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(73) Patenthaver: **Aschauer, Johann, Unterdörfl 49, 4362 Bad Kreuzen, Østrig**

(72) Opfinder: **Aschauer, Johann, Unterdörfl 49, 4362 Bad Kreuzen, Østrig**

(74) Fuldmægtig i Danmark: **Patrade A/S, Ceresbyen 75, 8000 Århus C, Danmark**

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The invention relates to an effect panel having a honeycomb structure forming a first layer and having honeycomb apertures, which extend substantially at a right angle to the layer, and having a second layer spaced apart from the first layer and formed as a glass plate. A glazing of this type is known from DE 86 10 271 U1.

A plate-shaped object consisting of three layers, the middle layer of which is formed as a honeycomb structure plate, is known from document DE 199 00 934 C2 (EP 1 020 585 A1). At least one of the outer layers is formed as a glass plate. Plastic is specified as the material for the honeycomb structure plate. Due to its structure, this object is suitable in particular as a component which can be mechanically loaded, for example, as a tabletop. This object is less suitable for use as a window or façade element, in particular because the two outer layers lie against the honeycomb structure plate and therefore no possibility is provided for ventilating the space between the outer layers and the honeycomb structure plate and thus avoiding the formation of condensed water. This also applies to other known multilayer components (DE 44 45 228 A1), which are assembled from two cover layers made of glass and a middle support layer made of a honeycomb structure plate, which lies against the two cover layers.

The invention is based on the object of proposing an effect panel which is suitable for use as a façade element.

To achieve this object, the honeycomb structure lies against a third layer consisting of wood, and therefore the wood properties can be used for façade elements.

The honeycomb structure can be varied almost arbitrarily with respect to construction and material selection to achieve the respective desired effect. Effect in this context is to be understood not only as the visual impression but rather also other physical effects.

The honeycomb structure can consist of a material containing fibers, in particular cellulose fibers, for example, cardboard. This material is particularly cost-effective to produce and process. Further advantages of the material are that it is a renewable raw material and/or environmentally-friendly disposal is possible because of this fact. However, the honeycomb structure can also consist of film material, in particular plastic or metal film material. Another embodiment provides that the

honeycomb structure is treated using a fire retardant. Such effect panels can be used as fire protection elements. The honeycomb structure can also be formed by pipe segments lying against one another.

A further embodiment provides that the clear width of the honeycomb openings and/or the wall thickness between the honeycomb openings changes over the planar extension of the honeycomb structure. Many types of visual effects may thus be achieved and the mentioned effects with respect to thermal insulation can even vary over the surface of the effect panel. The honeycomb structure can be formed in any desired colors. It is even conceivable to provide the inner surfaces of the honeycomb openings with various colors, and therefore the color of the effect panel appears different when it is observed from various sides.

According to a further embodiment, spacers are provided between the honeycomb structure and the glass plate. The individual layers of the effect panel thus do not necessarily have to be held together by a frame, but rather clamps can be used for this purpose, for example. Furthermore, honeycomb structures having a low rigidity can also be installed thanks to these spacers.

If, according to a further embodiment, the spacers consist of oblong elements, which are embedded in depressions of the honeycomb structure and protrude beyond the plane of the honeycomb structure, the rigidity of the honeycomb structure is enhanced simultaneously.

According to another embodiment, at least one surface of the second layer formed as a glass plate is provided with a surface structure, whereby further design options result.

The three layers can all be enclosed by a frame. In this case, the frame can have openings which enable ventilation of the space between the honeycomb structure and the glass plate.

The frame can consist of diverse materials and profile shapes. If the attachment to the exterior of a building is provided, the resistance has to be ensured and possibly provided ventilation openings have to be designed as sealed against driving rain.

The effect panel according to the invention can be combined with insulating glass plates by the second layer being a layer of an insulating glass plate.

Another aspect of the invention relates to a façade cladding containing effect panels according to the invention. The above-mentioned advantages and design options are also applicable, of course, in the façade cladding.

One embodiment of the façade cladding provides that façade profiles are arranged between the effect panels. These façade profiles can be used in a known manner for fastening the effect panels on the façade.

