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(54) METHOD FOR MANUFACTURING A MULTIWALLED DEVICE, IN PARTICULAR A MULTIWALLED ROOF DEVICE

HERSTELLUNGSVERFAHREN FÜR EINE MEHRSCHALIGE VORRICHTUNG, INSBESONDERE EINE MEHRSCHALIGE DACHVORRICHTUNG

MÉTHODE DE PRODUCTION POUR UN DISPOSITIF MULTICOUCHE, EN PARTICULIER UN DISPOSITIF MULTICOUCHE DE TOITURE

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Description

Field of the invention

[0001] The present invention relates a method for manufacturing a multi-walled device, in particular a multi-walled roof device, still more particularly a multi-walled dome device.

Background

[0002] Roof devices in which one or more flat and/or domed plastic or glass elements are combined are known. Multi-walled plastic domes are thus for instance known in which a number of dome-like shells are arranged at a mutual distance. Dome devices in which a flat transparent plastic plate is combined with a dome-like shell are also known. Examples hereof are described in the following patent publications in the name of applicant: Belgian patent application no. 2016/5645, Belgian patent no. 1020769 and Belgian patent no. 1019311.

[0003] Such roof devices are typically provided with a frame for mounting on an upstand or on another suitable support structure.

[0004] Methods are further known for providing a gasket around a panel, for instance a glass panel for vehicles. EP 2 799 201 thus describes a method for manufacturing a panel assembly with a panel and a gasket, wherein the gasket is adhered to a peripheral part of the panel. Such a technique is for instance useful for glass panels which are mounted in sealed manner in vehicles or for solar panels which are arranged in sealed manner in a frame.

[0005] FR 2 578 575, US 4,909,875 and EP 0 069 021 disclose methods for arranging a frame around two parallel glass plates arranged at a distance of each other.

[0006] EP 2 799 201 discloses a method for arranging a gasket on a panel.

Summary of the invention

[0007] Embodiments of the invention have the object of providing a method for manufacturing a multi-walled device with which the wall elements of the multi-walled device can be assembled in improved manner for the purpose of forming an assembled whole whereby the number of operations necessary for manufacturing the multi-walled device is reduced.

[0008] According to the invention, a method according to claim 1 is provided which comprises the following steps:

- providing a first wall element having an upper side and an underside, and a second wall element having an upper side and an underside;
- placing the first and second wall element one above the other, wherein a spacer is arranged between the upper side of the first wall element and the underside of the second wall element;

- providing a mould which extends from the upper side of the second wall element to the underside of the first wall element, such that a space R is formed which is bounded by at least the mould, the spacer and a peripheral part of the first and second wall element, wherein the mould is provided with a flexible part extending in a peripheral direction of the first and second wall element;
- bending the flexible part;
- introducing an injection part via the flexible part into said space and arranging a sealing material in said space in the mould in pressureless manner with the injection part while the injection part is being moved in the peripheral direction relative to the peripheral part of the first and second wall element.

[0009] Using such a method a sealing frame can be formed in simple manner by arranging the injected sealing material along a peripheral part of a first and a second wall element arranged one above the other. By giving the mould a suitable shape the formed sealing frame can be given any desired shape in accordance with the application for which the multi-walled device is intended. During the process the spacer provides not only for a suitable distance between the first wall element and the second wall element, but also for a stop which ensures that the sealing material flowing between the first and the second wall element is stopped.

[0010] In an advantageous embodiment the sealing material has a dynamic viscosity, measured at a shear rate of 1/s, of below 35000 mPa·s when being arranged in the space. Such sealing materials can be arranged in pressureless manner in an open mould. In embodiments of the invention the mould is preferably open only at the position of the flexible part, such that the shape of the sealing element will be defined largely by the mould.

[0011] The sealing material can for instance be a curable polymer composition, such as a polyurethane material. The sealing material is for instance a polyurethane reaction mixture comprising a polyol and an isocyanate. The curable composition is preferably composed such that it is able to produce an elastomeric copolymer material with a sufficiently high density.

[0012] In an advantageous embodiment the mould comprises a first mould part and a second mould part, and at least one of the first and the second mould part is provided with a flexible tongue extending in the peripheral direction. In this way the mould can be easily arranged along a peripheral part of the two wall elements placed one above the other, wherein the first mould part can extend on the upper side of the second wall element and the first mould part can extend as far as the underside of the first wall element. The flexible part can then for instance be provided at the position where the first mould part connects to the second mould part, such that this flexible part can be "opened" for the purpose of injecting the sealing material.

[0013] According to an advantageous embodiment,

the first and the second wall element have a polygonal periphery, for instance a rectangular periphery. The at least one spacer can then be formed as a corresponding polygonal frame, such that a polygonal assembly is formed by the first and second wall element and the at least one spacer arranged therebetween. In this way multi-walled devices with the form of a polygon can thus be obtained. According to other embodiments, the first and the second wall element can have a round periphery and the at least one spacer can have a corresponding round form. Round roof devices can for instance be obtained in this way. The shape of the at least one spacer can also differ from the shape of the first and second wall element. A round spacer can thus for instance be provided between two hexagonal wall elements.

[0014] When the wall elements take a polygonal form, it is possible according to a possible embodiment to proceed as follows. The mould is provided along a first side of the polygonal assembly. An injecting step is then performed by having the injection part move along this first side for the purpose of injecting sealing material. The polygonal assembly is then rotated for the purpose of placing a second side of the polygonal assembly in the mould, and the injecting step is repeated along the second side. These steps are then repeated for each subsequent side of the polygonal assembly, such that a sealing frame is obtained which extends along the whole periphery of the polygonal assembly. When the first and the second wall element have a substantially rectangular periphery, the first, second, third and fourth sides can then thus be provided successively with a sealing layer by performing the above described steps for each side. In this way a rectangular multi-walled device is obtained, the first and the second wall element of which are anchored in a substantially rectangular frame manufactured from sealing material.

[0015] When the first and the second wall element have a round periphery, such that a round assembly is formed by the first and the second wall element and the at least one spacer arranged therebetween, the method can for instance be performed as follows. The mould is provided along the whole periphery of the round assembly, and the assembly is rotated while the injection part injects sealing material. According to another possible embodiment, the injection part can perform a circular movement along the periphery of the round assembly.

[0016] In an advantageous embodiment the first and the second wall element are one of the following: a glass plate, a glass dome, a plastic plate such as a polycarbonate plate, a plastic dome such as a polycarbonate dome.

[0017] According to an advantageous embodiment, the first wall element is a plate and the second wall element a dome element. According to another possible embodiment, both wall elements are dome elements. According to yet another embodiment, both wall elements are plates. The skilled person will further appreciate that it is also possible to provide more than two wall elements

in the multi-walled device. It is thus also possible to form multi-walled devices with three or more wall elements, wherein a spacer is provided between each pair of adjacent wall elements. One or more additional films can further also be provided between adjacent wall elements.

[0018] According to an advantageous embodiment, the periphery of the first wall element substantially corresponds to a periphery of the second wall element. The skilled person will appreciate that these peripheries can also differ, but that the peripheries being more or less equal has the advantage that the mould can take on a simple form and that a sealing frame can be obtained around the periphery of the first and second wall element with a relatively small amount of sealing material.

[0019] According to an advantageous embodiment, an outer periphery of the spacer is a maximum of 10% smaller than an outer periphery of the first and second wall element. This avoids too much sealing material flowing between the upper side of the first wall element and the underside of the second wall element. In a possible embodiment the spacer and the sealing material are arranged such that the sealing material extends to a position against the at least one spacer, and preferably adheres to the at least one spacer. In this way an even stronger multi-walled device is obtained, in which the sealing material is adhered to the at least one spacer.

