



(11)

EP 3 192 933 A1

(12)

EUROPEAN PATENT APPLICATION

(43) Date of publication:
19.07.2017 Bulletin 2017/29

(51) Int Cl.:
E04F 13/00 (2006.01) **E04F 13/08** (2006.01)
E04B 1/70 (2006.01) **E04B 1/76** (2006.01)

(21) Application number: **16196218.8**

(22) Date of filing: **28.10.2016**

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA ME
Designated Validation States:
MA MD

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(30) Priority: **18.01.2016 FI 20165027**

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(54) **ARRANGEMENT FOR RENOVATING THE OUTER SHELL OF A BUILDING**

(57) The invention relates to an arrangement for renovating the outer shell of a building, including thermal insulation elements (2) to be fastened to the exterior wall (1) of the building. The thermal insulation elements (2) are fastened at a distance forming the ventilation gap (7) from the outermost surface of the exterior wall. The ventilation gap (7) between the inside surface (3) of the thermal insulation element (2) and the exterior wall (1) is arranged to open into the outside air via at least one ventilation opening (6) in the lower edge and upper edge of the thermal insulation element, allowing moisture to escape from the exterior wall (1) via the ventilation gap (7) and the ventilation openings (6). The ventilation openings (6) are arranged to be closed when the moisture in the exterior wall reaches the desired moisture content.

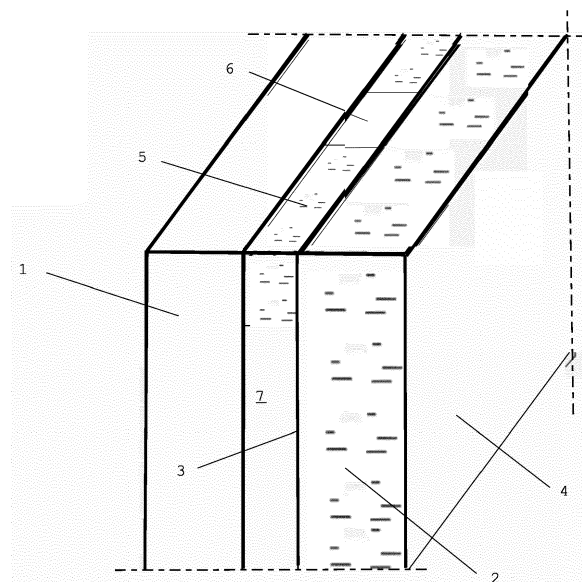


Fig. 3

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Description

[0001] The invention relates to an arrangement for renovating the outer shell of a building according to the preamble of claim 1, including thermal insulation elements to be fastened to the exterior wall of the building.

[0002] In Finland, as in many other countries, there are many buildings in need of repair. In order to repair these, various renovation elements have been developed, which are hung, for example, by means of fasteners on load-bearing structures. However, these known solutions are generally compromises between thermal insulation and, on the other hand, adequate ventilation in order to avoid moisture problems.

[0003] The object of the present invention is to provide a reliable renovation arrangement for renovating old facades, the element enabling good thermal insulation and, at the same time, providing appropriate ventilation, with which the drying of the old structure is assured.

[0004] In order to achieve this object, a renovation arrangement according to the invention is characterized by that the thermal insulation element has a core part of mineral wool and surface panels covering it on both sides, said surface panels having a tongue on one longitudinal edge and a groove on the opposite longitudinal edge, and that in the inner surface panel of the thermal insulation element is formed at least one opening, and that in the mineral wool of the core part of the thermal insulation element is formed at least one ventilation channel, which opens directly or via a separate connecting channel to the outside air, said mineral wool allowing the movement of moisture between said at least one opening and the ventilation channel.

[0005] The gap between the inside surface of the thermal insulation element and the exterior wall is preferably sealed on the circumferential edge of an area defined by one or more thermal insulation elements, in the upper edge and lower edge of which sealed area is formed one or more ventilation openings. Alternatively, said ventilation openings are formed in the upper and lower edges of the thermal insulation element over the entire width of the edge.

