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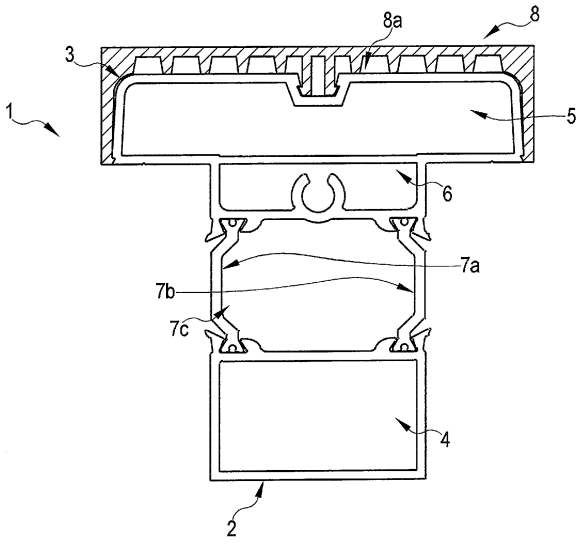
(54) **DEVICE FOR FORMING A STRUCTURE**

(57) Structure (10) comprising at least one device (1) connectable to at least one wall (11) of the structure (10), comprising a first and a second metal profiles (2, 3), the first metal profile (2) defining in section at least one first closed chamber (4), the second metal profile (3) defining in section at least one second closed chamber (5) comprising a polymer insulating element (7) which is interposed between the first metal profile (2) and the second metal profile (3), said first metal profile (2), said polymer insulating element (7) and said second metal profile (3) being arranged in series, so as to prevent the contact between the first metal profile (2) and the second metal profile (3) characterized in that said structure (10) defines at least one inner space and one outer space of the structure (10), wherein said first metal profile (2) faces the outer space and said second metal profile (3) faces the inner space and in that said second metal profile (3) comprises two or more chambers (5, 6), wherein said second metal profile (3) is a single element forming in section said two or more chambers (5, 6), wherein said second metal profile (3) is covered by a polymer cover (8) that faces the inner space.

FIG.1A



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Description

[0001] The present invention relates to devices for forming a structure, typically to elements that are arranged between the panels of a structure for the purpose of cooling, heating or fluidic treatments in general, which therefore must provide effective thermal insulation between the environment inside and outside the structure.

[0002] Such devices typically have one or more metal profile elements, which can be connected to the panels, or walls, of a structure.

[0003] Although different solutions of such devices are known, they typically lack adequate thermal insulation capacity.

[0004] Object of the present invention it is therefore to provide a device and related structure which are easy to manufacture while providing effective thermal insulation between the inside and the outside of the structure.

[0005] These and other objects are solved by a device and a structure according to one or more of the appended claims.

[0006] In particular, a device and a structure according to claims 1 and 8 are object of the present invention, while preferred aspects are set forth in the dependent claims.

[0007] Specifically, according to an aspect of the present invention, a device for forming a structure, connectable to at least one wall of the structure, comprises a first and a second metal profile, the first metal profile defining in section at least one first closed chamber, the second metal profile defining in section at least one second closed chamber. The device comprises a polymer insulating element interposed between the first metal profile and the second metal profile, where the first profile, insulating element and second profile are arranged in series so as to prevent the contact between the first profile and the second profile.

[0008] Profiles are elements made in a manner known in the art and are typically single, one-piece elements that therefore form two or more closed chambers.

[0009] Metal profiles and polymer insulating element are arranged in series, that is, in a linear series, one after the other in the same direction, like the links of a chain (without, of course, an intersection of the respective chambers), in which the polymer insulating element is interposed between the metal profiles.

[0010] According to an aspect of the invention, such metal profiles can each be made in one piece.

[0011] The first and second metal profiles, according to another aspect of the invention, actually form a sequence of two or more closed chambers arranged in series, preferably in a linear series, that is to say preferably aligned, one after the other along the same direction which connects the inner space to the outer space.

[0012] The second profile, arranged in use toward the inside of the structure, has at least one chamber adapted to provide a first thermal insulation. The profile is effectively hollow and is therefore filled with air in use or possibly filled with insulating material, which provides a first function of thermal insulation.

[0013] Additionally, the device has an additional insulating element, which is an element made of material thermally less conductive than the material of the metal profiles. By preventing the contact between the two metal profiles, this insulating element made of polymer material prevents direct heat transmission between the two elements.

[0014] The first metal profile, arranged in use toward the outside of the structure, also has a chamber that provides an additional insulating function due to the ambient air contained therein.

[0015] At least part of the second profile, typically at least part of the second device chamber made in the second profile, is covered with a polymer cover.

[0016] Such cover helps to improve the insulation efficiency of the device.

[0017] The polymer cover can also be arranged so as to ensure that the entire side, facing the inner space, of the second chamber of the second metal profile is covered and preferably enclosed by the polymer cover in order to further improve the insulating efficiency of the device.

[0018] For this purpose, the polymer cover preferably forms openings configured to form a plurality of air chambers between the polymer cover and the second profile.

[0019] Preferably, the first profile comprises exactly one closed chamber and/or the second profile forms exactly one or two closed chambers. This provides a good compromise between compactness, simplicity and insulating function of the device.

[0020] According to a preferred aspect, the polymer insulating element is in contact with the second chamber of the device.

[0021] According to a preferred aspect, the insulating element comprises two portions separated from each other and interposed between the first and second profiles.

[0022] An object of the present invention also relates to a structure comprising at least one device according to one or more of the preceding aspects and at least one wall constrained to the device.

[0023] According to a preferred aspect, the structure defines at least one inner space and one outer space of the structure, in which the first profile faces the outer space and the second profile (or anyway the polymer cover applied thereto) faces the inner space.

[0024] According to a preferred aspect, the wall comprises two metal sheets connected to each other by at least one polymer profile. The device is connected to the polymer profile and/or at least one of the metal sheets, preferably by at least one connection selected from: at least one screw connecting said polymer profile of said wall to said second metal profile of said device; a hinge connecting said first metal profile of said device to one of the metal sheets of said wall; retainers arranged with interference between said first metal profile of said device

and one of the metal sheets of the wall.

[0025] Hereinafter, referring to the appended figures, exemplary and non-limiting embodiments of the present invention will be discussed, wherein:

- Figure 1A shows an enlarged view of a first embodiment of the device, with the first metal profile defining in section a first closed chamber and the second metal profile defining in section a second and a third closed chamber;
- Figure 1B shows an enlarged view of a second embodiment of the device;
- Figure 1C shows an enlarged view of a third embodiment of the device;
- Figure 2A shows a connection between the profile of the wall and the device according to a first embodiment of the present invention;
- Figure 2B shows a connection between the profile of the wall and the device according to a second embodiment of the present invention;
- Figure 2C shows a connection between the profile of the wall and the device according to a third embodiment of the present invention;
- Figure 2D shows a connection between the profile of the wall and the device according to a further embodiment of the present invention;
- Figure 2E shows a connection between the profile of the wall and the first profile of the device according to a further embodiment of the present invention, with an enlarged view of a detail of the connection;
- Figure 3 shows a three-dimensional schematic view of a structure according to an embodiment of the present invention, made using the various embodiments of the device and comprising hinges and movable walls.

