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(11) **EP 1 712 694 A1**

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
18.10.2006 Bulletin 2006/42

(51) Int Cl.:
E04B 2/88 (2006.01)

(21) Application number: **05380068.6**

(22) Date of filing: **08.04.2005**

(84) Designated Contracting States:
**AT BE BG CH CY CZ DE DK EE ES FI FR GB GR
HU IE IS IT LI LT LU MC NL PL PT RO SE SI SK TR**
Designated Extension States:
AL BA HR LV MK YU

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(54) **Curtain wall for multi-storey buildings**

(57) It is structured in the form of a bearing sheet made up of a series of profiled plates (1), which run from the ground to the roof, grooved, to form trays with a U-shaped section, which are attached by their central branch to the front edge of the floor slabs and whose side branches (2) serve as supports and spacers for an exterior sheet (7), which forms the exposed face of the front wall, using modular pieces (9) that are mounted on strips (10) suitably attached to the front edge (3) of the trays (1), or panels that are directly secured to those edges if

there are no strips. The respective layers (6) of insulation and soundproofing material lie at the bottom of the trays (1), which are still at a considerable distance from the exterior sheet (7), forming a ventilated chamber that also runs from the floor to the roof, while the internal face of the bearing sheet (5) adapts to the insertion of another insulating and soundproofing layer (13), an inner sheet (12), which takes the form of a self-supporting back made up of panels composed of plaster sheets on a galvanised steel structure.

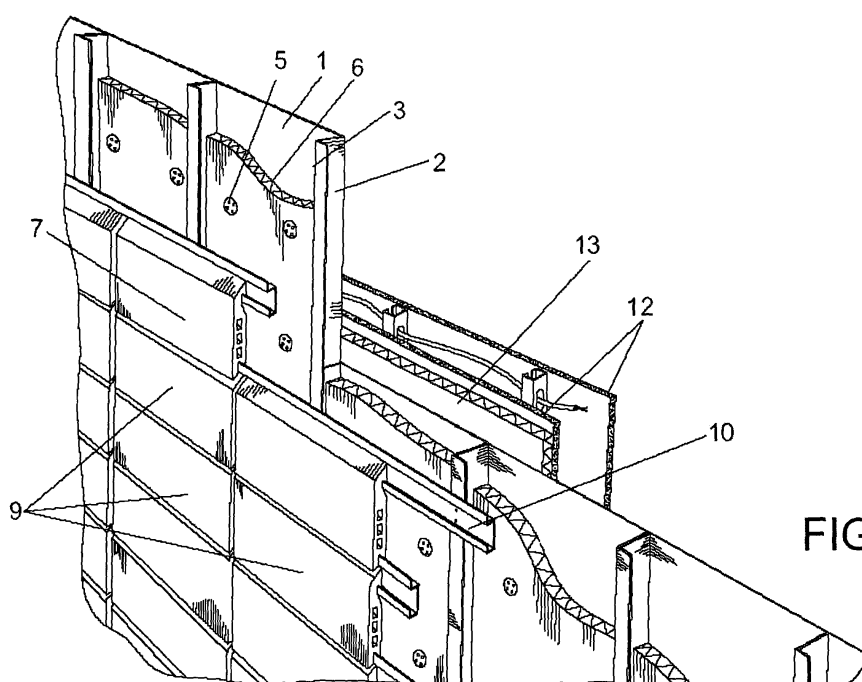


FIG. 1

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Description

OBJECT OF THE INVENTION

[0001] This invention is a wall for buildings, which has been especially devised for buildings with several storeys, and it is a floating wall, which covers the entire exterior wall with the soundproofing and heat insulation that is required for each particular case, and does so quickly, economically, efficiently and in a flexible way.

[0002] The front wall that is the subject of the invention can be applied to residential buildings and homes, but it is also valid for other types of buildings, and can provide the benefits of a ventilated front wall, at a cost that is similar to a conventional vertical exterior wall and the way in which it is laid in place and in which the quality is controlled are extremely efficient.

BACKGROUND TO THE INVENTION

[0003] In an overwhelming majority of cases, the classic exterior wall system for front walls that is currently used for homes and residential buildings, is based upon manufactured material comprising bricks or blocks, which are either made of ceramic material or concrete.

[0004] On each storey of the building, these materials lie freely on the lower floor and are secured to the upper one with mortar, and theoretically their stability is acceptable, although in many cases there is no such stability because of the dimensional tolerance levels at the edges of the floor slabs "in situ", which is often 5 cm, so the support of these materials on the edge of the floor slabs may only be a few centimetres, which seriously affects the stability.

[0005] Furthermore, it is not possible to reliably guarantee the airtightness of these exterior walls, in view of the craftsmanship used when erecting them.

[0006] There are a certain number of industrialised solutions available on the market for dealing with these exterior walls, but for a variety of reasons none of them have been fully implemented. They are generally systems that are based upon the use of different types of panels, and it is concrete panels that are predominantly utilised for residential or dwelling purposes, whether this is exclusively for the exterior wall, or for structural purposes. Some of these panels incorporate an insulation system, but they generally have major insulation bridges. The openings in the larger ones are open, but this means that such panels have to be specifically constructed for each particular solution.

