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Burkolóanyag alkalmazása beton építőelemen közvetlen kötéssel

Az európai szabadalom ellen, megadásának az Európai Szabadalmi Közlönyben való meghirdetésétől számított kilenc hónapon belül, felszólalást lehet benyújtani az Európai Szabadalmi Hivatalnál. (Európai Szabadalmi Egyezmény 99. cikk(1))

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USE OF A COATING MATERIAL FOR DIRECT CONNECTION TO A
CONCRETE STRUCTURE

DESCRIPTION

[0001] The invention relates to the use of a coating material for direct, form-fitting bonding to a concrete structure, comprising a layer of at least one polymer with a first surface for contact and connection to the concrete structure, wherein this surface has a surface structure.

[0002] Concrete components are provided with polymer layers for a wide variety of reasons. In particular, these polymer layers should, on the one hand, protect the concrete component itself from ambient influences in order to thereby obtain a longer useful lifetime of this concrete component. On the other hand, however, it is frequently also necessary to prevent direct contact of the concrete component with the surroundings, i.e., to protect the surroundings.

[0003] For these purposes, paints made of polymer dispersions are used, on the one hand. However, these have the disadvantage that they must be applied on-site, i.e., on installation of the concrete component, so this reduces the degree of prefabrication of the concrete component.

[0004] There are also known composite systems, in which a concrete component is bonded using an elastomer layer. For example, it is known from railway track construction that concrete ties may be provided with a so-called undertie pad. When there is a load on the rail system, the high pressure stresses in the gravel result in destruction of the gravel and deterioration of the track position. The reason for this is that the

gravel stones come in contact with the concrete ties only in some spots in the installed state so that great local stresses occur when rail vehicles travel over these contact surfaces. Due to the use of undertie pads, which must have sufficient elastic properties, the compression stress on the gravel can be reduced, in particular in the area of contact between the tie and the gravel, because the contact surface area is greater in this way than is possible with the gravel pebbles to penetrate into this undertie pad, as is the case with wooden ties, which are already sufficiently "elastic" to allow the pieces of gravel to penetrate into the undertie pad. In addition, however, this undertie pad also acts as noise abatement because it reduces direct further transfer of sound waves from the concrete tie into the gravel bed.

[0005] In all cases in which a concrete structure is provided with an elastomer mat, it is thus important that this elastomer mat has sufficiently good adhesion to the concrete component to prevent delamination. One possibility for achieving this, for example, is to adhesively bond the elastomer mat to the concrete component. However, it can then happen that this adhesive layer softens at elevated temperatures, thereby reducing the adhesive strength of the elastomer mat to the concrete component.

[0006] In addition, it is known from the state of the art that such elastomer mats can be joined to the concrete component by mechanical fastening means.

[0007] Thus, for example, DE 202 15 101 U describes a rail tie with a concrete body and at least one elastic plastic layer arranged on the bottom of the concrete body. A layer of tangled fibers, in particular a nonwoven layer, preferably a geotextile layer, which

adheres to the concrete of the concrete body and is bonded at the surface to the at least one elastic plastic layer, is provided between the concrete body and this plastic layer. The fibers of this intermediate layer are used here to achieve a mechanical anchoring in the concrete component by means of these fibers, wherein a micro-form fit is achieved. However, one disadvantage here is that another layer is required for providing the elastomer layer.

[0008] Concrete ties which are manufactured as semifinished parts with mounting grids are known from the company brochure "Ties with Undertie Pads in Ballasted Track" from "Getzner Werkstoffe" [Getzner Materials]. The mounting grid, which is integrated into the undertie pad, serves to fasten the bed to the ties. It is vibrated while the ties are being introduced into fresh concrete during production of the ties. However, this in turn necessitates increased effort in production of the undertie pad itself.

[0009] DE 10 2004 011 610 A describes a method for manufacturing a composite system between concrete and a high-polymer elastic material. The high-polymer elastic material is provided with a specially produced geometric surface modification as an original form in the injection molding process or by means of pressing, this original form being molded as nubby or ribbed elevations. After cooling the original mold, the nubby and/or ribbed elevations are remolded with a light pressure to form mushroom-shaped and/or T-shaped and/or cropped elevations using a hot reforming tool. The elevations therefore have a larger diameter in the upper region. This is also in turn associated with a multilayer production process.

[0010] US 2006/0097064 A1 discloses an elastomer coating material for placement beneath a railway tie. This coating material has continuous channels, on the one hand, while, on the other hand, having web-type elevations with an approximately T-shaped cross section. This document discloses the use of a coating material having the features of the preamble of claim 1.

[0011] DE 200 14 999 U1 describes a concrete tie for railway engineering in which a concrete body and an elastic plate material made of a high-polymer material are situated in contact with one another and bonded to one another. The sheet material is bonded in a form-fitting manner to the concrete body by means of a geometric surface modification. The geometric surface modification is formed by protruding nubs.

[0012] EP 0 049 879 A1 describes a tie boot or sleeper cover made of rubber, wherein recesses are molded into the surface of this railway tie cover which faces the rail tie. These recesses may be channel-shaped and/or there is the possibility that the recesses are also molded in addition to elevations in the form of a nubby and/or rectangular, i.e., quadrilateral cross section.

[0013] DE 27 01 597 A1 describes a flexible underlayment sheet for the rail track constructions or superstructure systems, in particular for ballast for the track, this underlayment being made of rubber or rubber-like elastic plastics. Such a sheet has hollow ribs running on its underside, parallel to one another, with mutual spacings over the entire width, each with a web formed in the interior, starting from the interior space cover facing the underside of the sheet and extending freely over essentially the entire length of the hollow ribs in the direction of the interior space

bottom in a stress-free state without contact with same.

[0014] EP 0 105 950 A1 describes a mat made of an elastic material for use beneath a gravel bed, wherein this mat has on its surface a sheet metal of such hardness and elasticity that the gravel cannot penetrate into the mat. Nubs, protrusions or the like may be provided on the underside of the mat.

[0015] DE 35 24 719 A1 describes a protective layer for an elastic rail bed mat consisting of a single layer or multilayer sheet of elastomeric materials disposed beneath a gravel bed, wherein the sheet has cavities and/or nubs. A protective layer made of a nonwoven, a woven fabric, an elastomer or a rubber-like plastic, whose strain capacity and compression resistance are selected so that penetration of the gravel will not result in destruction of the mat, is arranged on the side of the rail bed mat facing the gravel bed.

[0016] DE EP 0 833 008 A1 describes a foot plate for a railway tie made of concrete. On the one hand, a support plate, the top side of which is enclosed in concrete, is provided with means for anchoring it in the railway tie and with means for venting air trapped in the railway tie when casting the concrete. On the other hand, this support plate is provided with an elastomer coating, which is connected to at least the underside of the plate.

[0017] The object of the invention is to create the possibility of easily connecting a coating material to a concrete component.

[0018] The object of the invention is achieved by the use defined in the introduction, in which the surface structure is formed by at least approximately channel-shaped recesses and/or at least approximately channel-shaped elevations, wherein the at least approximately channel-shaped recesses and/or elevations are formed in the manner of a tube profile running at least approximately parallel to the surface, to produce the form fit. It is advantageous here that the concrete can flow into these recesses and/or elevations over a large area in the form of possibly continuous, i.e., uninterrupted, channels and thus a large surface area is made available to form the connection. It is also advantageous that this coating material can be produced continuously, so that no additional reforming steps and/or processing steps are necessary before connecting it to the concrete component, so that corresponding cost advantages can be achieved. Furthermore, the connection is accomplished essentially through mechanical measures on the coating material, so that it is not necessary to take into account special material compatibility issues with regard to the concrete component.

Due to the design of the at least approximately channel-type recesses and/or elevations in the manner of a tube profile running at least approximately parallel to the surface, it is possible, on the one hand, by avoiding sharp-edged transitions, to facilitate the flow of concrete material and to increase the degree of filling of the channels while, on the other hand, a type of loop formation and/or a form fit is achieved with the "elevation" embodiment, so that the concrete material that has flowed into the channels is surrounded by and enclosed in the polymer of the coating material over a large area in the region of these channel segments. This achieves a further

improvement in the connecting system, i.e., the pull-out strength of the coating material.

[0019] The channel-type recesses may also extend into the end face(s) of the coating material, and it is possible for these recesses to be designed, so that they are closed in the region of the end faces, i.e., rolled together.

[0020] It is also possible that the at least approximately channel-shaped recesses and/or elevations are interrupted in the direction of their longitudinal extent to form channel subsections. Thus, also the formation of a connection to the concrete component is improved in particular when the end faces in the case of channel-type recesses also have an undercut, for example, in the form of "elongated pores," and/or in the case of the channel-type elevations, this additionally achieves the result that the concrete material can flow more easily into these channels.

[0021] To improve the flow effect for the concrete material it is possible to provide that the channel subsections have a length, which is selected from a range with a lower limit of 30 % and an upper limit of 70 % of the total length of these channel-type recesses and/or elevations forming the channel subsections. It is thus also possible to achieve the result that in the case of faulty connections that might occur, they can be limited to a narrower region.

[0022] To improve these effects, these channel subsections may have a length which is selected from a range with a lower limit of 35 % and an upper limit of 65 % of the length of the channel-type recesses and/or elevations forming the channel subsections, in particular a length selected from a range with a lower

limit of 40 % and an upper limit of 60 % of the total length.

[0023] In particular these channel segments may have a length which is selected from a range with a lower limit of 1 mm and an upper limit of 100 mm in conjunction with these effects. It is also possible for these channel subsections to have a length selected from a range with a lower limit of 10 mm and an upper limit of 80 mm, in particular selected from a range with a lower limit of 20 mm and an upper limit of 50 mm.