[0020] In an advantageous embodiment a gas is injected between the first and the second wall element. In this way the insulating value of the multi-walled device can be increased. This gas can for instance be injected during injection of the sealing material, and more specifically just before the whole periphery of the first and second wall element has been provided with sealing material.

[0021] In an advantageous embodiment one or more inserts are incorporated in the mould, preferably one or more of the following inserts: a sensor such as a rain detector, a ventilation component, a lighting element, a bracket, a hinge, a screw-in insert, one or more cables or wires. In this way one or more inserts can be integrated into the frame around the first and second wall element formed by the sealing material. These one or more inserts can thus be incorporated in the multi-walled device in very simple manner, without additional attaching means being required. Compared to existing multi-walled devices, where such components are typically attached using separate attaching means, such embodiments thus has the advantage that these inserts can be incorporated more easily.

[0022] According to another aspect which does not form part of the invention, a multi-walled device is disclosed. The multi-walled device comprises a first wall element, a second wall element, a spacer arranged between the first and the second wall element and a cured sealing material extending along the whole periphery of the first and second wall element to a position against the spacer, wherein the cured sealing material is adhered to the whole periphery of the first and second wall element

and to the spacer. The spacer preferably also extends along the whole periphery of the first and second wall element, such that a closed space is bounded by the spacer and the first and second wall element. In this way the spacer forms a neatly contoured inner frame around which the cured sealing material is provided.

[0023] In an advantageous embodiment the spacer comprises a desiccant, preferably a silica gel. If moisture were present in the closed space bounded by the spacer and the frame of sealing material, the desiccant could absorb this moisture and thus prevent condensation in the space between the first and second wall element.

[0024] According to an advantageous embodiment, the sealing material is a cured polymer composition, preferably a cured copolymer, such as a cured polyurethane material.

[0025] In an advantageous embodiment the first and the second wall element have a polygonal periphery, for instance a rectangular periphery, and the spacer is a corresponding polygonal frame, for instance a rectangular frame. According to another possible embodiment, the first and the second wall element have a round periphery.

[0026] According to a possible embodiment, the first and the second wall element are one of the following: a glass plate, a glass dome, a plastic plate such as a polycarbonate plate, a plastic dome such as a polycarbonate dome. In embodiments plate-like wall elements can be combined with domed wall elements, but it is also possible to combine two or more plate-like elements or two or more domed wall elements. A periphery of the first wall element here preferably corresponds substantially to a periphery of the second wall element.

[0027] In an advantageous embodiment the peripheral dimensions of the at least one spacer are slightly smaller than the peripheral dimensions of the first and second wall element, wherein the cured sealing material is arranged between an underside of the second wall element and an upper side of the first wall element to a position against the spacer.

[0028] In an advantageous embodiment the first wall element has an underside and an upper side which is directed toward an underside of the second wall element, wherein the cured sealing material extends as far as an upper side of the second wall element and/or as far as the underside of the first wall element. In this way the assembly formed by the first wall element, the second wall element and the spacer is firmly anchored in the sealing material.

[0029] In embodiments where the second wall element is domed the second wall element preferably comprises four substantially flat parts running obliquely upward or horizontally from the outer periphery and fitting against a central domed part.

[0030] Further advantageous embodiments are described in the appended claims.

Brief figure description

[0031] The above stated and other advantageous features and objects of the invention will become more apparent, and the invention better understood, on the basis of the following detailed description when read in combination with the accompanying drawings, in which:

Figures 1A and 1B illustrate a schematic perspective view of a first embodiment of a method according to the invention for manufacturing a dome device ;

Figure 2A illustrates a cross-section of a first embodiment of a mould;

Figure 2B illustrates a cross-section of a second embodiment of a mould;

Figure 3 illustrates a schematic top view of a second embodiment of a method according to the invention;

Figure 4 illustrates a schematic top view of a third embodiment of a method according to the invention;

Figure 5 illustrates a schematic cross-section of an embodiment of a multi-walled device manufactured by a method according to the invention;

Figure 6 illustrates a schematic cross-section of another embodiment of a multi-walled dome device manufactured by a method according to the invention; and

Figure 7 illustrates a schematic cross-section of yet another embodiment of a dome device manufactured by a method according to the invention.

Detailed embodiments

[0032] Figure 1 illustrates schematically a first embodiment of a method for manufacturing a multi-walled device, here a multi-walled roof device. In a first step, which is illustrated in figure 1A, a first wall element 10 and a second wall element 20 are arranged one above the other with interposing of a spacer 30. First wall element 10 has an upper side 11 and an underside 12. Second wall element 20 has an upper side 21 and an underside 22. Spacer 30 is arranged between the upper side 11 of the first wall element and the underside 22 of the second wall element. In a second step, illustrated in figure 1B, a mould 100 is provided which extends from the upper side 21 of second wall element 20 to the underside 12 of first wall element 10. Mould 100 extends here along a first side 41 of the assembly 40 formed by first wall element 10, second wall element 20 and spacer 30. Together with first side 41, mould 100 bounds a space into which a sealing material is injected by an injection part 200. Mould 100 is provided for this purpose with a flexible part (not shown in figure 1B) extending in a peripheral direction of assembly 40, here in a direction parallel to the first side 41. Via the flexible part the injection part 200 can be introduced into the space R for the purpose of arranging a sealing material in said space in pressureless manner while injection part 200 is being moved relative to first side 41 in the direction P1. The sealing material prefer-

ably has a dynamic viscosity, measured at a shear rate of 1/s, of below 35000 mPa·s. The sealing material is preferably a curable polymer composition, for instance a PUR material.

[0033] Figure 2A illustrates a possible embodiment of the mould 100 of figure 1B in more detail. In the embodiment of figures 2A and 2B mould 100 comprises a first mould part 110 and a second mould part 120. First mould part 110 and/or second mould part 120 can be provided here with a flexible tongue 121 extending in the peripheral direction of assembly 40. In the illustrated embodiment second mould part 120 is provided with a flexible tongue 121, but the skilled person will appreciate that it is also possible to provide first mould part 110 with a flexible tongue or to provide both mould parts 110, 120 with a flexible tongue. In unloaded state flexible tongue 121 presses against an edge of first mould part 110. This flexible tongue 121 can be lifted for introduction of an injection part 200 for the purpose of arranging the sealing material in the space R. In the variant of figure 2A lower mould part 110 fits against an underside 12 of first wall element 10, and second mould part 120 fits against an upper side 21 of second wall element 20.

[0034] Figure 2B illustrates another possible embodiment of a mould 100. In this embodiment mould 100 is manufactured from one piece which is provided with a flexible tongue 121, which in normal state fits against the upper side 21 of second wall element 20 and can be lifted for the purpose of introducing the injection part 200. The skilled person will appreciate that other designs are also possible for mould 100, wherein mould 100 can be formed from one, two or more than two parts, and wherein one or more of these parts are configured to allow an injection part 200 to be introduced into the space R bounded by mould 100 on one side and a peripheral part of the assembly formed by first wall element 10, second wall element 20 and spacer 30 on the other.