[0007] Other types of panels are the light variety, commonly referred to as sandwich panels, which are composed of two external sheets, generally made of metallic plating, plastics or wooden sheeting, and one internal sheet that joins the aforementioned ones together and serves to insulate and soundproof, which could be made of such materials as polyurethane, polystyrene or high-density mineral wools. This type of panel requires an aux-

iliary structure that is usually made up of steel piping. They are extensively used for office buildings, shopping centres and similar constructions, but not for homes, in view of the fact that they are very expensive.

[0008] There is no comprehensive industrialised solution of this type in which the front wall is equipped with a ventilated chamber and for which the problem of the openings has been overcome.

[0009] However, there are front walls that are provided with a ventilated chamber, but their use is very limited, almost exclusively to luxury homes, where the chamber in question is formed with layers of stone secured to conventional manufactured materials by means of costly systems. To be specific, they are well-known systems in which the stone pieces are fixed with pieces of high-technology stainless steel that are very expensive, and they usually leave chambers of about 5 cm, from which the zone taken up by the insulation and soundproofing material has to be deducted, between 2 and 3 cm, and these systems include those manufactured by "STROW", which are anchorage systems based upon brickwork or concrete walls.

[0010] There are also systems that include fixing and exterior sheet, designed for ceramic pieces or vertical roof tiles, or also for panels of any type, which are weatherproof.

[0011] The system involving attachment to manufactured materials or concrete walls generally involves the use of strips, normally two sequences, and the insulation material is inserted between them. The thickness of the chambers is similar to the aforementioned case. In the case of the panels, some systems have an open joint, such as Naturvex, while others have a closed one, such as Knauf.

[0012] Thus, the common problem that is inherent to the ventilated front wall systems for residential buildings and similar ones that are currently used, revolves around their high price and the limited number of benefits provided.

DESCRIPTION OF THE INVENTION

[0013] The floating front wall that is proposed in the invention overcomes the above-mentioned problem in an entirely satisfactory way, so it is a solution that, as has already been pointed out, completely covers the exterior wall with soundproofing and thermal insulation, and does so quickly, economically, flexibly and efficiently. The exterior wall is light, it is assembled dry, allows different "coats" to be placed and can contain all the vertically running facilities that a residential building requires.

[0014] It is a multi-layered exterior wall that is based upon the concept of the ventilated front wall, with a chamber in the exterior through which the air can flow freely, which allows for better interior comfort conditions, at any time of the year, all of which is available at a price that makes the system affordable to the whole construction

area, including buildings of the "council house" type, where there is little room for extra economic costs.

[0015] With a view to this, the front wall that is specifically advocated is structured on a bearing sheet, which takes the form of series of grooved plates that are responsible for withstanding the stresses exerted by the weight of all the front wall elements and the wind overloads, and it is this bearing sheet that makes the exterior wall solid and serves to support the rest of its elements, these plates running from the floor to the roof, passing immediately in front of the floor slabs. This bearing sheet transmits all the stresses, not only those exerted by gravity but also those caused by wind, to the building structure.

[0016] The bearing sheets affects several storeys of the building and can affect the entire building, given that their height is only restricted by the transporting of the trays, because the profilers from which they are obtained theoretically give unlimited lengths.

[0017] The trays adapt to the edge of the different floor slabs with the aid of different duly attached fittings, so that any unevenness in the floor slab finish can be corrected, and the plates are ballistically driven into these fittings, this being a very quick and simple process, especially if one takes into account the fact that those fittings can simply take the form of an L-shaped section.

[0018] These grooved plates, serving as trays, are arranged vertically in such a way that the folds at their side edges serve not only as props but also as the joining point between plates to create the bearing sheet. Furthermore, these side branches serve as front spacers for the exterior sheet or "epidermis", which is to constitute the exposed face of the front wall.

[0019] This exterior sheet, which serves to protect against the weather and is equipped with whatever finish or decoration might be necessary, is positioned at the right distance from the bearing sheet to leave room for the ventilated chamber between them, and this chamber is sufficiently large to enable installations to run through.

[0020] The exterior sheet can either be directly attached to the vertical ribs of the trays that constitute the bearing sheet, or fitted with the aid of strips, depending on the type of material that is used for the exterior sheet, given that this can be obtained using ceramic pieces or stone pieces hanging from those strips, by means of cellulose-cement panels or wooden panels, duly treated with plastic material or sheets of glass, etc.

[0021] The front wall is also equipped with an inner sheet, which serves to provide the interior with the required surface finish. It is attached to the rear of the bearing sheet that creates a chamber for the interior fittings.

[0022] As a supplement to the structure described, the intermediate sheet is lined, both on the outside and the inside, with layers of material, which serve to both soundproof and insulate it, the exterior being equipped with a protective film, in such a way that this, as it also passes in front of the floor slabs, prevents the considerable strong insulation bridges that occur in this zone. The in-

sulation material can be incorporated into the tray at the beginning.

[0023] Suitable modulation for the trays that form part of the intermediate or bearing sheet, as well as in the exterior or interior sheets, make it easy to create holes or openings for doors or windows, the required finishes helping to form these elements, and the tops of the corners, roof frames and lower finish also form part of the front wall.

[0024] The continuity of the structure so described is interrupted by the openings in the front wall, these holes forming the windows and the doors, where there are frames that are formed by means of a section of plating that can be joined to the exterior wall structure, not only at the sides but also at the top and bottom, and these frames serve as pre-frames where the final carpentry or metalwork will be fitted.