[0024] It is advantageous if the tubular profiles are designed to protrude beyond the surface, so that again a better flow of concrete material into the profiles is achieved.

[0025] The at least approximately channel-type recesses and/or elevations in the manner of a tubular profile may have a height above the surface of the layer, which is selected from a range with a lower limit of 2 mm and an upper limit of 20 mm. Below 2 mm, the diameter of the channels is too small in the case of the elevations, so that the flow of concrete material into the channels is again made difficult. Above 20 mm, in particular in the case of elastomeric embodiments of the coating material, it may happen that the cross section of these channels undergoes changes while the concrete material is flowing into them and the surface structure, which is designed with a loop shape, may optionally be compressed to the extent that the effect of the flow of the concrete material is entirely prevented.

[0026] At least individual ones of the at least approximately channel-type recesses and/or elevations

may have a height which is different from that of the additional recesses and/or elevations in the coating material, which are at least approximately channel-shaped, thereby facilitating the ventilation during the penetration of the concrete material onto this coating material.

[0027] According to one embodiment variant, it is possible to provide that a second surface, opposite the first surfaces of the layer, is also designed with a surface structure, so that another concrete component can be bonded to this coating material by means of this additional surface and thus the coating material can act as a buffer between these two concrete components.

[0028] It is advantageous if this coating material has a density gradient with an increasing density in the interior of the layer of the coating material.

[0029] To improve the bonding properties of the coating material, the at least approximately channel-type recesses and/or elevations of a linear embodiment may also be arranged so that they are distributed at right angles to an external lateral edge, in a zigzag pattern and/or in a curved and/or wavy shape above the first and/or second surface. For example, in conjunction with the channel subsections, a type of chessboard pattern may be formed between the elevations and the channel subsections, by the fact that the channel subsections run at least approximately at a right angle to the elevations. On the other hand, it is also possible that the channel subsections have a course relative to the elevations that is different from 90° , for example, is selected from a range with a lower limit of 10° and an upper limit of 85° , in particular from a range with a lower limit of 20° and an upper limit of 75° , for example, selected from a

range with a lower limit of 30° and an upper limit of 65°. Thus the distribution of forces in the connecting region of the coating material/concrete component can be varied accordingly.

[0030] The elevations and/or recesses may be bordered by straight side walls. On the other hand, it is also possible that at least individual ones, preferably all of these walls, have a crowning.

[0031] The at least approximately channel-shaped recesses and/or elevations may have a round, oval, mushroom-shaped, T-shaped, triangular, rectangular or polygonal cross section, depending on the required adhesive strength of the coating material to the concrete component and/or for adaptation of different strength classes of the concrete and/or the stiffness of the concrete during the cementing process.

[0032] In this context, it should be pointed out that, with regard to the arrangement of these recesses and/or elevations and/or embodiments of same, multiple different variants, for example, recesses and/or elevations with a round and/or oval and/or mushroom-shaped and/or T-shaped and/or triangular and/or rectangular and/or polygonal cross sections may be implemented in a coating material.

[0033] The coating material may be formed from an elastomer or a thermoplastic polymer. This permits a corresponding adaptability for a wide variety of different intended purposes of the coating material.

[0034] In particular the elastomer may be selected from a group consisting of natural rubber (NR), styrene-butadiene rubber (SBR), ethylene-propylene-diene rubber (EPDM), butadiene rubber (BR), nitrile

rubber (NBR), chloroprene rubber (CR), chlorosulfonated polyethylene (CSM) and polyurethane (PUR) as well as cuts or blends thereof. These elastomers are suitable in particular for continuous production of the coating material and also have a corresponding vibration and/or damping behavior. Furthermore, hard impacts with the concrete component from any side where the coating material is arranged can be prevented, so that the concrete component is better protected from destruction.

[0035] Mixtures and/or cuts of natural rubber and/or styrene-butadiene rubber and/or ethylene-propylene-diene rubber and/or butadiene rubber and/or nitrile rubber and/or chloroprene rubber and/or chlorosulfonated polyethylene and/or polyurethane with natural rubber and/or styrene-butadiene rubber and/or ethylene-propylene-diene rubber and/or butadiene rubber and/or nitrile rubber and/or chloroprene rubber and/or chlorosulfonated polyethylene and/or polyurethane may be used in particular.

[0036] The coating material, i.e., its base body, may be formed from a thermoplastic material, for example, polyethylene (PE), ultra-high-molecular polyethylene (UHMW-PE), polypropylene (PP), an ethylene-vinyl-acetate copolymer (EVA), a polyamide (PA), polyvinyl chloride (PVC), polyethylene terephthalate (PET), a polyurethane (PUR), polytetrafluoroethylene (PTFE) or a thermoplastic elastomer (TPE). Here again, mixtures of the thermoplastic materials are also possible, such as polyethylene and/or ultra-high-molecular polyethylene and/or polypropylene and/or ethylene-vinyl-acetate copolymers and/or polyamide and/or polyvinyl chloride and/or polyethylene terephthalate and/or polyurethane and/or polytetrafluoroethylene and/or a thermoplastic elastomer with polyethylene and/or ultra-high-molecular

polyethylene and/or polypropylene and/or ethylene-vinyl-acetate copolymers and/or polyamide and/or polyvinyl chloride and/or polyethylene terephthalate and/or polyurethane and/or polytetrafluoroethylene and/or a thermoplastic elastomer.

[0037] The base body may be a solid material or may be foamed, such as an EPDM foam. It is also possible that the base body is provided with a reinforcement such as a metallic material, for example, steel, brass or the like and/or a fiber material, in particular in the form of short fibers with a fiber length, which is selected, for example, from a range with a lower limit of 5 mm and an upper limit of 50 mm. The fibers, for example, staple fibers, may be selected from a group consisting of textile fibers, polyethylene fibers, polypropylene fibers, polyamide fibers, polyacrylonitrile fibers and polyester fibers, but mixtures of these types of fibers are also possible. The fibers may also be distributed at least approximately homogenously in the base body and/or it is possible to implement the distribution in the form of a gradient.

[0038] The reinforcement may also be formed over a large area, in the form of a rod or mesh.

[0039] The coating material may have at least one chamber, which forms a cavity through which the vibration properties and/or noise abatement properties of the coating material can be influenced in a controlled manner. In addition, the compressibility of this coating material can also be influenced in this way. The chamber may be designed to be open or closed.

[0040] For the noise abatement properties, it is advantageous if the chamber is filled at least

partially with at least one filling material, for example, forming a so-called "spring-mass system."

[0041] The cavity on the end face(s) may be designed to be open. Within the scope of the invention, it is also possible to seal at least one of the end openings and/or to design it to be sealed, for example, by gluing the side walls of the chambers together in this region or rolling them together.

[0042] The filling materials may be selected from a group comprising granules, knit fabrics, powders, pastes and/or mixtures thereof.

[0043] The layer of the coating material may have a layer thickness selected from a range with a lower limit of 2 mm and an upper limit of 50 mm. In particular this layer thickness may be selected from a range with a lower limit of 5 mm and an upper limit of 40 mm, preferably from a range with a lower limit of 3 mm and an upper limit of 20 mm. corresponding damping properties, in particular sound absorbing properties of the layer, can thus be achieved in this way.

[0044] The layer itself may be designed in one piece with corresponding advantages with regard to the production of the coating material and/or it is possible for this base body to be connected to at least one additional layer, for example, a cover layer, which has different properties in comparison with the present layer, so that again, for example, the embodiment of a "spring-mass system" can be achieved for noise abatement purposes. A better resistance to abrasion can be imparted to the coating material and/or lubricating properties can be imparted to the railroad undertie pad with this layer in this way.

[0045] The surface of the layer facing outward may be designed to be smooth and/or closed. It is also possible for this surface to also have a surface structure, for example, in the form of elevations and/or recesses and/or pores.

[0046] It is also possible for the surface facing the base body of the coating material to be designed to be smooth or to have a surface structure.

[0047] It is advantageous in particular if the additional layer is softer in comparison with the first layer, so that the connection to the concrete component is established via the hard layer of the coating material and this connection is more durable in comparison with soft elastic layers, in particular because the surface structure in this way is not compressed by the concrete flowing into the structure and the noise abatement properties can be influenced accordingly via the soft layer.

[0048] It is thus possible that this additional layer is formed by an additional polymer, in particular an additional elastomer, preferably selected from the elastomers listed above (NR, SBR, EPDM, BR, CR, CSM, PUR) and/or it may also be formed by a fiber material. Due to its softness and/or its design as a soft polymer, thus a larger contact surface area between the gravel bed and the tie is thus possible even with the embodiment variant of the undertie pad so that again the individual pebbles of gravel can be protected better from destruction.

[0049] The fiber material may be formed here by a knit fabric in the form of a nonwoven or felt or by a woven fabric and/or a cord. Thus, a good bonding and adhesion of this additional layer to the first layer, i.e., the

basic body of the coating material can be achieved, for example, again through mechanical anchoring of the fibers of the additional layer in the first layer, for example, in that the first layer is extruded onto the additional layer so that these fibers can penetrate into the material of the first layer which is still soft and/or they can flow into the interspaces in the woven fabric when in the free-flowing state of the material for the first layer.

[0050] For the resistance to environmental influences and/or for the mechanical load-bearing strength of this laminated material, it is advantageous if the fiber material comprises fibers selected from a group consisting of polyethylene, polypropylene, polyamide, polyacrylonitrile and polyester fibers, wherein here again, blends of these types of fibers are also possible. For example, blend fiber materials comprising approximately 50 % polyethylene and approximately 50 % polyamide and/or polyester fibers are possible in order to influence the temperature behavior of this fiber material, for example. Other compositions in addition to this 50/50 composition are of course also possible.