[0026] A device 1 for forming a structure 10 comprises a first and a second metal profiles 2, 3.

[0027] The first metal profile 2 defines in section at least one first closed chamber 4, while the second metal profile 3 defines in section at least one second closed chamber 5.

[0028] The metal profiles 2, 3 are one-piece elements made, for example, by extrusion. Specifically, in the case where the first metal profile 2 or the second metal profile 3 has two or more chambers, such metal profile is a single element that forms in section these two or more chambers.

[0029] The preferred material for the metal profiles 2, 3 is aluminum or at least an aluminum alloy.

[0030] In preferred embodiments, the first profile 2 forms exactly one closed chamber 4, while the second metal profile forms two closed chambers 5, 6.

[0031] In other embodiments, the number of chambers of the metal profiles 2 and 3 can be variable for each profile.

[0032] It should also be noted that these first and second metal profiles 2, 3 can each be made in one piece, for example from aluminum.

[0033] The device 1 further comprises a polymer insulating element 7 interposed between the first metal profile 2 and the second metal profile 3.

[0034] The polymer insulating element 7 can take different shapes in different embodiments. In general, the polymer insulating element 7 is shaped so as to prevent the contact between the first metal profile 2 and the second metal profile 3.

[0035] The polymer insulating element 7 preferably has two portions 7a, 7b arranged distal to each other, considering the sectional view of the device. The two portions can be elements separated from each other or they can be connected to each other, such as by a transverse portion connecting the two portions 7a, 7b. The two portions 7a, 7b are typically essentially identical and are arranged in a specular manner in the device, typically with respect to a plane passing through both the metal profiles 2, 3.

[0036] Preferably, the two portions 7a, 7b are arranged to form a chamber 7c with the metal profiles 2, 3. The two portions 7a, 7b themselves and outer walls of metal profiles 2, 3 constitute the walls of this chamber 7c. According to a possible aspect, considering the sectional view of the device 1, each portion 7a, 7b is arranged substantially flush with a wall of at least one of the two metal profiles 2, 3, preferably with both a wall of the first metal profile 2 and a wall of the second metal profile 3.

[0037] The connection between the portions 7a, 7b and the metal profiles 2, 3 can be made in different ways. According to a preferred aspect, the ends of the portions 7a, 7b are coupled by interlocking in corresponding seats made on the outer surface of the metal profiles 2, 3.

[0038] In general, the polymer insulating element 7 makes it possible to avoid direct heat transmission between the two metal profiles 2, 3.

[0039] Polymer materials are typically thermally insulating, so different polymer materials can be used to make the polymer insulating element 7. The Applicant found that insulating elements 7 made of polyamide provided a good compromise between mechanical and thermal properties.

[0040] The metal profiles 2, 3 and the polymer insulating element 7 are arranged in series, with the polymer insulating element 7 arranged between the two metal profiles 2, 3.

[0041] Considering the section of the device, the metal profiles 2, 3 are arranged opposite each other, with respect to the polymer insulating element 7.

[0042] In a possible embodiment, as discussed, the second profile has exactly two closed chambers 5, 6, specifically the aforementioned second chamber 5 and an additional third chamber 6. Therefore, the third chamber 6 is in contact with the polymer insulating element 7, whereas the second chamber 5 is opposite the polymer insulating element 7 with respect to the third chamber 6.

[0043] The second chamber 5 has at least one surface directed toward, and facing, the inner space of the struc-

ture 10 and at least one opposite surface facing the third chamber 6.

[0044] The size of the second chamber 5 (i.e., the area of the closed figure formed by the second chamber 5) is typically larger than the third chamber 6 of the second metal profile 3.

[0045] In this embodiment of the invention, the first and the second metal profiles 2, 3 actually form a sequence of two or more closed chambers 5, 6, 4 arranged in series, preferably in a linear series, that is to say preferably aligned, one after the other along the same direction which connects the inner space to the outer space of the structure 10.

[0046] According to an aspect of the invention, at least the closed chambers 5, 6 of the second profile 3 are aligned with each other, in series, along the direction joining the inner space to the outer space of the structure 10.

[0047] According to a preferred aspect, at least part of the second metal profile 3, typically at least part of the second chamber 5 of the second profile 3, is covered with a polymer cover 8. Such a cover 8 is arranged to preferably cover at least the walls of the second metal profile 3 which, in use, face the inside of the structure 10.

[0048] In general, the polymer cover 8 helps to improve the insulation efficiency of the device.

[0049] According to a further preferred aspect, the cover 8 can be applied so that at least the entire inwardly facing side of the second chamber 5 of the second metal profile 3 is covered and preferably enclosed by the polymer cover 8 in order to further improve the insulating efficiency of the device.

[0050] In other words, at least the entire inwardly facing surface of the second chamber 5 of the second profile 3, that is at least the entire surface of the chamber 5 which is intended to face the inner space of the structure 10, is preferably covered by the polymer cover 8, so that the latter can effectively act as a thermally insulating barrier with respect to this second chamber 5 and thus with respect to the entire device 1.

[0051] The cover 8 can be applied to the second profile 3 by means of different technologies, such as by mechanical constraint or adhesion or gluing.

[0052] Various materials can be used. Preferred solutions use a cover made of PVC (polyvinyl chloride), so that the cover 8 is provided with thermal insulating properties as well as antibacterial properties.

[0053] According to a preferred aspect, the polymer cover 8 has recesses 8a configured to form a plurality of air chambers between the body of the polymer cover 8 and the second profile 3, when the former is constrained to the latter.

[0054] As discussed, the device 1 is preferably used in a closed structure 10 equipped with a plurality of walls 11 typically in the form of panels. The devices 1 are typically arranged next to at least part of the uprights 10a of the closed structure 10. In preferred embodiments, they are arranged at both the uprights 10a and the crossbeams 10b of the structure 10.

[0055] According to an additional preferred aspect, a gasket 17 is provided between the device 1 and the wall 11.

[0056] The gasket 17 typically seals the space between the device 1 and the wall 11 and is preferably arranged between the polymer cover 8 and a metal sheet 11b of the wall 11.

[0057] Specifically, the gasket 17, preferably made of polymer material, is arranged toward the inner space of the structure 10 and increases the thermal insulating efficiency of the inner space of the structure 10 with respect to the environment around the structure 10 itself.

[0058] According to yet another preferred aspect, there is a sealing element 18 positioned between the polymer profile 12 and the second profile 3, preferably coupled to the second chamber 5 of said profile.

[0059] This sealing element 18 ensures better sealing in the presence of liquid, for example as a result of condensation.

[0060] Finally, according to a further preferred aspect, the device 1 comprises exactly two metal profiles 2 and 3.

[0061] In use, the chambers 4, and 5 of the metal profiles 2, 3 are typically hollow, that is, they do not have fillers. Therefore, inside these chambers 4 and 5 there is, typically, ambient air.

[0062] However, in alternative embodiments, the presence of insulating material within said chambers is not excluded.

