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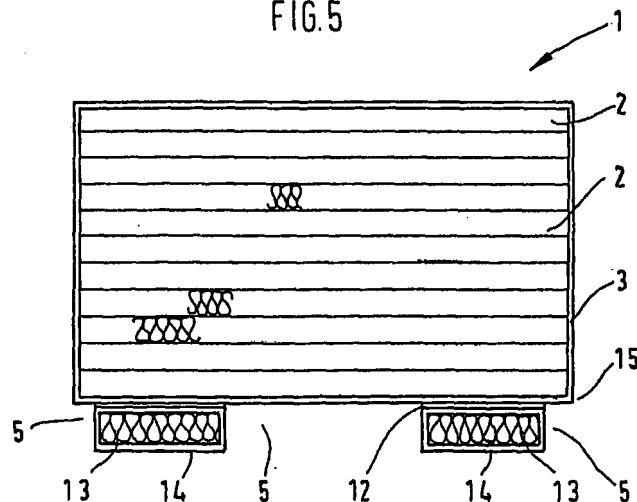
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(54) **Transport unit for rock wool products, in particular rock wool insulation panels, arranged in a stack**

(57) In a transport unit (1) for rock wool products (2) arranged in a stack, the stack has on its principal surfaces

receptacles (5) for handling by mechanical means of transport, such as fork-lift trucks, lifting equipment and the like.

FIG.5



Description

[0001] The invention relates to a transport unit for rock wool products, in particular rock wool insulation panels, arranged in a stack.

[0002] Insulation panels of this kind are used in considerable quantities for the construction trade, in particular for roof insulation and facade insulation. For the purposes of transport and storage, rock wool insulation panels of this kind are arranged in a stack, in which the insulation panels are usually arranged superposed with respect to their principal surfaces. For stabilisation, such stacks of superposed insulation panels are very often covered with sheeting, which is provided both as weather protection and protection against damage during transport.

[0003] The problem with the transport and storage of rock wool insulation products consists principally in the fact that these are products with comparatively large volumes, which proportionally may also have a relatively high weight. For example, insulation panels in bulk density ranges from 10kg/m^3 to 200kg/m^3 at an area size of up to $2000 \times 1200\text{mm}$ in thicknesses of, for example, 50mm to 200mm , so that with a stacked superposition of such panels, transport units of considerable dimensions are produced, which leads to a correspondingly high space requirement for transport and storage. On account of the size and weight alone, it is hardly possible to handle transport units of this kind manually, instead it is necessary to fall back on mechanical means of transport, such as fork-lift trucks and the like.

[0004] Since, in view of the circumstance that considerable amounts of insulation material per year are required in the Federal Republic of Germany alone, the insulation market is also very intensively served by competitors, there is inevitably a considerable cost pressure, which leads to the need for transport units to be optimised in all aspects. This also means that the transport units must be packaged or designed such that they can be handled by conventional means of transport, in particular fork-lift trucks without the risk of damage.

[0005] Conventionally, such stacks of insulation panels are arranged on wood pallets for the purposes of transport and storage, which, although they can be readily handled by fork-lift trucks, carry the disadvantage that they are heavy and voluminous for return of the empty packaging, and also relatively expensive. For this reason, there are efforts in the insulation industry to develop substitutes for these conventional pallets which allow easier return and in particular recycling.

[0006] In this context, it is already known (DE-A42 18 354) to form a transport unit, in which the stack of superposed insulation panels is mounted on support bodies, which are formed of a material that can be used for insulation purposes. The support body and insulation panels are in this case joined to one another by wrapping with a sheeting to form a transport unit. By virtue of the offset arrangement of the support body below the stack,

empty spaces or receptacles for the engagement of lifting devices of mechanical means of transport, such as the tines of fork-lift trucks, are produced. However, these transport units carry the risk that, in consequence of damage of the sheeting envelope, in the region of the support body as a result of handling by the mechanical means of transport, the sheeting envelope of the stack as a whole can inevitably be damaged, as a result of which the stability of the stack, which is essential for transport and storage, is endangered and, in particular during transport, collapse of the stack is possible. This problem also occurs in the case of transport units according to DE-U-296 20 646, in which the stack of insulation panels is supported by support bodies and the entirety comprising stack and support bodies is enveloped by means of a sheeting. In the rough conditions during reloading of such large transport units by means of mechanical means of transport, however damage to the sheeting envelope may very often occur in the region of the support body, for example by incision, tearing and the like, which does not necessarily immediately lead to a damage of the sheeting envelope as a whole, but during transport can lead to damage of the sheeting envelope overall by further tearing, with the harmful consequences described above.