[0051] This additional layer may also be formed from a thermoplastic material, for example, polyethylene (PE), ultra-high-molecular polyethylene (UHMW-PE), polypropylene (PP), an ethylene-vinyl-acetate copolymer (EVA), a polyamide (PA), polyvinyl chloride (PVC), polyethylene terephthalate (PET), polyurethane (PUR), polytetrafluoroethylene (PTFE) or a thermoplastic elastomer (TPE). Here again, a blend of the thermoplastic materials is also possible, such as, for example, polyethylene and/or ultra-high-molecular polyethylene and/or polypropylene and/or ethylene-vinyl-acetate copolymers and/or polyamide and/or polyvinyl chloride and/or polyethylene terephthalate

and/or polyurethane and/or polytetrafluoroethylene and/or a thermoplastic elastomer with polyethylene and/or ultra-high-molecular polyethylene and/or polypropylene and/or ethylene-vinyl-acetate copolymers and/or polyamide and/or polyvinyl chloride and/or polyethylene terephthalate and/or polyurethane and/or polytetrafluoroethylene and/or a thermoplastic elastomer.

[0052] At least one layer may be a solid material or may be foamed.

[0053] For better ventilation during the concreting process, the coating material may have at least one, preferably a plurality of recesses permeating this layer or these layers.

[0054] Similarly good adhesion properties and/or bonding properties are achieved when the at least approximately channel-type and/or pore-shaped recesses and/or at least approximately channel-type elevations extend over a portion of the surface and/or surfaces which is/are selected from a range with a lower limit of 20 % and an upper limit of 80 %, based on the total extent of the surface. In particular this amount may be selected from a range with a lower limit of 30 % and an upper limit of 70 %, preferably with a lower limit of 40 % and an upper limit of 60 %.

[0055] With regard to the improvement in preventing the deformation of these surface structures in the area of the formation of the connection to the concrete component, the coating material may have a static modulus of subgrade reaction according to DIN 45673-1 (stiffness per unit of area), which is selected from a range with a lower limit of 0.01 N/mm^3 and an upper limit of 0.5 N/mm^3 , at least in this connecting region.

The modulus of subgrade reaction can be selected in particular from a range with a lower limit of 0.05 N/mm^2 and an upper limit of 0.3 N/mm^2 , for example, from a range with a lower limit of 0.08 N/mm^2 and an upper limit of 0.25 N/mm^2 .

[0056] The coating material may have a groove in a first boundary region and may have a tongue and groove connection in a second boundary region in order to be able to cover continuously a larger surface area with the coating material.

[0057] In addition the coating material may have a crowned surface to form a ventilation system to allow the escape of air enclosed during the concreting process.

[0058] For a better understanding of the invention, this will now be described on the basis of the following figures, which are not to be seen as restricting the scope of protection of the invention.

[0059] They each show in a schematically simplified diagram:

Fig. 1: a composite system in cross section, consisting of the coating material and a concrete component to which it is bonded;

Fig. 2: an embodiment variant of the composite system according to Fig. 1 in cross section;

Fig. 3: another embodiment variant of the composite system according to Fig. 1 in cross section;

Fig. 4: a first embodiment variant of the coating material in an oblique view;

Fig. 5: the top view of a coating material with a schematic indication of surface structures distributed over the surface of the coating material;

Fig. 6: an embodiment variant of Fig. 5;

Fig. 7: an embodiment variant of Fig. 5;

Fig. 8: various forms of the surface structures;

Fig. 9: a composite system consisting of a coating material and two concrete components arranged on it, shown in cross section;

Fig. 10: the design of the composite system as a undertie pad;

Fig. 11: a composite system consisting of two ties connected to one another via the coating material;

Fig. 12: an embodiment variant of the composite system in cross section;

Fig. 13: an embodiment variant of the composite system in cross section;

Fig. 14: a coating material with chambers incorporated in cross section;

Fig. 15: a coating material design in multiple parts in cross section;

- Fig. 16: a coating material not according to the invention designed as a foam in cross section;
- Fig. 17: an embodiment variant of the coating material consisting of a foam layer with surface structures in cross section;
- Fig. 18: an embodiment variant of the coating material;
- Fig. 19: shows the coating material according to Fig. 18 in a view from above, in a sectional view according to line 18-18 in Fig. 18;
- Fig. 20: an embodiment variant of the coating material as channel-type recesses running obliquely in a view from above;
- Fig. 21: an embodiment variant of a coating material in side view with crowned side surfaces of the web-type elevations;
- Fig. 22: an embodiment variant of a coating material in front view with crowned side surfaces of the web-type elevations;
- Fig. 23: an embodiment variant of a coating material in front view with crowned side surfaces of the web-type elevations;
- Fig. 24: an embodiment variant of a coating material in front view with wavy side surfaces of the web-type elevations;

Fig. 25: an embodiment variant of a coating material in front view with a tongue and groove design.

[0060] It should be pointed out by way of introduction that the same parts are labeled with the same reference numerals and/or the same component designations in the different specific embodiments described below, wherein the disclosure content contained in the entire description can logically be applied to the same parts having the same reference numerals and/or the same component designations. The positions statements such as top, bottom, lateral, etc. selected in the description are also based on the figures which are described and illustrated below, and when there is a change in position they are to be applied logically to the new position. In addition individual features or combination of features from the different exemplary embodiments described and illustrated below may also constitute independent inventive approaches or approaches according to the invention.

[0061] It should also be pointed out that surface structures described below having at least approximately channel-type recesses and/or at least approximately channel-type elevations which are not designed in the manner of a tubular profile running at least approximately parallel to the surface to establish the form fit are not covered by the scope of protection of the claims.

[0062] Fig. 1 shows a composite system 1 comprising a coating material 2 as well as a concrete component 3. The coating material 2 has a surface structure 5 on a first surface 4 which faces the concrete component 3. This coating material 2 is connected to the concrete component 3 via this surface 4 and the surface

structure 5, in particular being connected in a form-fitting and/or force-locking manner.

[0063] The surface structure 5 in this embodiment variant of the composite system 1 is designed in the form of channel-type elevations 6 which protrude above the surface 4. The surface structures 5 are designed as loops - as seen in cross section - so that the channels 7 are formed. These channels 7 are filled at least largely with the concrete of the concrete component 3, which thus forms a mechanical anchoring of the coating material 2 on the concrete component 3.

[0064] Fig. 2 shows an embodiment variant of the composite system 1. This again consists of the coating material 2 and the concrete component 3. In comparison with the concrete component 3 according to Fig. 1, the concrete component according to Fig. 2 is designed to be larger than the coating material 2, which should thus illustrate the point that it is not absolutely necessary within the context of the invention for the coating material 2 and the concrete component 3 to have the same dimensions with respect to their height and/or width - as seen in cross section. Instead, concrete components 3 having any desired shape may be joined to the coating material 2, as is also shown in Fig. 3.

[0065] It is also not absolutely necessary for the connecting surface between the coating material 2 and the concrete component 3 to be designed to be planar. It may equally be domed, polygonal, etc.

[0066] The surface structure 5 in this embodiment variant is designed as at least approximately channel-type recesses 8, i.e., depressions in the coating material 2 in a layer 9 forming this coating material as the base body of the coating material 2. The cross

section of these at least approximately channel-type recesses 8 is designed to be essentially rectangular, wherein undercuts 10 are formed in the region of the surface 4 of the coating material 2, so that the cross section of these channel-type recesses 8 becomes wider in the area near the surface in the direction of the core 11 of the layer 9.

[0067] The channel-type recesses 8 in this embodiment variant of the composite system 1 run at least approximately parallel with regard to their longitudinal extent to the surface 4 of the coating material. This pattern may also be embodied formed in all the other variants of the invention.

[0068] In the case of the embodiment variants of the composite system 1 according to Fig. 3 which are not claimed for the invention, the surface structure 5 is also designed in the form of at least approximately channel type recesses 8 wherein these recesses 8 run at least approximately vertically to the surface 4 of the coating material 2 in contrast with the embodiment variant according to Fig. 2.

[0069] These recesses 8 may have different cross sections, for example, round, oval, quadrilateral, rectangular or polygonal.

[0070] The composite system 1 is suitable for a wide variety of applications. On the one hand, for example, it is thus possible to line containers that are made of concrete in biogas installations and/or sewage treatment facilities, so that protection is provided for the concrete since the media contained in these facilities very often have a corrosive effect on concrete, in particular steel-reinforced concrete. It is also conceivable to line water pipes, for example,

with such coating systems so that these water pipes can be used for a longer period of time. This also applies to water tanks.

[0071] On the other hand, it is also possible to design the concrete components 3 as noise abatement walls, for example, and/or as protective walls in general, wherein the surface of these protective walls facing the traffic may be furnished with the coating material 2 in order to provide a certain amount of protection in the event of a crash of a passenger vehicle and/or to ameliorate the consequences of such a crash.

[0072] Seals on balconies or terraces to prevent the penetration of moisture are also possible with this composite system. In this case, it is advantageous if the coating 2 is arranged with an offset by a certain length with respect to the concrete component 3 so as to result in an overlap region, which can be designed to overlap with another concrete component so that abutting joints of the concrete components 3 are covered by the coating material 2. This offset may be designed to be linear, on the one hand, but may also be two-dimensional.

[0073] It is also possible to produce strain joints with the coating material according to the invention, as will be described in greater detail below, when the coating is provided on these two concrete components 3 and they are joined to one another.