[0063] As discussed, the walls 11 are preferably in panel form. Specifically, in particularly advantageous solutions, the walls have metal sheets 11a arranged substantially parallel with each other and connected together by at least one polymer profile 12, typically four polymer profiles 12.

[0064] Specifically, in the most basic solution, a wall 11 of the structure 10 has a substantially rectangular section, in which the metal sheets 11a form the long sides of the rectangle, whereas the polymer profiles 12 are arranged at the two short sides of the rectangle. At each of the upper and lower ends of the wall 10 there is an additional polymer profile 12, which is adapted to constrain together the walls 11a, 11b at these ends.

[0065] In general, an inner space 11c of the wall, i.e. a chamber inside the wall, is defined by the metal sheets 11 and the polymer profiles 12. This inner space 11c is typically filled, preferably with insulating material. In possible embodiments such an insulating material comprises a mineral material, such as rock wool. Different solutions are possible, for example by using a polymer foam material as insulating material.

[0066] The metal sheets 11a, 11b are typically folded at the ends. These ends are typically inserted within special seats (slits) of the polymer profiles 12. In possible embodiments, connecting elements, such as screws, rivets or the like, could be used to constrain the metal sheets 11a, 11b to the polymer profiles 12 at these seats. Alternatively (particularly in embodiments using a polymer foam material as insulating material), the coupling be-

tween the metal sheets 11a, 11b and the polymer profiles 12 at the seats, typically with the aid of the insulating material, is sufficient to ensure effective coupling between the elements.

[0067] The polymer profile 12, typically made by extrusion, typically forms a closed chamber. Various materials can be used. In a preferred solution, the polymer profiles 12 are typically made of PVC.

[0068] In the structure 10, the device 1 is coupled to at least one wall 11. Typically, as in Figs. 2A, 2B, 2D, and 2E, the device 1 is interposed between (and thus connected to) two walls, which, for example, can be arranged parallel (as for example in the embodiments of Figs. 2A, 2D, 2E) or angled to each other (as for example in the embodiment of Figure 2B).

[0069] However, for example in the case of joints of several uprights and crossbeams in the structure 10, as shown for example in Figure 2C, two devices 1 can each be coupled to a wall 11 on one side and to the other device 1 on the other side.

[0070] Additionally, according to a possible solution, the devices 1 can be arranged at uprights 10a and crossbeams 10b of the structure 10 so as to form one or more frames within which the walls 11 are to be constrained.

[0071] The coupling between the device 1 and the respective wall 11 (or the respective walls 11) can take place in different ways.

[0072] For example, the device 1 and the wall 11 can be coupled by screws 13, such as in the embodiment of Figure 2D.

[0073] Specifically, in a preferred aspect, the screws 13 are arranged within a respective bushing which is inserted into the wall 11, typically into one of the polymer profiles 12 of the wall 11.

[0074] In addition or as an alternative, a device 1 can be arranged with interference between two walls 11. For example the wall 11, in particular one of the respective polymer profiles 12, can be provided with elastic fins 13 which, in use, are deformed by the contact with the device 1, as shown for example in Figure 1A.

[0075] In addition or as an alternative, inserts or retainers 15 could be arranged between the wall and the device 11 so as to be compressed by this arrangement.

[0076] Typically, such inserts or retainers 15 are placed at one of the metal sheets 11a and facing the outer or inner (more typically outer) side of the structure.

[0077] In other words, the inserts or retainers 15 are arranged to increase the thickness of the walls 11, that is to say the dimension arranged along the direction joining the exterior and the interior of the structure 10.

[0078] It should be noted that the coupling between the device 1 and the wall 11 could be not rigid. For example, a wall 11 could act as a door for the structure 10.

[0079] In such a case it is possible, for example, to constrain the device 1 and the wall 11 together by means of a hinge 14, so that the wall 11 can be rotated with respect to the device 1. The wall 11 that acts as a door can be typically operated to be opened or closed by at least one handle 19 or a corresponding operating device.

[0080] In use, a structure 10 has a framework comprising a plurality of uprights 10a and crossbeams 10b. The walls 11 are constrained to uprights and crossbeams, so as to form a closed structure.

[0081] The devices 1 are arranged next to at least part of the uprights 10a, typically next to at least part of uprights 10a and crossbeams 10b. The devices 1 are arranged so that the first profile 2 faces the outside of the structure 1, whereas the second profile 3, covered by the polymer cover 8, faces the inside of the structure 10.

Claims

1. Structure (10) comprising at least one device (1) connectable to at least one wall (11) of the structure (10), comprising a first and a second metal profiles (2, 3), the first metal profile (2) defining in section at least one first closed chamber (4), the second metal profile (3) defining in section at least one second closed chamber (5) comprising a polymer insulating element (7) which is interposed between the first metal profile (2) and the second metal profile (3), said first metal profile (2), said polymer insulating element (7) and said second metal profile (3) being arranged in series, so as to prevent the contact between the first metal profile (2) and the second metal profile (3) **characterized in that** said structure (10) defines at least one inner space and one outer space of the structure (10), wherein said first metal profile (2) faces the outer space and said second metal profile (3) faces the inner space and **in that** said second metal profile (3) comprises two or more chambers (5, 6), wherein said second metal profile (3) is a single element forming in section said two or more chambers (5, 6), wherein said second metal profile (3) is covered by a polymer cover (8) that faces the inner space.

2. Structure (10) according to claim 1, wherein the device (1) comprises a first and a second metal profiles (2, 3) each made in one piece.

3. Structure (10) according to claim 1 or 2, wherein said first metal profile (2) and/or said second metal profile (3) form two or more closed chambers arranged in series one after the other along the same direction connecting the inner space to the outer space.

4. Structure (10) according to one of claim 1 to 3, comprising at least one wall (11) of the structure (10) constrained to the device (1), wherein said wall (11) comprises two metal sheets (11a, 11b) connected to each other by at least one polymer profile (12), said device (1) being connected to said polymer profile (12) and/or to at least one of said metal sheets (11a, 11b), preferably by at least one connection se-

lected from:

- at least one screw (13) connecting said polymer profile (12) of said wall (11) to said second metal profile (3) of said device (1);
- a hinge (14) connecting said first metal profile (2) of said device (1) to one of the metal sheets (11a, 11b) of said wall (11);
- inserts or retainers (15), arranged with interference between said first metal profile (2) of said device (1) and one of the metal sheets (11a, 11b) of said wall (11).

5. Structure (10) according to any one of the preceding claims, **characterized in that** at least the entire surface facing inside the second chamber (5) of the second metal profile (3) is covered by the polymer cover (8).

6. Device (1) for forming a structure (10) according to one of the preceding claims, connectable to at least one wall (11) of the structure (10), comprising a first and a second metal profiles (2, 3), the first metal profile (2) defining in section at least one first closed chamber (4), the second metal profile (3) defining in section at least one second closed chamber (5) comprising a polymer insulating element (7) which is interposed between the first metal profile (2) and the second metal profile (3), said first metal profile (2), said polymer insulating element (7) and said second metal profile (3) being arranged in series, so as to prevent the contact between the first metal profile (2) and the second metal profile (3), e wherein said first metal profile (2) is intended to face the outer space of the structure (10) and said second metal profile (3) is intended to face the inner space of the structure (10), **characterized in that** said second metal profile (3) comprises two or more chambers (5, 6), wherein said metal profile (3) is a single element forming in section said two or more chambers (5, 6), wherein said second metal profile (3) is covered by a polymer cover (8) intended to face the inner space.

