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(71) Applicant: **POLI-TOP S.r.l.**
Via Dante Alighieri 3,
Meduna di Livenza (TV) (IT)

(72) Inventor: **Cester, Renzo**
via Riviera Scarpa 49
I-Motta di Livenza (TV) (IT)
Inventor: **Panontin, Duilio**
via Capitello 33
I-Pozzo di Pasiano di Pordenone (PN) (IT)
Inventor: **Panontin, Mario**
via Bosco Albaredo 8
I-Meduna di Livenza (TV) (IT)

(74) Representative: **Dalla Rosa, Adriano**
Via S. Vito 13/B
I-33170 Pordenone (IT)

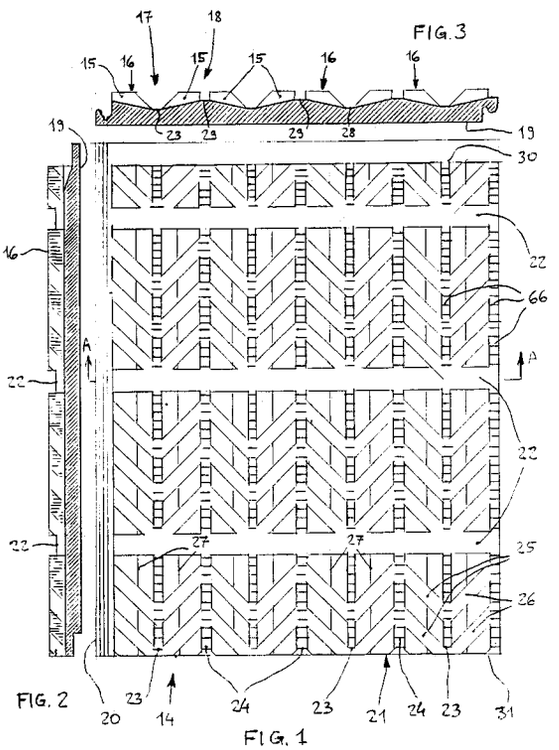
(54) Insulating panel for inhabited buildings.

(57) Insulating panel to be applied either onto roofs or against inner or outer walls of inhabited buildings.

Panel comprising a part (14) made of foamed plastic material, shaped on its surface with relief parts (15) and depressed parts (17, 18) for laying and supporting a plurality of roof covering elements of different forms, said part (14) being coated on its surface with one or more layers of waterproofing material like the bitumen emulsion and thereafter with eventual fine-grained solid material to roughen such surface.

Panel comprising also a plurality of relief parts (67) on its upper surface, in which drilled inner inserts (68) are provided, which are made of material with hardness and mechanical strenght higher than those of the panel material. Thus, the roof covering elements may be fixed to such inner inserts (68) without damaging the panel material.

Support panel acting as insulation, as water-proofing material and provided with a simple, light and cheap structure.



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The invention relates to an insulating panel for inhabited buildings, particularly applicable on the roof thereof and realized in such a manner as to perform the function of insulating and waterproofing material as well as of support structure. At the present time, the roof covering for inhabited buildings is carried out by utilizing particular support structures, made of masonry or wood etc.., which are generally arranged inclined at directions opposite and joined to each other on the ridge of the roof, onto which a plurality of insulating panels placed side by side and reciprocally joined is disposed, with the interposition of one or more layers of suitable per se known waterproofing material, panels onto which the roof tiles, the bent tiles or other similar per se known covering elements are then laid, in a manner that an air circulation for the ventilation and thermal stabilization of the whole assembly be established in the hollow space provided between said covering elements and said panels. This kind of coverages for inhabited buildings has evident limitations and inconveniences in use, resulting from both the presence of insulating panels generally constituted by polystyrene foam or other similar porous plastic materials, which in the course of time are subject to eventual reciprocal disconnections and water seepages, caused by the atmospheric precipitations, winds and other natural agents, with consequent progressive decay of the roof insulation and waterproofing, and the constructive complexity of the same coverages, which require to perform several operating steps involving many working weeks, thus resulting to be complicated and economically burdensome. The object of the present invention is to overcome the above mentioned inconveniences and limitations of the present roof coverages, by utilizing an insulating panel according to the invention, which is obtained with such constructive characteristics as to simplify and reduce the component parts of said coverages, being also applicable for different functions in the inhabited buildings.

Moreover, this insulation panel is adapted to insure in as simple and rapid manner the safe support and fixing of the covering elements to be fitted onto any kind of roofs, and in particular of highly inclined roofs, by preventing any possibility of fallings, detachings and undesired damagings thereof.

This insulating panel is obtained with the features substantially described with particular reference to the attached claims of the present patent.

The invention will appear more comprehensible by the following description, given solely by way of a not-limiting example and with reference to the accompanying drawings, wherein :

- Fig. 1 shows a plan view of the insulating panel according to the invention, in a first embodiment thereof ;
- Figs. 2 and 3 show respectively a longitudinal and a side view of the panel of Fig. 1, this latter being cutaway along the line A-A ;
- Figs. 4, 5 and 6 show respectively a plan view, a longitudinal view and a side view cutaway along the line B-B of the present panel, which is used for supporting a first kind of covering elements ;
- Figs. 7, 8 and 9 show respectively a plan view, a longitudinal view and a side view cutaway along the line C-C of the present panel, which is used for supporting a second kind of covering elements ;
- Figs. 10, 11 and 12 show respectively a plan view, a longitudinal view and a side view cutaway along the line D-D of the present panel, which is used for supporting a third kind of covering elements ;
- Fig. 13 shows a panel according to the invention set up in two different applicative positions in an inhabited building;
- Fig. 14 shows a plan view of the insulating panel according to the invention, in a second embodiment thereof ;
- Figs. 15 and 16 show respectively a longitudinal and a side view of the panel of Fig. 14, this latter being cutaway along the line F-F;
- Fig. 17 shows an enlarged item of the Fig. 16 ;
- Figs. 18 and 19 show respectively a plan view and a cutaway side view of the panel according to the invention, in a third embodiment thereof ;
- Figs. 20 and 21 show respectively a plan view and a side view of an additional component part of the insulating panel according to the invention, which can be fitted to the same panel ;
- Figs. 22, 23 and 24 show a front view of the additional component part of both the Figs. 20 and 21, in three different embodiments thereof ;
- Fig. 25 shows an insulating panel according to the invention, which is installed in an inhabited building, together with its additional component part of the preceding Figures 20 - 24.

By referring now to the Figs. 1, 2 and 3, it is noted that the present insulating panel is substantially constituted by a flat part 14 of almost parallelepiped form, in the present case of rectangular form, but which may be obtained of course also with other geometric forms, said panel being made either of insulating material and preferably of polystyrene foam or other suitable plastic material with foamed cellular structure, having limited specific weight and being cheap, or also of eventual further

per se known plastic materials in case filled with eventual per se known fillers which lend themselves for the function of insulating materials and which permit a profitable compromise among the weight, operative steps and costs thereof.

In the present case of the panel made of polystyrene foam or foamed plastic material of another kind (for instance polyurethane), the panel is obtained advantageously by injection molding with a single molding operation and has an upper main surface constituted by a plurality of relief parts 15, obtained as it will be described hereinafter and making a discontinuous flat surface 16 at the upper portion thereof, and by a plurality of recessed parts 17, 18 shaped as it will be described and provided for supporting difference types of covering elements, in the case in which the present insulating panel be fitted on the roof of inhabited buildings, in the manner described hereinafter.

Moreover, this insulating panel has a lower flat main surface 19, matchable onto the support structures of inhabited buildings, as well as longitudinal surfaces 20 and transversal surfaces 21 which are flat too and lend themselves for being approached with correspondent surfaces of identical insulating panels, for the arrangement thereof on the roof. The upper surface of the present panel is provided with a plurality of transversal rectilinear cavities 22 of a determinate identical width, extended for the entire panel width and arranged parallel and reciprocally equally spaced, as well as a plurality of longitudinal rectilinear cavities 23, of a same width which however is smaller than that of the previous cavities, said longitudinal cavities being intersecting orthogonally the previous cavities and being extended for the entire lenght of the panel referred to, parallelly and reciprocally equally spaced.

Furthermore, such panel upper surface is provided with a plurality of longitudinal rectilinear cavities 24 of a same width, which however is smaller than that of the preceding cavities, said longitudinal cavities being provided at a position intermediate to that of the preceding longitudinal cavities and being extended parallelly to these latter for the entire panel lenght, therefore by intersecting orthogonally the previous described transversal cavities 22 too. Finally, the above mentioned panel upper surface is provided with a plurality of inclined cavities 25 and 26 symmetrical to each other, of the same determinate width and with opposite inclination directions, which are provided on the zones of the panel upper surface determined between two longitudinal cavities 23 and two transversal cavities 22, said inclined cavities being delimited at the respective ends thereof by the correspondent longitudinal cavities 23 and the associated intermediate longitudinal cavities 24.

It is to point out that the relief parts 15 determined by the cavities 22, 23, 24, 25 and 26 are flared symmetrically along each one of the longitudinal cavities 23, therefore determining a plurality of discontinuous longitudinal rectilinear edges 27, which are parallel from each other.