[0074] Finally, embodiments in the form of undertie pads and concrete ties are also possible, wherein these concrete ties may be embodied as simple ties, as frame ties, ear ties, U ties, etc.

[0075] In all these applications, it is advantageous that the stability of the concrete can be increased without any additional coating agent. In addition, in the case of undertie pads, this also offers an opportunity to reduce the load on the gravel bed, as explained in the introduction.

[0076] In the embodiment variant according to Fig. 3, it is shown with dash-dot lines that the channel type recesses 7 may be provided with a bead 12 on the end protruding into the concrete component 3 in order to thereby form a type of undercut and increase the adhesive strength of the concrete to the coating material 2. This bead 12 may have any cross section.

[0077] Within the context of the present invention it is also possible to provide such beads 12 in other embodiment variants.

[0078] Fig. 4 shows an embodiment variant of the coating material 2 in comparison with the coating material 2 according to Fig. 1. The at least approximately channel-type elevations 6 which are designed again in the form of blades - as seen in cross section - are not designed as continuous channels 7 but instead are separated at predeterminable intervals, forming channel subsections 13. These again protrude above the surface 4 of the coating material 2.

[0079] This design with channel subsections 13 makes it easier for the liquid concrete mixture to penetrate into the channels 7 of the channel subsections 13.

[0080] These channel subsections 13 may be designed to be arranged in rows side by side or as shown in Fig. 4 may be arranged with an offset from one another within two neighboring rows.

[0081] Figs. 5 through 7 show possible distributions of the at least approximately channel-type elevations 6 and/or recesses 8 over the surface 4 of the coating material 2.

[0082] It should be pointed out that within the context of the invention it is of course possible to provide both the at least approximately channel-type elevations 6 and the at least approximately channel-type recesses 8 on this surface 4.

[0083] As shown in Fig. 5, these recesses 8 and/or elevations 6 may also have a zigzag shape or may be designed in the shape of an arrow, as shown in Fig. 6, or in a mixture arranged in a linear and arc-shaped fashion over the surface 4 of the coating material 2.

[0084] The variants shown here represent only a few possible embodiments and other geometries are of course also conceivable within the context of the invention.

[0085] Fig. 8 shows a cross section through a coating material 2, which shows a wide variety of examples of possible cross sections as the surface structure 5 for the elevations 6, which are at least approximately channel-shaped. These elevations 6 may thus be at least approximately square and/or at least approximately trapezoidal or at least approximately oval and/or at least approximately round and/or at least approximately T-shaped and/or polygonal, such as, for example, at least approximately octagonal, or designed to be octagonal, as seen in cross section, so that the above-mentioned channel 7 is situated in the interior of these elevations.

[0086] These cross sections and/or examples of such cross sections of channels 7 may be used for continuous elevations 6, i.e., elevations 6 extending on the surface 4 without interruption as well as for the channel subsections 13 according to Fig. 4.

[0087] Within the context of the invention there is of course also the possibility of designing these cross sections for the recesses 8, for example, according to Fig. 2 and/or 3. Likewise, a distribution according to the example shown in Figs. 5 to 7 for such cross sections over the surface 4 of the coating material 2 is also possible.

[0088] As additionally indicated with dash-dot lines in Fig. 8, there is the possibility within the context of the invention to design a second surface 14 of the coating material 2 with such at least approximately channel-type elevations 6. Likewise this second surface 14, which is designed to be opposite the first surface 4 may have corresponding recesses 8 (not shown) and/or combinations of recesses 8 and elevations 6.

[0089] In addition within the context of the invention there is also the possibility of providing additional surfaces of the coating material 2 with such surface structures 5.

[0090] Fig. 9 shows one possible application of the coating material 2 in which a concrete component 3 and/or a concrete component 15 is/are arranged both on the first surface 4 and on the second surface 14 and is/are connected to the coating material 2 via the surface structure 5 designed as the at least channel-type elevations 6 in this case. Thus, the coating material may act as a buffer between these two concrete components 3, 15, for example, and/or may also function

to prevent and/or reduce structure-borne sound transmission at the same time.

[0091] Fig. 10 shows an application case of the coating material 2, in which the concrete component 3 is designed as a concrete tie and thus the coating material 2 forms a so-called undertie pad in order to thereby reduce possible gravel pressing due to wheel loads onto the gravel bed via the concrete tie. This figure shows schematically a rail line 16, which is arranged on the top side of the concrete component 3 which is designed as a concrete tie.

[0092] Although an at least approximately loop-type design of the surface structure 5 (as seen in cross section) is again provided in this application example, all other cross-sectional variants which have already been shown and/or which are also conceivable and implementable in the context of the invention are naturally also included and can thus be replaced by these loop-type surface structures 5 and/or also replaced by corresponding recesses.

[0093] Fig. 11 also shows the application case of a concrete tie, but in this embodiment variant the coating material 2 serves to connect two concrete components 3, 15 in the form of concrete ties, in accordance with the specific embodiment according to Fig. 9, in order to thus create a connection between the concrete ties having shear strength but flexural elasticity.

[0094] Although not shown here, it is of course also possible with this embodiment variant to provide the coating material 2 on the bottom side of the concrete ties as a undertie pad in accordance with the embodiment variant according to Fig. 10.

[0095] The embodiments relate to the cross sections of the elevations 6 and/or recesses 8 according to Fig. 10, which are also applicable here.

[0096] Figs. 12 and 13 show several different embodiments of cross sections for the at least approximately channel-type recesses 8, wherein these work together with elevations 6 to ensure a better anchoring of the coating material 2 on the concrete component 3.

[0097] As can be seen in these two figures, the cross sections of the at least approximately channel-type recesses 8 may be designed to vary over the course of the surface 4 of the coating material 2 and/or these cross sections of the recesses 8 may also change completely.

[0098] The elevations 6 in this embodiment variant are arranged over the surface 4 in such a way that they partially intersect with the recesses 8 so that they also constitute a type of undercut 10 of the recesses 8 and thus contribute toward a better anchoring of the concrete in the coating material 2. These elevations 6 may be designed to be mushroom-shaped, for example, or they may also be oval, as shown in the left part of Fig. 12; likewise, these channels may be designed to be at least oval or pot-shaped, as shown in the right portion of Fig. 12.

[0099] Again in these embodiment variants it is possible for the elevations 6 to be designed like channels as is shown on many of the elevations in Figs. 12 and 13 through the indication of the channels 7.

[0100] In addition, these elevations 6 may again be designed as subsections.

[0101] It should be pointed out here that all possible conceivable variants of elevations 6 with recesses 8 are possible in all the embodiment variants of the coating material 2.

[0102] In addition, it should be pointed out that, as already described above, the elevations 6 may also have different heights above the surface 4.

[0103] Furthermore, it is indicated with dash-dot lines in Figs. 12 and 13 that the coating material 2 may have at least one, preferably a plurality of, continuous recesses 17 (including more than two, as shown in Fig. 12), which extend from the first surface 4 to the second surface 14 to thereby achieve a ventilation system for venting air trapped during the concreting of the concrete component 3 through the coating material 2. These recesses 17 may be designed to extend beneath the at least channel-type recesses 8 beginning in the direction of the second surface 14; likewise these channel type recesses 17 may also extend through the elevations 6 - as indicated in Fig. 13.

[0104] Here again, combinations of the two embodiment variants are also possible.

[0105] Likewise it is possible for these recesses 17 not to extend into the second surface 14 but instead to extend into the end faces and/or lateral faces of the coating material 2, for example.

[0106] Fig. 14 shows an embodiment variant of the coating material 2 in cross section in which the layer 9 of the coating material 2 has at least one chamber,

preferably a plurality of chambers 18. These chambers 18 may be arranged in the center of the core, as shown in Fig. 14; likewise an acentric arrangement of same within the layer 9 is also possible - as seen in cross section.

[0107] With these chambers 18, a corresponding variance in the compressibility of the layer 9 and/or of the coating material 2 and thus also a variance in the vibrational behavior are also achieved. As already mentioned above, these chambers 18 may also be partially filled.

[0108] Although the coating material 2 is preferably manufactured in one piece because in this way the production is definitely simplified in comparison with the corresponding coating materials according to the state of the art, within the context of the invention, it is also possible to design this coating material 2 in multiple parts, as indicated in Fig. 15, to arrange another layer 19, for example, on the bottom side, i.e., the additional surface 14 of the coating material 2, i.e., opposite the surface structure 5. This additional layer 19 may also be an elastomer layer, wherein this layer preferably has different properties from layer 9 of this coating material 2. Likewise it is also possible for this layer 19 to be designed in the form of a thermoplastic polymer or a fiber material, for example, a knit fabric or a woven fabric, as indicated by the arrangement of fibers 20 in Fig. 15. A mechanical bonding between the layer 9 and the additional layer 19 is possible due to these fibers 20 in that at least individual ones of these fibers 20 protrude partially into the layer 9 of the coating material 2.

[0109] Fig. 16 shows an embodiment variant not according to the invention in which the coating material 2 is designed in the form of an integral foam according to the above embodiments so that the recesses 8 in the preceding examples are formed by pores 21 at the surface 4. These pores 21 may be designed to widen in the direction of the core 11 of the layer 9 of the coating material 2, so that again, a type of undercut is formed.

[0110] For example, the integral foam may be formed by a PUR or EPDM foam.

[0111] It is also possible for the base body of the coating material 2, i.e., the layer 9 to be formed by a "normal" foam, i.e., not an integral foam.

[0112] Fig. 17 shows a combination of integral foam with at least approximately channel-type elevations 6 in the coating material 2 arranged at the surface 4.

[0113] The channel-type recesses 8 already described above may of course also be used again in this exemplary embodiment.