7. Device (1) according to claim 6, wherein the first metal profile (2) and/or the second metal profile (3) are made as single elements and have two or more chambers each.

8. Device (1) according to claim 6 or 7, **characterized by** comprising a first and a second metal profiles (2, 3) each made in one piece.

9. Device (1) according to any one of claims 6 to 8, wherein said first metal profile (2), and/or said second metal profile (3) form two or more closed chambers arranged in series one, after the other, along the same direction connecting the inner space to the outer space.

10. Device (1) according to any one of claims 6 to 9, **characterized in that** at least the entire surface, intended to face inside, of the second chamber (5) of the second metal profile (3) is covered by the polymer cover (8).

11. Device (1) according to any one of claims 6 to 10, wherein said polymer cover (8) has recesses (8a) configured to form a plurality of air chambers between said polymer cover (8) and said second metal profile (3).

12. Device (1) according to one of the preceding claims 6 to 11, wherein the first metal profile (2) comprises a single closed chamber (4) and said second metal profile (3) forms exactly two closed chambers (5, 6).

13. Device (1) according to one of the preceding claims 6 to 12, wherein said polymer insulating element (7) is in contact with the third chamber (6) of the second metal profile (3), the section of said third chamber (6) of the second metal profile (3) being smaller than the section of the second chamber (5) of the second metal profile (3).

14. Device (1) according to one of the preceding claims 6 to 13, wherein said polymer insulating element (7) comprises two portions (7a, 7b) separated from each other, which are interposed between said first and second metal profiles (2, 3).