[0035] Figure 3 illustrates an embodiment of the method for a first and second wall element 10, 20 with a polygonal periphery, here a hexagonal periphery. Spacer 30 also describes a corresponding polygonal frame, here a hexagonal frame. It is noted that spacer 30 can be formed as one integral frame or can be formed from a plurality of parts, for instance six separate elongate parts which are provided between first wall element 10 and second wall element 20 and form a substantially hexagonal frame. Mould 100 is here provided along a first side 51 of the assembly 50 formed by first wall element 10, second wall element 20 and spacer 30. In a first step injection material is injected by an injection part 200 into a space bounded by mould 100 and first side 51 for the purpose of forming a first part of a sealing frame around assembly 50. After this first step, assembly 50 is rotated in the direction of arrow P2 such that the second side 52 of assembly 50 is carried into the mould. Sealing material is then once again injected via injection part 200 such that a second part of the sealing frame is formed along second side 52. These steps are repeated for the third,

fourth, fifth and sixth side of assembly 50, such that the injected sealing material forms a sealing frame extending along the whole periphery of assembly 50. Figure 3 illustrates a variant in which the assembly is hexagonal, but the skilled person will appreciate that a similar method can be used for any random polygonal assembly. The skilled person will further appreciate that the first and second wall element 10, 20 need not necessarily have the same shape as spacer 30. The first and the second wall element can thus for instance be hexagonal, while a round spacer 30 is provided between the first and the second wall element 10, 20.

[0036] Figure 4 illustrates yet another embodiment of a method for manufacturing a multi-walled device, wherein the first and the second wall element have a round periphery, such that a round assembly 60 is formed by the first and the second wall element 10, 20 and the spacer 30 arranged therebetween. Mould 100 likewise takes a round form here. Mould 100 can be provided here with an annular flexible tongue (not shown) which allows injection part 200 to be introduced into a space bounded by mould 100 and the peripheral part 61 of assembly 60. In this embodiment the mould 100 with the assembly 60 can on the one hand be rotated in the direction of arrow P2 while sealing material is being arranged by injection part 30. According to a variant, injection part 200 can perform a circular movement for the purpose of arranging sealing material in pressureless manner in the space R bounded by mould 100 and the peripheral part 61 of assembly 60.

[0037] Figure 5 illustrates a possible embodiment of a multi-walled device manufactured by a method according to the invention. The multi-walled device of figure 5 comprises a first wall element 10, an additional first wall element 10' arranged under first wall element 10, a second wall element 20 and a spacer 30. Wall elements 10, 10', 20 can for instance be glass plates or polycarbonate plates. First wall element 10 and additional wall element 10' can for instance be a glass plate. Glass plate 10 is then preferably adhered to glass plate 10'. A film can for instance be provided for this purpose between glass plate 10 and glass plate 10', for instance a polyvinyl butyral (PVB) film. According to an alternative, a light-transmitting plastic layer, for instance a polycarbonate layer, can be provided between glass plate 10 and glass plate 10'. Such an embodiment has the advantage that the impact resistance is improved, that this embodiment is lightweight (the plastic layer contributes to the strength of the whole and is lighter than glass), and enables a better fire classification. The use of a plastic layer ensures that if the glass shatters as a result of fire, the plastic layer nevertheless prevents an opening from being created. According to a variant, one lower glass plate 10 of toughened glass can be provided, and wall element 10' can thus be dispensed with.

[0038] Wall elements 10, 10', 20 and spacer 30 together form an assembly 40 with a peripheral part 41 around which a sealing material 80 is provided. Sealing material

80 adheres to wall elements 10, 10', 20 and spacer 30 and forms a sealing frame around the whole peripheral part 41 of assembly 40. Sealing material 80 extends from an upper side 21 of second wall element 20 to an underside 12' of the lower additional wall element 10'. An insert, here a screw-in insert 71, is incorporated in sealing material 80. Sealing material 80 is adhered to wall elements 10, 10', 20 and to spacer 30. The insert can on the one hand be held by adhesion to the sealing material and on the other by giving the insert a suitable form which ensures an anchoring of the insert in sealing material 80. The illustrated embodiment with screw-in insert 71 has the advantage that accessories can be easily attached to the multi-walled device. An awning can thus for instance be attached using a screw 72 which is screwed into screw-in insert 71. Figure 5 shows the multi-walled device in cross-section, and the skilled person will appreciate that a plurality of screw-in inserts 71 can be provided, distributed over the periphery of the multi-walled device. Other inserts such as sensors, ventilation components, lighting elements, brackets, hinges, cables or wires and so on can further also be incorporated in the sealing material.

[0039] Figure 6 illustrates a further developed embodiment of a multi-walled device which is similar to that of figure 5, with the difference that an additional upper wall element 20' is provided above the second wall element 20. provided between the additional upper wall element 20' and second wall element 20 is an additional spacer 30'. The assembly 40 formed by wall elements 10, 10', 20, 20' and spacers 30, 30' has a peripheral part 41 which is provided with a sealing material 80 extending from an upper side 21' of the additional upper wall element 20' to an underside 12' of the lower additional wall element 10'. Sealing material 80 is adhered to wall elements 10, 10', 20 and to spacers 30, 30'. Incorporated in the sealing frame formed by sealing material 80 is a rain detector 73 and a bracket 74. Bracket 74 is for instance intended for mounting of a surface-mounting motor for the purpose of opening/closing the multi-walled device. The above discussion of wall elements 10, 10' of figure 5 also applies to wall element 10, 10' in figure 6.

[0040] Figure 7 illustrates yet another variant of a multi-walled dome device. The multi-walled dome device of figure 7 comprises a first wall element 10 with an upper side 11 and an underside 12, a second wall element 20 with an upper side 21 and an underside 22, and a spacer 30. Spacer 30 is situated between the underside 22 of second wall element 20 and the upper side 11 of first wall element 10. A peripheral part 41 of assembly 40 formed by first and second wall elements 10, 20 and spacer 30 is provided with a sealing material 80. The sealing material extends from an upper side 21 of second wall element 20 to an underside 12 of first wall element 10, and further between the underside 22 of second wall element 20 and the upper side 11 of first wall element 10 to a position against spacer 30. Sealing material 80 extends along the whole periphery 41 of the dome device such

that sealing material 80 forms a sealing frame for the assembly 40. One or more inserts can be incorporated in the sealing material 80. In the variant of figure 7 a hinge 75 and a set of electric wires 76 are incorporated in sealing material 80. Electric wires 76 can for instance be used to power lighting elements and/or other electronic components such as sensors. Using hinge 75 the multi-walled dome device can be hingedly mounted.

[0041] The skilled person will appreciate that many variants can be envisaged within the scope of the invention, which is defined solely by the following claims.

Claims

1. Method for manufacturing a multi-walled device, in particular a multi-walled roof device, comprising of:

- providing a first wall element (10) having an upper side (11) and an underside (12), and a second wall element (20) having an upper side (21) and an underside (22);
- placing the first and second wall element one above the other, wherein at least one spacer (30) is arranged between the upper side (11) of the first wall element (10) and the underside (22) of the second wall element (20); said method for manufacturing being **characterised by** the following steps:

- providing a mould (100) which extends from the upper side (21) of the second wall element (20) to the underside (12) of the first wall element (10), such that a space R is formed which is bounded by at least the mould (100), the at least one spacer (30) and a peripheral part (41; 51; 61) of the first and second wall element; wherein the mould is provided with a flexible part (121) extending in a peripheral direction;
- introducing an injection part (200) via the flexible part into the space R and arranging a sealing material in said space in the mould in pressureless manner with the injection part while the injection part is being moved relative to the peripheral part of the first and second wall element.