[0114] Figs. 18 and 19 show an embodiment variant of the coating material 2 which has, on the one hand, web-type elevations 6 and, on the other hand, the at least approximately channel-type recesses 8 in these elevations 6, forming the channels 7, such that the recesses 8 are subdivided into the channel subsections 13 by the elevations 6, i.e., the channels 7 do not extend continuously.

[0115] The elevations 6 are distributed asymmetrically over the surface 4 of the coating material 2, as is shown in Fig. 19, wherein two elevations 6 form a

group, which are arranged at a first distance 22 from one another and a second distance 23 is formed between the groups, this distance being greater than the first distance 22.

[0116] Within the context of the invention, it is also possible that more than two elevations 6 form a group, i.e., three or four, and it is also possible that the distances of the elevations 6 within a group having more than two elevations 6 are also different. Furthermore, the groups of elevations 6 may also be arranged in completely irregular distances from one another.

[0117] Due to these designs, the concrete can penetrate into the interspaces between the elevations 6 and into the channels 7 of the recesses 8 at different rates because of the small distances between the elevations 6 of a group such that the smaller distances 22 between the elevations 6 of a group become filled with concrete later and/or more slowly, which thus forms a ventilation system to allow the escape of air enclosed during the cementing process.

[0118] A width 24 of the web-type elevations 6 may be selected from a range with a lower limit of 1 mm and an upper limit of 10 mm, in particular selected from a range with a lower limit of 2 mm and an upper limit of 7 mm.

[0119] The distance 22 between the elevations 6 of a group may be selected from a range with a lower limit of 0.5 mm and an upper limit of 10 mm, in particular from a range with a lower limit of 1 mm and an upper limit of 3 mm.

[0120] The distance 23 between the groups of elevations 6 may be selected from a range with a lower limit of 2 mm and an upper limit of 20 mm, in particular selected from a range with a lower limit of 3 mm and an upper limit of 7 mm. Distances 23 which are greater than 20 mm reduce the adhesive surfaces with concrete so that the adhesive strength of the adhesive system may decline.

[0121] The distances 22 and 23 may be created by corresponding molds, for example, or by subsequent milling out of the solid material.

[0122] The recesses 8, i.e., the channels 7 may be produced by subsequent drilling or milling of the elevations 6 or preferably by a suitably shaped nozzle of an extrusion tool.

[0123] Instead of this checkerboard-type design of the elevations 6 in relation to the channels 7 of Figs. 18 and 19 with at least approximately right angle arrangement of the channels 7 relative to the elevations 6, it is possible within the context of the invention as shown in Fig. 20, which shows a top view of the coating material 2, cut by the channels 7, so that the channels 7 are arranged at an angle other than 90° to the elevations 6. For example, the angle may be selected from a range with a lower limit of 10° and an upper limit of 85°.

[0124] Fig. 21 shows a coating material 2 in a side view with elevation 6 having side walls 25, which have a crowning so that the force-locking effect with the concrete is improved. The radius of the crowning may be selected from a range with a lower limit of 1000 mm and an upper limit of 10,000 mm. Again in this embodiment, the elevations 5 may have recesses 8 (not shown). As

shown here, two elevations may form a group in this variant, although a symmetrical embodiment of the elevations 6 without a grouping is also possible, so that an elevation 6 may have two crowned side surfaces 25, for example. However, the crowning may also be formed only one of two side surfaces 6, for example, only the respective right or left side wall 6 and/or mixed forms may also be formed, in which, for example, two side walls 25 situated side by side are designed with crowning and the adjacent side walls are designed to be straight. It is also possible for different crowning radii to be provided within a given crown as well as between different crowns of two elevations 6.

[0125] The embodiment of the coating material 2 according to Fig. 22, shown in a front view, has a crowning, although it is in the surface 4 which comes into contact with the concrete tie. Therefore, this also achieves better ventilation for the air enclosed during cementing.

[0126] Alternatively or in addition to that, the crowning may also be present on the surface of the elevations 6 which come into contact with the concrete. This surface is designed to protrude above the surface 4 above which the elevations 6 protrude.

[0127] It is likewise possible to design the bottom surface between the elevations 6 with crowns by guiding a tool, such as a disk miller, for example, with which the recesses are formed, between the elevations 6, for example, accordingly, so that at least some of the channels 7 have a different spacing from this bottom surface, as indicated with dash-dot lines in Fig. 22.

[0128] The at least approximately channel-shaped recesses 8 here have a different diameter which is

larger in the case of the channels 7 arranged centrally than with the channels 7 formed at the edges. More than two mutually differing diameters of the channels 7 are also possible.

[0129] In contrast with that embodiment, the channels 7 have the same diameter in the embodiment of the coating material 2 according to Fig. 23, but the channels are not arranged at least in a linear pattern, as is the case according to Fig. 22, but instead follow the shape of an arc.

[0130] Fig. 24 shows a coating material 2 in a front view, having as an example of a possible surface modification a wavy profile, as seen in cross section, so that a larger surface area is created for bonding the concrete, in addition to the at least approximately channel-type recesses 8.

[0131] The coating materials 2 according to Figs. 22 to 24 may also be provided with elevations 6 (not shown), as described with respect to Figs. 18 to 21.

[0132] Finally, Fig. 25 shows a variant of the invention with which it is possible to provide larger widths of concrete surfaces completely with coating material 2 over the entire surface. Therefore, the coating material 2 has a groove 27 on a first edge area 26 and a tongue 29 on a second edge area 28 situated opposite the first edge area. This makes it possible to join together a plurality of coating materials 2 by means of the groove 27 and tongue 29 connection to form an element having a larger surface area.

[0133] In one embodiment variant, it is possible for a coating material 2 to have two grooves 27 each and for another coating material 2 to have two tongues 29, but

the asymmetrical design with the tongue 29 and the groove 27 is preferred, because this requires only one mold, i.e., (extrusion) die.

[0134] Groove 27 and tongue 29 may be formed over the entire longitudinal extent of the coating material 2.

[0135] Instead of the tongue-and-groove connection, other connecting mechanisms may also be provided.

[0136] As already mentioned above, this coating material 2 can preferably be produced by a continuous process. Examples of this include pressing processes, injection molding processes, extrusion processes and/or automatic vulcanization processes. Since these processes have already been described to a sufficient extent in the state of the art, at this point reference shall be made only to the relevant literature, for example, Röthemayer/Sommer, Kautschuktechnologie Werkstoffe - Verarbeitung - Produkte [Rubber Technology - Materials - Processing - Products]; Hanser, 2001, in particular chapters 10 through 12.

[0137] The composite system 1 can now be produced in such a way that, for example, as an embodiment variant of the tie, a corresponding mold casing is made available, providing the outside dimensions for the tie. The coating material 2 is inserted into this shell and the liquid concrete composition is cast into it and then hardened. The viscosity of the concrete composition should be adjusted so that it is possible to ensure with sufficient certainty that the concrete will flow into the recesses 8 and/or the channels 7. It is also possible to vibrate the concrete introduced into the mold casing to compact it and to drive out air trapped inside.

[0138] In this variant it is advantageous if the coating material 2 is furnished with the ventilation openings, i.e., for example, recesses 17 and/or ventilation systems such as those described above and if the bottom of the shell optionally also has ventilation openings.

[0139] As an alternative to this it is possible to first pour the concrete composition into the shell and then, in a second step, to apply the coating material 2 to the concrete composition while the latter is still liquid and to press it into the shell.

[0140] Here again, the use of coating materials 2 with continuous recesses 17 and/or ventilation systems is advantageous.

[0141] The thickness of the coating material 2 is preferably selected for the embodiment variant of undertie pad, thus achieving a spring resiliency of 1 to 1.5 mm.

[0142] In conclusion, it should be pointed out for the sake of order that, for better understanding of the structure of the composite system 1 and/or the coating material 2, this structure and/or the components thereof shall be represented as enlarged and/or reduced and/or in part without a dimensional scale.

REFERENCE LIST

[0143]

- 1 composite system
- 2 coating material
- 3 concrete component
- 4 surface
- 5 surface structure

- 6 elevation
- 7 channel
- 8 recess
- 9 layer
- 10 undercut

- 11 core
- 12 bulge
- 13 channel subsection
- 14 surface
- 15 concrete component

- 16 rail line
- 17 recess
- 18 chamber
- 19 layer
- 20 fiber

- 21 pore
- 22 distance
- 23 distance
- 24 width
- 25 side wall

- 26 edge area
- 27 groove
- 28 edge area

29 tongue

Burkolóanyag alkalmazása beton építőelemen közvetlen kötéssel

Szabadalmi igénypontok

1. Burkolóanyag (2) alkalmazása beton építőelemen (3) közvetlen alakzáró kötéssel, amely tartalmaz réteget (9), amely legalább egy polimerből van és amelynek a beton építőelemen felfekvésre és azzal összekötésre szolgáló első felülete (4) van, amely felület (4) felületi struktúrát (5) tartalmaz, **azzal jellemezve, hogy a felületi struktúra (5) legalább megközelítőleg csatornaszerű bemélyedésekkel (8), illetve legalább megközelítőleg csatornaszerű kiemelkedésekkel (6) van kialakítva, és a legalább megközelítőleg csatornaszerű bemélyedések (8), illetve kiemelkedések (6) az alakzárás létrehozásához a felülettel legalább megközelítőleg párhuzamos csőprofilként vannak kialakítva.**
2. Az 1. igénypont szerinti alkalmazás, **azzal jellemezve, hogy a legalább megközelítőleg csatornaszerű bemélyedések (8), illetve kiemelkedések (6) hosszirányban, csatorna részdarabok (13) kialakításához meg vannak szakítva.**
3. A 2. igénypont szerinti alkalmazás, **azzal jellemezve, hogy a csatorna részdarabok (13) hosszúsága a csatorna részdarabokat (13) alkotó csatornaszerű bemélyedések (8), illetve kiemelkedések (6) teljes hosszúságának 30%-os alsó határú és 70%-os felső határú tartományából van kiválasztva.**
4. A 2. vagy 3. igénypont szerinti alkalmazás, **azzal jellemezve, hogy a csatorna részdarabok (13) hosszúsága 1 mm alsó határú és 100 mm felső határú tartományból van kiválasztva.**
5. Az 1-4. igénypontok bármelyike szerinti alkalmazás, **azzal jellemezve, hogy a csőprofilok a felület (4) felett kiugróan vannak kialakítva.**