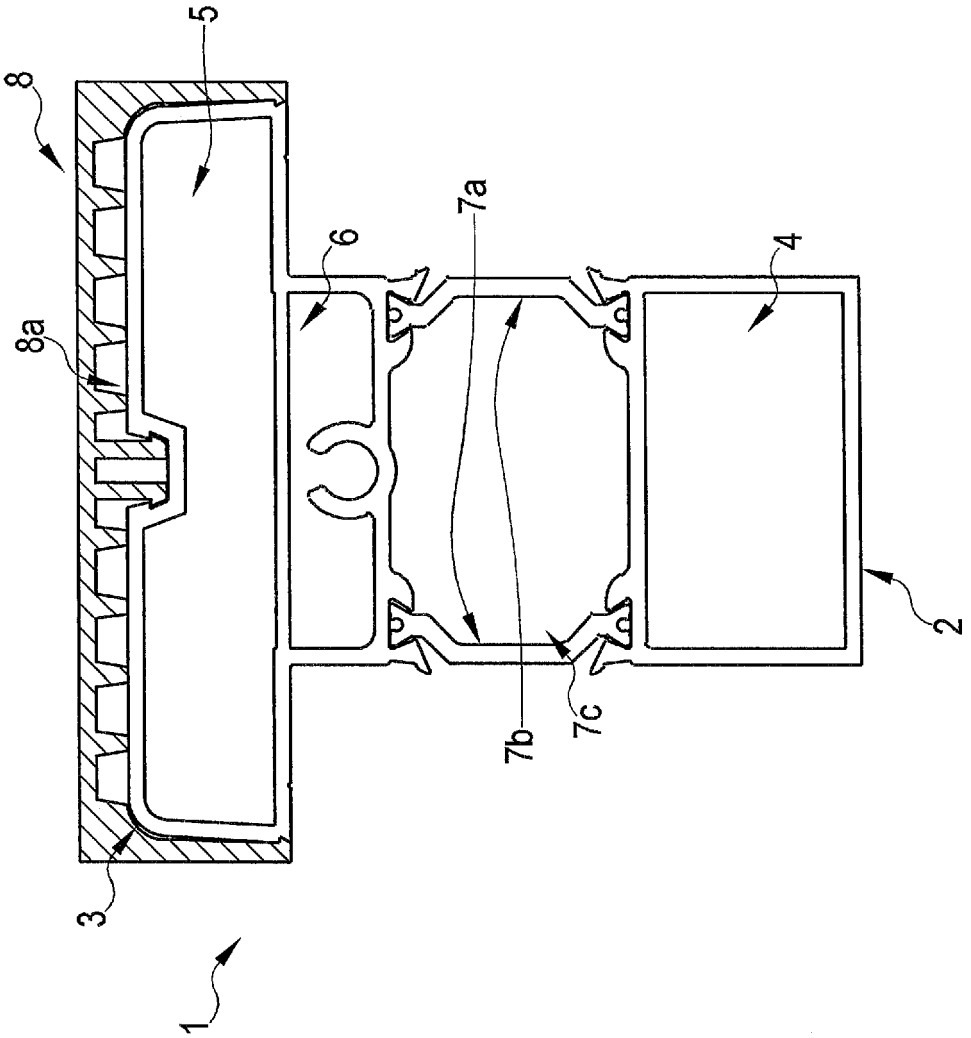


FIG.1A

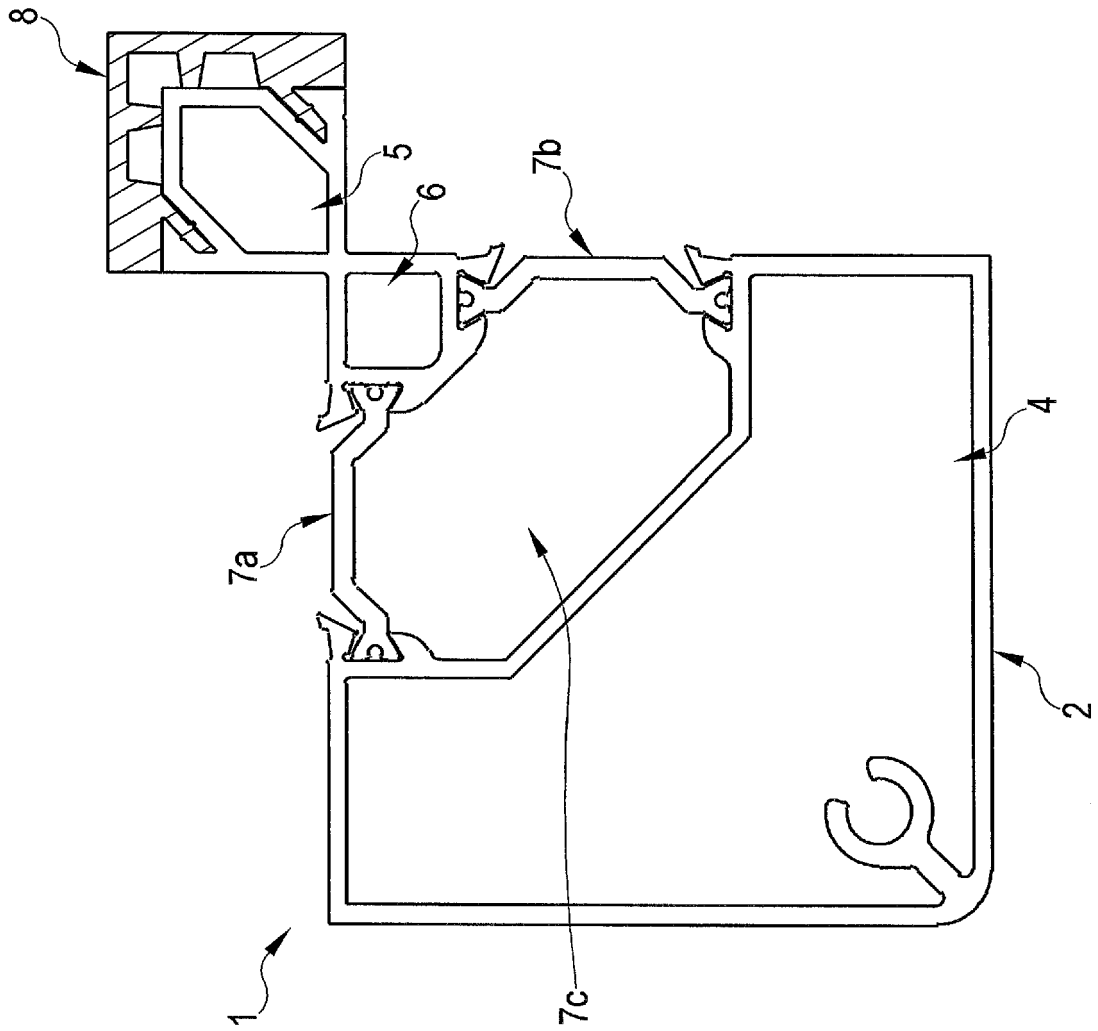


FIG.1B

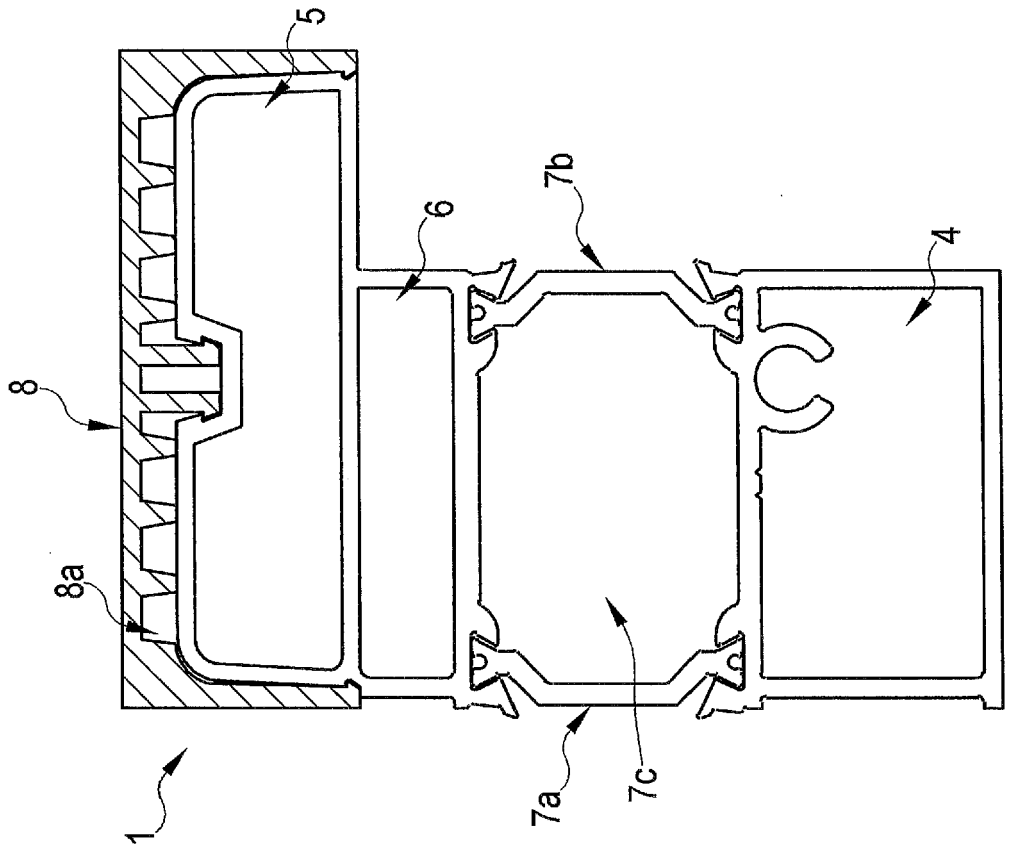
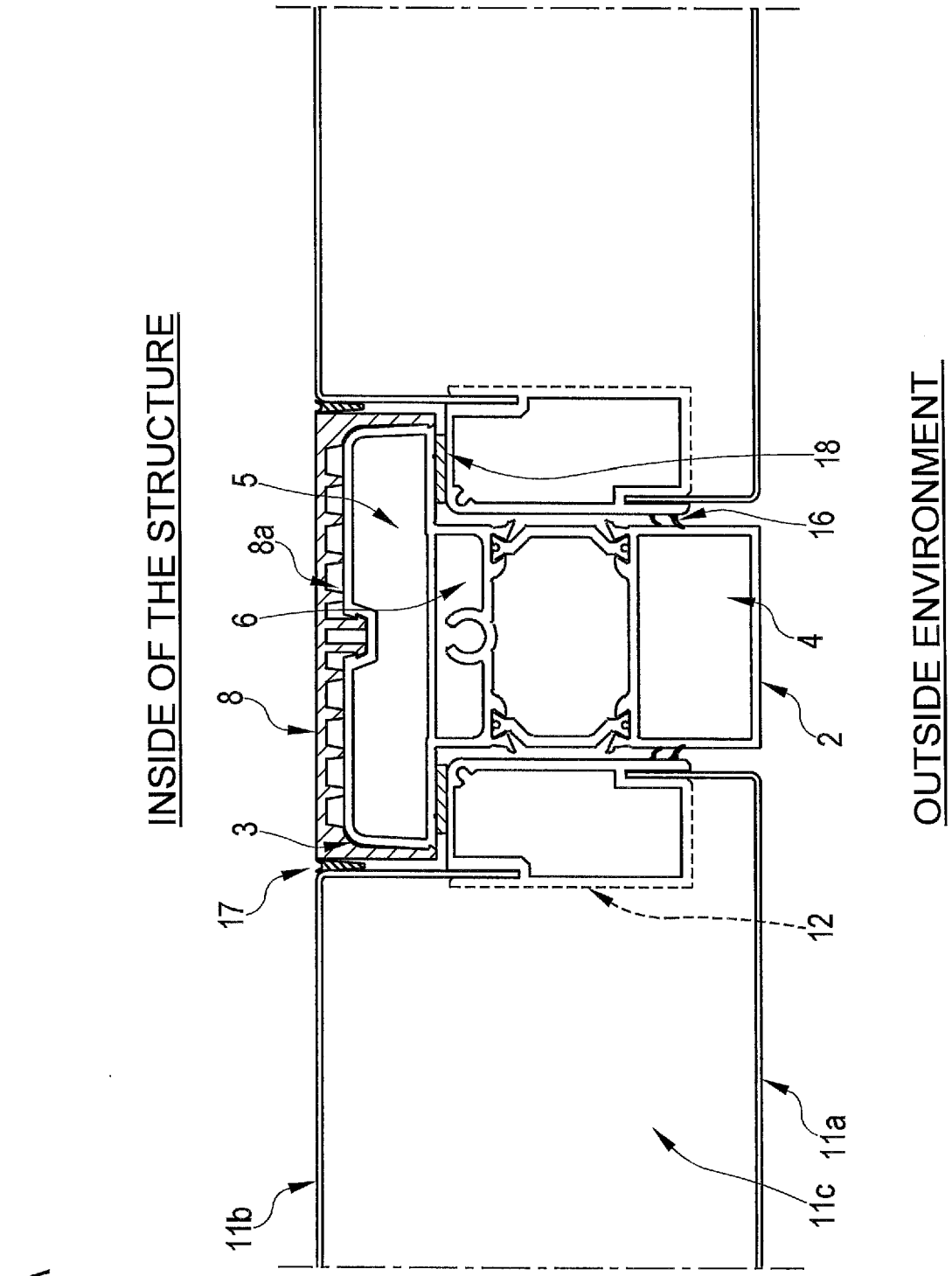