[0025] The ventilated chamber is suitably designed to enable it to house all types of installations such as the plumbing, electricity, telecommunications, ventilation, gas fittings, etc., which can be accessed from the exterior without causing any inconvenience to the users.

[0026] As can be deduced from the aforementioned, the main advantage of the invention system, lies in the industrialised nature of all its components, in such a way that on a works level, i. e. "in situ", all that are necessary are the mounting activities, which allows for a greater control over the workers' performance, the machinery and the materials, etc.

[0027] It will be easy to dismantle the front walls, so they can be given "top quality" recycling treatment when they have come to the end of their useful working life.

[0028] The fact that it is much easier to give quality assurance for this invention when compared to conventional front walls means that it can be guaranteed that there will be a lower number of incidents, faults and pathologies, while at the same time the benefits can be guaranteed where airtightness, soundproofing and insulation are concerned.

[0029] The appearance of the front wall can be easily changed, without it being necessary to dismantle it, except in the case of the exterior sheet, and it is easy and quick to repair and replace, with the consequent cutting of costs. The ease with which changes, improvements and replacements can be made also applies to the installations.

DESCRIPTION OF THE DRAWINGS

[0030] In order to complement the description that is being made and with the aim of allowing a better understanding of the characteristics of the invention, according to an example of the preferred embodiment of same, we include a set of drawings of an illustrative and non-restrictive nature, representing the following:

Figure 1.- This shows a partial diagram in perspective of a floating front wall erected in accordance with

the object of this invention, in which the constituent elements are shown sectioned or duly cut off so that the interior of the structure can be clearly seen.

Figure 2.- This shows a representation similar to Figure 1, where a different type of material is used for the exterior sheet or exposed face of the front wall.

Figure 3.- This shows a diagram in profile and section of the front wall, duly connected to two floor slabs, which also portrays in diagram form and with arrows, its effectiveness where insulation is concerned, and it also shows the upper finish given to the front wall at roof level.

Figure 4.- This shows a close-up of the section similar to Figure 3, but for an area of the front wall in which a communications opening is placed linking with the exterior.

Figure 5.- This shows a close up of a cross section at the height of the opening in question.

REALISATION OF A PREFERRED EMBODIMENT OF THE INVENTION

[0031] It can be observed from the figures, how the floating front wall that is the object of the invention is structured from an intermediate sheet that contains a series of grooved plates (1), in the form of profiled steel trays, made of either galvanised or pre-enamelled plates, arranged vertically from the floor to the roof, whose side branches (2) are L-shaped in profile, with the end branch (3) facing either inwards or outwards, depending on the type of commercial tray that is chosen, so it can be attached to the adjoining plates or trays, these side and double branches of the plates forming the supports for the rest of the elements that constitute the front wall.

[0032] The trays (1), with a duly modulated middle branch, 60 cm wide for example, is fixed through the middle branch to the edge of the floor slabs (4), as can be seen in Figure 3, and the resources that are used to attach the trays (1) to the floor slabs (4), for example bolts or screws (5), can also be simultaneously used to secure to the front of those trays (1) insulating and soundproofing plates (6), preferably made of glass wool or rock wool, equipped with a protective film.

[0033] The elbowed edge (3) of the side branches (2) of the trays (1), which protrudes outwards considerably with respect to the insulation and soundproofing layer (6), is used to attach the exterior sheet (7), and there is also a suitable distance between them to create the ventilated chamber (8), which runs throughout the entire height of the front wall.

[0034] The exterior sheet (7) can be obtained using small modules (9), arranged in a coplanar way, fixed or suspended from strips (10) duly locked to the uprights formed by the side branches of the trays (1), as can be

seen in Figure 1, or those strips (10) may not be provided, as shown in Figure 2, when the exterior sheet (7) takes the form of larger panels (11), such as panels made of steel plating, cellulose-cement, wood-cement, treated wood, cellular polycarbonate, polymethacrylate or other plastics materials, sheet glass or even natural stones.

[0035] The front wall is supplemented by a non-continuous inner sheet (12), that is to say it runs between floor slab and floor slab (4), as can also be seen in Figure 3, this inner sheet (12) forming a self-supporting back consisting of panels of plaster sheeting on galvanised steel structures, such as "pladur®" type plates, although it can also be attached to the trays, improving the insulation conditions in the first case, but above all, improving the soundproofing.

[0036] Another layer (13) of insulation and soundproofing materials can be inserted between this inner sheet and the bearing sheet or intermediate sheet, with a view to preventing the insulation bridges caused by the trays (1), through their side branches.

[0037] Metallic and angular sections (14) are secured to the floor slabs (4), in order to attach the latter to the trays (1), and those metallic and angular sections (14) can either be screwed into the concrete mass or fixed during the final stage when the compression layer is laid in place, but in any case it is necessary to position those sections (14) perfectly, so that their vertical branches are coplanar, in spite of any unevenness between the superimposed floor slabs and any differences in their respective sizes, thereby ensuring that the trays (1) are perfectly adjusted to those sections (14), and they must finally be driven in ballistically, that is to say, with piercing nails that are applied with a gun (for example HILTI-ENP2).