6. Az előző igénypontok bármelyike szerinti alkalmazás, **azzal jellemezve, hogy** legalább egyes, legalább megközelítőleg csatornaszerű bemélyedések (8), illetve kiemelkedések (6) magassága a többi, legalább megközelítőleg csatornaszerű bemélyedések (8), illetve kiemelkedések (6) magasságától eltérő.
7. Az előző igénypontok bármelyike szerinti alkalmazás, **azzal jellemezve, hogy** a rétegnek az első felülettel (4) szemben lévő második felülete (14) szintén felületi struktúrával (5) rendelkezik.
8. Az előző igénypontok bármelyike szerinti alkalmazás, **azzal jellemezve, hogy** a legalább megközelítőleg csatornaszerű bemélyedések (8), illetve kiemelkedések (6) az első és/vagy második felületen (4, 14) elosztva, az egyik külső oldalperemre merőlegesen, cikk-cakk alakban és/vagy ívelt, illetve hullám alakban és/vagy lineárisan vannak elrendezve.
9. Az előző igénypontok bármelyike szerinti alkalmazás, **azzal jellemezve, hogy** a legalább megközelítőleg csatornaszerű bemélyedések (8), illetve kiemelkedések (6) kerek, ovális, gombafejszerű, T-alakú, háromszög, négyszög vagy poligon keresztmetszetűek.
10. Az előző igénypontok bármelyike szerinti alkalmazás, **azzal jellemezve, hogy** a rétegben (9) legalább egy kamra (18) van elrendezve.
11. A 10. igénypont szerinti alkalmazás, **azzal jellemezve, hogy** a legalább egy kamra (18) töltőanyaggal legalább részben fel van töltve.
12. Az előző igénypontok bármelyike szerinti alkalmazás, **azzal jellemezve, hogy** a réteg (9) legalább egy további réteggel (19) van összekötve, amely a réteghez (9) képest eltérő tulajdonságokkal rendelkezik.
13. A 12. igénypont szerinti alkalmazás, **azzal jellemezve, hogy** a további réteg (19) további polimerrel vagy szálas anyaggal van kialakítva.

14. A 13. igénypont szerinti alkalmazás, **azzal jellemezve, hogy** a szálas anyag filz vagy filc alakjában vagy szövetként kialakított keleme.
15. Az előző igénypontok bármelyike szerinti alkalmazás, **azzal jellemezve, hogy** a rétegen (9) áthatoló bemélyedések (17) vannak a rétegben (9) elrendezve.
16. Az előző igénypontok bármelyike szerinti alkalmazás, **azzal jellemezve, hogy** a legalább megközelítőleg csatornaszerű bemélyedések (8), illetve kiemelkedések (6) a felület(ek) (4, 14) olyan részére terjednek ki, amely a felület(ek) (4, 14) teljes méretére vonatkozó 20%-os alsó határú és 80%-os felső határú tartományából van kiválasztva.
17. Az előző igénypontok bármelyike szerinti alkalmazás, **azzal jellemezve, hogy** a felület (4), illetve a kiemelkedések (6) domborítással vannak kialakítva.

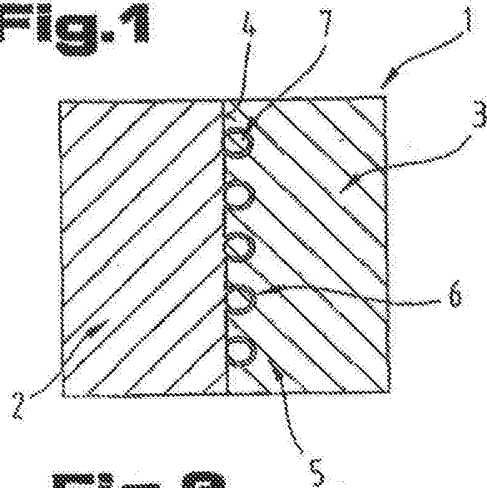
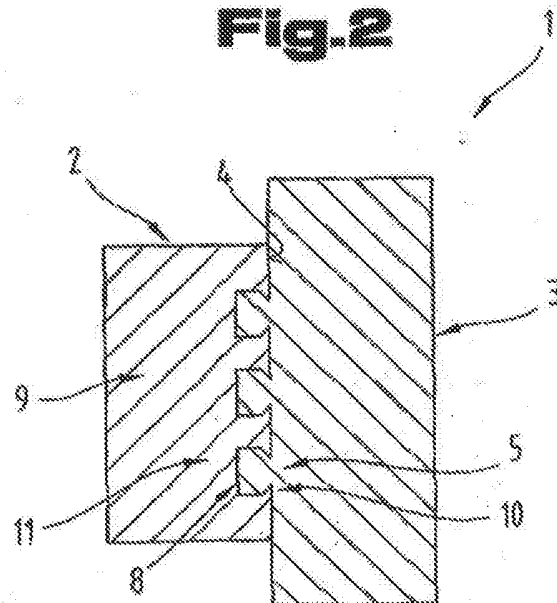
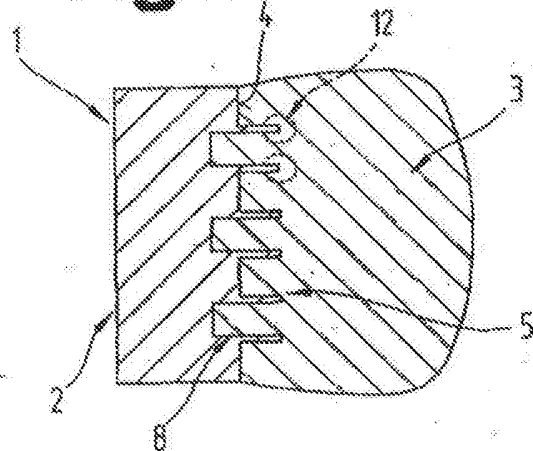
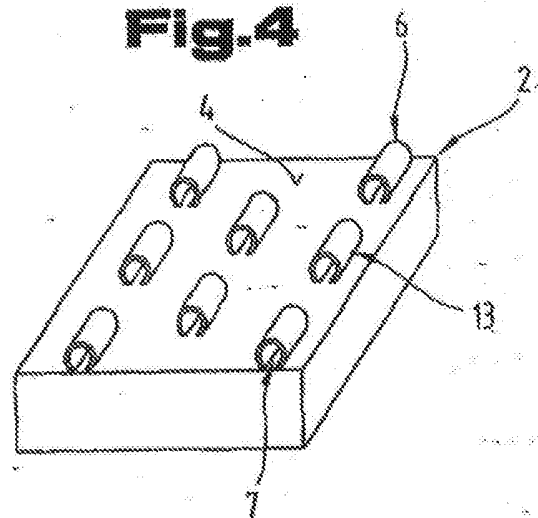
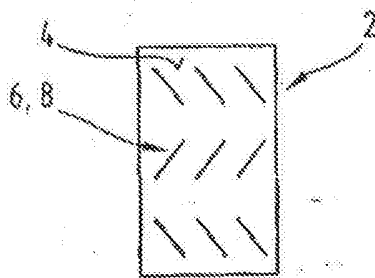
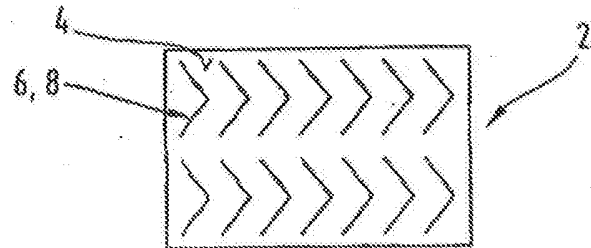
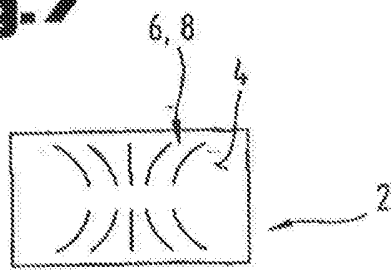
Fig.1**Fig.2****Fig.3****Fig.4****Fig.5****Fig.6****Fig.7**