2. Method according to claim 1, wherein the sealing material has a dynamic viscosity, measured at a shear rate of 1/s, of below 35000 mPa·s when being arranged in the space.
3. Method according to any one of the foregoing claims, wherein the sealing material is a curable polymer composition, for instance a PUR material.
4. Method according to any one of the foregoing claims,

wherein the mould comprises a first mould part (110) and a second mould part (120), and at least one of the first and the second mould part is provided with a flexible tongue (121) extending in the peripheral direction.

5. Method according to any one of the foregoing claims, wherein the first and the second wall element have a polygonal periphery and wherein the at least one spacer is a corresponding polygonal frame, such that a polygonal assembly (50) is formed by the first and second wall element and the at least one spacer arranged therebetween. 10
6. Method according to the foregoing claims, wherein the mould is provided along a first side (51) of the polygonal assembly (50), after which an injecting step is performed by having the injection part move along this first side (51) for the purpose of injecting sealing material, after which the polygonal assembly is rotated and a second side (52) of the polygonal assembly is placed in the mould, and the injecting step is repeated along the second side (52), after which these steps are repeated for each subsequent side of the polygonal assembly (50). 15 20
7. Method according to claim 5 or 6, wherein the first and the second wall element (10, 20) have a substantially rectangular periphery and wherein the at least one spacer takes the form of a frame, such that a rectangular assembly (40) is formed by the first and second wall element and the spacer arranged therebetween. 25 30
8. Method according to the foregoing claims, wherein the mould is provided along a first side (41) of the rectangular assembly (40), after which an injecting step is performed by having the injection part move along this first side (41) for the purpose of injecting sealing material, after which the rectangular assembly (40) is rotated through a quarter turn, a second side (42) of the rectangular assembly is placed in the mould, and the injecting step is repeated along the second side (42), after which these steps are repeated for a third and a fourth side (43, 44) of the rectangular assembly. 35 40 45
9. Method according to any one of the claims 1-4, wherein the first and the second wall element have a round periphery, such that a round assembly (60) is formed by the first and second wall element and the at least one spacer arranged therebetween. 50
10. Method according to the foregoing claims, wherein the mould is provided along the whole periphery of the round assembly (60), and the assembly is rotated while the injection part injects sealing material. 55

11. Method according to any one of the foregoing claims, wherein the first and the second wall element (10, 20) are one of the following: a glass plate, a glass dome, a plastic plate such as a polycarbonate plate, a plastic dome such as a polycarbonate dome. 5
12. Method according to any one of the foregoing claims, wherein the first wall element (10) is a plate and the second wall element (20) is a dome.
13. Method according to any one of the foregoing claims, wherein a periphery of the first wall element substantially corresponds to a periphery of the second wall element.
14. Method according to any one of the foregoing claims, wherein an outer periphery of the spacer (30) is a maximum of 10% smaller than an outer periphery of the first and the second wall element (10, 20).
15. Method according to any one of the foregoing claims, wherein a gas G is injected between the first wall element (10) and the second wall element (20).
16. Method according to any one of the foregoing claims, wherein one or more additional wall parts (10', 20') are provided above and/or below the first and second wall element, and wherein the mould extends from the upper side of the upper additional wall part and/or to the underside of the lower additional wall part.
17. Method according to any one of the claims 1, wherein one or more inserts are incorporated in the sealing material, preferably one or more of the following inserts: a sensor such as a rain detector, a ventilation component, a lighting element, a cable, a bracket, a hinge, a screw-in insert.

40 Patentansprüche

1. Verfahren zum Herstellen einer mehrschaligen Vorrichtung, im Besonderen einer mehrschaligen Dachvorrichtung, das aufweist:
 - Vorsehen eines ersten Wandelements (10), das eine Oberseite (11) und eine Unterseite (12) hat, und eines zweiten Wandelements (20), das eine Oberseite (21) und eine Unterseite (22) hat;
 - Anordnen des ersten und zweiten Wandelements übereinander, wobei wenigstens ein Abstandselement (30) zwischen der Oberseite (11) des ersten Wandelements (10) und der Unterseite (22) des zweiten Wandelements (20) angeordnet ist;

wobei das Herstellungsverfahren durch die folgenden Schritte gekennzeichnet ist:

- Vorsehen einer Form (100), die von der Oberseite (21) des zweiten Wandelements (20) zur Unterseite (12) des ersten Wandelements (10) verläuft, sodass ein Raum R ausgebildet ist, der von wenigstens der Form (100), dem wenigstens einen Abstandselement (30) und einer Umfangskomponente (41; 51; 61) des ersten und zweiten Wandelements begrenzt wird; wobei die Form mit einer flexiblen Komponente (121) vorgesehen ist, die in einer Umfangsrichtung verläuft;
- Einführen einer Einspritzkomponente (200) über die flexible Komponente in den Raum R und Anordnen eines Abdichtungsmaterials im Raum in der Form in druckloser Weise durch die Einspritzkomponente, während die Einspritzkomponente bezüglich der Umfangskomponente des ersten und zweiten Wandelements bewegt wird.
2. Verfahren nach Anspruch 1, wobei das Abdichtungsmaterial eine in einer Schergeschwindigkeit von 1/s gemessene dynamische Viskosität von unter 35.000 mPa·s hat, wenn sie in dem Raum angeordnet ist.
 3. Verfahren nach einem der vorhergehenden Ansprüche, wobei das Abdichtungsmaterial eine aushärtbaren Polymerzusammensetzung ist, zum Beispiel ein PUR-Material.
 4. Verfahren nach einem der vorhergehenden Ansprüche, wobei die Form eine erste Formkomponente (110) und eine zweite Formkomponente (120) aufweist, und wenigstens eine von der ersten und der zweiten Formkomponente mit einer flexiblen Zunge (121) vorgesehen ist, die in der Umfangsrichtung verläuft.
 5. Verfahren nach einem der vorhergehenden Ansprüche, wobei das erste und das zweite Wandelement einen polygonalen Umfang haben und wobei das wenigstens eine Abstandselement ein entsprechender polygonaler Rahmen ist, sodass eine polygonale Anordnung (50) durch das erste und zweite Wandelement und das wenigstens eine dazwischen angeordnete Abstandselement gebildet wird.
 6. Verfahren nach den vorhergehenden Ansprüchen, wobei die Form entlang einer ersten Seite (51) der polygonalen Anordnung (50) vorgesehen ist, wonach ein Einspritzschritt durchgeführt wird, bei dem die Einspritzkomponente entlang der ersten Seite (51) zum Zweck des Einspritzens von Abdichtungsmaterial bewegt wird, wonach die polygonale Anordnung rotiert wird und eine zweite Seite (52) der polygonalen Anordnung in der Form angeordnet wird, und der Einspritzschritt entlang der zweiten Seite (52) wiederholt wird, wonach diese Schritte für jede
- nachfolgende Seite der polygonalen Anordnung (50) wiederholt werden.
7. Verfahren nach Anspruch 5 oder 6, wobei das erste und das zweite Wandelement (10, 20) einen im wesentlichen rechteckigen Umfang haben und wobei das wenigstens eine Abstandselement die Form eines Rahmens annimmt, sodass eine rechteckige Anordnung (40) durch das erste und zweite Wandelement und das dazwischen angeordnete Abstandselement gebildet wird.
 8. Verfahren nach den vorhergehenden Ansprüchen, wobei die Form entlang einer ersten Seite (41) der rechteckigen Anordnung (40) vorgesehen wird, wonach ein Einspritzschritt durchgeführt wird, bei dem die Einspritzkomponente entlang der ersten Seite (41) zum Zweck des Einspritzens von Abdichtungsmaterial bewegt wird, wonach die rechteckige Anordnung (40) in einer Vierteldrehung rotiert wird, eine zweite Seite (42) der rechteckigen Anordnung in der Form angeordnet wird, und der Einspritzschritt entlang der zweiten Seite (42) wiederholt wird, wonach diese Schritte für eine dritte und eine vierte Seite (43, 44) der rechteckigen Anordnung wiederholt werden.
 9. Verfahren nach einem der Ansprüche 1 bis 4, wobei das erste und das zweite Wandelement einen runden Umfang haben, sodass eine runde Anordnung (60) durch das erste und zweite Wandelement und das wenigstens eine dazwischen angeordnete Abstandselement gebildet wird.
 10. Verfahren nach einem der vorhergehenden Ansprüche, wobei die Form entlang des Gesamtumfangs der runden Anordnung (60) vorgesehen wird, und die Anordnung rotiert wird, während die Einspritzkomponente das Abdichtungsmaterial einspritzt.
 11. Verfahren nach den vorhergehenden Ansprüchen, wobei das erste und zweite Wandelement (10, 20) eines der folgenden sind: eine Glasplatte, eine Glaskuppel, eine Plastikplatte, wie eine Polycarbonatplatte, eine Plastikkuppel, wie eine Polycarbonatkuppel.
 12. Verfahren nach einem der vorhergehenden Ansprüche, wobei das erste Wandelement (10) eine Platte ist, und das zweite Wandelement (20) eine Kuppel ist.
 13. Verfahren nach einem der vorhergehenden Ansprüche, wobei ein Umfang des ersten Wandelements im Wesentlichen einem Umfang des zweiten Wandelements entspricht.
 14. Verfahren nach einem der vorhergehenden Ansprü-