[0007] Lastly, to prevent this risk of damaging of the envelope as a whole, it is known (DE-A 198 42 721) to provide a transport unit comprised of a stack of superposed insulation panels, in which the stack as a whole is enveloped by means of a sheeting, not however the support bodies. The latter, however, are not made from a material suitable for insulation purposes. The support bodies are in this case adhesively bonded to the lower base surface of the stack. However it was regarded as necessary, particularly with consideration to obtaining stable bundles, to connect the individual insulation panels within the stack to each other by means of an adhesion bond, which however involves additional outlay. As a further disadvantage, it is to be noted that the hot-melt adhesive usually used in this context can easily penetrate into the surface of the rock wool insulation panels, and as a result the properties of the insulation product can be negatively affected, in particular in the event of excessive adhesive application. In particular, this is disadvantageous in the case of insulation panels for which particular fire resistance requirements must be observed. The application of the adhesive to insulation panels for the adhesive bonding is also subject to disadvantageous from the point of view of efficient production.

[0008] The object of the invention is to provide a transport unit for rock wool products, in particular insulation panels, which is particularly well adapted to the criterion of handleability by means of mechanical transport means, main attention also being paid to the fact that as little waste material as possible ought to occur for environmental protection reasons. Furthermore, it is necessary for a transport unit developed in this manner to meet the latent cost pressure on the insulating materials in-

dustry, that is to say be comparatively uncomplicated in construction and inexpensive.

[0009] This object is achieved according to the invention by the features contained in the characterising part of claim 1, expedient further developments being characterised by the features contained in the subclaims.

[0010] According to the invention, on the stack of superposed insulation panels, which is preferably entirely or partly wrapped with an envelope, receptacles for handling by mechanical transport means are provided, at least on one of the principal surfaces of the stack.

[0011] These receptacles may be designed in various ways. For example, particularly for transport in a harsh environment and in the case of voluminous stacks, in particular stacks of heavy weight, it is expedient to form the receptacles by means of recesses of a lamellar panel, which is arranged below the stack as support for the stack. The lamellar panel, by virtue of the manufacture and because of the special fibre alignment essentially perpendicular to the principal surface, is characterised by elevated compressive strength, so that a support in the form of a lamellar panel is very suitable for the aforementioned application. Since the lamellar panel is also formed of rock wool, and in particular can be formed of uniform material with the insulation panel, such a support is also suitable for use as insulation material in situ, that is to say on the construction site. In this case, return as empty packaging is no longer necessary. As a consequence of the compression-resistant design of the lamellar panel, such a support, which may in particular be constructed in the manner of a pallet, can also be used as a reusable means of transport and can accordingly be frequently used. In this case, it is of particular advantage that such a lamellar panel support can be wound to form a roll, which is again of advantage for return of the empty packaging. The receptacles within a lamellar panel can in this case be formed such that lamellar elements with different lamellar lengths can be used, so that hollows are formed by recesses, which form the receptacles for the means of transport.

[0012] According to a further embodiment, the stack is enveloped with a textile web, which is preferably designed so as to be tension resistant, for example as a polyethylene textile web, and in which the tabs forming the receptacles are realised. The design may be integral, i.e. the tabs can be formed of uniform material with the textile web. However, they may alternatively also be mounted on and welded, adhesively bonded or otherwise connected to the textile web. The tabs, which form the receptacles for the engagement of the mechanical means of transport may be stiffened to allow a simple access by the entering fork tines, without the tabs needing to be separately held open. A stiffening of this type maybe carried out by embedding mesh-like stiffening nets and the like in the tabs.

[0013] In a further embodiment, the tabs may be filled with strips of rock wool insulation material, which at the same time can be used as mould cores in the case of a

single part formation of the tabs with the textile web. These rock wool insulation strips, which can be removed from the tabs, can be used in situ as supports for the stack. This is in particular of advantage for a transport unit in which the tabs are formed or arranged on the upper cover surface of the stack, because in this case there is also the possibility of supporting the stack on site on the strips removed from the tabs, which are then arranged below the stack. If required, the removable strips can be coated with a bonding agent or adhesive, which is covered with a peel film. Expediently, the filling bodies, which fill the tabs, can also be provided with a delayed activatable adhesive coat, which is in particular activated when these filling bodies are to be used as supports for the stack.