[0006] A solution according to the invention enables the escape of possible moisture in the exterior wall structures via the ventilation openings into the outside air. This is specifically necessary when renovating extremely wet structures. Once the structure has sufficiently dried, the ventilation openings can be closed in order that the thermal insulation capacity can be kept as good as possible. Preferably, for closing the ventilation openings are used mechanically operated closing elements, which are provided with a sealing material that tightly closes the opening and is like the sealing material used in sealing the circumferential edge. As the sealing material can be used, for example, soft mineral wool, which is preferably covered on its outer edge by a plate to prevent moisture from passing into the sealing material from the outside. Ventilation openings can also be formed by leaving the

ventilation gap in the upper and lower edge of the thermal insulation element entirely open. The side edges of the ventilation gap can also be left entirely open in order to further increase the efficiency of the initial ventilation. Once the moisture content of the old wall has dropped sufficiently low, these ventilation openings are closed, for example, by means of insulated lists on the circumferential edge of an area defined by one or more thermal insulation elements.

[0007] A solution according to the invention enables efficient initial drying and good thermal insulation once the structure has dried, after the ventilation openings have been closed. The repaired structure has its final appearance immediately after repair and provides the old structure protection from the weather by preventing it from getting wet. During boosted ventilation, ventilation air bypasses the thermal insulation of the new element, thus its insulating affect is less during boosted ventilation than it will finally be. Ventilation flow as well as the thermal insulation levels of the element and the old structure influence the warming of the air in the ventilation slot. The element protects the old structure and decreases stress caused by weather. Protection from the weather and warming of the ventilation air boost the drying of the moisture of the old structure via the ventilation slot. The ventilation air flow can be affected i.a. by the opening section of the perforation of the fastening spines as well as the flow resistances of the air intake and exhaust openings.

[0008] In the following, the invention is described in more detail by referring to the accompanying drawings, in which:

Fig. 1 shows a diagrammatic principle illustration of the placement of thermal insulation elements in a vertical installation,

Fig. 2 shows a diagrammatic principle illustration of the placement of thermal insulation elements in a horizontal installation,

Fig. 3 shows a partial section of the sealing between a thermal insulation element and the exterior wall in the upper edge area, and

Fig. 4 shows diagrammatically an embodiment of a horizontal fastening support.

[0009] Fig. 1 shows the placement of thermal insulation elements 2 in a vertical installation. The height h of the thermal insulation elements 2 is typically 3 - 12 m and the width 1.2 m. The ventilation channel in the thermal insulation elements is preferably arranged at the seam site 10 between the elements, said channel opening at its upper end into the outside air as protected from the rain, for example, by a protection plate (not shown). When the elements are installed vertically, there can be, in the vertical direction, one or more elements installed one on top of the other. If the building is, for example, 20 m high,

it may have 2 units of 10-meter-high elements. In this case, ventilation preferably occurs at the upper and lower edges of each element, i.e. ventilation occurs also in the horizontal seam between the elements.

[0010] Fig. 2 shows the placement of the thermal insulation elements 2 in a horizontal installation. The length L of the thermal insulation elements 2 is typically 3 - 12 m and the width W 1.2 m. The ventilation channel in the thermal insulation elements is preferably arranged at the horizontal seam site 11 between the elements, said channel opening into the connecting channel arranged in connection with the vertical seam 12 between the elements, said connecting channel opening at its upper end into the outside air as protected from the rain, for example, by a protection plate. These ventilation channels mentioned in Figs. 1 and 2 are channels in the thermal insulation element itself or at the seam site between the elements, said channels forming the conventional ventilation system of the building while in service. There can be one or more channels per element.