Besides, it is to point out that the recessed parts 17, 18 are respectively provided, as evident from the Figs. 3, 6, 9 and 12, in correspondence of the longitudinal cavities 23 and the intermediate longitudinal cavities 24, and that the side outline of all the cited cavities is undulated being provided with a series of depressions at the bottom zones 28 of the longitudinal cavities 23, which are joined by convex bent surfaces with a series of tops provided at the bottom zones 29 of the intermediate cavities 24.

The purpose of the above specified panel support structure, constituted by the relief parts 15 and the cavities 22, 23, 24, 25, 26, is to permit the arrangement ad support onto the same panel of a plurality of roof tiles, bent tiles and covering elements for roofs of a type which can be commomly found in commerce, by arranging them depending on the type thereof used from time to time onto said panel at positions different and suitable to insure an effective support thereof, by avoiding undesired detachings and fallings therefrom. In order to permit such an arrangement and support onto a plurality of similar panels fitted on the roof at positions adjacent to each other, each panel is so shaped as the zones of its upper surface defined by the trasversal cavities 22 which are contiguous to the side edges 30 and 31 of the same panel, be provided partially on said panel and partially on the directly contiguous panel, so that the covering elements fitted at these positions are laid on and supported by both the panels referred to.

Obviously, the insulating panel according to the invention may be provided with relief parts and cavities which are shaped and arranged differently than those described, in order to permit to lay and support covering elements thereon which are of kinds and forms different than those which will be described solely by way of example, thus without departing from the protection field of the present invention.

Moreover, each so obtained panel is subjected to a special waterproofing treatment on its upper surface, consisting of applying one or more layers of at least a bitumen emulsion uniformly onto all such an outer surface, so as to make this latter waterproof thus preventing any water contact and seepage through the porous cellular structure of the material of the same panel. Such a bitumen emulsion is applied preferably by means of spraying treatment by suitable spraying equipments

thereon, or it may be applied also by dipping treatment thereof or by means of further eventual per se known treatment systems.

The bitumen emulsion is of the type commonly used for performing road pavings and for instance it may be of the type manufactured and put in commerce by the Firm S.I.B.A., Società Italiana Bitumi Affini, via G. Bovio 28, Novara, Italy, constituted by a so-called cationic bitumen emulsion (for example Mod. RR60 or MR 60) composed of pure bitumen, plasticizers and petroliferous solvents, emulsifiers and stabilizers as well as water, with different and variable weight parts of each emulsion component, whose weight contents may be deduced by the technical characteristics of such products, given directly by this or eventual other manufacturer firms. Moreover, the considered waterproofing treatment foresees advantageously also the use of sandy material like for instance fine sand of the river Po, grits of different kind without earthy material or suitable other fine-grained solid materials, which is applied by means of aspersion or spraying systems or suitable other systems of conventional type onto the bitumen emulsion, previously applied on the upper surface of the present insulating panel, in order to amalgamate almost evenly with such bitumen emulsion, so as to determine a rough and aesthetically pleasant outer surface of the panel, and therefore preventing undersired glueings and adhesions of such bitumen emulsion on the contact thereof with the surfaces of the load bearing structure of the roof and the building walls to which said panel may be also fitted.

In this way, thanks to the use of the bitumen emulsion which is a substance which is kept and applied at ambient temperature, it is possible to obtain an effective and close amalgamation thereof on the surface of the material with foamed cellular structure of the panel, without damage for such surface, by performing few and simple processing steps, which therefore permit to obtain constructively simple panels, with materials of almost universal use with low specific weight and cheaply.

On the contrary, these results would not have been attainable when instead of the bitumen emulsion for obtaining the panel waterproofing, it was employed liquid bitumen which, by requiring high melting temperatures which are higher than those for melting the panel material, would have involved the destruction or the damage of the same panel, with consequent incompatibility of use of the liquid bitumen for this particular use. Likewise, it would not have been possible all the same to utilize bitumen paints which are solid at ambient temperature, to be applied on the surface of the present insulating panel, since in this case it were needed particular solvents for making liquid said bitumen paints, in order to allow the impregnation of the panel, which solvents would have attacked and destroyed chemically the panel material, so that also in this case they must be considered incompatible for this specific use.

By examining now the Figs. 4-6, 7-9 and 10-12, there are shown three different types of covering elements for the roofs of inhabited buildings, which are laid on and supported at different and variable positions by the insulating panel according to the invention.

In the Figs. 4-6, in particular, it is noted that the covering element is constituted by a common roof tile of "Marseillaise" type, having an extended rectilinear body 32 (Fig. 5) and a side section shaped with two flat parts 33 and 34 provided with respective upper concavities 35 and 36 and joined to each other by a lower concavity 37 (Fig. 6).

As evident by referring to the Fig. 4 too, each roof tile of this type is laid with the two flat parts 33 and 34 on the relief parts 15 of the insulating panel and with a side edge 38 thereof in a transversal rectilinear cavity 22 of the present panel, while with its opposite side edge 39 it is disposed on a correspondent side edge 40 of a contiguous roof tile already fitted on this position, and the associated longitudinal edges 41 and 42 of said flat parts 33 and 34 are the one laid on and the other one covered by correspondent longitudinal edges 43 and 44 of two roof tiles adjacent to that referred to.

The reciprocal arrangement of this type of roof tiles is evident with a dashed line from the Fig. 4.

Moreover, in the Figs. 7-9 it is noted that the covering element is constituted by a common tile of "Portuguese" type having an extended rectilinear body 45 (Fig. 8) and a side section shaped with a flat part 46 and a convey part 47 (Fig. 9). As evident by reference to the Fig. 7 too, in which the reciprocal arrangement of this type of roof tiles is shown with a dashed line, each tile is laid with its flat part 46 on the relief parts 15 of the insulating panel and with a side edge 48 thereof in a transversal rectilinear cavity 22 of the present panel, while with its opposite side edge 49 it is disposed over a correspondent side edge 48 of a contiguous tile which has been already fitted on this position, and the relevent longitudinal edges 50 and 51 of the flat part 46 and the convex part 47 are the one covered by and the other one laid on correspondent longitudinal edges 51 and 50 of two roof tiles adjacent to that referred to.

Finally, in the Figs. 10-12 it is noted that the covering element is constituted by a common bent tile having an extended rectilinear body and a side section shaped with two inclined flat parts 52 and 53 joined to each other by a bent part 54 (Fig. 12). As evident by referring to the Fig. 10 too, in which

the reciprocal arrangement of this type of bent tile is shown with a dashed line, each bent tile is laid on at an overturned condition thereof with its bent part 54 in a longitudinal cavity 23 of the panel, so that the inclined flat parts 52 and 53 thereof be turned upward, and with its side edge 55 it is laid in a transversal cavity 22 of the same panel, while with its opposite side edge 56 it is placed upon a correspondent side edge 55 of a contiguous bent tile. Then, a further bent tile of this type is disposed over two contiguous overturned bent tiles so fitted on position.

By referring now to the Fig. 13, it is noted that a so obtained insulating panel is fitted at two different assembling positions on an inhabited building.

At the classic application position on the roof, the panels are disposed directly onto conventional support structures 57 for the building roofs, at positions contiguous from each other and the slits which are in case provided between a panel and the next one are subsequently sealed by adequate per se known sealing materials, thereafter the roof covering elements are arranged on the so assembled panels.

Thanks to the shaped outer outline of each panel, a hollow space 58 acting as a duct for the ventilation air circulation, indicated by the arrows E, is provided between said covering elements and the outer surface of all the panels. In this way, the panel according to the invention has the advantage that it is able to support the covering elements and to insure both an effective waterproofing and an insulation and a ventilation of the floors of the inhabited buildings, thereby avoiding to utilize particular wateproofing materials for the same purpose, as effected hitherto. Likewise, such panel may be in case utilized also as insulation for building inner and outer walls, by arranging a plurality of such panels reciprocally assembled against the walls (for instance that indicated at 59), in a manner that the relevant upper surfaces of such panels be disposed against such walls, thus providing a hollow space 60 for permitting a ventilation of the same walls, by means of air circulation through at least an upper opening 61 and a lower opening 62 provided on one o more of the reciprocally assembled panels. Besides, in order to make easier the installation of such panels, the structure constituted by the reciprocally assembled panels is provided with at least a plastic net 63, which is applied against the lower surface of the same panels so as to cover it thoroughly and such plastic net in turn is covered by cement stucco, thereby providing a paneling acting as insulation and which may be prefabricated with different and variable dimensions, depending on the form and dimensions of the walls to which such paneling must be assembled. This so obtained paneling assembling, then, is carried out by utilizing conventional materials foreseen for the masonry and, at the end of fitting thereof when the paneling is firmly filed against the associated building wall, the visible surface of the same paneling may be plastered so as to conform it to the appearance of the room, wall etc... Each so obtained paneling, finally, may be advantageously provided with suitable regulation systems for the port of both the upper opening 61 and lower opening 62, constituted for instance by movable locks 64 and 65 respectively associated with said openings 61 and 62 and provided in correspondence of the panel upper surface turned toward the building wall, said locks being operable by means of mechanisms having levers and tension rods or the like (not shown) housed in the cavities of such panels and accessible from the paneling front side, for instance at the lower zone thereof, so as such locks may be shifted from an opened position of the port of such openings, preferably during the summery and anyhow sunny season, thereby to provide a ventilation of the whole assembly, to a fully closed position of the post of such openings, preferably during the wintry and anyhow cold season, therefore by avoiding such ventilation and thus maintaining some air inside the hollow space 60 which improves the insulating effect of the whole assembly. In this case, the insulating panels for this kind of use may be made waterproof as described or also not waterproof. Finally, these insulating panels in the case in which are fitted on roofs, may be adequately shaped for preventing undesired slidings and detachings of the roof tiles or bent tiles disposed thereon, particularly in presence of highly inclined roofs.