[0038] The diagram in Figure 3 uses arrows (R) to show the effects of the front wall on solar radiation, dissipated solar radiation and reflected solar radiation being generated, as well as a flow that is released by the ventilation in the chamber (8), only a minimum flow being transmitted to the interior, whereas the heat inside the zone in winter, which is shown in diagram form with a radiator (15), will be prevented from reaching the exterior thanks to the double barrier without insulation bridges that is formed by the exterior insulation and soundproofing layer (6) and the interior (13) insulation and soundproofing layer.

[0039] It must also be pointed out that it is possible to make the ventilation chamber (8) large, by merely designing the side branches (2) of the trays (1) properly, and that this chamber (8) can also be used to house the communal installations and fittings (16) for the homes, such as water, gas, electricity pipes, etc.

[0040] The modular nature of the front wall makes it possible, by suitably blocking off the trays (1) and by removing the modules (9) concerned from the exterior sheet (7), as well as also removing the portions of insulation and soundproofing layers (6) and (13) and from the inner sheet (12), to create openings in the front wall, which can serve as windows and/or balconies, these

openings being finished with outer steel frames, which contain jambs, sills, flashing and drip rails, on which the closing and locking will be placed.

[0041] With a view to being more specific, Figures 4 and 5 show an opening for a balcony, involving a plated frame (17) the same size as the opening, in order to ensure, on the one hand, that it serves as a pre-frame for mounting the aluminium work (18) that makes up the exterior wall itself, which is screwed onto the frame (17), and this frame is finally finished with a plate on the zone that juts out with respect to the carpentry (18), using the same material that has been used to line the general surface of the front wall. It can particularly be observed in Figure 4, how the frame (17) goes quite a distance into the interior, as far as the interior lining for the front wall, where it is provided with a suitable incut for fitting a drawer or splayed (19) for a shutter, if there happens to be one.

[0042] Going back to Figure 3, it can be seen how the ventilated chamber (8) makes it possible to lay service piping (16) of considerable width, such as the (20) ventilation pipe that, once they have run past the roof (21) undergo a double orthogonal inflection in such a way that their outlet (22) is facing downwards, thereby ensuring that water cannot flow in.

[0043] In cases such as the one shown in Figure 3, where the roofing does not take the form of a real roof because the front wall itself protrudes above the roofing forming an outer frame for the building, it is planned that the top of the front wall is capped with a coping or saddle element (23), also made of plating, in the form of an inverted "U", which is screwed to the grooved plates (1) or secured using any other conventional method that is considered suitable, and that is especially designed to be conducive to creating air movement inside the ventilated chamber.

[0044] The extraction pipes from the kitchens and similar pipes may be arranged in the same way as the ventilation pipes (20), so that the former do not have to cross the roof, which is what generally happens, so that there is not risk of filtering at slope interchanges that are difficult to deal with.

Claims

1. st. - Floating front wall for multi-storey buildings, of the type that is equipped with a ventilated chamber, specifically devised for residential buildings, at any level, **characterised by** the fact that it is structured with one bearing sheet and an intermediate one (1), serving as a supporting element for the rest of the front wall structure and an element that can withstand the stresses exerted by the weight of those elements and the overloads caused by the wind, this bearing sheet (1) being completed with an exterior sheet (7), which serves as a barrier against the weather, which is the exposed face of the front wall and that is fixed to the bearing sheet (1) in such a

way that the two form a ventilated chamber (8), and finally an inner sheet (12), which provides the inner compartment with the required surface finish and which serves as a rear support for the bearing sheet (1).

2. nd. - Floating front wall for multi-storey buildings, as in the 1st Claim, **characterised by** the fact that the bearing sheet (1) takes the form of profiled, galvanised or pre-enamelled steel plates, which serve basically as trays that are U-shaped in section, connected to each other, vertically, through their side branches (2), these trays (1) being attached to the front edge of the different floor slabs (4) in the building, their side branches acting as spacers for the exterior sheet (7), to which the aforementioned sheet (7) is either directly or indirectly fixed, it having been envisaged that angular sections (14) be placed on the front edge of the floor slabs, these being duly secured to the floor slab in such a way that the vertical branches are coplanar, so that they can be fixed screwed to the trays either ballistically or by another quick means of driving the securing devices in.

3. rd. - Floating front wall for multi-storey buildings, as in the preceding claims, **characterised by** the fact that the trays (1) have orthogonal elbows (3) on the free edge of their side branches (2), through which they either directly receive plates (11) forming part of the exterior sheet or exposed face of the front wall, or transversal strips (10) to which small modules (9) belonging to the exterior sheet are screwed, suspended with a grooving and tonguing attachment, or by any other means.

4. th. - Floating front wall for multi-storey buildings, as in the preceding claims, **characterised by** the fact that insulating and soundproof panels (6) are placed in the middle of the trays (1) that form the bearing sheet, preferably made of glass wool with a protective film that take up the entire bottom of the trays and whose front face is at a considerable distance from the exterior sheet (7), to keep the chamber (8) ventilated, panels (6), that can be fixed to the trays (1) at the plant.

5. th. - Floating front wall for multi-storey buildings, as in the preceding claims, **characterised by** the fact that the inner sheet (12) is not continuous and runs between adjacent floor slabs (4), taking the form of a self-supporting rear backing consisting of panels of plaster sheeting on a galvanised steel structure, and another layer (13) of soundproof and insulating material is inserted between this and the bearing sheet (1).