[0011] Fig. 3 shows the installation of the thermal insulation element 2 in relation to the exterior wall 1 as a partial section in the upper edge area of the element. The thermal insulation element 2 preferably comprises a core part of mineral wool, to both main surfaces of which are fastened, preferably by gluing, surface panels 3, 4, which are preferably of plastic-coated sheet steel. The mineral wool layer is preferably formed from structural wool lamellae, in which the fibres are substantially perpendicular in relation to the surface panels 3, 4.

[0012] Fig. 3A shows the renovation thermal insulation element presented in the earlier Finnish patent application FI20155582 of the applicant, in which in the horizontal lower edge of the surface panels 32a, 32b of plastic-coated sheet steel is made a groove 34 and in the upper edge a tongue 35. In the inner surface panel can be made an opening 37, which is preferably covered by a water vapour-permeable membrane 36 fastened to the outer surface of the inner surface panel 32b. There can be a plurality of openings and among them can be various shapes and various sizes in surface area. The total surface area of the openings is preferably approx. 10% of the surface area of the inner surface panel, the minimum being approx. 5%. The total surface area of the openings can, depending on the situation, also be larger, for example, from 15% up to 80%, provided that the strength of the inner surface panel permits this. When gluing the core part to a surface panel 32b with openings, the core part remains without the adhesive layer at the openings in the surface panel, wherein moisture is allowed to move at the openings through the mineral wool relatively easily into the ventilation channel 39 formed in the thermal insulation element, said ventilation channel being preferably arranged near the outermost surface panel 32a of the thermal insulation element 32 in the vicinity of the groove. A ventilation channel can be made, for example, by milling a groove of the desired depth and width on the edge of the core part 32c in connection with the manu-

facture of the thermal insulation element. Fig. 3A shows the formation of the ventilation channels 33 used in the initial drying by leaving off a portion of the layer 38 of soft mineral wool. In this embodiment, the layer 38 of soft mineral wool is used to even out unevennesses in the exterior wall 1.

[0013] According to Fig. 3, the thermal insulation element 2 is fastened at a distance forming the ventilation gap 7 from the exterior wall 1. The thermal insulation element 2 is preferably fastened by means of separate fastening supports to the old load-bearing wall 1. The fastening support can be, for example, an elongated hat profile 20 of metal shown in Fig. 4, which has, for fastening to the exterior wall, lateral surfaces 23, 23', which can be pre-perforated for inserting the fastening elements (not shown) into the exterior wall. The horizontal upper and lower surfaces 21, 21' of the hat profile are preferably provided with perforations 22, 22', whose total surface area forms respectively approx. 15 - 25 % of the total surface area of the corresponding upper or lower surface. This perforation allows the air stream to travel in the ventilation gap 7 when the fastening supports between the upper and lower edges are horizontally installed. The fastening supports can also be used in a horizontal installation of the thermal insulation elements, wherein the fastening supports are installed in a vertical position, and they can be without perforations 22, 22', by arranging the ventilation openings of the upper and lower edge to open into the ventilation gap between each of the two adjacent vertical fastening supports. Such hat profiles preferably extend across the entire width of the thermal insulation element to be fastened. As the fastening supports can naturally be used also many other suitable fastening supports, the above presented hat profile of metal being only an example of a preferred fastening support embodiment. Fastening supports can be formed, for example, from individual fasteners, which allow the air stream to travel freely around them in both lateral and vertical directions.

[0014] In the circumferential edge of a thermal insulation element 2 is arranged a sealed section 5 of, for example, soft mineral wool, which encircles the area formed by one or more thermal insulation elements. For example, the sealed section presented in Figs. 1 and 2 preferably travels along the circumferential edge of an area defined by all the elements together, wherein between the thermal insulation elements and the outer surface is formed an extensive cavity space. In the upper and lower edges of this sealed section is formed respectively at least one ventilation opening 6, through which openings the moisture-removing boosted ventilation air intended for the initial drying can travel from the ventilation opening of the lower edge via the ventilation gap 7 through the ventilation opening 6 of the upper edge into the outside air. As the material of the sealed section can be used, for example, soft mineral wool, which is preferably covered at its outer edge by a plate to prevent the passage of moisture into the sealing material from the outside. For