By referring to the Figs. 1, 4, 7 and 10 again, it is noted that in this case all the longitudinal cavities 23, 24 of the upper surface of the panel according to the invention are provided with a plurality of scorings 66 extended horizontally for the whole width of each cavity, at positions parallel and equally spaced from each other, so as to determine a plurality of cavities in which correspondent projecting parts provided on the roof tiles or bent tiles may be inserted, with consequent locking at position thereof and impossibility of their undesired slidings or detachings therefrom.

With reference now to the Figs. 14-17, it is shown an insulating panel for inhabited buildings according to the invention and obtained in a second embodiment thereof, which is practically identical to the previously described first embodiment of the panel and is different therefrom exclusively for the inventive features which will be described hereinafter. In accordance therewith, the locking in position of the roof covering elements and particularly of the bent tiles, which are unprovided with

angular end edges engaging corresponding panel transversal cavities 22, which edges on the contrary are provided on the various types of tiles, is carried out by means of a plurality of relief parts 67 provided on the insulating panel upper surface, integrally therewith, preferably in correspondence of the intermediate cavities 24, namely in the positions wherein the overturned bent tiles are laid on and fixed to such an upper surface, said relief parts being provided with at least a respective inner insert 68 made of suitable material with hardness and mechanical strenght which are higher than those of the panel material. As evident in detail from the Fig. 17, each inner insert 68 is made preferably of high-density plastic having hardness and mechanical strenght which are higher than that of the panel plastic, i.e. polystyrene or other suitable high-density plastic, which is injection molded on the low-density plastic of the insulating panel during the molding thereof, so as such high-density plastic is firmly included into the plastic of such panel. Moreover, such inner insert 68 is provided with at least a cavity 69, which is internally threaded at not threaded and enters inside the respective insert for a determinate depth thereof, in order to permit the insertion of a correspondent threaded or not threaded element therein, as i. e. threaded screw, nail or the like, which is marked with the reference numeral 70 (Fig. 16) and is inserted in advance through a correspondent through hole of each bent tile or other covering element and afterwards through such cavity 69, so as to fix firmly in position such bent tile or covering element thereto, which is arranged overturned onto the panel with its rounded convex surface, and onto which the adjacent bent tiles, which aren't overturned, are then laid at the two sides thereof, thereby avoiding any danger of undesired detaching, falling or slipping of all the bent tiles or covering elements from the upper surface of the present insulating panel.

Of course, the insert 68 may be obtained also in a manner and with a material which are different from what described merely by way of example, thus without departing from the protection sphere of the present invention.

Therefore, in this way such insert may be made also of another kind of hard material like i.e. metallic material, wood, ceramic or plastic filler materials with suitable hardness and mechanical strength, which may be included in the panel material both during the molding of this latter and separately too. Thanks to the presence of such relief parts 67 with the inserts 68 made of hard and mechanically strong material, which may be joined together in a simple and rapid way with few working steps, thus it is possible to fix in position on the panel upper surface the bent tiles or other roof covering elements, by means of screws, nails or similar fixing elements, which interact with the hard and strong material of such inserts, without bringing such fixing elements into direct contact with the scaly material with reduced strength of the same panel, thereby preventing with absolute certainty to cause undesired damagings and/or strains of the constructive structure of such panels, and also by insuring reliable and not removable fixings of all the covering elements to the respective panels, in presence of any kind of roofs and particularly in presence also of highly inclined roofs, with consequent exclusion of any possibility of fallings, detachings and damagings of the same covering elements.

By examining now the Figs. 18 and 19, a third possible embodiment of the panel according to the invention is shown, wherein it is noted that in this case the panel is constructed in a slightly different manner than that previously described, in fact it is planned for laying and fixing exclusively bent tiles onto its upper surface and not more tiles of various kind, as previously.

For this purpose, the panel is unprovided with all the previously described cavities and is realized with outer flat surfaces, on the upper surface of which a series of identical projecting elements 71 is provided, having the same thickness and which are spaced from each other of an identical space 72 in the direction of the panel width, such projecting elements 71 being shaped as steps 73 with undulated outlines correspondent to the bent tile shape, so as to permit the same bent tiles, which are superimposed to each other, to be laid on the upper edges of such outlines (as evident from the Fig. 19), thereby providing channels with the spaces 72 comprised between the projecting elements 71, for the air circulation in order to obtain the ventilation between each bent tile laid on and fixed to the panel and the upper surface of this latter.

By examining now the Figs. 20 and 21, an additional component part 74 of the present insulating panel is shown, which is applied onto the roofs of the inhabited buildings combined with the panels referred to, to permit the tiles, bent tiles and other roof covering elements of different shapes and sizes to be supported thereon at the terminal and sloping zone of the same roofs.

As particularly evident from such Figures, the additional component part 74 is substantially constituted by a part of insulating material and preferably of foam polystyrene or other suitable plastic with foamed cellular structure, having high density, hardness and specific weight, preferably of the same component material of the inner inserts 68 of each insulating panel according to the invention, such part being provided with two rectilinear flat legs 75 and 76, almost orthogonal to each other,

which are extended for the entire width of each respective insulating panel applied an the roof and adequately profiled on their surface, in the manners and for the purposes hereinafter described by way of example, of which the leg 75 is assigned to be laid on and fixed with its outer flat surface to the roof, at the terminal and sloping zone thereof, and is adapted at its free end to fit the correspondent end of respective insulating panels, i.e. by means of a protection slot junction, so as a free space between the end edge of said panels and the opposite flat wall of the leg 76 is defined, thereby locking said panels in position and preventing any undesired slipping downward thereof. In particular, such leg 75 of the additional component part 74 is fixed to the roof by means of screws, nails or similar fixing devices, which are firstly inserted through correspondent orthogonal through holes 77 of said leg and thereafter inserted tightly in the same roof.

In turn, the remaining leg 76 of the additional component part 74 is projected beyond the outer surface of each panel so placed in position, in order to support the tiles, bent tiles and different employed roof covering elements, in the manner described later, by avoiding with absolute certainty any undesired detaching or slipping downward thereof.

In the Figs. 22-24 there are now shown three different embodiments of the above specified additional component part 74, wherein it is noted that the lower outline thereof is equal for all the three embodiments, namely it is constituted by a flat bottom wall 78 to be laid on the roof of the inhabited buildings, in which various grooves 79 having different height and shapes are provided, which extend for the entire thickness of the leg 76 and partly of the let 75 too, for such a depth as to communicate with the free space defined between the end edge of each insulating panel applied in position and the flat wall of the leg 76, so as to permit the circulation of a ventilation air flow from outside through the gap provided between the upper outer surface of all the panels and the overhanging covering elements, as particularly evident in the Fig.25. The upper wall of such additional component parts, constituted by the upper edge of the leg 76, on the contrary, is shaped with different outlines to allow the tiles, bent tiles and covering elements of different kind to be laid thereon and fixed thereto.

In particular, in the Fig. 22 it is noted that the outline of the additional component part 74 is provided with a flat portion 80 which alternates with a semicircular portion 81, for supporting correspondent tiles 82 of "Portuguese" type, in the Fig. 23 it is noted that such additional component part has an outline with a continuous rectilinear portion 83, for supporting corespondent tiles 84 of "Marseillaise" type, while in the Fig. 24 it is noted that such additional component part has an outline with a hollowed bent portion 85 which alternates with a projecting part 86, for supporting correspondent bent tiles 87.

Besides, all the profiled portions of the upper wall of such additional component parts are adequately provided with through grooves spaced from each other and provided for the entire thickness of the relevant legs 76, which are marked respectively with the reference numerals 88, 89 and 90, thereby insuring an effective ventilation air circulation again in the gap comprised between the upper outer surface of the insulating panels and the covering elements laid on and fixed to the same. Finally, by examining the Fig. 25, it is shown schematically the roof 91 of an inhabited building, to which the insulating panels according to the invention as well as the additional component parts 74 have been applied and fixed. Then, as it is clearly evident, since the leg 76 of such additional component parts is raised with respect to the panel upper outer surface, the tiles, bent tiles and other covering elements which are arranged thereon are supported onto such leg 76 at a raised position and suitably fixed in position in the inner inserts 68 of the respective panels, so as they may no more slip downward due to the pressure of the overhanging roof covering elements.

The use of the so obtained additional component parts, besides to insure the safe support and fixing of the roof covering elements, also permits an effective ventilation air circulation between the panels and the covering elements, whose passage port is defined exclusively by the reduced sizes of the through holes 77 and 88, 89 or 90, which are selected in such a way as to prevent any undesired penetration of the birds or the insects of determined sizes therein, which circumstance permits to eliminate the flexible guards previously needed for these purposes, thereby simplifying remarkably the assembly construction with consequent savings of materials and working steps for setting up such flexible guards.