6. th. - Floating front wall for multi-storey buildings, as in the preceding claims, **characterised by** the fact

that the width of the ventilated chamber (8) is such that it is possible to fit in them installations for the building such as pipes for supplying gas, water, electricity, etc., as well as ducts for ventilation or for extracting air, smoke, etc., that pass through interior of the front wall at roof level, without having to cross the roof. 5

7. th.- Floating front wall for multi-storey buildings, as in the preceding claims, **characterised by** the fact that the top is capped with a plated coping or saddle element (23), in the form of an inverted " U", which juts out sideways from the rear and outer planes of the front wall and is screwed to the bearing trays (1) or attached by any other suitable means, designed to assist the movement of air inside the ventilated chamber. 10 15

8. th. - Floating front wall for multi-storey buildings, as in the preceding claims, **characterised by** the fact that a plated frame (17) is placed in the zones where it is planned to have doors and/or windows, which serves as a pre-frame whose exterior adapts to the sides and the upper and lower zones of the front wall, onto which the exterior wall metalwork for that opening is screwed, the frame containing the jambs, sill, flashing and drip rail . 20 25

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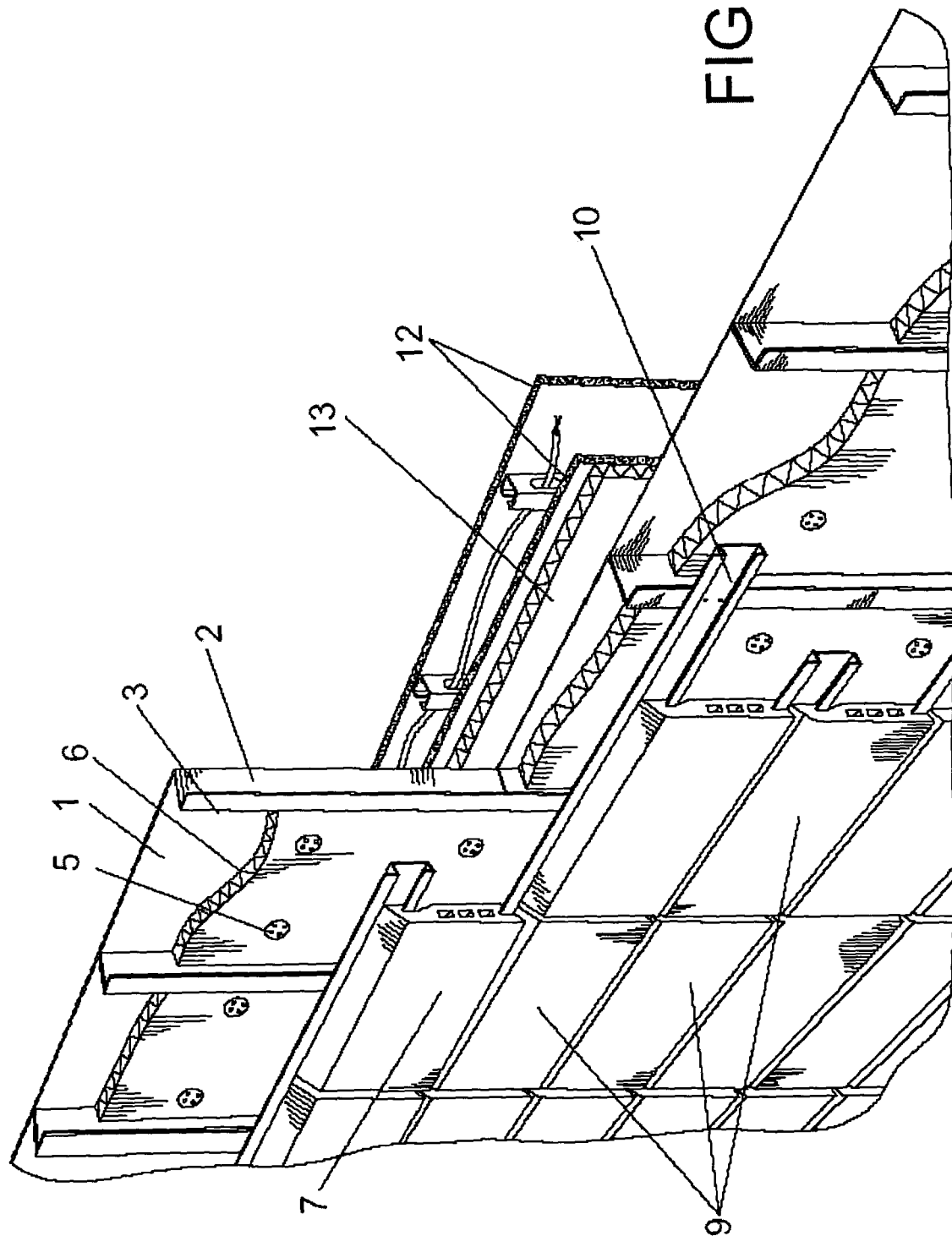