According to an alternative embodiment of the façade cladding, joints are arranged between the effect panels, which are preferably filled using a plastically moldable material. A façade cladding which appears almost like a uniform surface can be provided by these measures.

The invention will be explained in greater detail hereafter on the basis of the exemplary embodiments illustrated in the drawings. In the figures:

Figure 1 shows one embodiment of an effect panel having three layers,

Figures 2 and 3 show an exemplary embodiment of a honeycomb structure,

Figure 4 shows an exemplary embodiment of a honeycomb structure having reinforcing strips,

Figure 5 shows an exemplary embodiment of a honeycomb structure having reinforcing strips which are simultaneously used as spacers,

Figure 6 shows an exemplary embodiment of a honeycomb structure having T-profiles as spacers,

Figure 7 shows an embodiment of a honeycomb structure having pins as spacers, which does not represent part of the invention,

Figure 8 shows an exemplary embodiment of an effect panel designed as a façade panel according to the invention, and

Figures 9 and 10 show an exemplary embodiment of façade claddings having effect panels according to the invention.

It is to be noted as an introduction that identical parts are provided with identical reference signs and/or identical component designations in the different described embodiments, wherein the disclosures contained in the entire description can be transferred accordingly to identical parts having identical reference signs and/or identical component designations. The position specifications selected in the description, for example, top, bottom, lateral, etc., relate to the immediately described and illustrated figure and are to be transferred accordingly to the new position in the event of a position change.

The exemplary embodiments show possible embodiment variants of the effect panel and the façade cladding, wherein it is to be noted here that the invention is not restricted to the especially illustrated embodiment variants thereof, but rather diverse combinations of the individual embodiment variants with one another are also possible and this possible variation is also within the scope of routine measures of a person skilled in the art active in this technical field on the basis of the teaching on the technical measures by the present invention. Thus, all conceivable embodiment variants which are possible by way of combinations of individual details of the embodiment variants illustrated and described are also comprised by the scope of protection defined by the patent claims.

Figure 1 shows an embodiment of an effect panel having three layers. A first layer 1 in the form of a honeycomb structure is arranged spaced apart by a distance 4 from a second layer 2, which is formed as a glass plate. A glass plate which lies against the honeycomb structure 1 is provided as the third layer 3. The effect panel according to Figure 1 is equivalent in construction to an effect panel according to the invention, but in contrast to an effect panel according to the invention, has a glass plate and not a wood layer as the third layer 3.

Figure 1 furthermore shows, solely by way of example and schematically, a frame which holds together the mentioned layers. A Z-shaped profile 6 encloses the glass plate 2, a spacer profile 8, and the honeycomb structure 1. A terminus profile 9 is fastened on the profile 6 by fastening means 7, for example, screws. Of course, other frame constructions can also be used for holding together the effect panel. The effect panel can also be constructed without a frame, as mentioned above. At least in this exemplary embodiment, high demands with respect to the

strength and rigidity thereof are not placed on the honeycomb structure 1, because it is not loaded by external forces. In order that the honeycomb structure 1 maintains its shape, it can either be formed as sufficiently dimensionally stable or can be reinforced by corresponding inlays, as explained in greater detail hereafter. Alternatively or additionally, the honeycomb structure 1 can also be connected to the layer 3 by adhesive bonding.

For ventilation of the space formed by the distance 4 between the honeycomb structure 1 and the glass plate 2, openings 10 are provided in the frame, in particular in its lower and upper regions, of which only one is visible in Figure 1, specifically in the upper region of the effect panel. An airflow is indicated by an arrow 11, which flows through the mentioned space and thus prevents the fogging of the glass plate 2, for example. However, it is also possible to terminate the entire space between the two glass plates 2 and 3 sealed by a suitable frame, evacuate it, and possibly fill it with a gas. Pure gases such as carbon dioxide or nitrogen, or also gas mixtures, and also noble gases are suitable as the gas. Even air, which is dehumidified as completely as possible beforehand, can be decanted into the evacuated space.