Claims

1. Insulating panel for inhabited buildings, which can be fitted particularly on support structures for roofs of such buildings, comprising a part of almost parallelepiped form or of other geometrical forms, made of insulating material and preferably of polystyrene foam or other suitable plastic material with foamed cellular structure of per se known type, characterized in that said part (14), which is realized preferably with flat form, has a discontinuous upper surface

provided with a plurality of relief parts (15) and recessed parts (17, 18) with different forms and arrangements, in the case of application thereof on the building roofs, said parts (15, 17, 18) being adapted to support a plurality of roof covering elements having different forms and arrangements, said part (14) being coated for at least the entire outer surface thereof with waterproofing material compatible with the panel material and applied at ambient temperature onto said outer surface, preferably by one or more layers of bitumen emulsion of the type used for performing road pavings and by one or more in case overlapping layers of fine-grained solid materials, as for instance sandy material preferably of the type fine sand of the river Po, grits etc..., adapted to roughen and make aesthetically pleasant said outer surface.

2. Insulating panel according to claim 1, characterized in that said relief parts (15) and said recessed parts (17, 18) are defined by a plurality of transversal rectilinear cavities (22), parallel and reciprocally spaced, by a plurality of longitudinal rectilinear cavities (23, 24) parallel and reciprocally spaced and intersecting orthogonally the preceding cavities, and by a plurality of inclined cavities (25, 26) with inclination directions which are opposite from each other, provided between said transversal rectilinear cavities (22) and longitudinal cavities (23, 24).

3. Insulating panel according to claim 2, characterized in that the side outline of all said cavities (22, 23, 24, 25 26) is preferably undulated, with a series of depressions on the bottom zones (28) of said longitudinal cavities (23), which are joined by means of convex inclined surfaces with a series of tops provided on the bottom zones (29) of said longitudinal cavities (24).

4. Insulating panel according to claim 3, characterized in that said longitudinal cavities (23, 24) are provided with a plurality of scorings (66) extended horizontally for the entire width of each cavity, at positions parallel and equally spaced from each other, by defining a plurality of cavities adapted for the insertion of correspondent projecting parts provided on the covering elements therein, thereby preventing undesired detachings and slidings of said covering elements from their application position onto the panels.

5. Insulating panel according to the preceding claims, characterized in that each panel may be also disposed against the building inner or outer walls, preferably at the preassembled condition thereof with a plurality of other panels so as to form a movable paneling, provided with at least two openings (61, 62) for the ventilation and means like levers and tension rods or the like associated with movable locks 64, 65), adapted to open or close the port of said openings (61, 62), said movable paneling being provided with a metallic net (63) applied against the visible lower surface of said panels and covered by cement, and being applicable by means of conventional masonry materials against the associated wall, so as all the upper surfaces of said panels be arranged against the same wall and be defined a hollow space (60) for air circulation therebetween, and said movable locks (64, 65) being shiftable by said means from an opened to a closed position of the port of said openings (61, 62), in order to permit or prevent respectively the air circulation through said openings (61, 62) and said hollow space (60).

6. Insulating panel according to claim 5, characterized in that said paneling may be subsequently plastered at its visible surface.

7. Insulating panel according to claim 5, characterized in that said operating means for the locks (64, 65) are housed within said cavities of the panels and accessible from the front side of said paneling.

8. Insulating panel according to the preceding claims, characterized by a plurality of relief parts (67) provided on the upper surface of said part (14) and obtained preferably integrally therewith in correspondence of said longitudinal cavities (24), said relief parts (67) being provided with at least a respective inner insert (68) made of suitable material with hardness and mechanical strenghth which are higher than those of the material of said part (14), said inner inserts (68) being provided respectively with at least one cavity (69), which is threaded or not threaded and provided for a determinate depth of the respective insert, for the insertion of screws, nails or similar fixing elements (70) therein, which are inserted in advance through correspondent through holes of said covering elements, for fixing in position these latter onto said part (14).

9. Insulating panel according to claim 8, characterized in that each inner insert (68) is constituted preferably by high-density plastic which is injection molded on the plastic of said

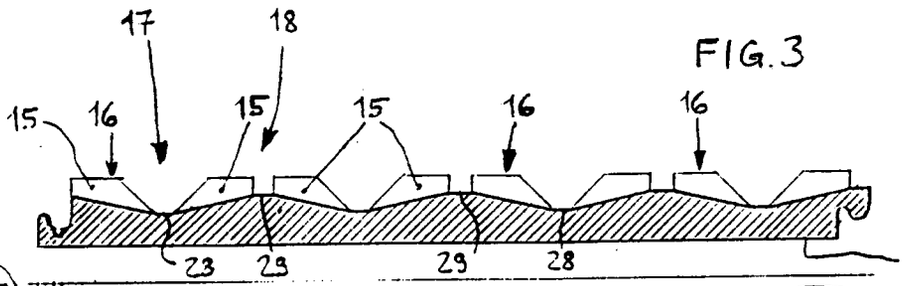
part (14) during the molding thereof.

10. Insulating panel according to claim 9, characterized in that each inner insert (68) may be made also of another kind of hard material like i.e. metallic material, wood, ceramic or plastic filler materials of per se known kind, which may be included in the material of said part (14) both during the molding of this latter and separately too.

11. Insulating panel according to claim 10, characterized in that it comprises a plurality of projecting elements (71) provided on the upper surface thereof and spaced from each other of an identical space (72) in the direction of the panel width, said projecting elements (71) being shaped as steps (73) with undulated outlines correspondent to those of said covering elements, preferably of the bent tiles, for supporting the same and also for providing channels for ventilation air circulation between said covering elements and each panel.

12. Insulating panel according to the preceding claims, in which said roof covering elements are supported on and fixed to the roof combined with additional support component parts (74) applied thereon at the terminal and sloping zone of the roofs, characterized in that said additional component part (74) is provided with a first and a second rectilinear flat leg (75, 76) almost orthogonal to each other, extended for the entire width of each respective insulating panel and whose lower surface (78) and upper surface (80, 81; 83; 85, 86) are respectively profiled preferably identical and with different outlines, correspondent to the shape of the respective covering elements to be supported (82, 84, 87), and are also provided with respective through grooves (79; 88; 89; 90) for the ventilation air circulation, said first leg (75) being adapted to be laid on the building roof (91) and being provided with a plurality of through holes (77) for passing the devices (72) for fixing the additional component part (74) onto said roof (91), and being couplable with the correspondent panel and said second leg (76) being projected beyond the outer surface of each panel, in order to be able to support said covering elements at a raised position thereof, by preventing any slipping downward thereof.