FIG. 1

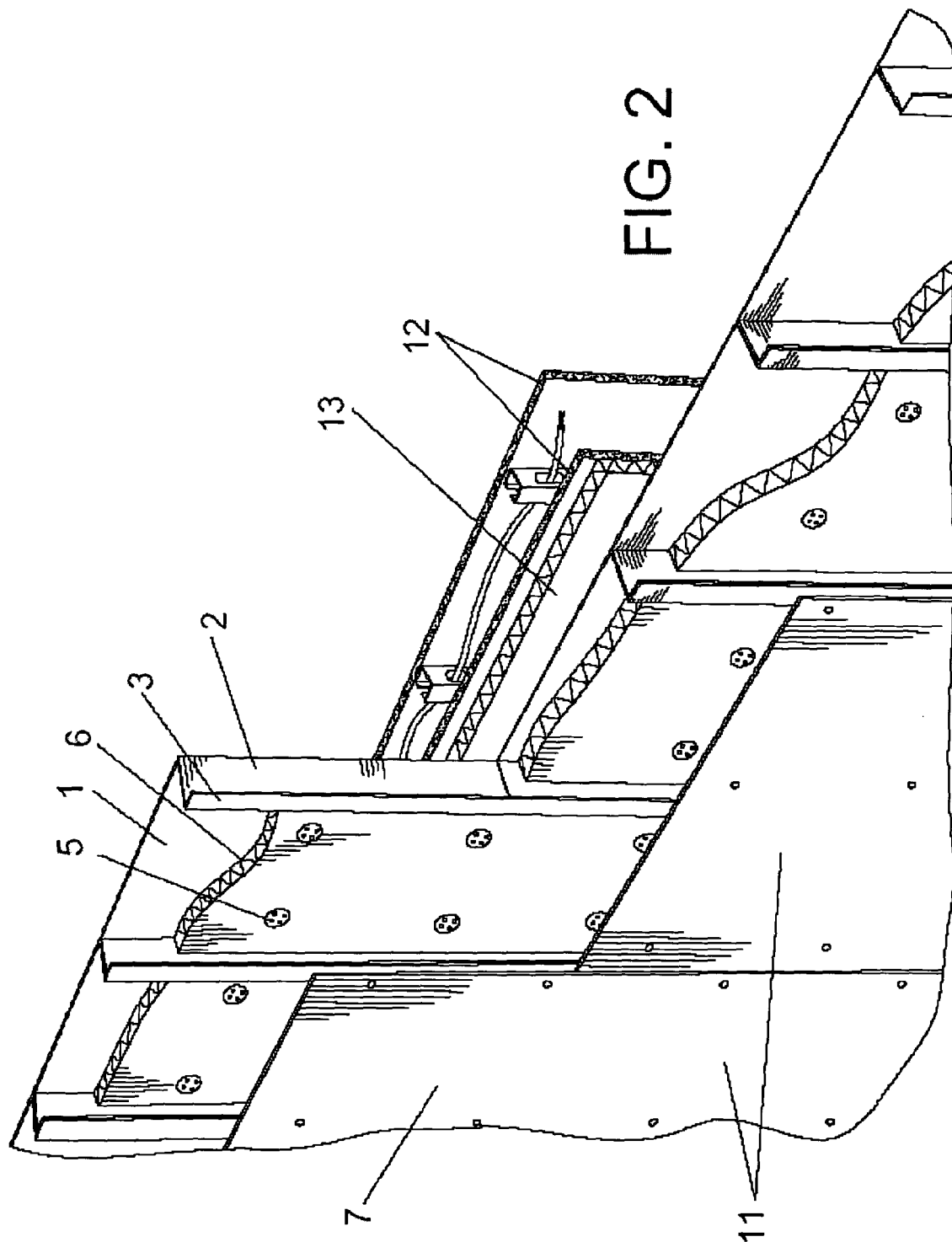
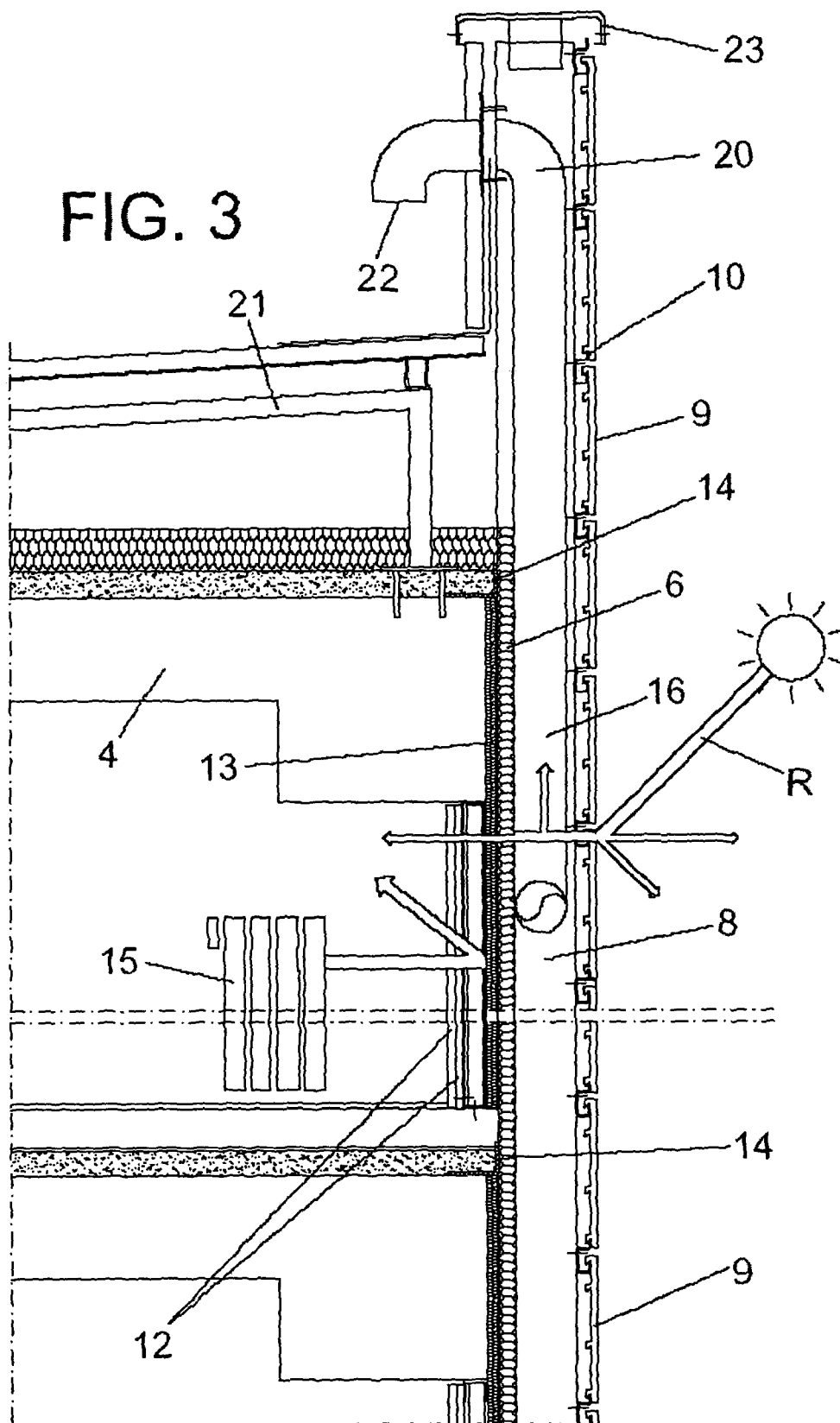