che, wobei ein Außenumfang des Abstandselements (30) maximal 10 % kleiner als ein Außenumfang des ersten und des zweiten Wandelements (10, 20) ist.

15. Verfahren nach einem der vorhergehenden Ansprüche, wobei ein Gas G zwischen das erste Wandelement (10) und das zweite Wandelement (20) eingespritzt wird.

16. Verfahren nach einem der vorhergehenden Ansprüche, wobei eine oder mehrere und zusätzliche Wandkomponenten (10', 20') über und/oder unter dem ersten und zweiten Wandelement vorgesehen werden, und wobei die Form von der Oberseite der oberen zusätzlichen Wandkomponente und/oder zur Unterseite der unteren zusätzlichen Wandkomponente aus verläuft.

17. Verfahren nach einem der Ansprüche 1 bis 16, wobei ein oder mehrere Einsätze in dem Abdichtungsmaterial integriert sind, vorzugsweise ein oder mehrere der folgenden Einsätze: ein Sensor, wie ein Regendetektor; ein Beleuchtungselement, ein Kabel, eine Klammer, ein Gelenk, ein Einschraubeinsatz.

Revendications

1. Procédé de fabrication d'un dispositif à parois multiples, en particulier, un dispositif de toit à parois multiples, comprenant :

la fourniture d'un premier élément de paroi (10) comportant une face supérieure (11) et une face inférieure (12), et d'un second élément de paroi (20) comportant une face supérieure (21) et une face inférieure (22) ;

la mise en place des premier et second éléments de paroi l'un au-dessus de l'autre, dans lequel au moins une entretoise (30) est agencée entre la face supérieure (11) du premier élément de paroi (10) et la face inférieure (22) du second élément de paroi (20) ; ledit procédé de fabrication étant **caractérisé par** les étapes suivantes :

la préparation d'un moule (100) qui s'étend à partir de la face supérieure (21) du second élément de paroi (20) vers la face inférieure (12) du premier élément de paroi (10), de telle sorte qu'il est formé un espace R qui est bordé au moins par le moule (100), la au moins une entretoise (30) et une partie périphérique (41 ; 51 ; 61) des premier et second éléments de paroi ; dans lequel le moule comporte une partie flexible (121) s'étendant dans une direction périphérique ;

l'introduction d'une partie d'injection (200) par l'intermédiaire de la partie flexible dans l'espace R et l'introduction d'un matériau de scellement dans ledit espace dans le moule d'une manière non pressurisée avec la partie d'injection pendant que la partie d'injection est déplacée par rapport à la partie périphérique des premier et second éléments de paroi.

2. Procédé selon la revendication 1, dans lequel le matériau de scellement présente une viscosité dynamique, mesurée sous un taux de cisaillement de 1/s, inférieure à 35000 mPa.s lorsqu'il est introduit dans l'espace.

3. Procédé selon l'une quelconque des revendications précédentes, dans lequel le matériau de scellement est une composition polymère durcissable, par exemple un matériau à base de polyuréthane (PUR).

4. Procédé selon l'une quelconque des revendications précédentes, dans lequel le moule comprend une première partie de moule (110) et une seconde partie de moule (120), et au moins l'une de la première et la seconde partie de moule comporte une languette souple (121) s'étendant dans la direction périphérique.

5. Procédé selon l'une quelconque des revendications précédentes, dans lequel les premier et second éléments de paroi présentent une périphérie polygonale et dans lequel la au moins une entretoise est une structure polygonale correspondante, de telle sorte qu'un ensemble polygonal (50) est formé par les premier et second éléments de paroi et la au moins une entretoise agencée entre eux.

6. Procédé selon les revendications précédentes, dans lequel le moule est agencé le long d'un premier côté (51) de l'ensemble polygonal (50), après quoi une étape d'injection est réalisée en déplaçant la partie d'injection le long de ce premier côté (51) dans le but d'injecter le matériau de scellement, après quoi l'ensemble polygonal est tourné et un deuxième côté (52) de l'ensemble polygonal est placé dans le moule, et l'étape d'injection est répétée le long du deuxième côté (52), après quoi ces étapes sont répétées pour chaque côté supplémentaire de l'ensemble polygonal (50).

7. Procédé selon la revendication 5 ou 6, dans lequel le premier et le second éléments de paroi (10, 20) présentent une périphérie sensiblement rectangulaire et dans lequel la au moins une entretoise prend la forme d'une structure, de telle sorte qu'un ensemble rectangulaire (40) est formé par les premier et

second éléments de paroi et l'entretoise agencée entre eux.

8. Procédé selon les revendications précédentes, dans lequel le moule est agencé le long d'un premier côté (41) de l'ensemble rectangulaire (40), après quoi une étape d'injection est réalisée en déplaçant la partie d'injection le long du premier côté (41) dans le but d'injecter du matériau de scellement, après quoi l'ensemble rectangulaire (40) est tourné sur un quart de tour, un deuxième côté (42) de l'ensemble rectangulaire est placé dans le moule, et l'étape d'injection est répétée le long du deuxième côté (42), après quoi ces étapes sont répétées pour un troisième et un quatrième côtés (43, 44) de l'ensemble rectangulaire. 5
9. Procédé selon l'une quelconque des revendications 1 à 4, dans lequel les premier et second éléments de paroi présentent une périphérie circulaire, de telle sorte qu'un ensemble circulaire (60) est formé par les premier et second éléments de paroi et la au moins une entretoise agencée entre eux. 10
10. Procédé selon les revendications précédentes, dans lequel le moule est agencé le long de la totalité de la périphérie de l'ensemble circulaire (60) et l'ensemble est tourné pendant que la partie d'injection injecte du matériau de scellement. 15
11. Procédé selon l'une quelconque des revendications précédentes, dans lequel le premier et le second éléments de paroi (10, 20) sont l'un des suivants : une plaque en verre, un dôme en verre, une plaque en matière plastique telle qu'une plaque de polycarbonate, un dôme en matière plastique tel qu'un dôme en polycarbonate. 20
12. Procédé selon l'une quelconque des revendications précédentes, dans lequel le premier élément de paroi (10) est une plaque et le second élément de paroi (20) est un dôme. 25
13. Procédé selon l'une quelconque des revendications précédentes, dans lequel une périphérie du premier élément de paroi correspond sensiblement à une périphérie du second élément de paroi. 30
14. Procédé selon l'une quelconque des revendications précédentes, dans lequel une circonférence externe de l'entretoise (30) est au maximum de 10% inférieure à une circonférence externe des premier et second éléments de paroi (10, 20). 35
15. Procédé selon l'une quelconque des revendications précédentes, dans lequel un gaz G est injecté entre le premier élément de paroi (10) et le second élément de paroi (20). 40