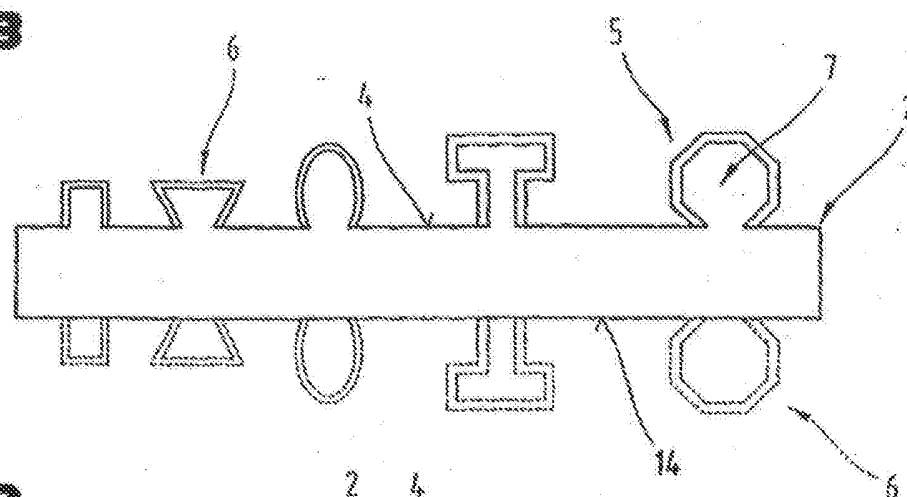
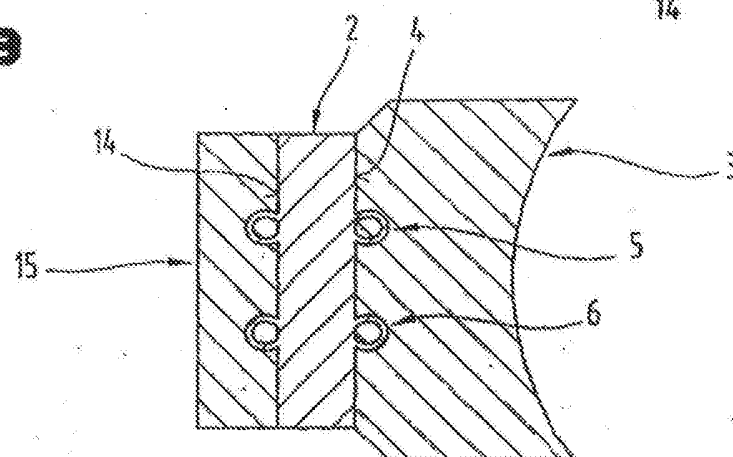
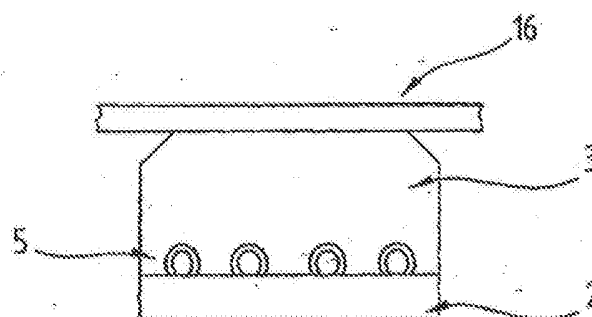
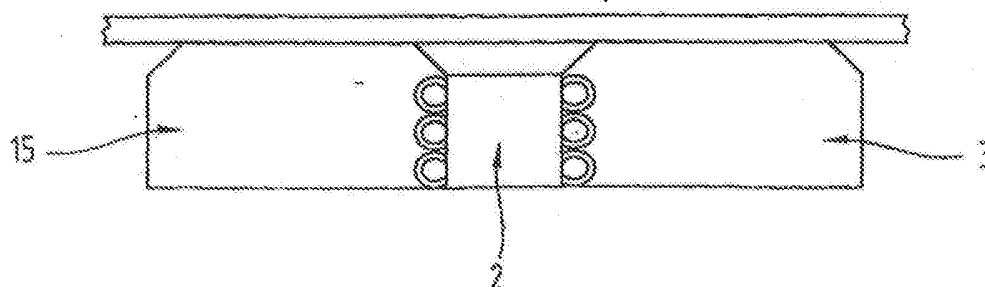
Fig. 8**Fig. 9****Fig. 10****Fig. 11**

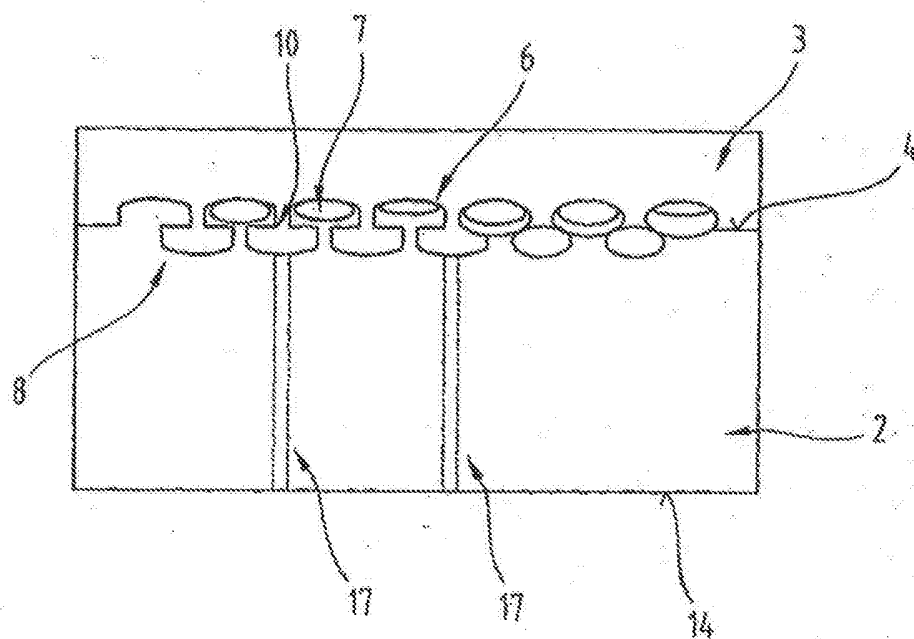
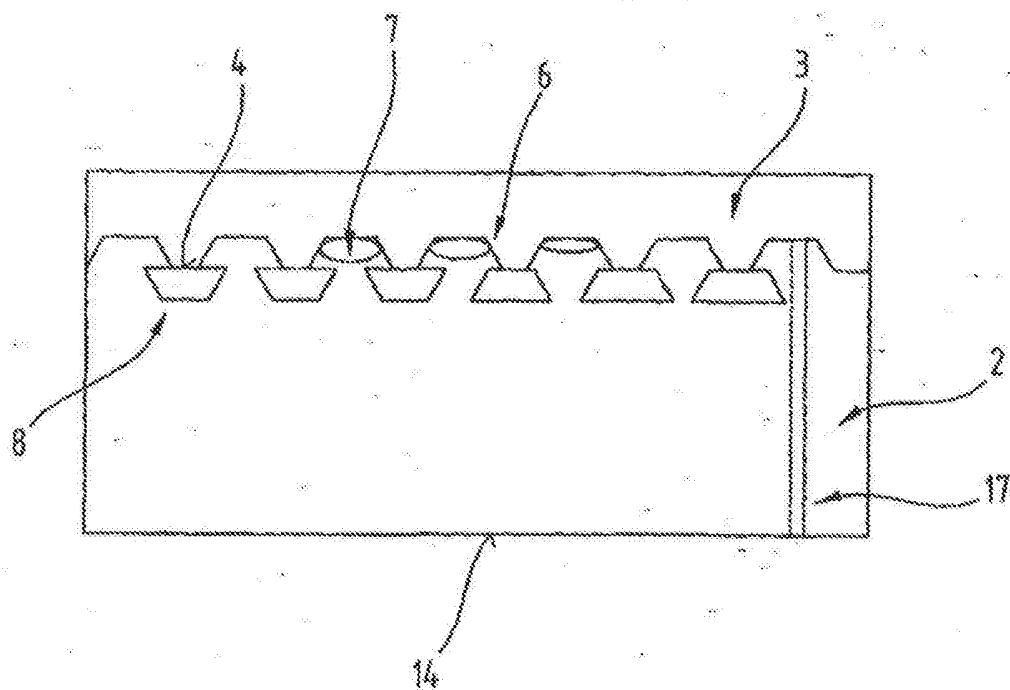
Fig.12**Fig.13**

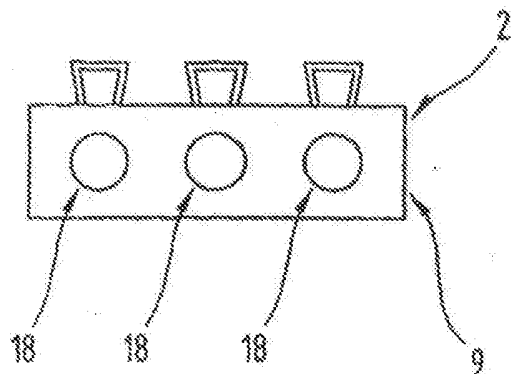
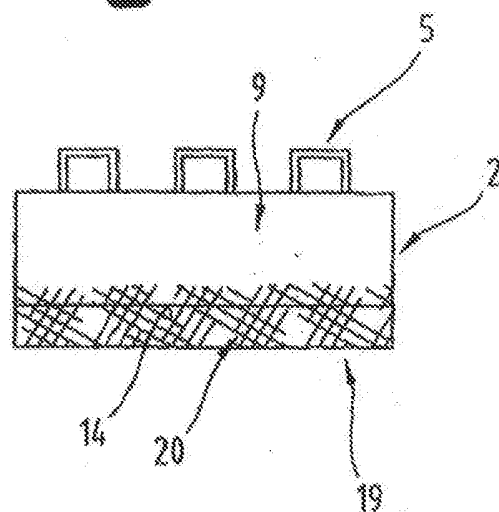
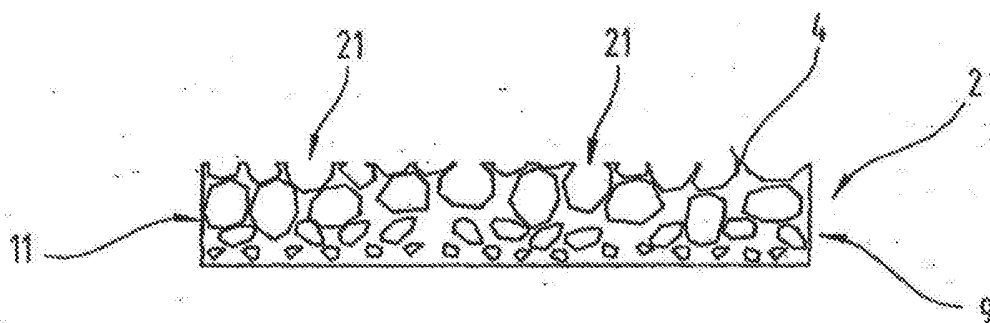
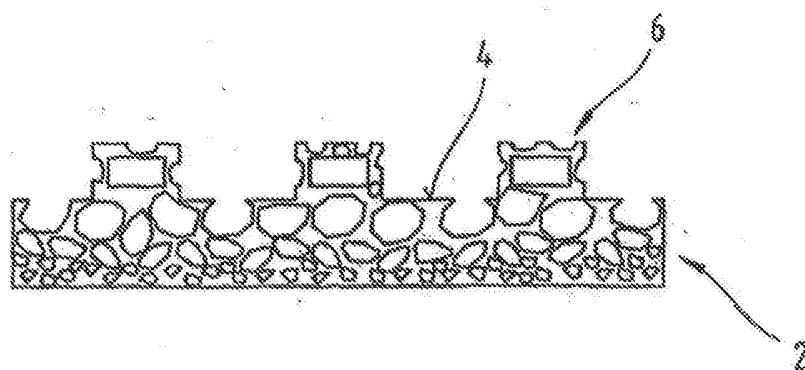
Fig.14**Fig.15****Fig.16****Fig.17**