FIG. 3



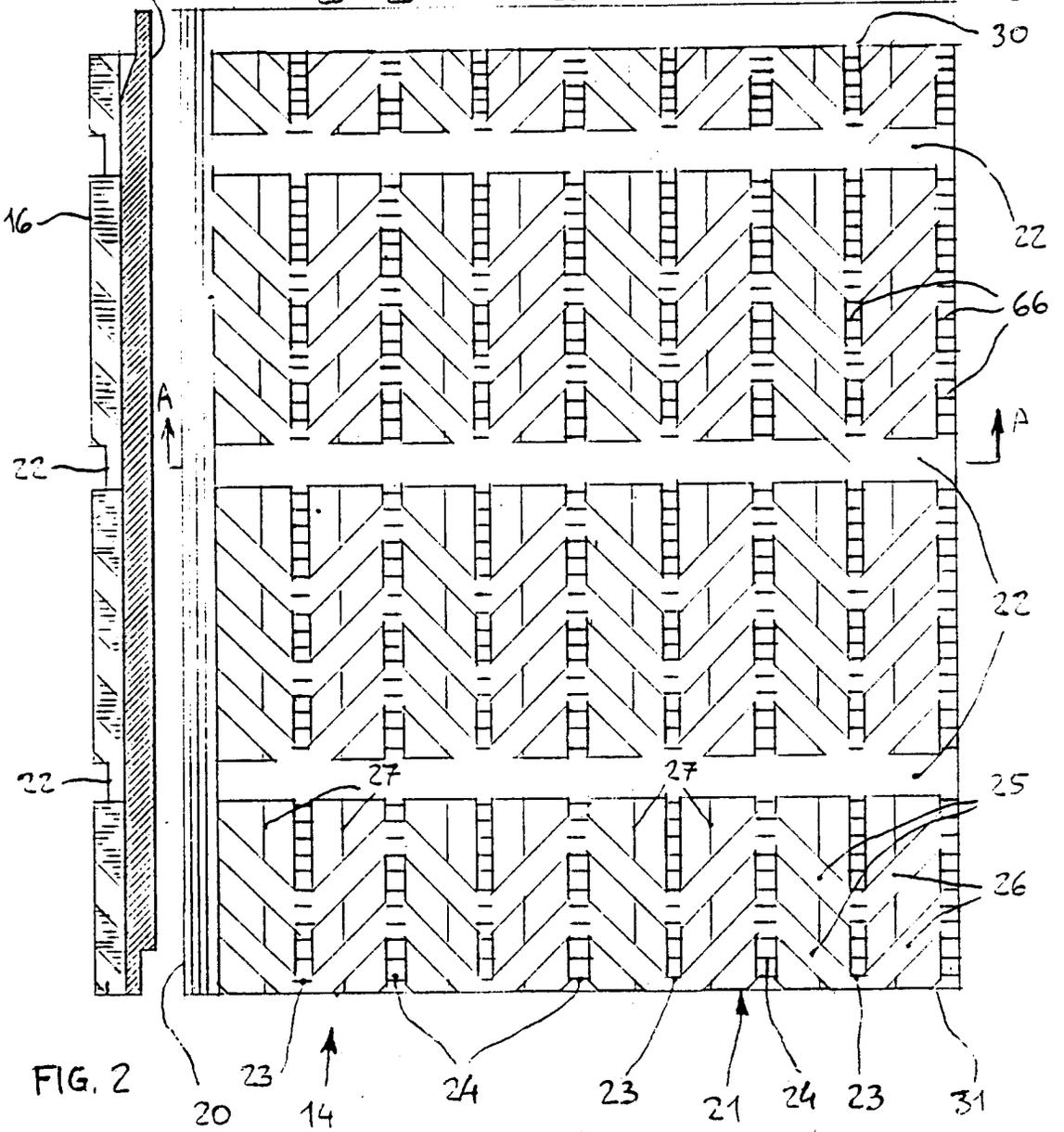


FIG. 2

FIG. 1

FIG. 6

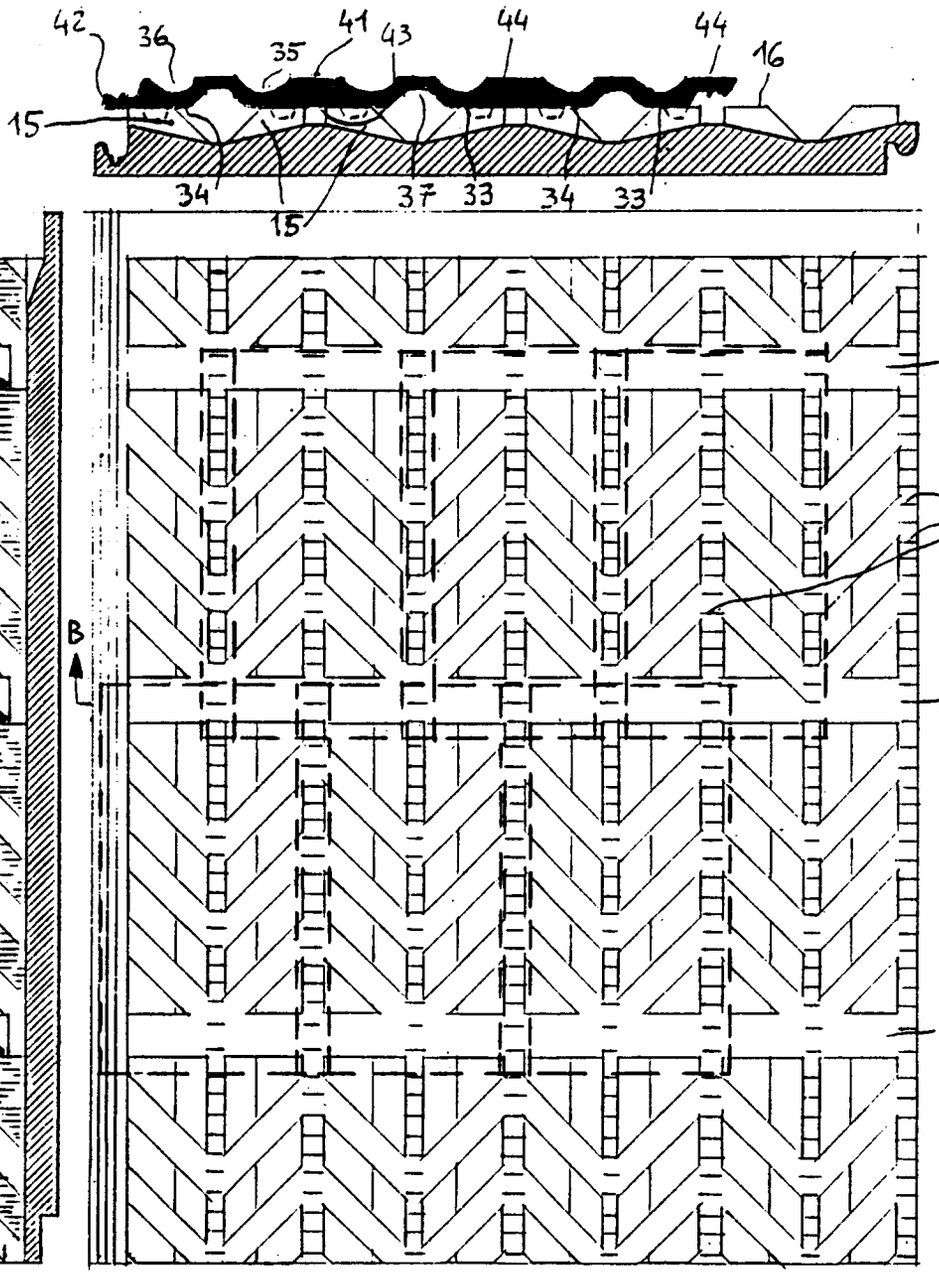
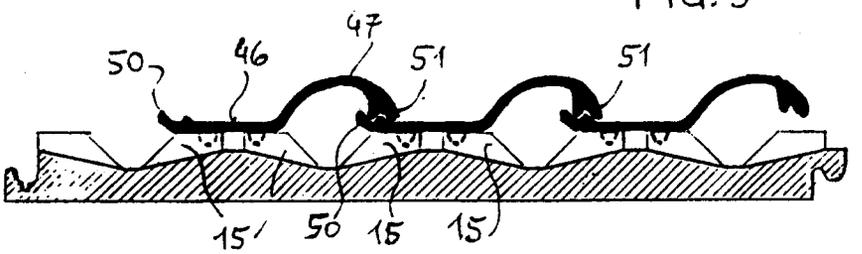