closing the ventilation openings can be used mechanical closing elements, which can already have a section of soft mineral wool that tightly closes the opening 6. The closing elements can be, for example, elements articulately connected to the thermal insulation element 2 or separate elements, which are brought to the site when the moisture content in the exterior wall has dropped to a given level. The moisture content of the exterior wall is to be defined on the basis of experience from the initial moisture content of the exterior wall, wherein the ventilation openings can be closed after a given period of time or preferably by using moisture sensors arranged in connection with the outer shell, on the basis of the measurement result from which the correct time for closing the ventilation openings can be more exactly determined. The boosted ventilation intended for the initial drying can also be decreased gradually by partially closing the ventilation openings before boosted ventilation is entirely ended. Once boosted ventilation has ended, ventilation of the building while in service is taken care of via the ventilation channels in the thermal insulation elements themselves or the ventilation channels separately arranged while in service. The ventilation channels in the thermal insulation elements or arranged separately also function normally during the boosted ventilation, contributing to the initial drying of the building. When moisture sensors are used, the moisture content of the exterior wall can be actively monitored also after closing the ventilation openings and if the moisture content should, for some reason, rise again unusually high, the ventilation openings can, as needed, be reopened partially or entirely to achieve boosted ventilation. The closing elements of the ventilation openings can, if desired, also be arranged as remote-controlled in order to facilitate their closing and possible reopening.

[0015] The initial ventilation can also be implemented by leaving the ventilation gap entirely open at its upper and lower edges and possibly also at the sides, until the ventilation gap is closed, for example, by means of insulated lists when the old exterior wall reaches the desired decreased moisture content. The insulating material of the insulated lists can be, for example, soft mineral wool or other suitable insulating material. The ventilation of the building while in service is preferably arranged via the ventilation channels formed in the thermal insulation elements, into which channels the moisture escaping from the building is allowed to move via the cavity space closed at its edges.

[0016] In the above, as the thermal insulation material is as an example presented for use mineral wool thermal insulation between plastic-coated steel sheets, described in the earlier Finnish patent application FI20155582 of the applicant, into said insulation being arranged ventilation channels 39, but as the material can also be used other suitable thermal insulation materials, which can have various surface materials and various ventilation arrangements while in service.

Claims

1. An arrangement for renovating the outer shell of a building, including thermal insulation elements (2) to be fastened to an exterior wall (1) of the building, said thermal insulation elements (2) being fastened at a distance forming a ventilation gap (7) from the outermost surface of the exterior wall; where the ventilation gap (7) between an inside surface (3) of the thermal insulation element (2) and the exterior wall (1) is arranged to open into the outside air via at least one ventilation opening (6) in the lower edge and in the upper edge of the thermal insulation element, allowing moisture to escape from the exterior wall (1) via the ventilation gap (7) and the ventilation openings (6), and said ventilation openings (6) are arranged to be closed when the moisture in the exterior wall reaches a desired moisture content, **characterized in that** the thermal insulation element (32) has a core part of mineral wool and surface panels (3, 4) covering it on both sides, said surface panels having a tongue (35) on one longitudinal edge and a groove (34) on the opposite longitudinal edge, and that in the inner surface panel (3) of the thermal insulation element is formed at least one opening (37), and that in the mineral wool (32c) of the core part of the thermal insulation element (32) is formed at least one ventilation channel (39), which opens directly or via a separate connecting channel into the outside air, said mineral wool allowing the movement of moisture between said at least one opening (37) and the ventilation channel (39).
2. A renovation arrangement according to claim 1, **characterized in that** the ventilation gap (7) is sealed on the circumferential edge of an area defined by one or more thermal insulation elements, in the upper edge and lower edge of which sealed area (5) is formed one or more ventilation openings (6).
3. A renovation arrangement according to claim 1, **characterized in that** said ventilation openings are formed in the upper and lower edges of the thermal insulation element over the entire width of the edge.
4. A renovation arrangement according to any one of claims 1 - 3, **characterized in that** the desired moisture content is to be defined on the basis of experience from the initial moisture content of the exterior wall (1) or by using moisture sensors arranged in connection with the outer shell.
5. A renovation arrangement according to any one of claims 1 - 4, **characterized in that** the thermal insulation elements (2) are fastened at a distance in the range of 20 - 50 mm from the outermost surface of the exterior wall (1).