As already mentioned, for example, cardboard can be used as the material for the honeycomb structure 1. Figures 2 and 3 show, by way of example, a honeycomb structure 1 formed from corrugated cardboard, wherein Figure 2 shows a lateral view of corresponding layer 1 and Figure 5 shows a view in the direction of the arrow V in Figure 2. If necessary, the honeycomb structure 1 can be formed or reinforced such that it stands practically loose between the glass plates 2 and 3. Figures 2 and 3 show an option for reinforcing the honeycomb structure 1, consisting in this example of corrugated cardboard. Reinforcement layers 12, which are formed thicker or consist of a different material than the other layers, are incorporated between the layers of the corrugated cardboard.

Figure 4 shows another example of a reinforcement, in which slots are incorporated into the honeycomb structure, for example, milled, into which reinforcing strips 13, which consist of plywood, for example, are laid and are optionally fastened by adhesive bonding. In some cases, it can be sufficient if the slots are filled with a curing material. As Figure 5 shows, the reinforcing strips 13 can also protrude above the surface of the honeycomb structure 1 and in this manner can simultaneously form spacers, which are supported on the layer 2. Figure 6 shows another example of spacers which simultaneously exert a reinforcing function.

These are T-profiles 14, for example, made of aluminum, which are adhesively bonded onto the honeycomb structure 1, for example. In some cases, it can be sufficient to provide spacers which do not reinforce the honeycomb structure 1 and are only supported in a punctiform manner on the layers 2, 3. Figure 7 shows such an example, in which pins 15 arranged in a grid penetrate the honeycomb structure 1 and protrude on both sides. However, this example does not represent a part of the invention. The material of the honeycomb structure 1 can be treated with a fire retardant, and therefore the honeycomb structure is fire-resistant or fire-inhibiting. If the material consists of fibers, it can be impregnated with the fire retardant. However, it is also possible to coat the material with fire retardant or, in the case of plastic, to integrate substances having fire-inhibiting effect into the material.

Exemplary embodiments of a façade cladding which is constructed using effect panels according to the invention will be described hereafter. Figure 8 shows an exemplary embodiment of such an effect panel designed for installation in a façade cladding. The frame identified here with 18 can be embodied as solid as shown in the drawings, alternatively, however, it can also be produced from drawn or extruded profiles. Wood, aluminum, or plastic, for example, come into consideration as the material for the frame 18. As Figure 8 shows, in this exemplary embodiment, the surface of the glass plate 2 arranged on the building exterior (on the left in the figure) is not overlapped by the frame 18. This can be enabled as indicated in the drawing by an adhesive bond between the frame 18 and the glass plate 2. The plate forming the third layer 3 is identified with 19 in this example and consists of wood. In this example, an insulation layer 20 is arranged on the side of the plate 19 facing away from the honeycomb structure 1.

Figures 9 and 10 show two exemplary embodiments of a façade cladding containing effect panels of the above-described type. In both examples, the frames 18 of the effect panels are fastened on pillars 23, which are in turn connected to a building or a building wall (not shown). In the example according to Figure 9, fastening means extend through between the frames 18 of two adjacent effect panels, using which a façade profile 21, possibly with a rubber-elastic part interposed, is tensioned against the glass plate 2. In the example according to Figure 10, the joints between adjacent effect panels are relatively narrow and are filled with a sealing compound 22, as indicated in the figure. Both in the embodiment according to Figure 9 and also that according to Figure 10, rear ventilation of the glass plates 2 can be ensured using appropriately formed openings in the frame.

As a matter of form, it is finally to be noted that for better comprehension of the construction of the effect panel and the façade cladding, these and/or the components thereof were partially shown not to scale and/or enlarged and/or reduced in size.

Patentkrav

1. Effektpanel med en bikagestruktur, der danner et første lag (1) og har bikageåbninger, som strækker sig i det væsentlige vinkelret på laget, hvilket effektpanel har et andet lag (2) i afstand fra det første lag (1) og udformet som en glasplade, **kendetegnet ved, at** bikagestrukturen (1) ligger an mod et tredje lag (3), som består af træ.