FIG.1C


INSIDE OF THE STRUCTURE
OUTSIDE ENVIRONMENT
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8a
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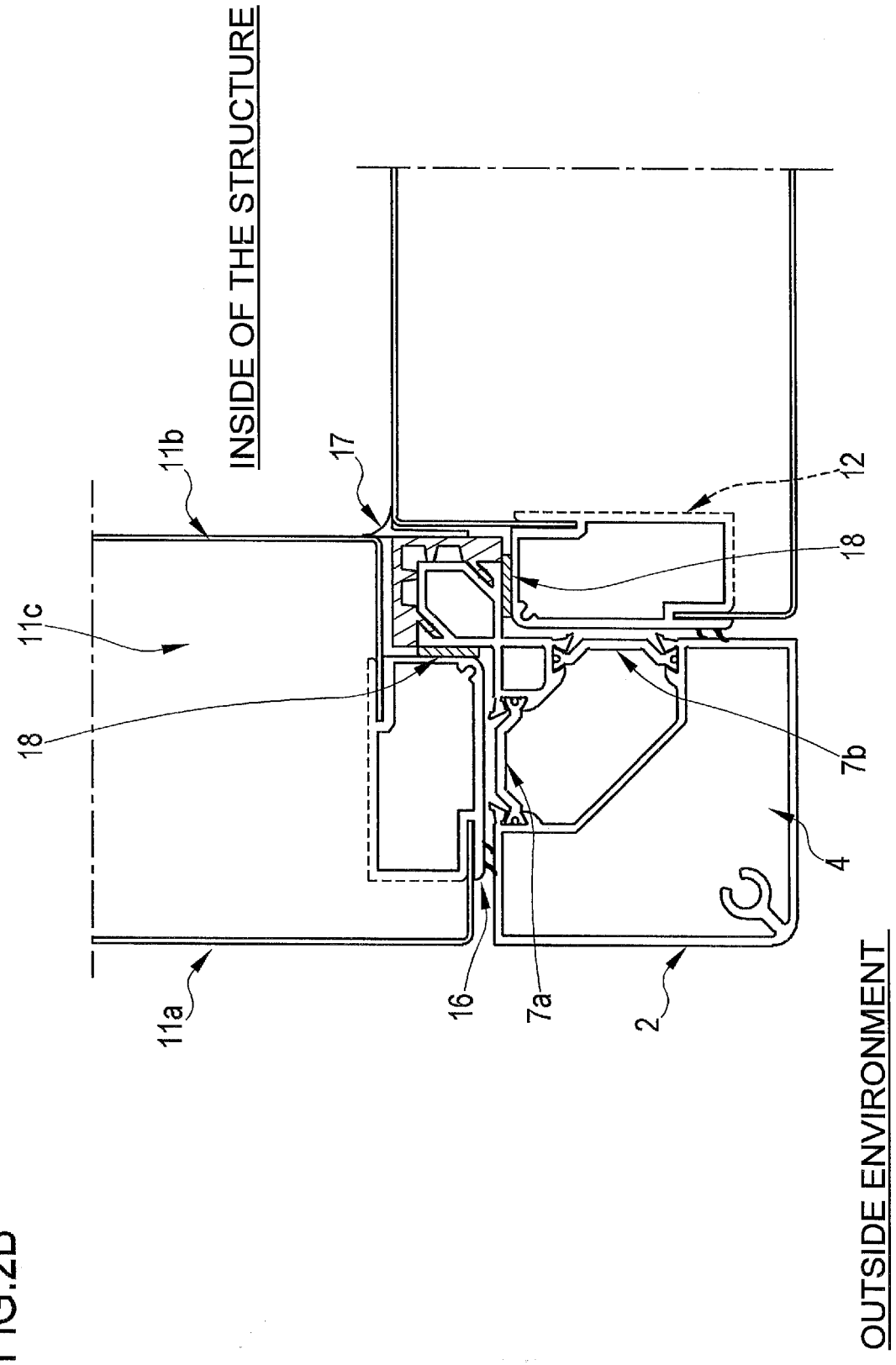
8
3
17
11b
18
16
4
2
12
11a
11c