FIG. 3



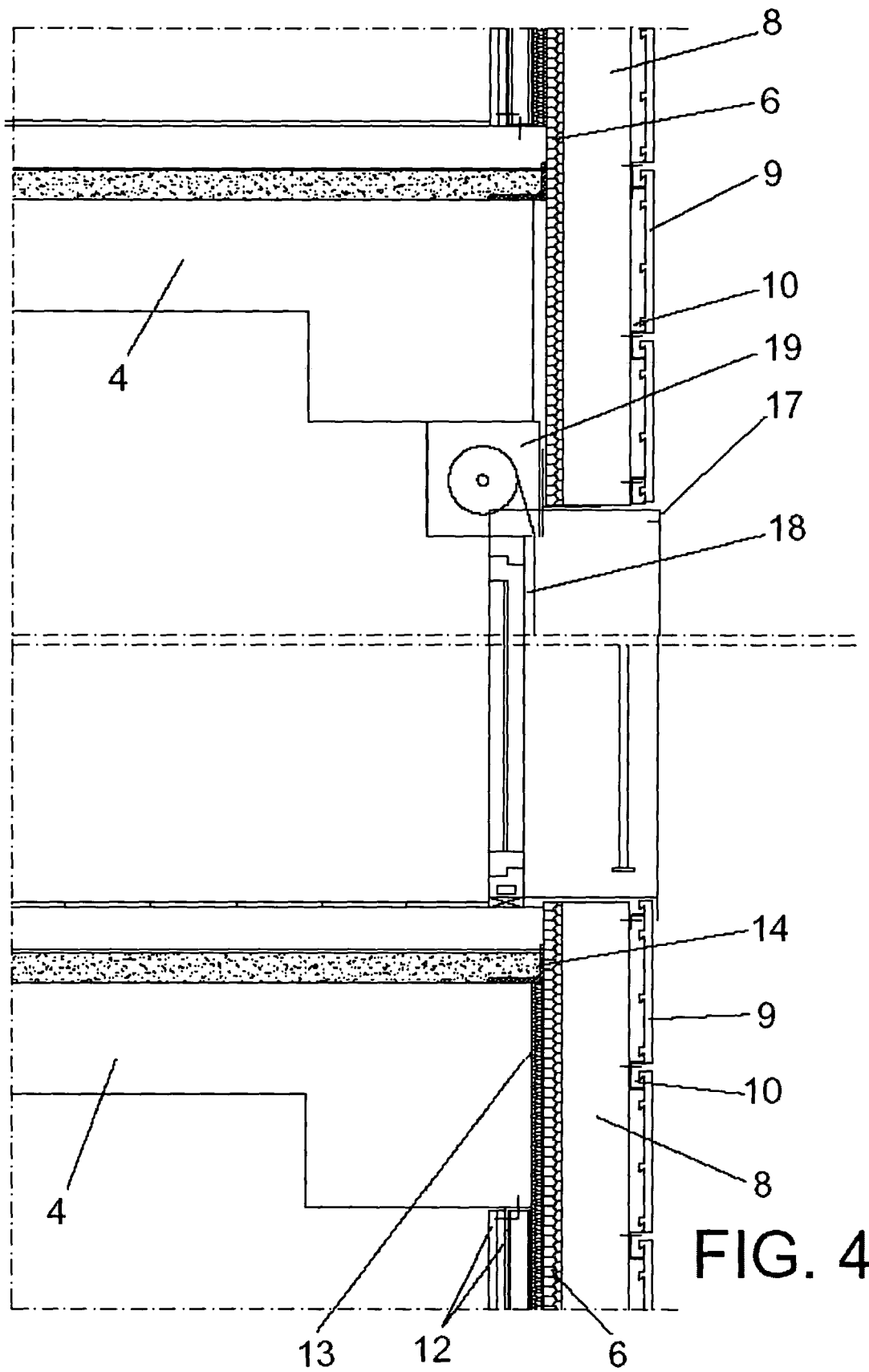


FIG. 4

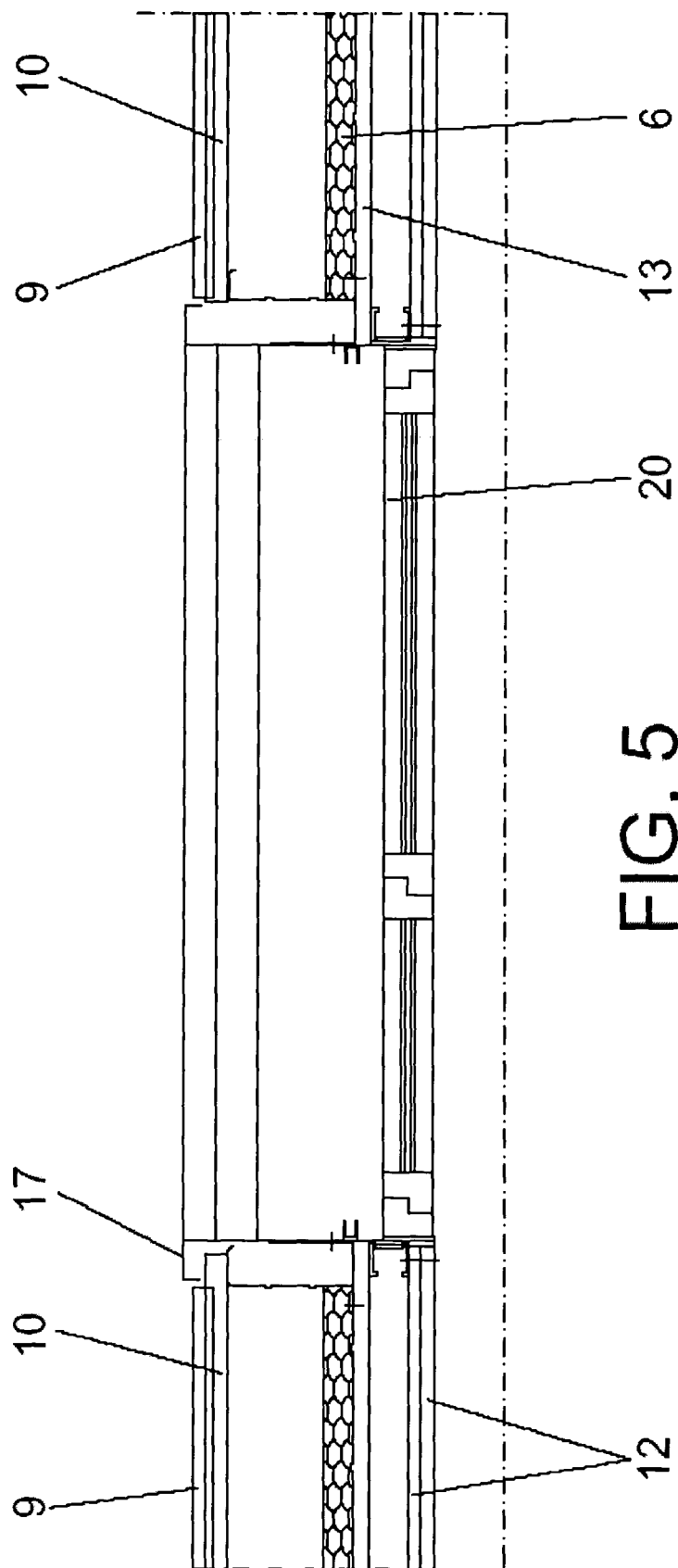


FIG. 5



DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
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X	----- BRAICOVICH E: "THE CURTAIN WALL TURNS ITSELF INTO THREE" NUOVA FINESTRA, TECNOMEDIA, MILANO, IT, vol. 21, no. 2, 2000, pages 116-120, XP000970398 ISSN: 0394-3216	1,2,4-8	
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Y	----- EP 0 070 532 A (G + H MONTAGE GMBH) 26 January 1983 (1983-01-26) * figures 1,3 *	3	
A	----- FR 2 628 775 A (GTM BATIMENT TRAVAUX PUBLICS) 22 September 1989 (1989-09-22) * figures 7,8 *	7,8	
			TECHNICAL FIELDS SEARCHED (Int.Cl.7)
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The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 23 August 2005	Examiner Rosborough, J
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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EPO FORM 1503 03.82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 05 38 0068

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
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23-08-2005

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