2. Effektpanel ifølge krav 1, **kendetegnet ved, at** bikagestrukturen (1) omfatter indbyrdes adskilte forstærkninger (12, 13, 14, 15).

3. Effektpanel ifølge krav 1, **kendetegnet ved, at** forstærkningerne er udformet som forstærkningslister (13), som er indført i modsvarende åbninger i bikagestrukturen (1) og fastgjort ved klæbning.

4. Effektpanel ifølge krav 2, **kendetegnet ved, at** forstærkningerne (13, 14, 15) danner afstandsstykker, som støtter mod glaspladen (2).

Fig. 1

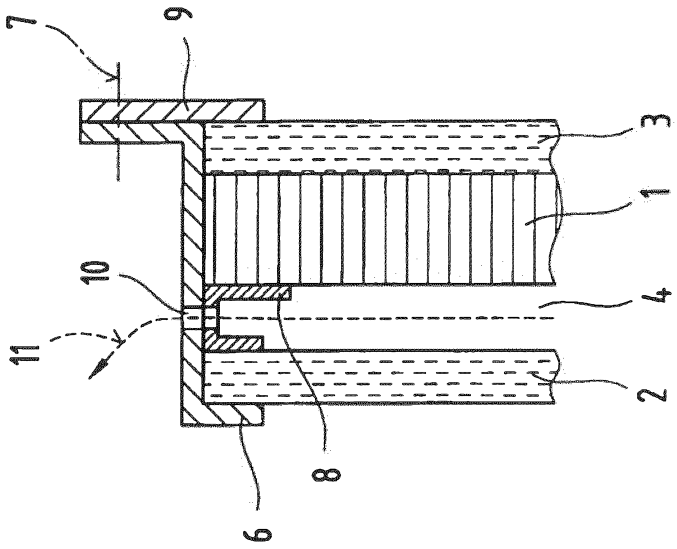

Fig. 3

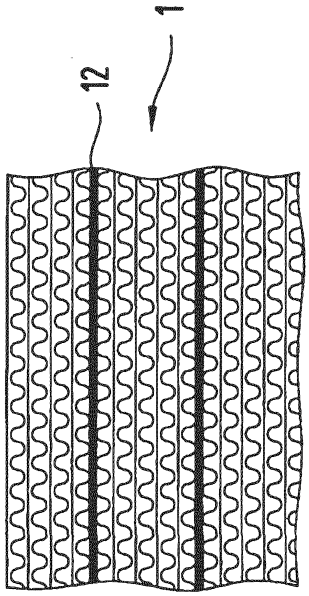

Fig. 2

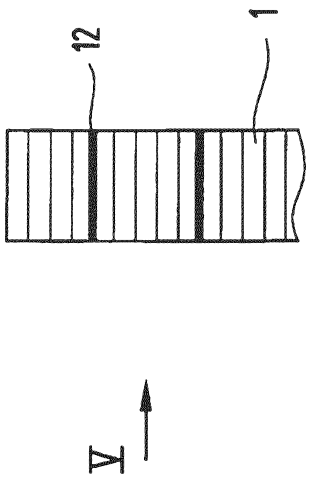

Fig. 7

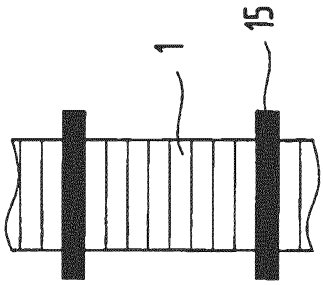

Fig. 6

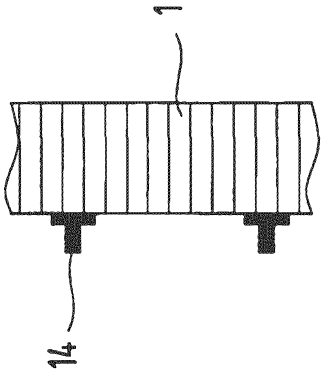