16. Procédé selon l'une quelconque des revendications précédentes, dans lequel une ou plusieurs parties de paroi supplémentaire (10', 20') sont agencées au-dessus et/ou au-dessous des premier et second éléments de paroi, et dans lequel le moule s'étend à partir de la face supérieure de la partie de paroi supplémentaire supérieure et/ou vers la face inférieure de la partie de paroi supplémentaire inférieure. 45
17. Procédé selon l'une quelconque des revendications 1 à 16, dans lequel un ou plusieurs inserts sont incorporés dans le matériau de scellement, de préférence, un ou plusieurs inserts suivants : un capteur tel qu'un capteur de pluie, un composant de ventilation, un élément d'éclairage, un câble, un support, une charnière, un insert de vissage. 50

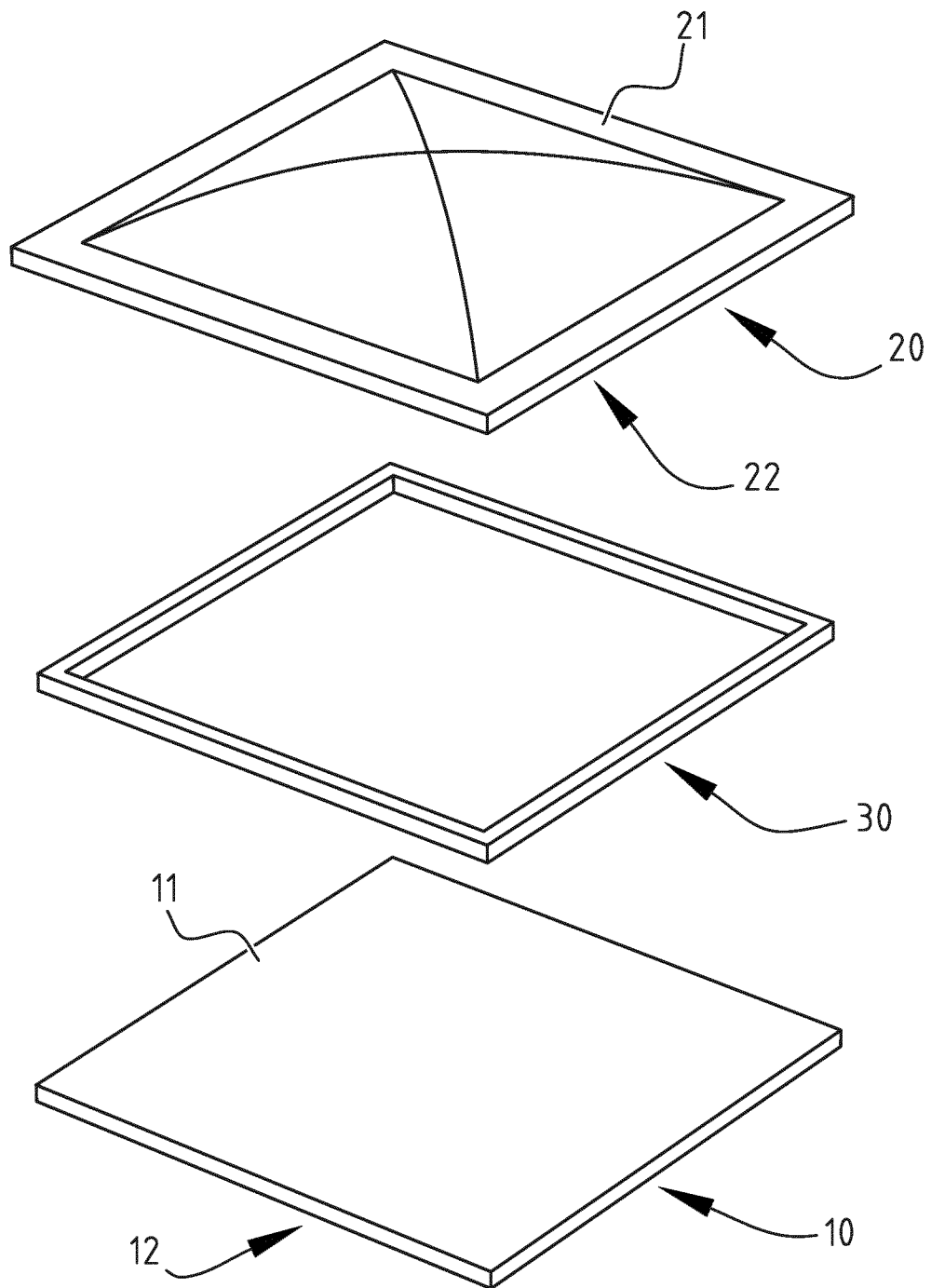


FIG. 1A

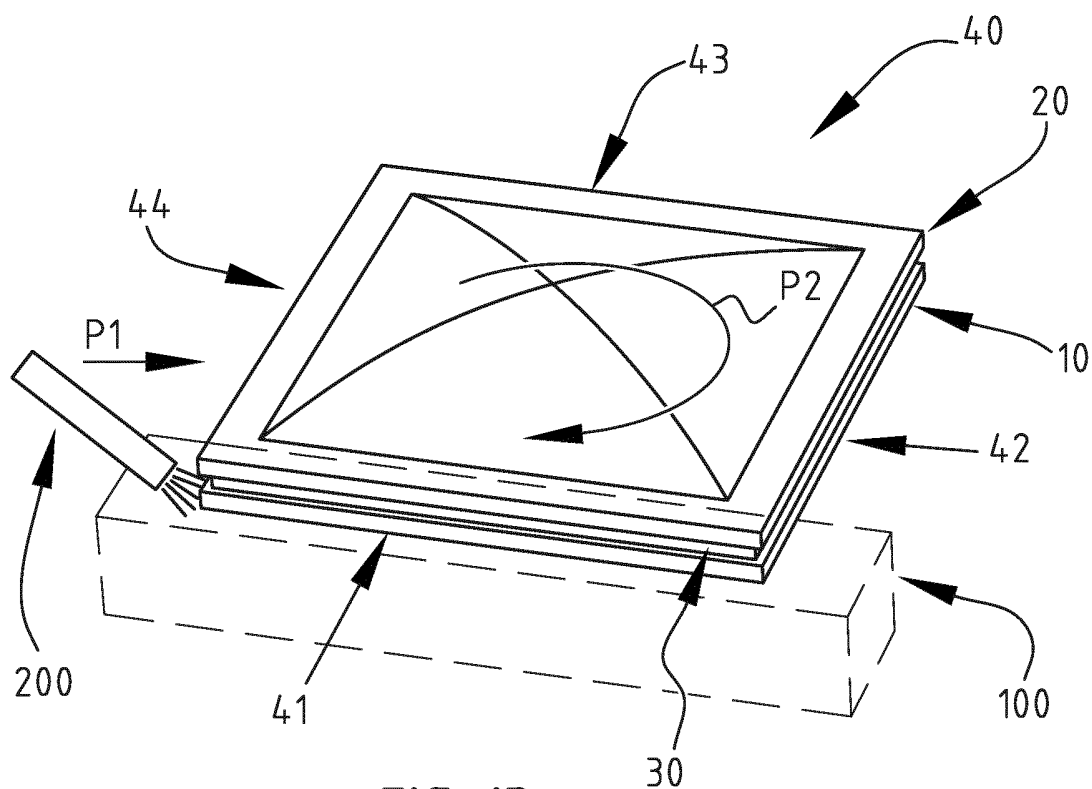


FIG. 1B