[0014] In a further, very advantageous embodiment of the invention, in which the support is of identical material to that of the insulation wool of the stack, the support is preferably itself formed as an insulating panel, which is expediently surrounded with a plastic sheeting for protection against the effects of weather. Since insulation panels for specific applications are available in predetermined standard dimensions, in which, for example, the insulation materials are available with a uniform length in staged widths and thicknesses, the support is preferably of the same standard type as the insulation panel, but with a smaller standard width, so that, with a central arrangement of the insulation panel, the recesses for the mechanical means of transport are laterally delimited. This embodiment is in particular suitable for pallet stacks for insulation of flat roofs. In this case the transport units are hoisted by means of a lifting means onto the roof, where the insulation panels are then unpacked. Since the support originates from the same panel-type series as the insulation panel, the support can also be used on the roof for insulation purposes. In this case, the only pallet waste to be returned would be the sheeting envelope, which envelops the support in the form as an insulation panel, assuming it cannot itself be otherwise used on the construction site. With this concept, the transport unit can thus be processed in its entirety in situ on the construction site. Then, only the packaging envelopes of the stacks would need to be returned, which was already done anyway.

[0015] In a further embodiment, the insulation panels originating from the same type series, which are used as supports can also be arranged in the vicinity of the stack edges, so that, depending on the offset arrangement, two lateral recesses toward the edges at the outside, and one central recess between the two supports are produced for the engagement of the mechanical means of transport. In this case, it is expedient if an adhesive bond or adhesion bond is provided between the support and stack underside. This may be carried out by means of an activatable adhesive, for which purpose the sheeting envelope, surrounding the insulation panel, of the support is provided with an adhesive coat, which is covered with a peel film. This ensures a firm bond between the support

and stack and at the same time prevents the adhesive affecting the insulation properties of the support, which after all can also be used for insulation purposes.

[0016] In a further embodiment, the supports are bearing elements, which are formed from components inherent in the system, in particular a sheeting reel, wherein the sheeting is, for example, a waterproofing sheet, which can be used for waterproofing purposes. Expediently, the supports are also formed from packaging elements which receive other additional components, such as dowels, screws and the like, and are packaged tightly in such a way that the bearing elements are designed so as to be suitably compression resistant for their properties as supports of the panel stack. Here, too, the advantage consists in the fact that the transport unit can be used as a whole on site, which leads to a significant waste reduction on the construction sites.

[0017] According to a further expedient concept of the invention, the stack of the transport unit is received by corner profiles arranged at the four bottom corners, which form the supports and at the same time act as edge protection. These supports possess a reusable function and can thus be used as often as required. Preferably they are made of plastic, and are thus easy to produce and can be readily cleaned. To improve the hold, the corner profiles can here be connected to one another crosswise by means of struts. If the crosswise-arranged struts are connected centrally to one another by means of a joint, the support device can be very readily collapsed in the manner of scissors for return, so that the transport volume can be considerably minimised for empty packaging return.

[0018] Typical embodiments of the invention are described below with reference to the drawing, wherein

Fig. 1 shows a side view of a stack of rock wool insulation panels on a pallet formed as a lamellar panel,

Fig. 2 shows a further embodiment, also in side view, in which two tabs are provided above a stack of rock wool insulation panels,

Fig. 3 shows a side view of a further embodiment of a stack of insulation panels in two functional positions,

Fig. 4 shows the side view of a further embodiment with a support formed from a partial element of the insulation panels of the supported stack,

Fig. 5 shows an analogous embodiment to Figure 4,

Fig. 6 shows an embodiment similar to Figures 4 and 5, in which the support arranged on the underside of the stack is formed from components inherent in the system,

Fig. 7 shows a further embodiment of a transport unit, in which the stack of rock wool insulation panels is supported by plastic corner elements, and

Fig. 8 shows a perspective view of the corner element, all figures being shown in purely schematic form.