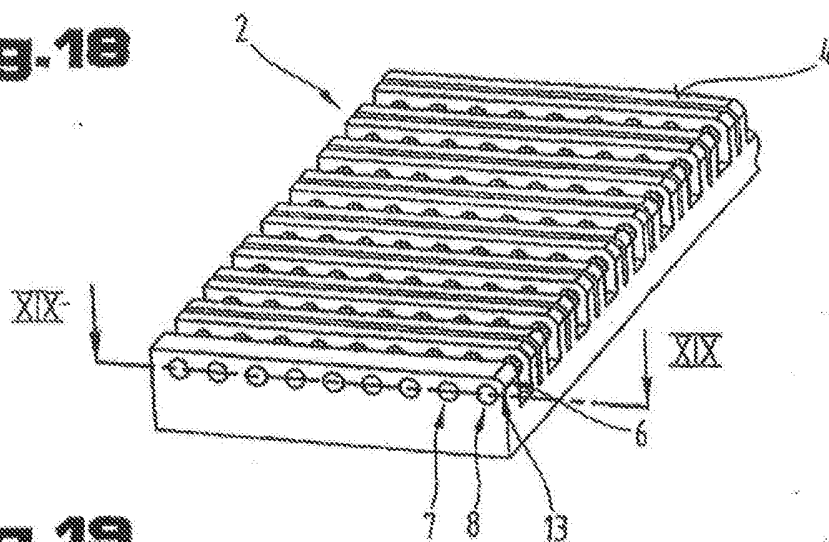
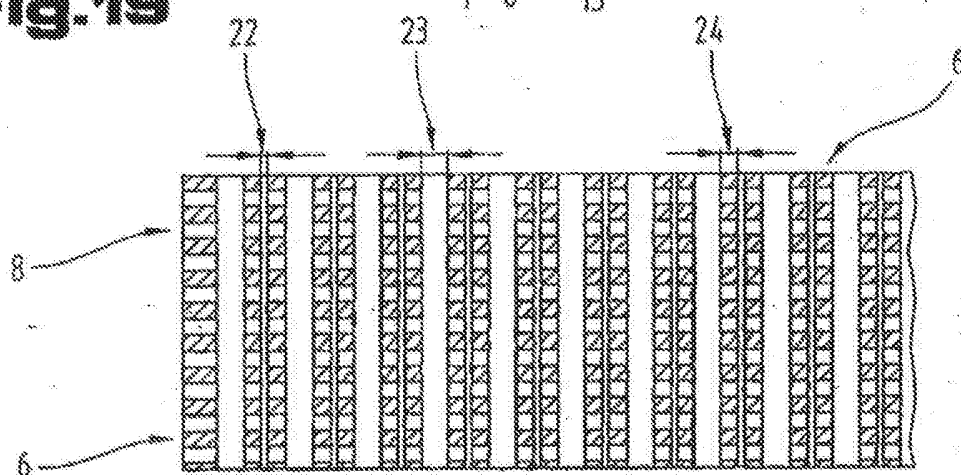
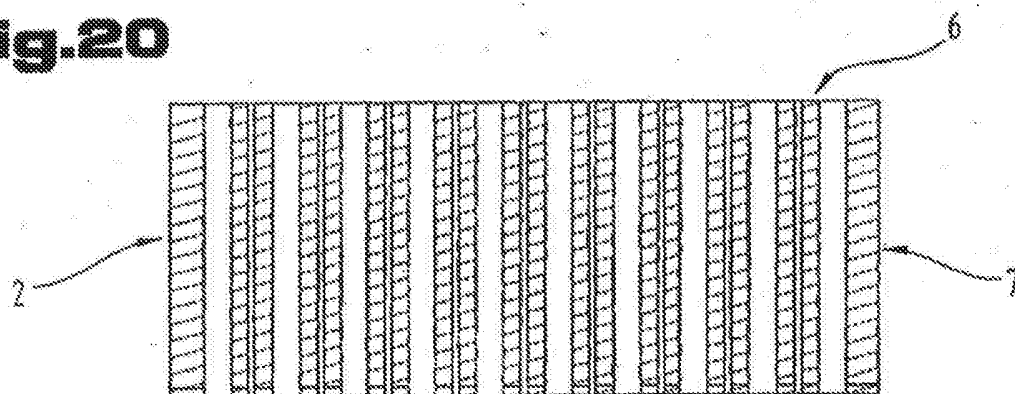
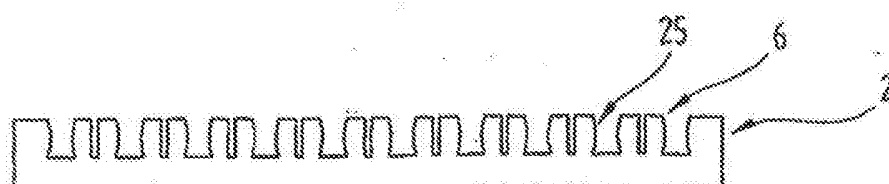
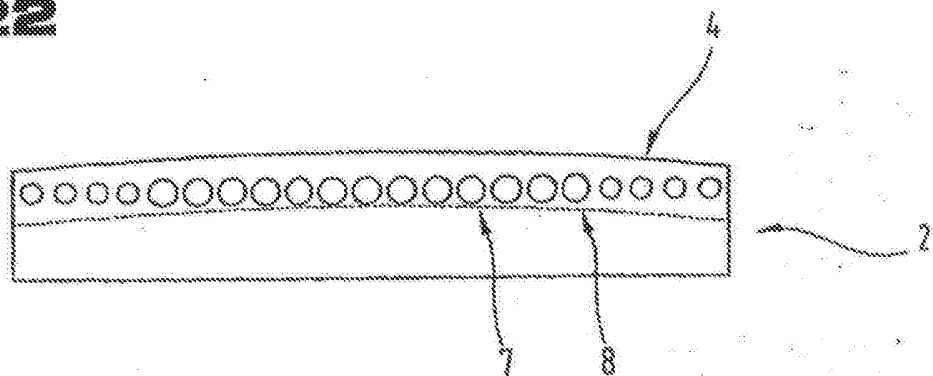
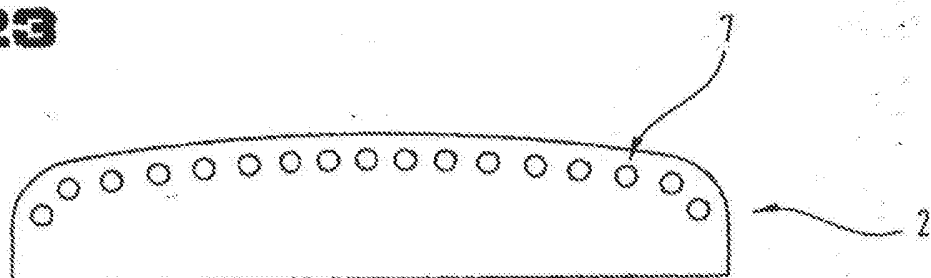
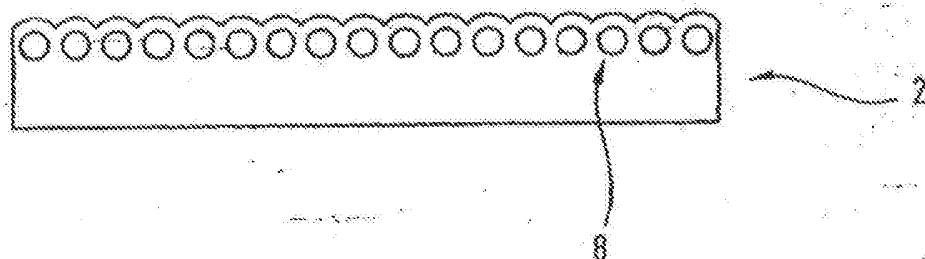
Fig.18**Fig.19****Fig.20****Fig.21**

Fig.22**Fig.23****Fig.24****Fig.25**