FIG.2A


INSIDE OF THE STRUCTURE
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OUTSIDE ENVIRONMENT

FIG.2B

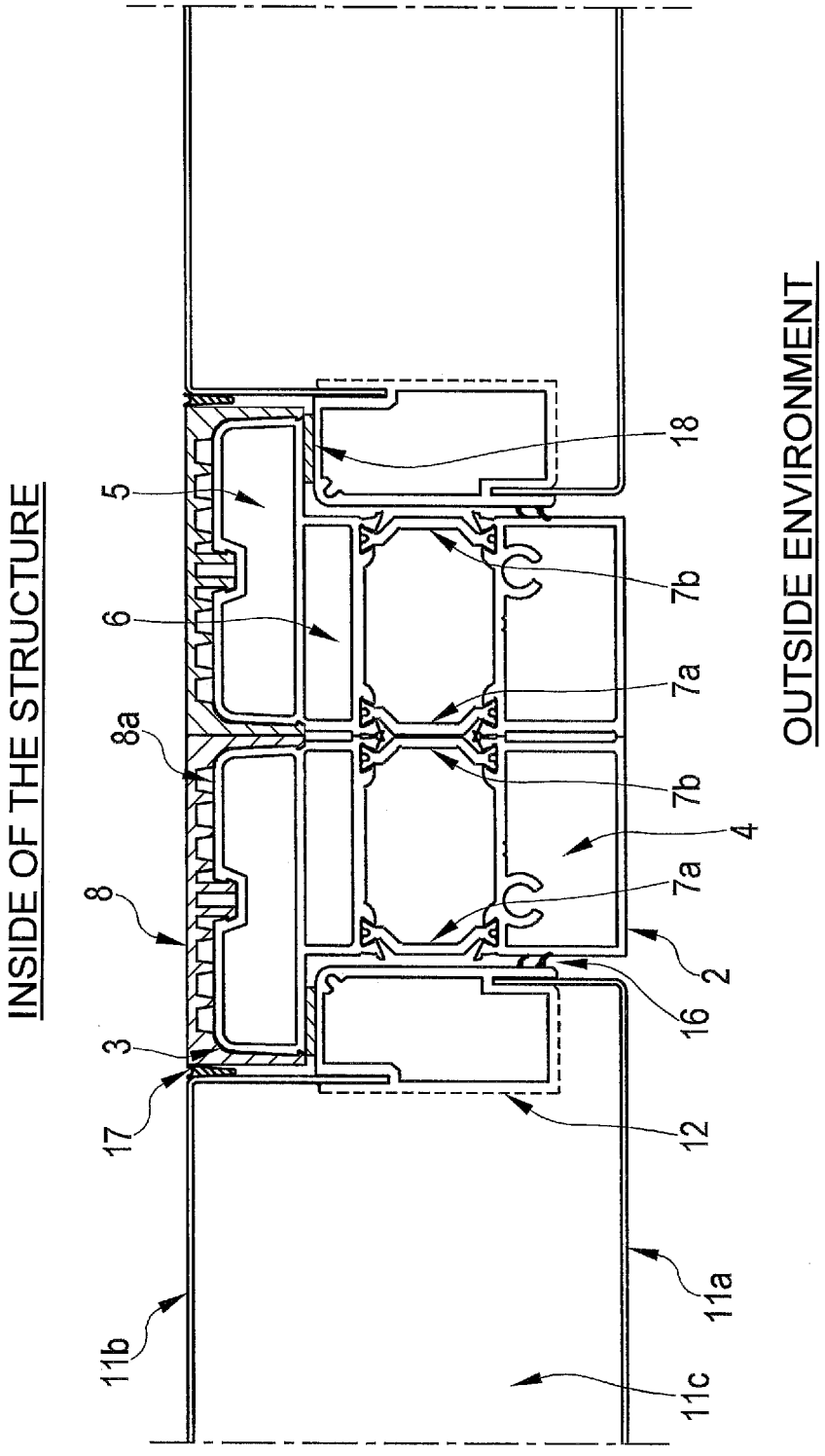
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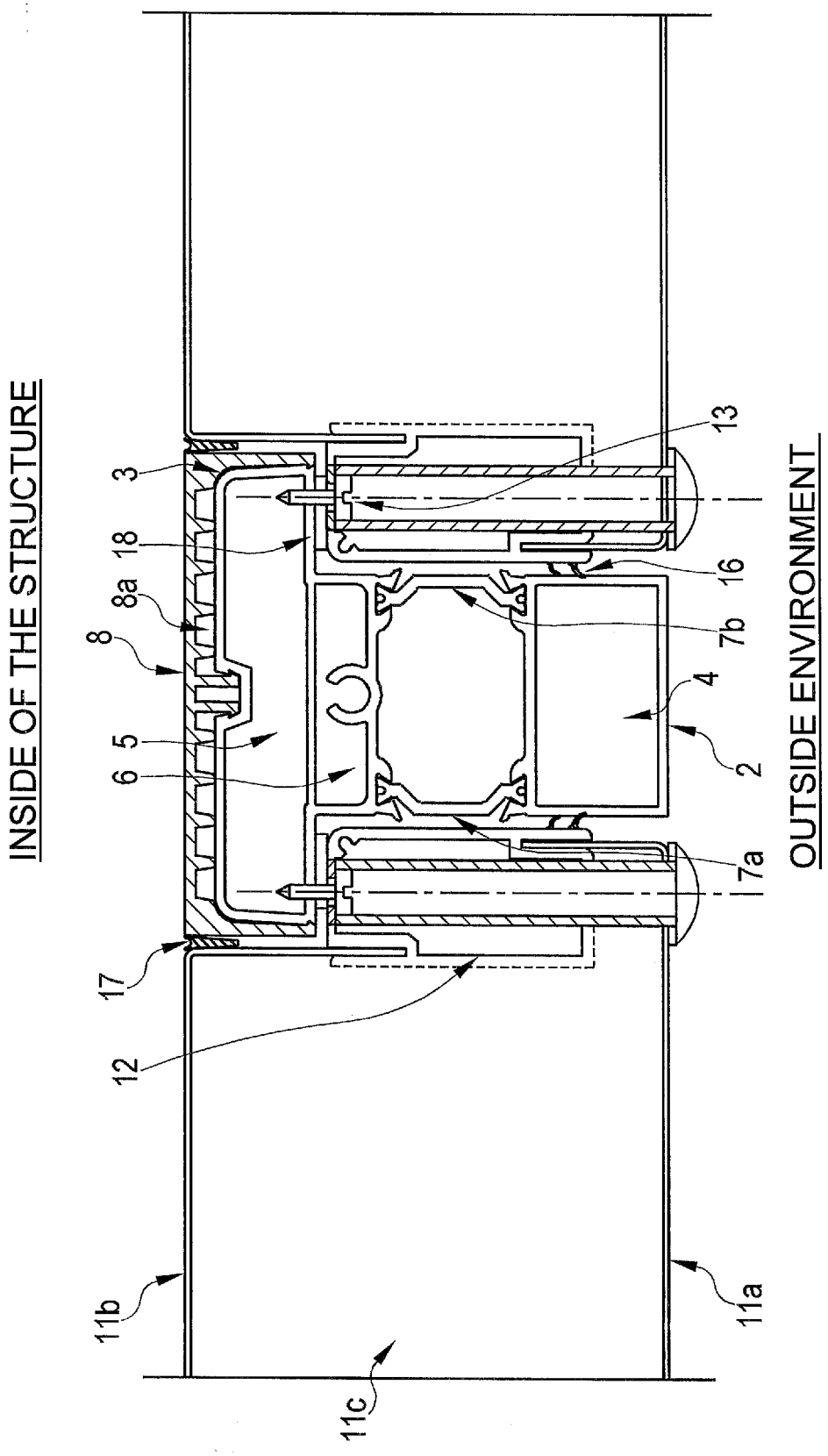
FIG.2C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7b
16
13
7a