[0019] In the transport unit shown in Figure 1 and generally designated 1, a stack of superposed rock wool insulation panels 2 is enveloped with a sheeting 3 and received on a support 4 designed in the manner of a pallet. The sheeting packaging of the stack according to Figure 1 only envelopes the stack of insulation panels 2 at four peripheral sides, but leaves the two end faces free, the front one of which is visible in this view. Naturally, a sheeting packaging can also alternatively be provided in which the end faces also can be completely, or where a shrink film is used only partially, covered in the outer regions.

[0020] The sheeting used is in particular a plastic film, such as a heat-shrink film, a packaging of sheeting, however, also being expedient in which the ends are wrapped one over the other and joined by bonding, welding or the like. In this case it is also expedient from case to case to subject the stack of insulation panels to compression, then wrap over the sheeting, so that, after release, the finished sheeting envelope is tensioned by virtue of the resilient property of the previously compressed insulation panels. Since, however, the invention is not concerned with the type of enveloping per se, the various possibility for enveloping a stack with a sheeting, e.g. also with a sheeting colour and the like, do not need to be discussed here. The object of enveloping is the confinement of the insulation panels superposed in the stack for transport and storage and as protection of the insulation panels against the effects of weather and against damage and the like. Furthermore, the modular envelopment of a stack of insulation panels also allows the superposition of several such stacks to obtain a so-called large bundle.

[0021] In the illustrated embodiment, the support 4 is constructed by a pallet-like construction of lamellar pieces with different lamellar length, so that receptacles 5 result, which can be used for the engagement of mechanical means of transport, in particular the tines of fork-lift trucks.

[0022] To this end, the support 4 is, in the example, constructed from three lamellar elements 6 with the same lamellar length, between which lamellar elements 7 with shorter lamellar length are arranged. This results in corresponding recesses with respect to the base area of the longer lamellar elements 6, by means of which the hollows 5 for the engagement of the means of transport are delimited.

[0023] In the case of the lamellar panels, these are comparatively compression-resistant structures by virtue of the special fibre alignment. If, in the case of conventional insulation panels, the fibres are aligned essentially in the longitudinal direction of the two principal surfaces,

principally by virtue of the production process of the rock wool insulation panels, the fibre orientation of the lamellar panels, which are known per se, is principally perpendicular to the two principal surfaces, which results in an increased compression resistance compared to the insulation panel with fibres aligned parallel to the principal surfaces. The production of lamellar panels of this kind is carried out by cutting lamellar-like blocks of conventional insulation panels, which are then turned through 90° and fastened to a planar support material, such as aluminium foil or glass or plastics fabric by adhesive bonding to form the lamellar panel. In Figure 1, the lamination is designated 8 and consists of a fabricreinforced aluminium foil. This forms, so to speak, the upper support surface of the support 4, on which the stack of insulation panels 2 is arranged, and simultaneously serves as barrier for possible rising moisture.

[0024] Although the support 4 constructed of lamellar panels 6 and 7 is a compression-resistant pallet-like panel, after use it can be readily rolled up into a reel, facilitating the return of the empty pallet.

[0025] Naturally, it is also possible to form the pallet-like support panel shown in Figure 1 from only two longer lamellar panels 6, which are arranged at the edges and between them form a hollow 5 by virtue of the recessed lamellar panel 7, which is used for access by the tines of the fork-lift truck. However the central arrangement of the further lamellar panel 6 forms a more stable structure, which prevents sagging of the support panel 4 in the inner region.

[0026] This is in particular expedient in the context of high stacks constructed from a multiplicity of superposed insulation panels, and for stacks with very large-area insulation panels.

[0027] In particular when the transport unit is used in regions where poor weather conditions prevail, the pallet-like support 4 can be wrapped with a sheeting, so that even if the transport unit is placed on damp terrain or exposed to rain, a correspondingly long service life of the support 4, formed as a reusable pallet, is ensured. It is also possible, to treat the support 4 with water-repellent agents, so that it is resistant to water, which may occur in situ on the construction site in the form of puddles.