Fig. 5

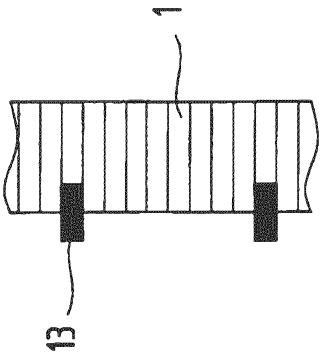

Fig. 4

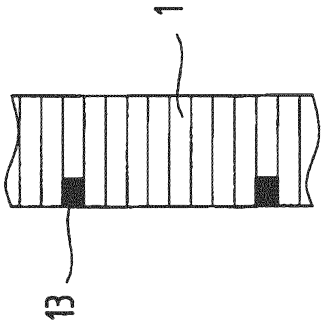

Fig. 10

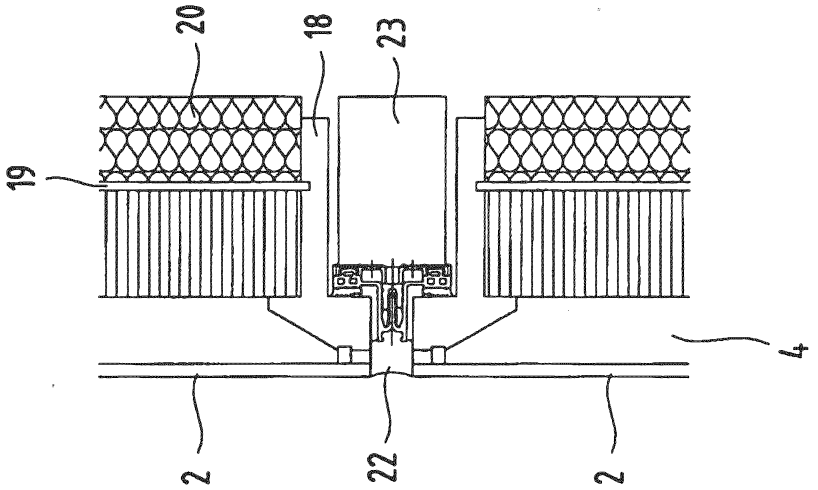

Fig. 9

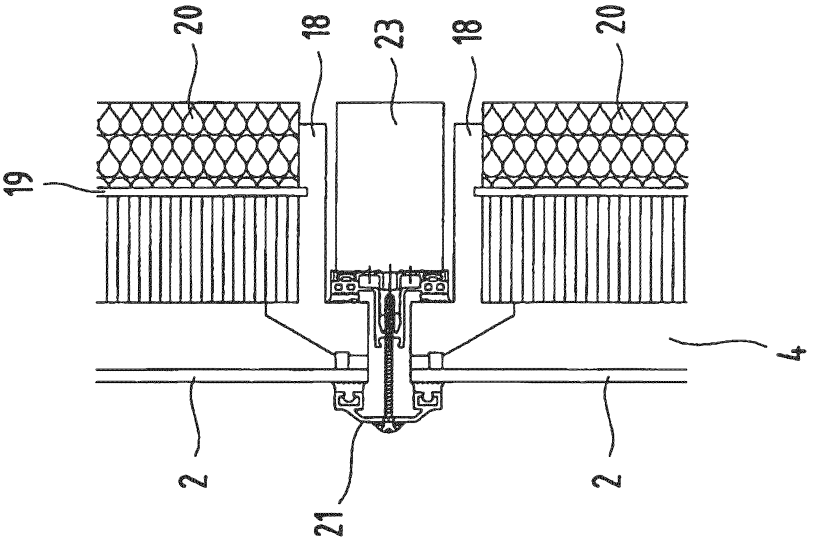

Fig. 8

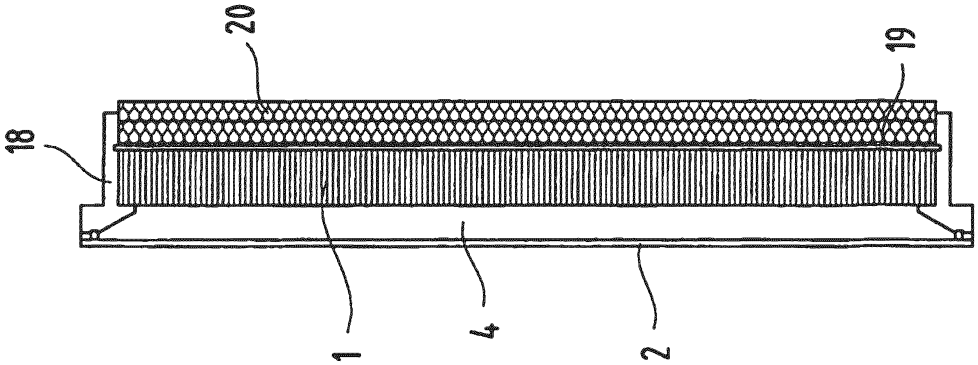

Fig.16

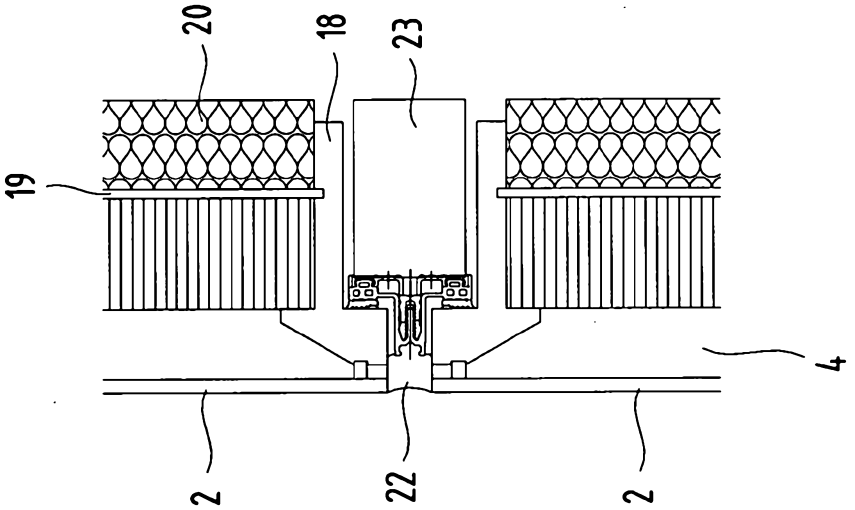

Fig.15

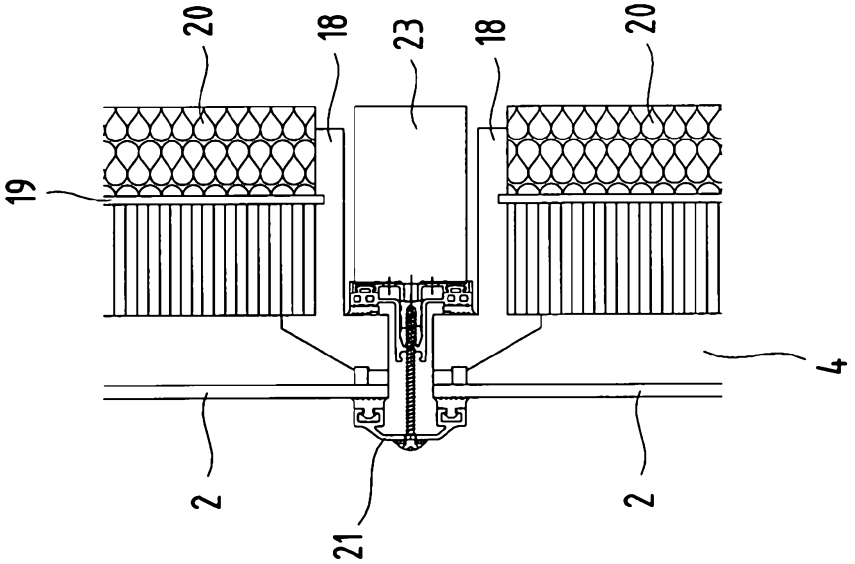

Fig.14