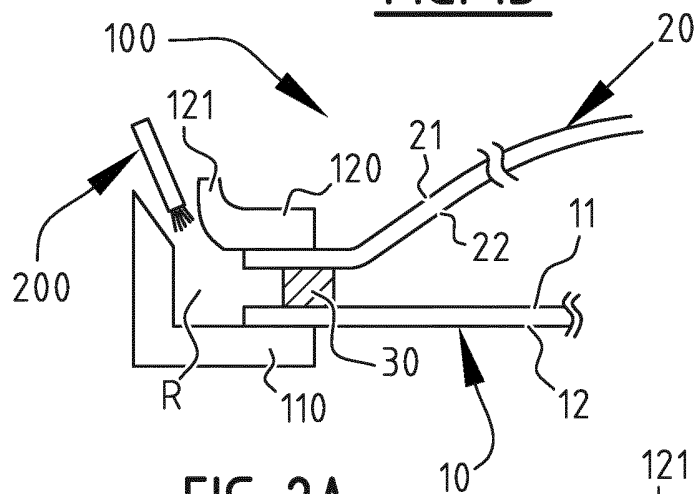


FIG. 2A

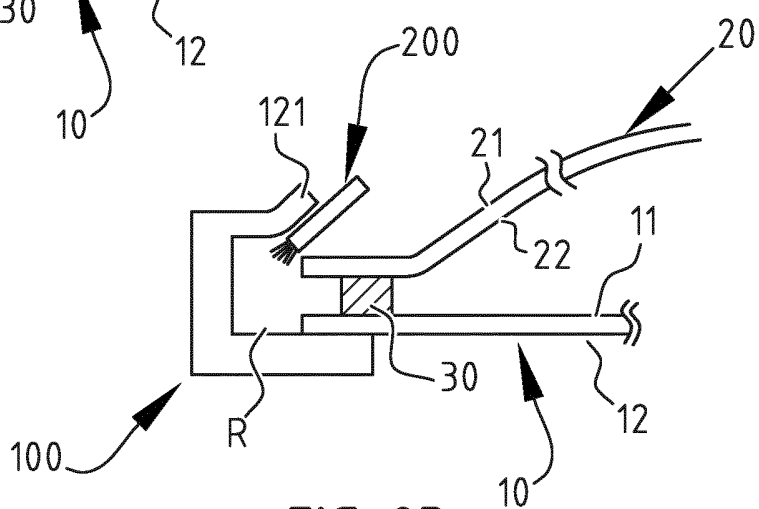


FIG. 2B

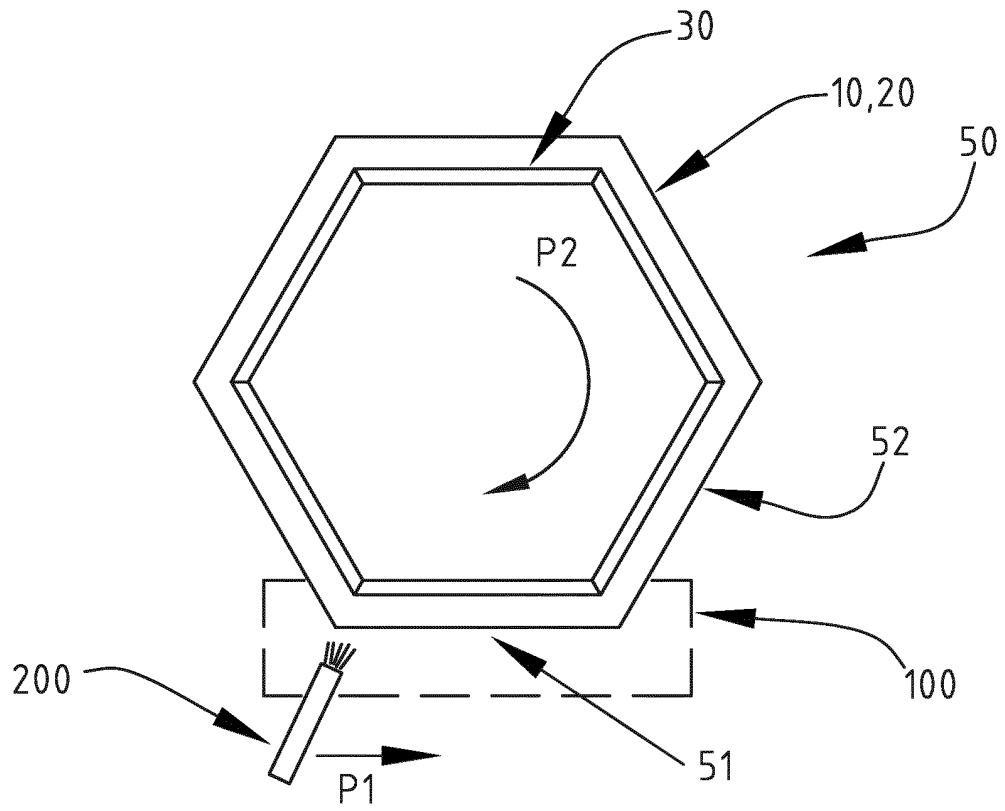


FIG. 3

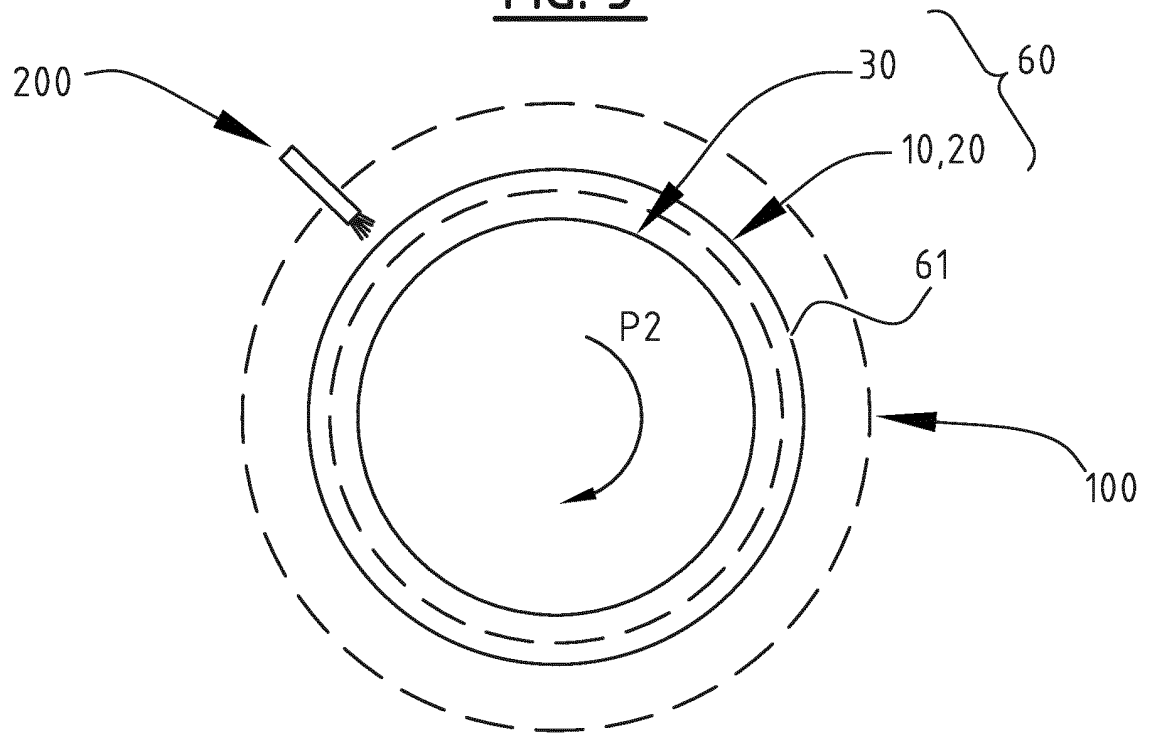


FIG. 4

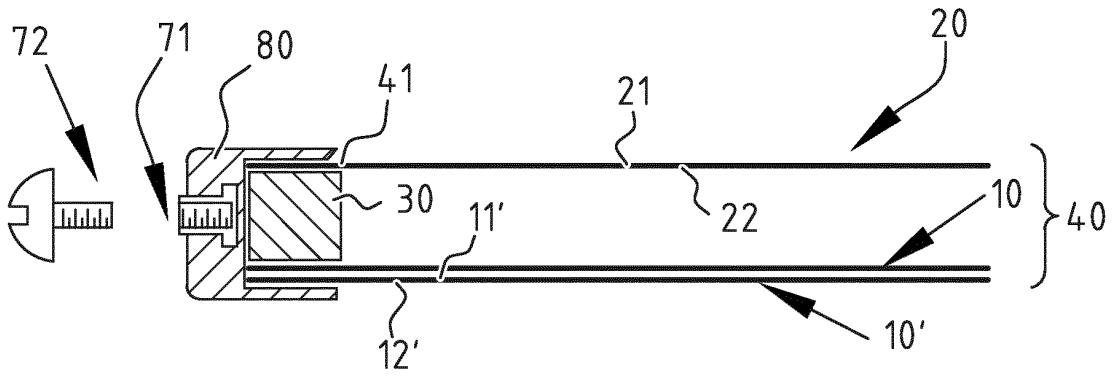


FIG. 5

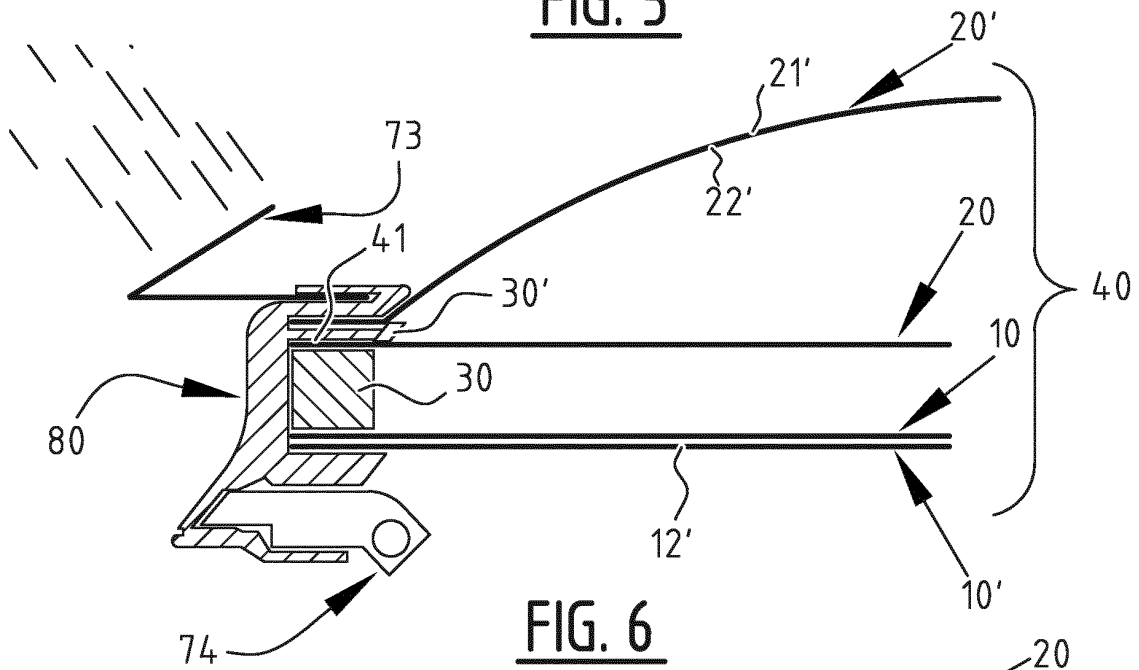


FIG. 6

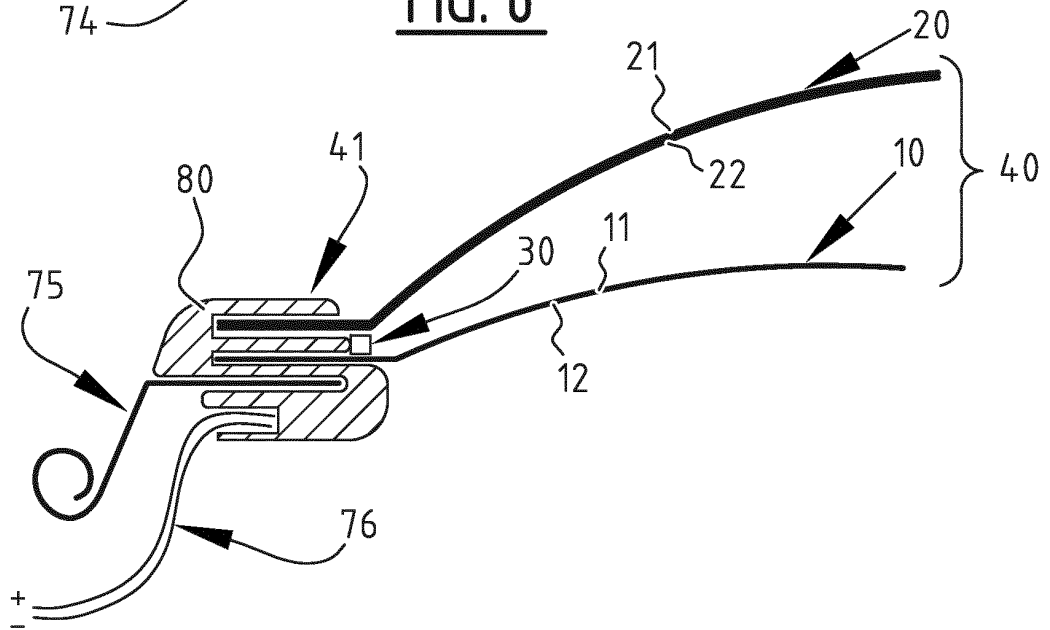


FIG. 7

REFERENCES CITED IN THE DESCRIPTION

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