[0028] In the embodiment according to Figure 2, the stack of superposed insulation panels 2, which is usually covered with a textile web, which is provided either only over the periphery or else covers the two exposed end faces. The textile web designated 9 is in this typical embodiment designed so as to have high tensile strength and preferably produced from polyethylene, since in this embodiment the receptacles 5 for the means of transport are formed by tabs 10 arranged above the stack, so that the forces occurring on lifting of the stack are introduced into the textile web 9 via the tabs 10. The tabs 10 may be elements that are produced separately and fastened on the upper cover surface of the fabric 9, for example by welding or adhesive bonding, expediently however the tabs 10 are designed integrally with the fabric web 9

and therefore also of identical material. The one-part production may for example be carried out in that, during enveloping of the stack with the fabric web 9, corresponding cores with the dimensions of the subsequent recesses 5 are mounted in order to shape the tabs 10. Then the cores can be removed again, so that the tabs 10 open at both sides remain for engagement of the tines of a fork lift truck. By means of a correspondingly stiff design of the tabs 10, it is ensured that the tabs 10 remain dimensionally stable, that is to say do not collapse in the region of the recesses 5.

[0029] A modification of the embodiment according to Figure 2 is shown by Figure 3, two functional positions being reproduced here in one drawing. For the formation of the panel stack, the stack is enveloped with a fabric web 9, specifically analogous to the embodiment according to Figure 2, tabs 10 again being provided in the upper region. In this embodiment however the tabs 10 are filled with strips 11 of rock wool insulation material, which form, or can form, so to speak, the cores for forming the recesses 5 of the tabs 10. In this case it is preferred that the strips 11 are made of the same material as the insulation panels, which offers the advantage that the strips can then also be used for insulation purposes, with the intended application of the insulation panels of the stack in situ, i.e. on the construction site.

[0030] For the case in which a mechanical means of transport, for example, a fork-lift truck, is needed for handling the stack, the insulation strips 11 only need to be removed on site. In this case it is possible to use the insulation strips 11 also as a support 4, as is made clear in the lower functional representation in Figure 3, the support here being formed by the strips 11 of insulation material removed from the tabs 10. For the purpose of stability, an adhesive bond 12 is provided between the top side of the insulation strips 11 and the underside of the panel stack. This adhesion bond may for example already be prepared by providing the insulation strips 11 mounted so to speak as cores within the tabs 10 with an adhesion layer, which are outwardly covered by a peelable film strip.

[0031] In the embodiment according to Figure 4, in which a stack of insulation panels 2 is again enveloped by means of a fabric web or sheeting 3, an element of uniform material with the insulation panels 2 packaged in the transport unit is used as support 4, specifically a corresponding strip with smaller width than the end longitudinal extension of the insulation panels 2 visible in Figure 4. By this means receptacles 5 for the engagement of the mechanical means of transport are delimited, or provided, at the left and right below the stack. This embodiment offers the advantage that the insulation element or insulation panel 13 with reduced width constituting the support 4 can be also used in situ for insulation purposes. Also in this embodiment according to Figure 4, it may be expedient to wrap the support with a sheeting 14 in order to make the support weather resistant. This is of advantage in view of ground moisture often caused

by rain, which could otherwise damage the support 4 according to the invention.

[0032] A modified embodiment is shown in Figure 5. Here, too, the transport unit 1 comprises a stack of superposed insulation panels 2, which are enclosed by a sheeting envelope 3, the support 4 here being formed by two insulation panels 13, which are again expediently of identical material or uniform material to the insulation panels 2 within the stack. Here it is preferred that supports 4 are elements which like insulation panels 2 are also contained within the stack in standard dimensions. For example, the stack of insulation panels 2 could also be formed with a length and width of 2000 x 1200 mm, however the insulation panels 13 are designed to a standard size of 625 x 1200, with the result that the insulation panels 13 can be aligned so as to be flush with the stack in their property as supports and, by virtue of the reduced dimensions, also delimit the desired recesses 5 as receptacles. In the embodiment according to Figure 5, in this case receptacles 3 are identified purely schematically 3, this depending purely on the arrangement of insulation panels 13 below the stack. Depending on the nature of the mechanical means of transport used, the insulation panels 13 can be offset to a greater or lesser extent with respect to the outer, lower edge of the stack designated 15.

[0033] In the typical embodiment of Figure 5, it is also expedient if the insulation panels 13 serving as support are enveloped with a sheeting 14 taking into consideration weather protection, here, too, it being possible to provide an adhesion bond or adhesive bond analogous to the typical embodiment of Figure 3. This is designated with the same reference 12. An advantage of the embodiment of Figure 5 consists in the fact that the insulation panels 13, which are present in an adapted standard to the insulation panels located in the stack can advantageously be used in situ on the construction site along with the insulation panels for insulation purposes. Only the sheeting 14 provided in the case of protection against weather conditions needs to be removed, wherein this again should have a greater thickness than the sheeting envelope 3 in order to take account of the more difficult transport conditions in the base region.