6. A renovation arrangement according to any one of claims 1 - 5, **characterized in that** the thermal insulation elements (2) are arranged in a vertical position and fastened to the exterior wall on horizontal fastening supports (20), and that said horizontal fastening supports (20) are provided with perforations (22, 22'), which allow the air in the ventilation gap (7) to travel between the ventilation openings (6) of the lower and upper edges.
7. A renovation arrangement according to claim 6, **characterized in that** the horizontal fastening support is a hat profile (20) of metal, in the horizontal upper and lower surfaces (21, 21') of which are formed perforations (22, 22'), the sum total surface area of which perforations in each surface is in the range of 15 - 25 % of the total surface area of the corresponding upper or lower surface.
8. A renovation arrangement (2) according to any one of claims 1 - 7, **characterized in that** said at least one opening (37) of the surface panel (3) is covered by a water vapour-permeable membrane.
9. A renovation arrangement (2) according to any one of claims 1 - 8, **characterized in that** the material of the surface panels (3, 4) is plastic-coated sheet steel.

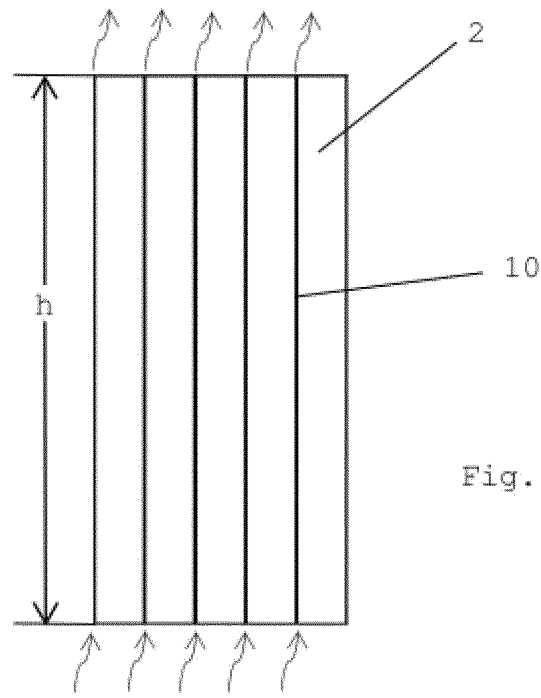


Fig. 1

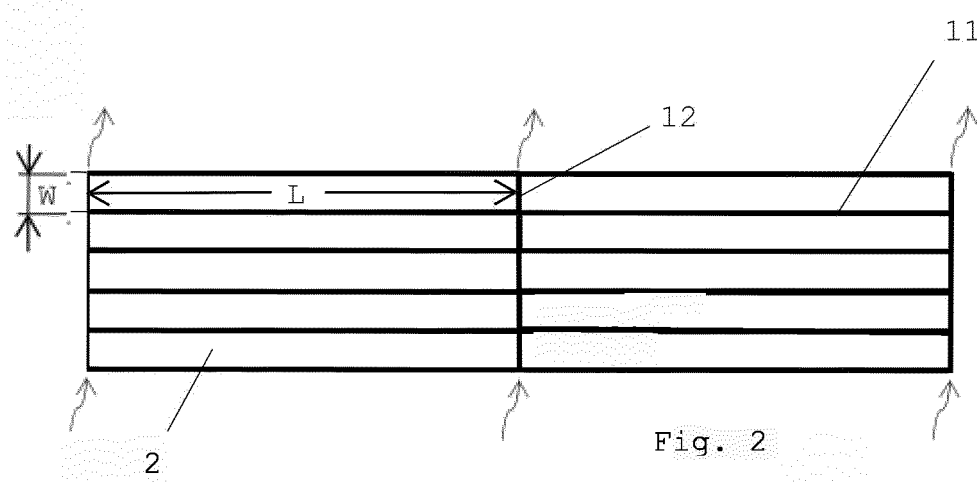


Fig. 2

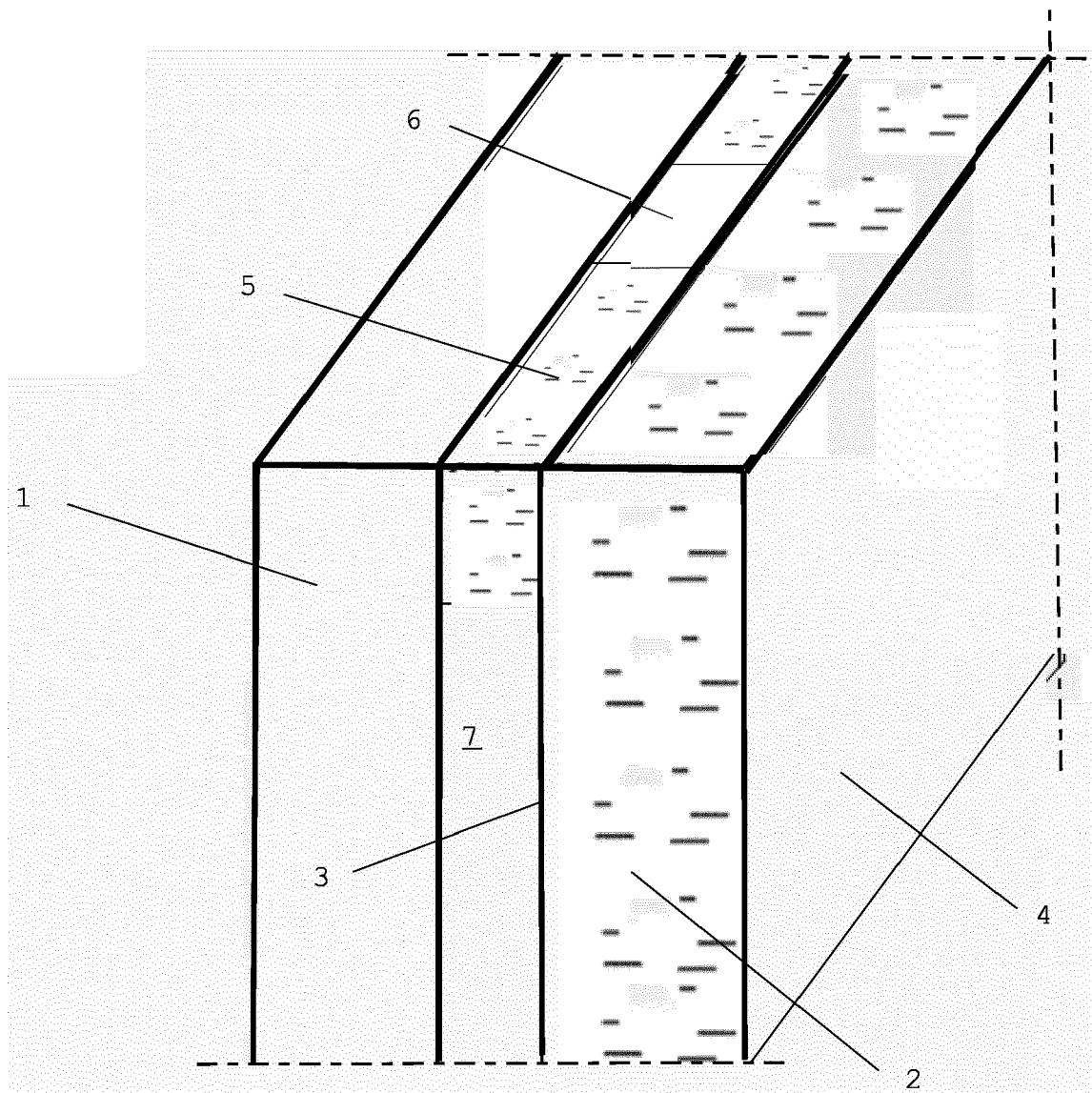


Fig. 3

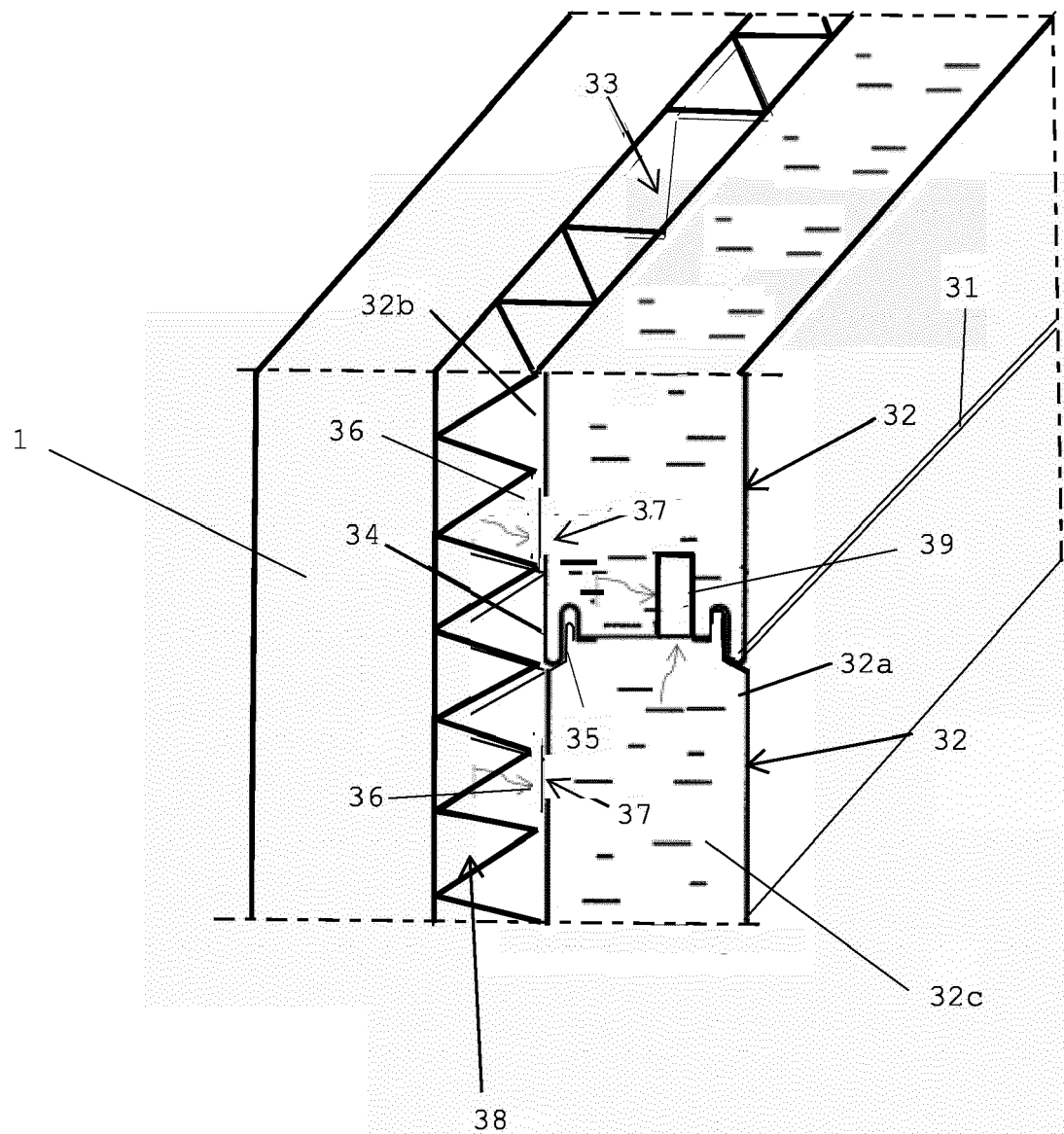


Fig. 3A

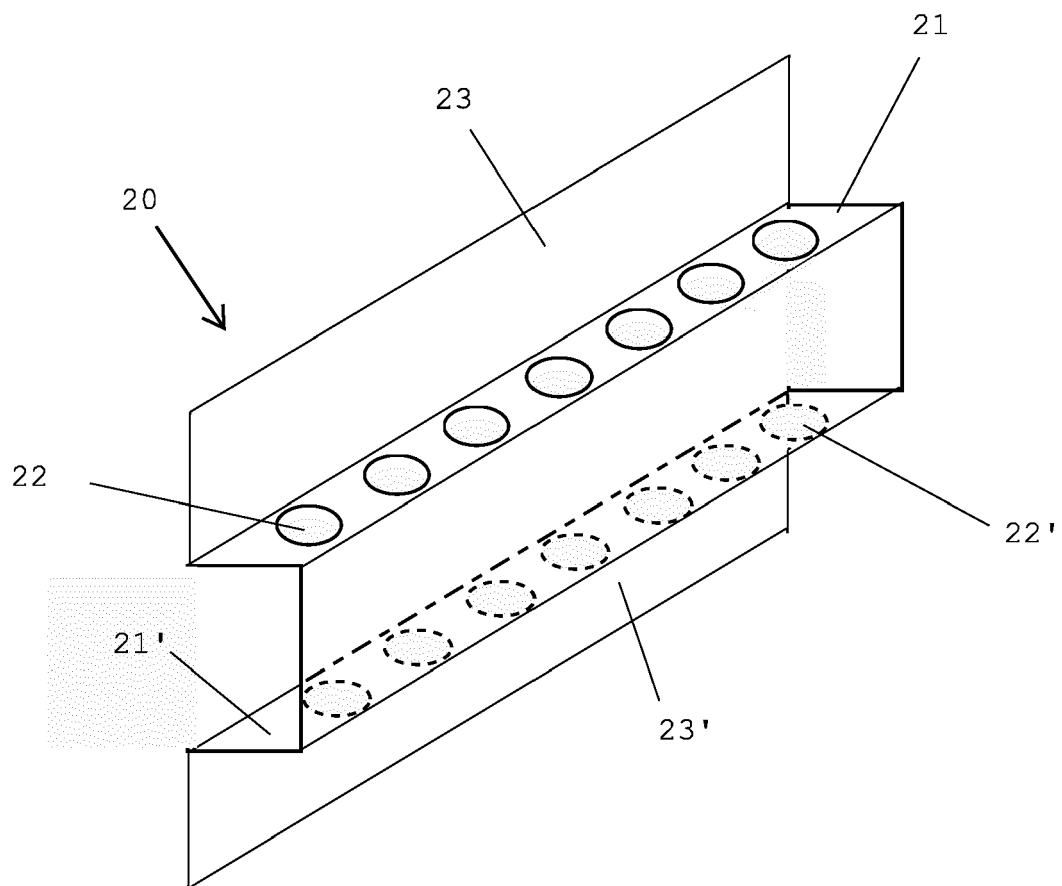


Fig. 4



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