FIG. 5

FIG. 4

FIG. 9



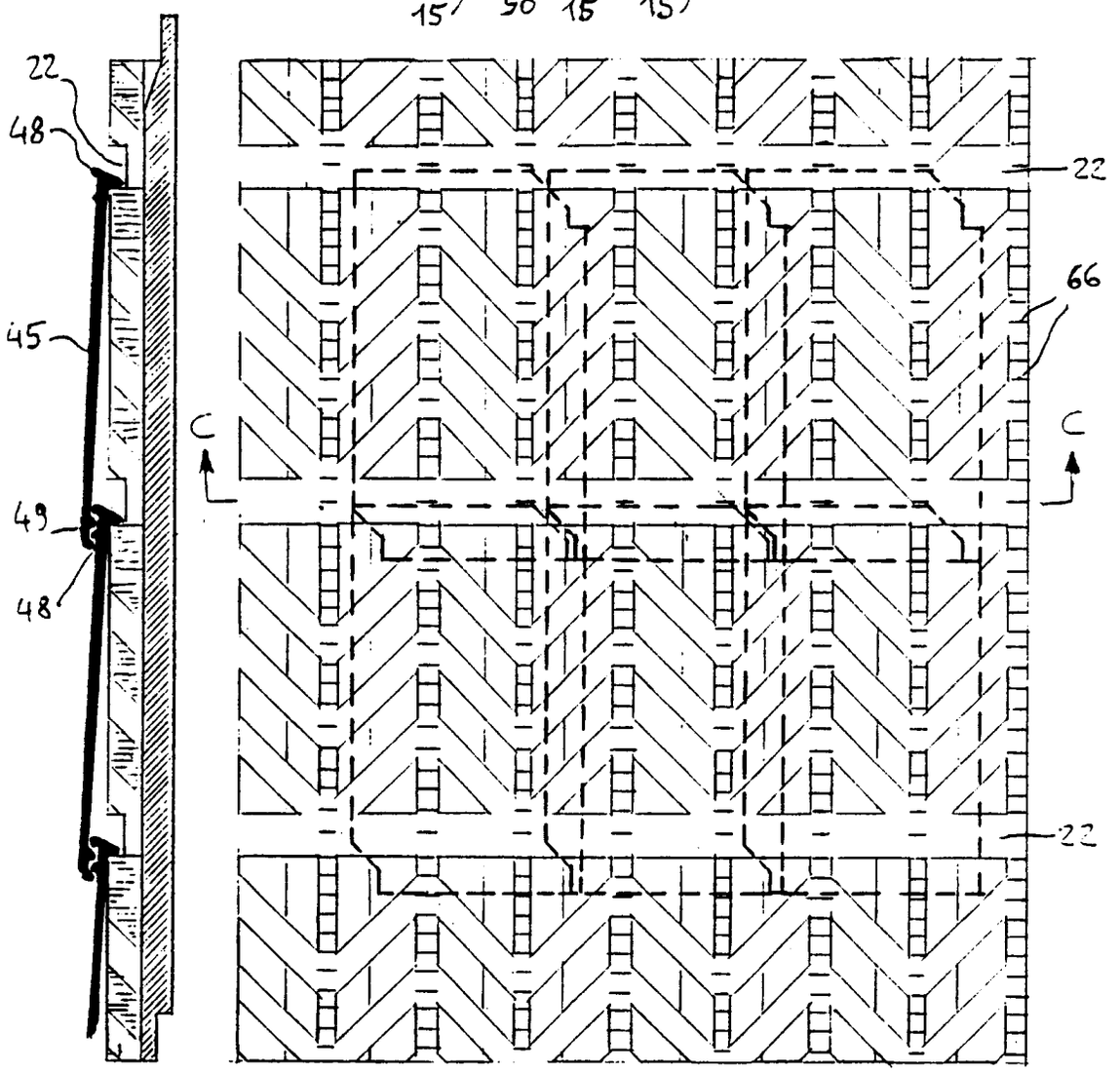


FIG. 8

FIG. 7

FIG. 12

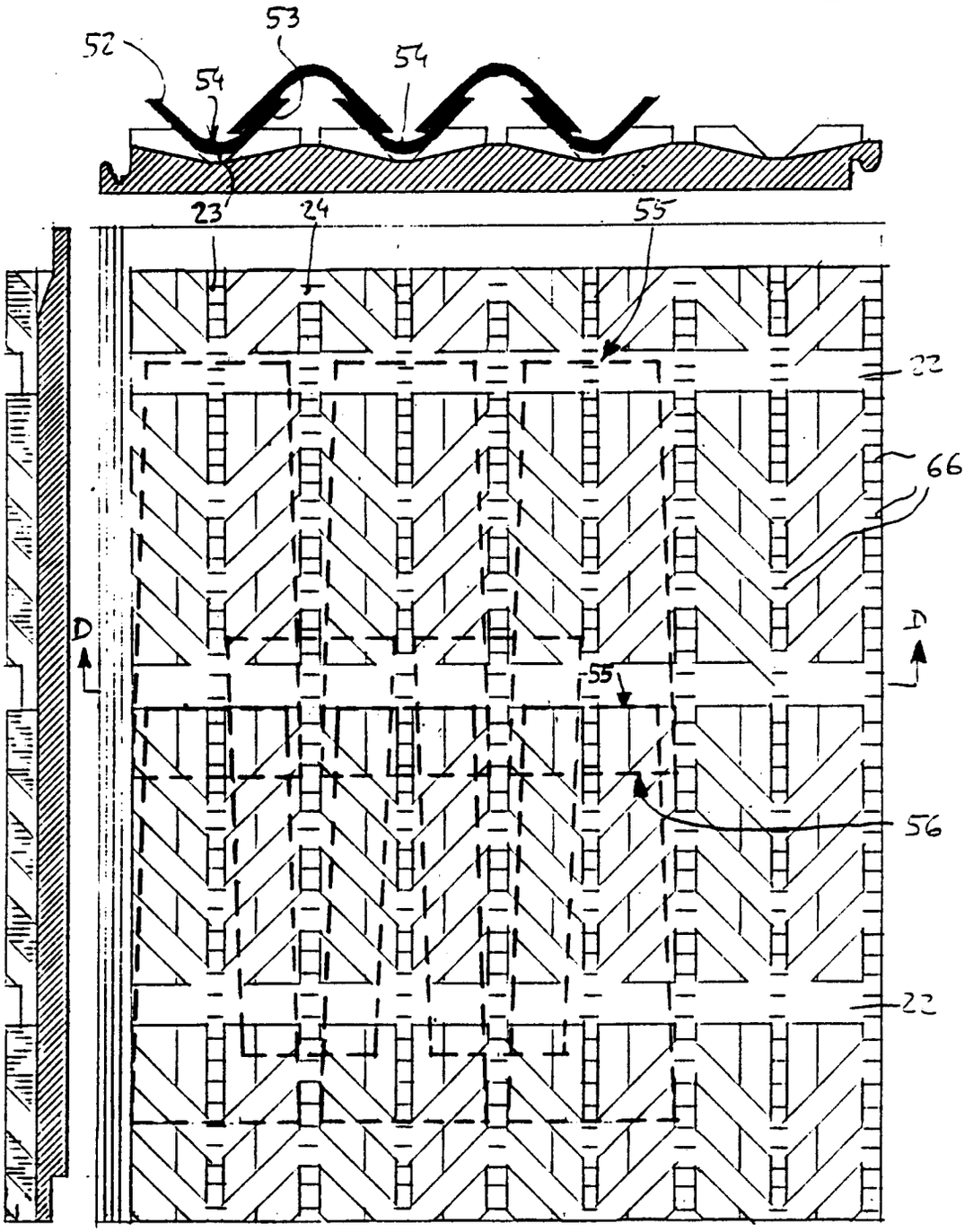


FIG. 11

FIG, 10

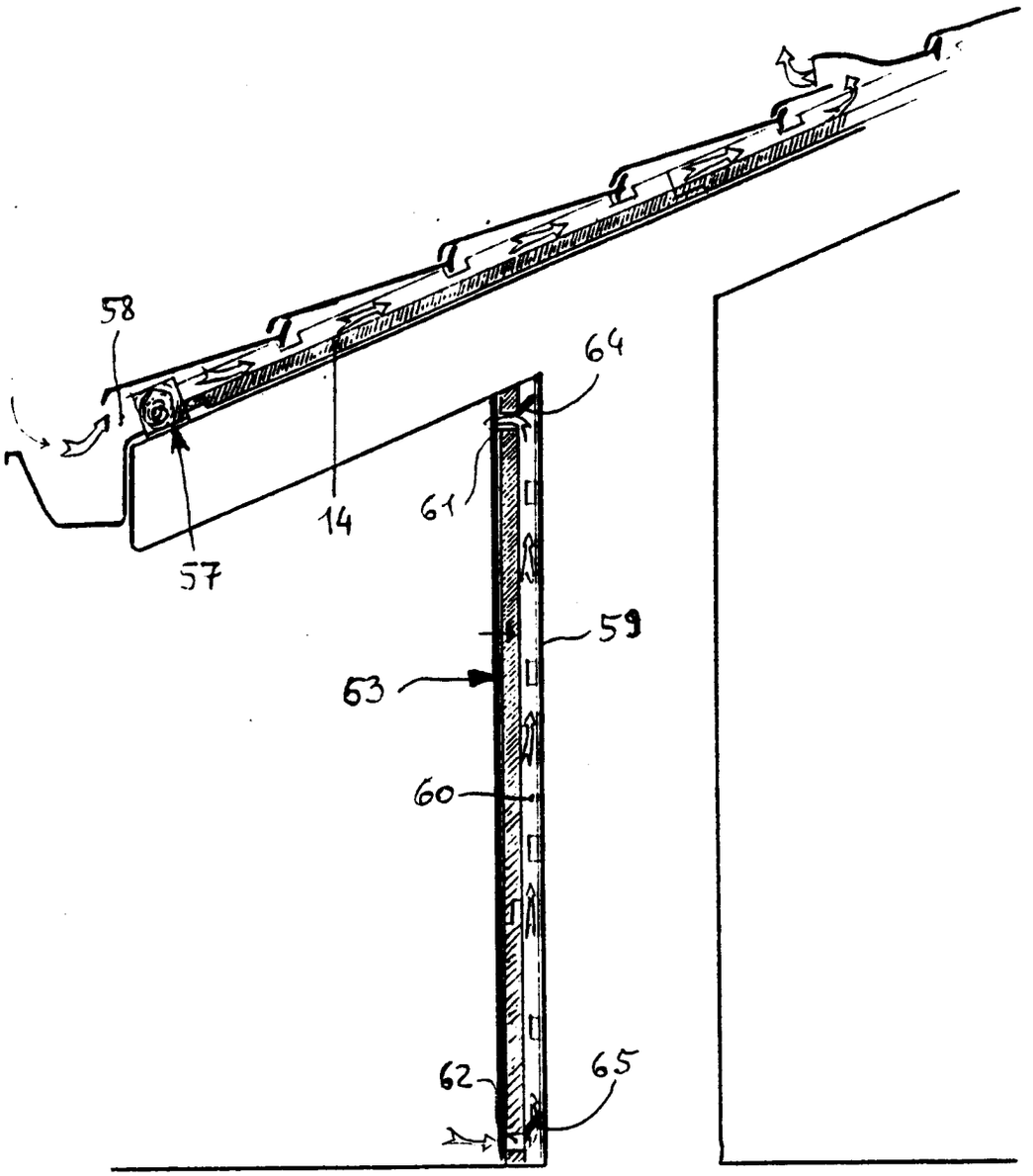


FIG. 13

FIG. 16

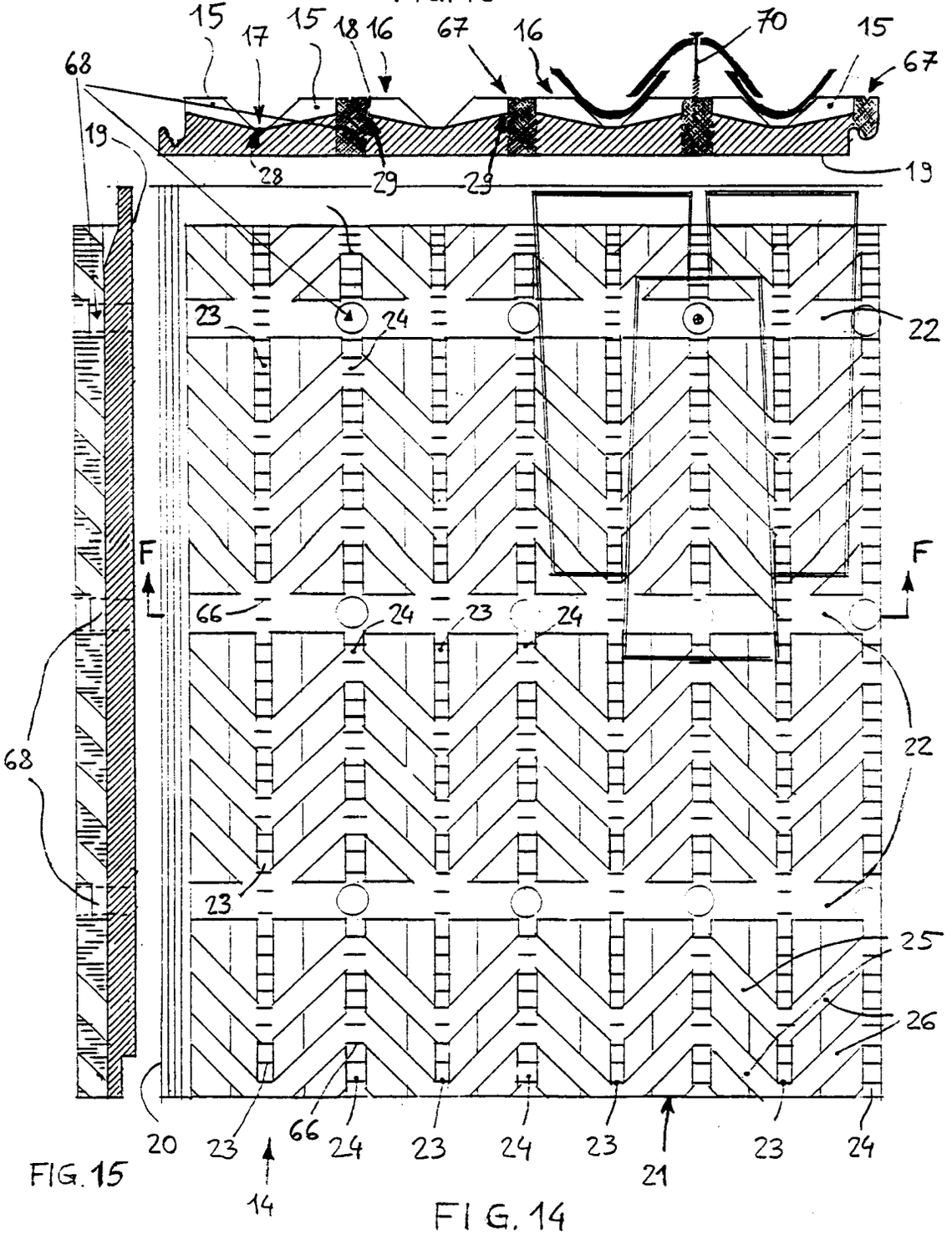


FIG. 15

FIG. 14

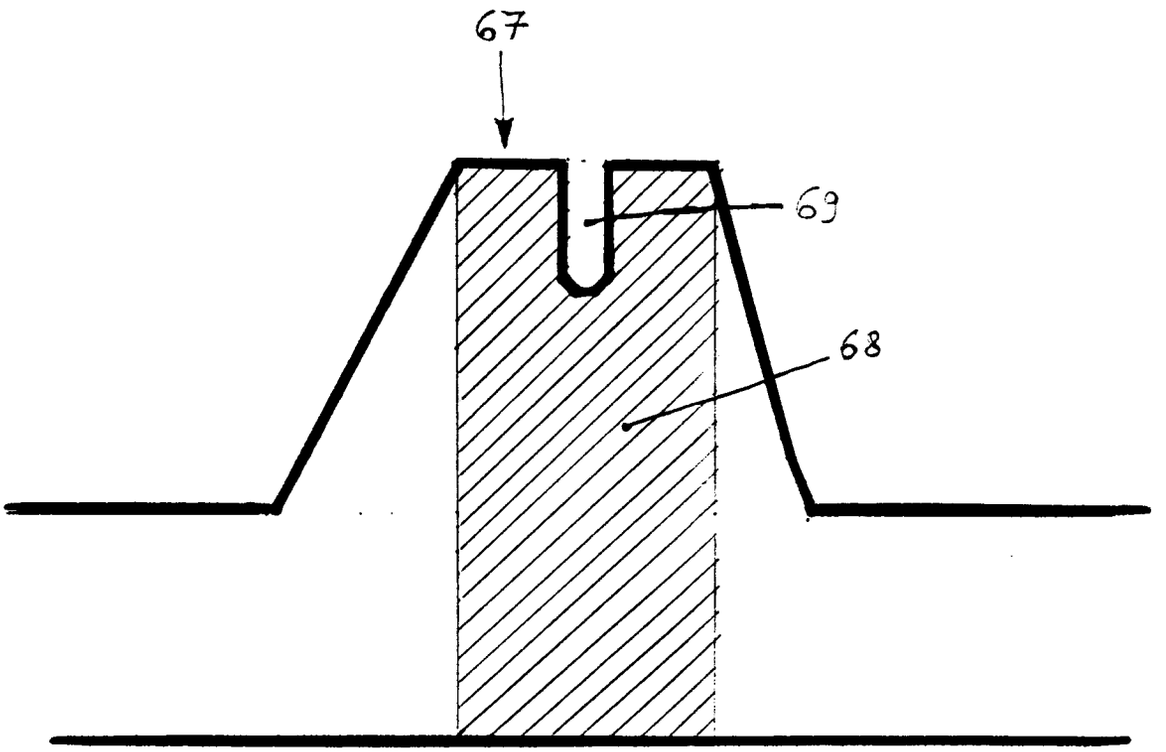


FIG. 17

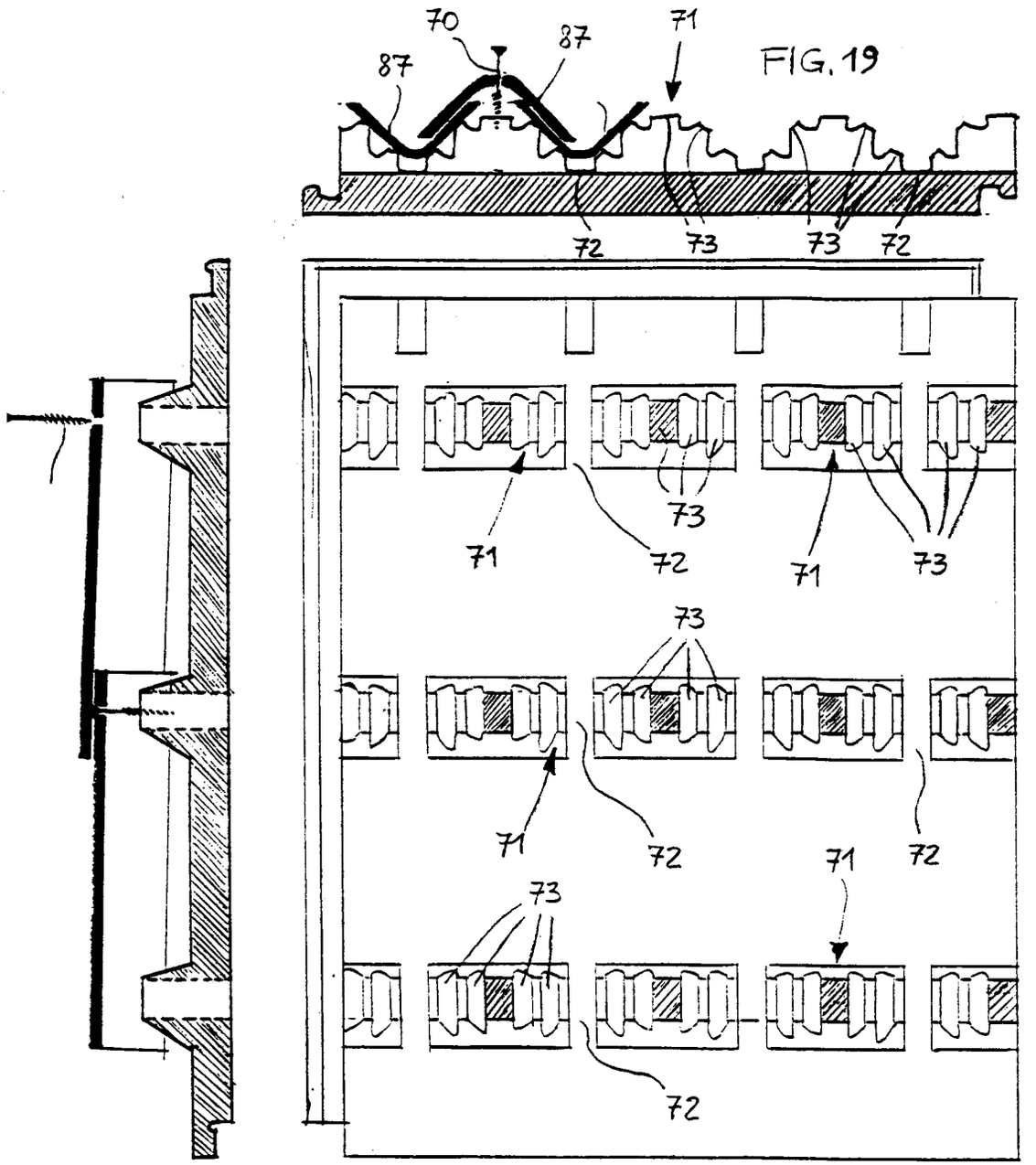


FIG. 19

FIG. 18

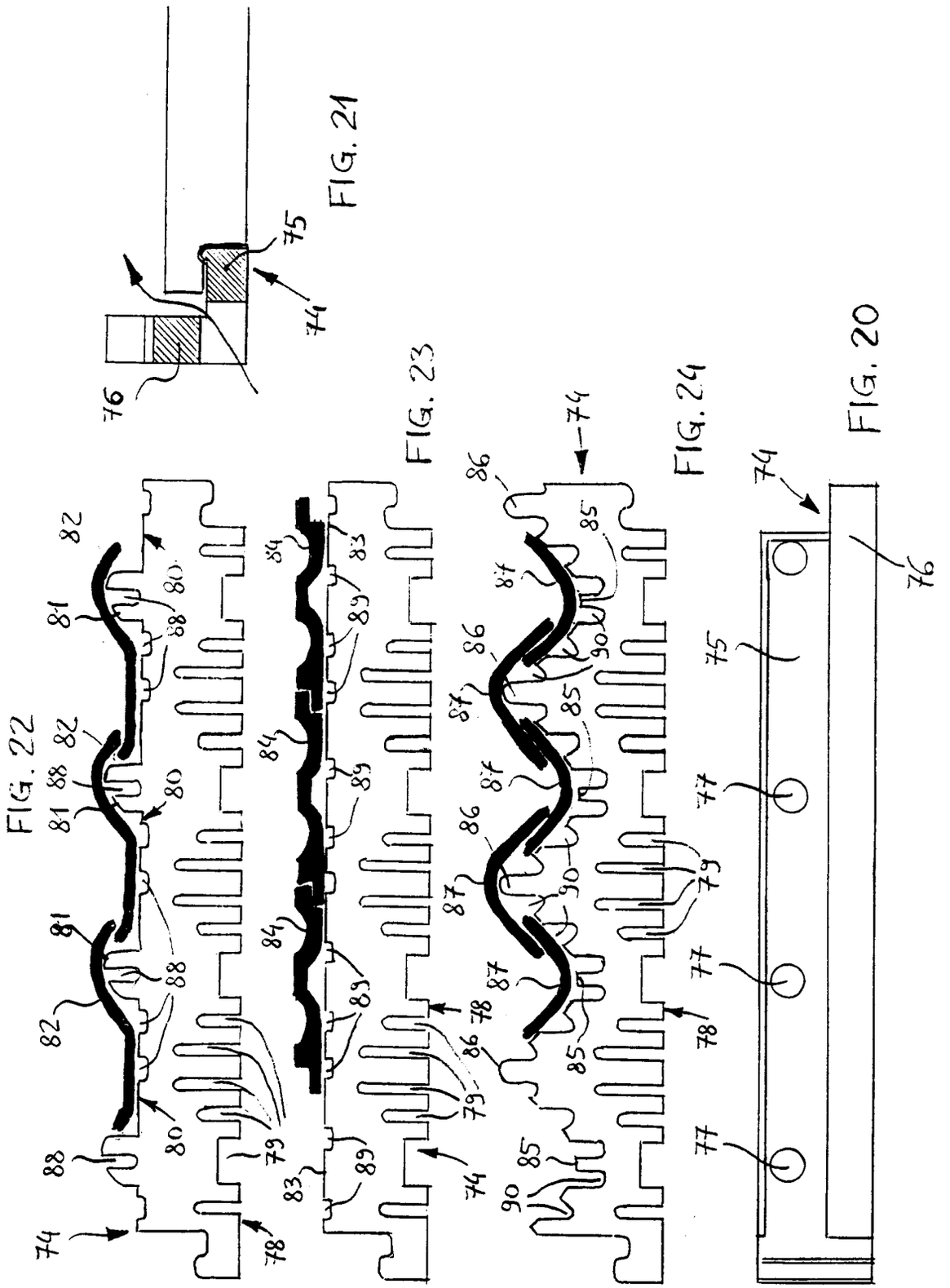


FIG. 22
FIG. 23
FIG. 24
FIG. 20
FIG. 21
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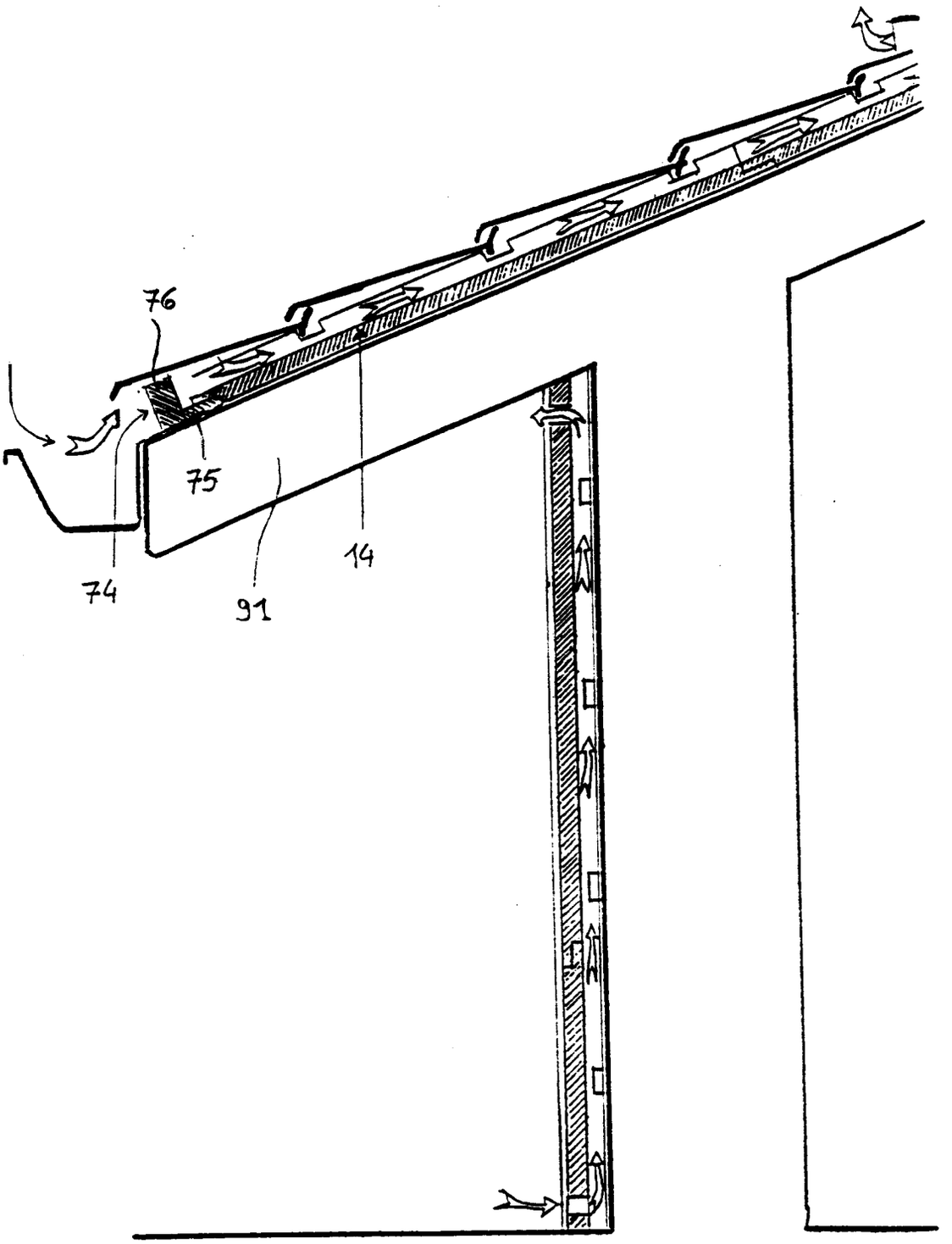

FIG. 25

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Application Number
EP 93 11 6424

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.5)