[0034] According to the embodiment of Figure 6, a stack, wrapped with a sheeting or the like, of superposed insulation panels is received on two supports 4 which are arranged below the stack and preferably fixed by an adhesion bond such that they inwardly or outwardly delimit corresponding receptacles 5 for the mechanical engagement of lifting elements of means of transport. In the case of the embodiment according to Figure 5, the supports 4 are formed by components inherent in the system, which can expediently be used on the construction site in conjunction with the insulation panels supplied in the stack.

[0035] If, in the transport unit shown according to Figure 6, for example insulation panels for the insulation of pitched roofs are used, the supports 4 are expediently formed by sheeting reels, in which plastic sheeting is

wound around a sturdy core, such as a tube, it then being possible to use the sheeting as a roof insulation sheet or the like or as a cover sheet. In the process, an auxiliary, which is required in any case for the laying of insulation panels, may be transported onto the roof together with the transport unit, so that the transport unit contains the insulation panel as well as the required sheeting web together in one package. Depending on the particular application case, the support 4 may be a structure produced, for example, from waterproofing sheets or packages which may contain the nails, screws or dowels and other additional components for the insulation purpose or construction purpose. The supports 4, depending on the type of additional components, may extend only over a partial section of the width of the stack, so that, for the possibility of access from both sides by a means of transport, a total of 4 supports are arranged below the stack. The supports 4 can then, however, extend over the entire width of the stack, as is expedient in particular in the preceding embodiments, so that they terminate essentially flush with the stack edges.

[0036] In the embodiment according to Figure 7, the supports are designed as corner elements 16, which are preferably made of plastic and thereby form reusable elements and at the same time serve as edge protection for the stack. Such corner elements 16 are preferably suitable as edge protection elements and supporting elements. In the embodiment shown, which Figure 8 also shows in schematic perspective representation, the corner element 16 is designed with two lateral surfaces and one base surface, the base surface being provided with projections 16, which may be designed as lug-like projections or studs. For better clarification, the corner region of the stack, which is received by the corner protection element 16 is indicated in broken lines in schematic representation. Fixing of the corner protection elements may take place by means of an adhesion bond. However, it is also expedient if the corner elements 16 are connected to one another by means of a crosswise support. The downwardly projecting lugs 17 in this case delimit an inner recess 5, which may also serve for the engagement of the means of transport.

Claims

1. Transport unit for insulation panels made of fibres, in particular rock wool insulation panels (2) arranged in a stack, the stack having on at least one of its principal surfaces receptacles for handling by mechanical means of transport, such as fork-lift trucks, lifting equipment and like, wherein the receptacles are formed by support bodies made of fibre insulation material arranged below the stack, **characterised in that** receptacles are realised by at least one support body which is of identical material to the fibre insulation panels forming the stack and which is wrapped with sheeting.

2. Transport unit according to claim 1, **characterised in that** the support body has a smaller width dimension than the panels forming the stack and being arranged centrally below the stack so that the support body delimits at both sides the receptacles for mechanical engagement by the means of transport. 5
3. Transport unit according to claim 1, **characterised in that** the receptacles are formed by two support bodies having a smaller width dimension than the panels forming the stack and being offset to a greater or lesser extent with respect to the outer, lower edge of the stack. 10
4. Transport unit according to one of the preceding claims **characterised in that** the support bodies are provided on at least one side with an adhesive coat (12). 15

