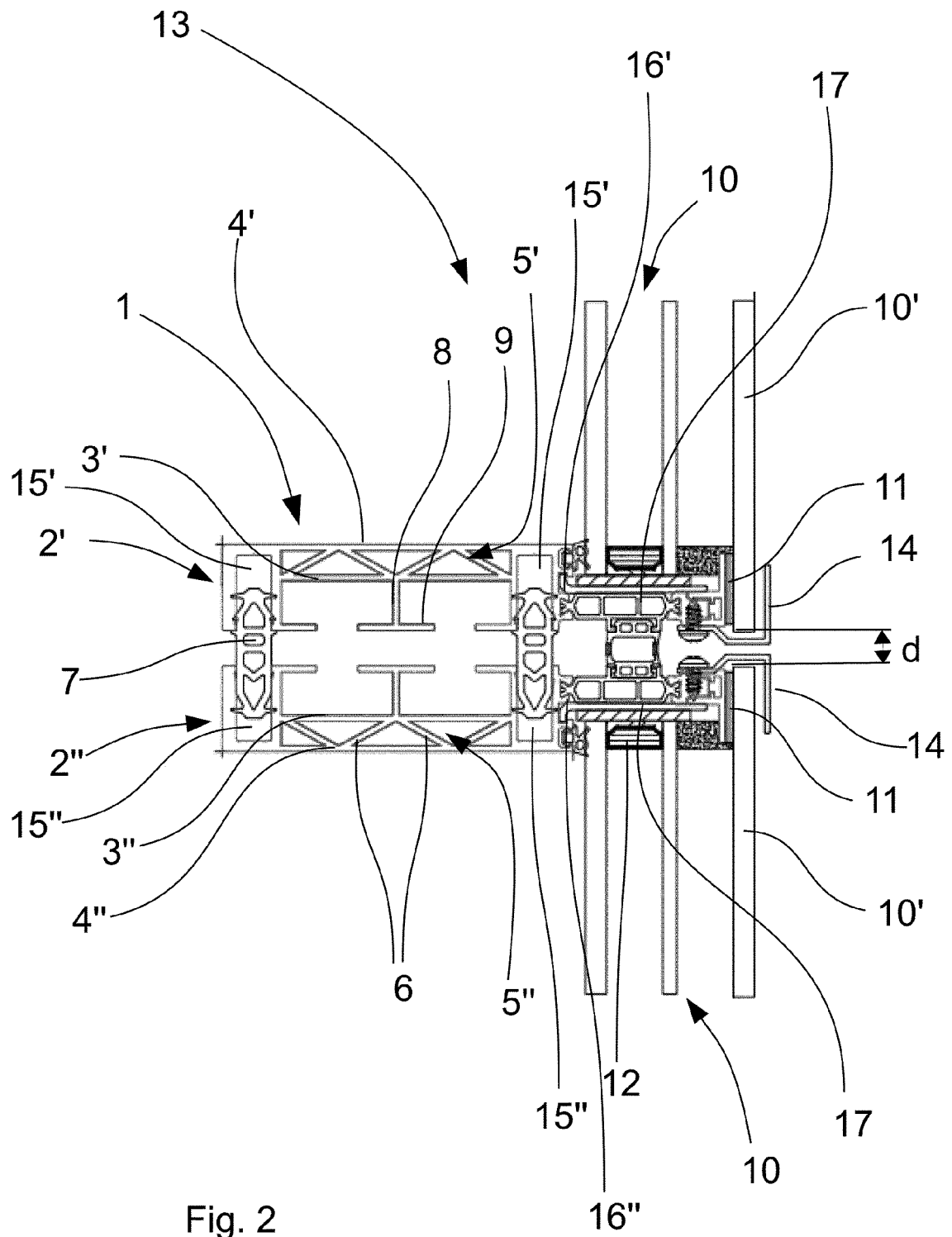


Fig. 2



EUROPEAN SEARCH REPORT

Application Number
EP 14 19 7763

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DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	EP 0 569 876 A1 (NORSK HYDRO AS [NO]) 18 November 1993 (1993-11-18) * column 3, line 44 - column 6, line 55; figures *	1-15	INV. E04B2/90
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A		4-7, 10-13,15	
			TECHNICAL FIELDS SEARCHED (IPC)
			E04B
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 4 June 2015	Examiner Dieterle, Sibille
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EPO FORM 1503 03/02 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
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5 This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
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04-06-2015

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REFERENCES CITED IN THE DESCRIPTION

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