X Y	DE-A-35 08 632 (M. HELFRECHT) * claims 1-4; figures *	1 2	E04B7/20 E04F13/00 E04D13/16
X Y	DE-A-30 30 841 (M. HELFRECHT) * page 10, last paragraph - page 13, line 20; figures *	1 2	
X A	FR-A-2 431 012 (P. GREGOIRE) * page 2, line 4 - line 35; figures *	1 10	
X A	EP-A-0 123 710 (RHINOLITH SA) * page 3, line 20 - line 40; figures 1-3 *	1 3,8,10,11	
X A	DE-A-30 29 199 (H. GLASER) * figures *	1 4,12	
X Y A	US-A-4 333 290 (KOBERSTEIN) * column 1, line 12 - line 15 * * column 2, line 45 - column 5, line 28; figures *	1,8 5,6 7,9-11	
Y A	DE-A-32 12 489 (REICH ET AL.) * page 5, last paragraph - page 6; figures *	5,6 7	
A	EP-A-0 271 134 (R.E.IN. SPA) * abstract; figures *	5,6	

-/--

TECHNICAL FIELDS SEARCHED (Int.Cl.5)
E04B
E04D
E04F

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	25 October 1994	Righetti, R

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EUROPEAN SEARCH REPORT

Application Number
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DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.5)
A	FR-A-2 539 787 (M. GOUBAUD) * abstract; figures *	12	
A	US-A-3 034 261 (J. Z. HOLLMANN ET AL.) * column 1, line 15-30 * * column 2, line 11-26; figures *	1	
X A	DE-A-37 40 808 (P. BALLAS) * abstract; figures *	1 3,5	
X	DE-A-35 09 644 (W. GUTJAHR) * abstract; figures *	1	
			TECHNICAL FIELDS SEARCHED (Int.Cl.5)

The present search report has been drawn up for all claims

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