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FIG.1

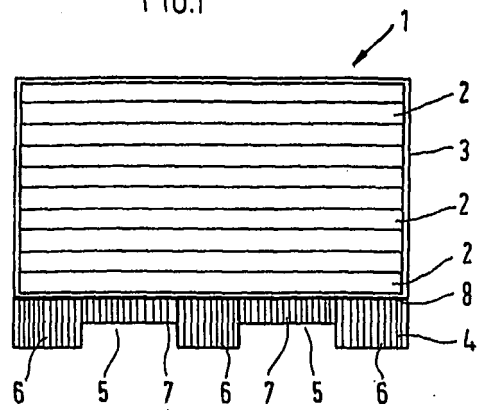


FIG.2

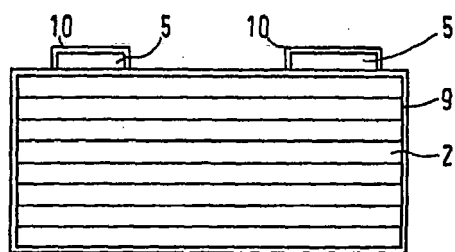


FIG.3

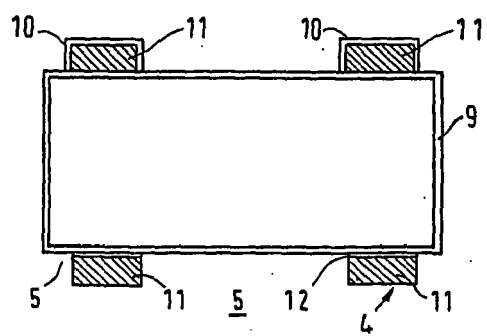


FIG. 4.

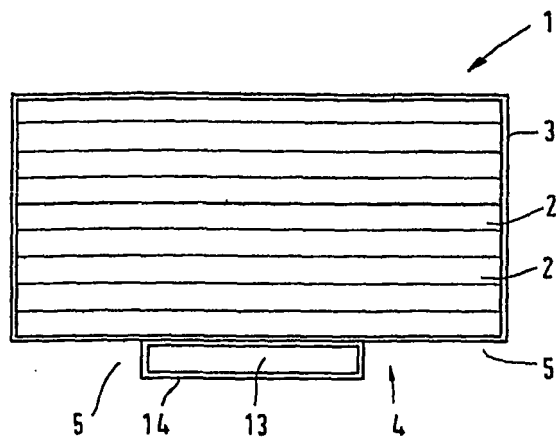


FIG. 5

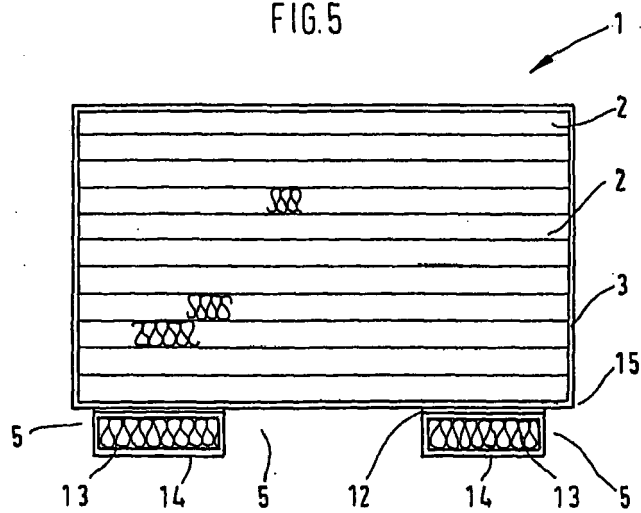


FIG. 6

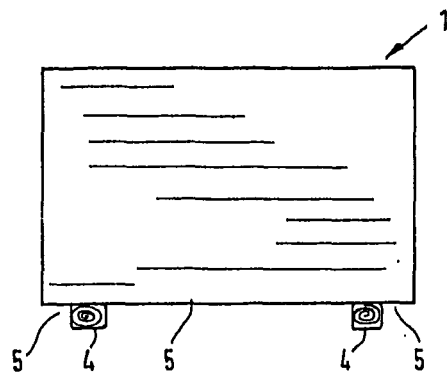


FIG. 7

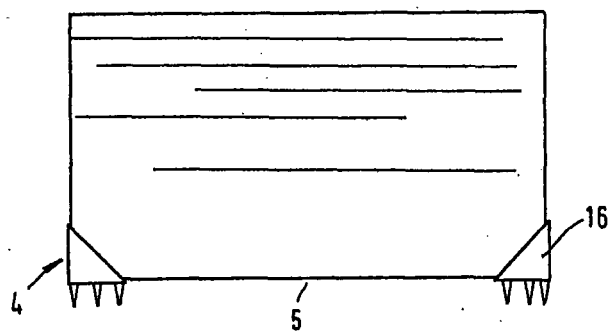


FIG. 8