FIG.2D

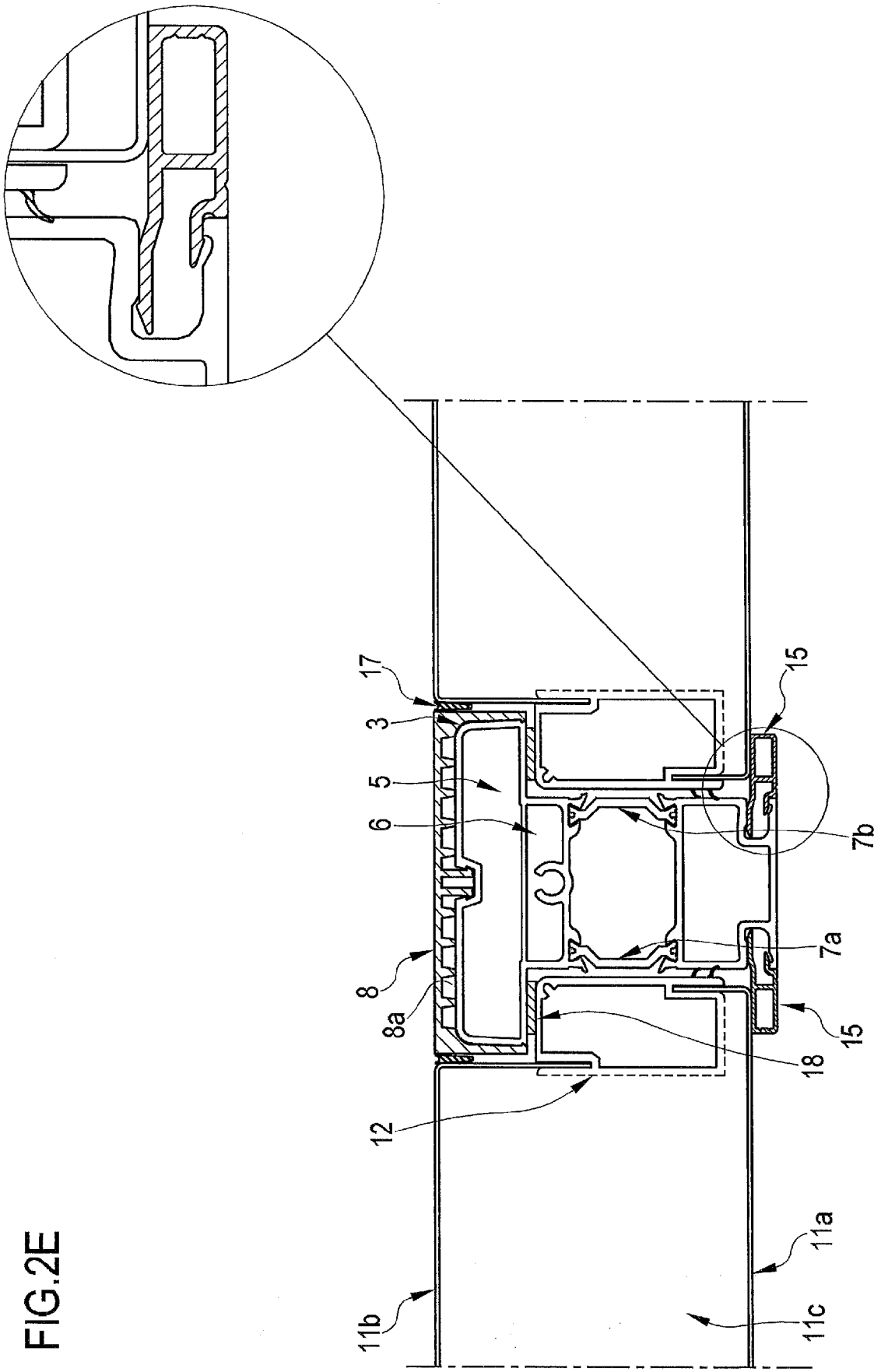

FIG.2E

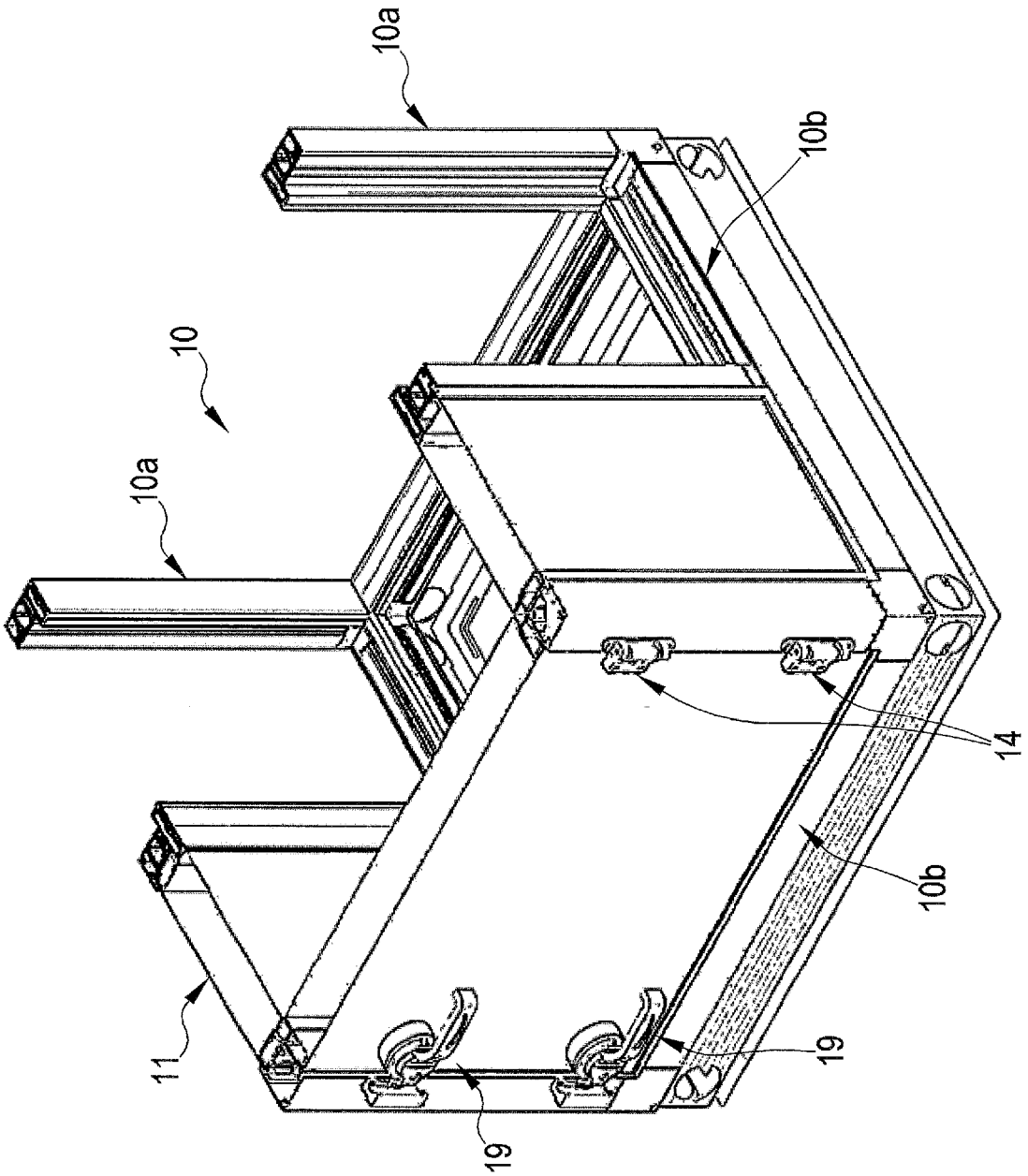

FIG.3

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EUROPEAN SEARCH REPORT

Application Number
EP 23 17 8525

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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)

E04B
E04C
F25D
F24F
E06B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	29 September 2023	López-García, G

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29-09-2023

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