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(54) **Sínalj papucs**

DESCRIPTION

[0001] The invention relates to a sleeper (cross tie) shoe with a floor and lateral walls which are produced from an elastic material, wherein spring elements are disposed on the floor so as to project over the latter, and gaps are formed between the spring elements, as well as to a method for the manufacture of said sleeper shoe, in which a floor and lateral walls of the sleeper shoe are manufactured from an elastic material by means of vulcanization in a mould, wherein spring elements are disposed on the floor in a manner such as to leave gaps between them.

[0002] EP 0 049 879 A1 or WO 99/16976 A1 disclose sleeper shoes of the type defined above.

[0003] Elastic sleeper sheaths are often employed in the field of ballastless tracks to elastically decouple the track and the substrate. In this manner, the entire sleeper, i.e., for example, a monoblock or twin-block sleeper, can be provided with an elastic sheath, for example formed from natural rubber (NR), styrene-butadiene rubber (SBR) or vulcanizates formed from ethylene-propylene-diene monomers (EPDM). Currently, for the most part, cellular material based on polyurethane (PUR), EPDM or NR/SBR is placed on the floor of this sheath in order to be able to provide it with appropriate vertical elasticity. This cellular material is normally in the shape of a plate. In addition, it is possible to produce the vertical elasticity by means of individual spring elements. The elastic behaviour is imparted in this case by the deformability of these spring elements, made possible by the spaces between the spring elements. However, on open stretches, a problem arises, since water can collect between the spring elements. When temperatures are low, ice is formed from this, which reduces the elastic behaviour of the spring elements.

[0004] In order to overcome this problem, in DE 92 02 613 U1, proposes a rail sleeper for anchoring railway tracks in a ballastless superstructure installed in appropriate recesses of the superstructure with its lower region in a sleeper shoe consisting of a floor plate and lateral walls formed from an elastic material, wherein in the region of the upper edge of the lateral walls, an all-round sealing connection is provided against the lateral surfaces of the rail sleeper.

[0005] A similar solution is provided in DE 297 19 400 U1, wherein the rail sleeper is provided with an all-round groove, the sleeper shoe is formed as one piece and has a moulded-on sealing bead formed at the upper edge of the sleeper shoe which has a sealing head with a high ductility which is cranked inwardly of the rail sleeper and which can be anchored in the all-round groove of the rail sleeper.

[0006] In order to increase the seal, DE 698 07 31 T2 again proposes, inter alia, a stiff shell for the sleeper shoe, so that it retains its seal even under conditions when a conventional shoe formed from elastic material would run the risk of being ripped apart or being burst. In this case, elastic segments are installed under compressive and shear elastic pre-stress.

[0007] In principle, it is also known to provide extensive mass-spring systems which are used to dampen vibrations in the track construction provided with a plurality of elastic support portions disposed in a spaced apart manner on a support layer, wherein a non-load-bearing filler layer which partially fills the space between the support portions and which prevents the ingress of water into this space is provided, as described, for example, in CH 513 302 A. The damping element described therein additionally comprises a watertight skin which envelopes the

filler and the support portions. The difference between this and sleeper shoes is that here, the sleeper does not rest on the spring elements themselves, but a support plate is necessarily provided in order to allow the weight to be distributed over the individual spring elements. This support plate also functions as a barrier against the ingress of water into the spaces formed between the spring elements and the filler on the lower side of this damping element.

[0008] The aim of the present invention is to maintain the damping characteristics of a sleeper shoe as constant as possible, even under wet environmental conditions.

[0009] This aim of the invention is accomplished by means of the sleeper shoe defined in claim 1 and in the inventive method by means of which the gaps are at least approximately completely filled by a filler of this type. Because the gaps are at least approximately completely filled, the water absorption capacity of the sleeper shoe in this region is reduced to a minimum - the water which collects here may be that necessarily formed during manufacture, or from the ingress of water from outside - wherein because of the elastic materials, in particular the elasticity of the sleeper shoe itself, the water can be squeezed out when a train runs over it by means of the elastic deformability of the sleeper shoe during loading. This means that it is not entirely necessary to provide drainage openings for incoming water in the sleeper shoe itself, as has occasionally been described in the prior art. Because of the relative secant stiffness with respect to the secant stiffness of the spring element itself, it is possible on the one hand to use spring elements with very different spring feeds, and on the other hand, because of the low secant stiffness of this second elastic material of the filler, it does not increase or does not contribute significantly to an increase in the overall stiffness of the system, i.e. the deflection characteristics

of the sleeper shoe are essentially exclusively determined by the spring elements, and thus designing this damping system is easier. Thus, the elastic deformation of the spring element is not inhibited by the filler because of the elasticity thereof. Because this filler at least approximately completely fills the gaps, the volume which is left for water in this region is zero or disappearingly small, so that even when ice forms in the winter, the vibrational damping is not or only barely affected.

[0010] In order to improve this effect, in accordance with an embodiment of the invention, the filler has a secant stiffness which constitutes a maximum of 10% of the secant stiffness of the spring element. This separates its secant stiffness sufficiently from the secant stiffness of the spring element so that in this manner, the function of this filler can be concentrated on the essential function, namely preventing water from collecting in the floor region of the sleeper shoe.

[0011] In particular, the filler may also have a secant stiffness which is a maximum of 5% of the secant stiffness of the spring element.

[0012] It is also possible for a fill height of the filler to be larger than a height of the spring elements or of the shortest spring element in this direction. In this manner, this filler, after insertion of this sleeper, is compressed so that the gaps can be filled to a greater proportion with this filler. In the case in which the spring elements have a different height - the scope of the invention includes the possibility of using spring elements with different secant stiffnesses or spring elements with different dimensions, so that the spring characteristics of the system can be adapted appropriately, for example in order to accommodate curves - then preferably, the filler essentially extends to a maximum of the height of the

highest spring element so that in this manner, any water present in the sleeper shoe can be "squirted out" more easily.

[0013] In accordance with a variation, it is also possible in this regard for the filler to cover horizontally at least a portion of the spring elements which are configured with a smaller spring element height than the largest spring element height, so that with spring elements with different heights, the sleeper itself essentially lies on a flat surface, whereby, because of the low secant stiffness of the second elastic material of the filler, the damping behaviour, even of the spring elements which are shorter, is not or is hardly affected by the filler which is disposed over them in the direction of the sleeper.

[0014] The filler may overtop the spring elements by a value selected from a range with a lower limit of 1 mm and an upper limit of 10 mm. An excess height of the filler with respect to the spring element which is within this range has proved in practical tests to have a very good relationship between space filling by compression of the filler on the one hand and retention of the spring characteristics by the spring on the other hand. Below 1 mm, the compression of the filler by the tare weight of the sleeper is so low that, although improved space filling of the gaps can be observed by compression of the filler, a substantial improvement in this effect can be observed above this value. Excess heights of more than 10 mm stiffen the filler in some circumstances, such that the system of spring elements as a whole could become stiffened.

[0015] Preferably, the filler protrudes beyond at least some spring elements by an amount which is selected to be in the range with a lower limit of 2 mm and an upper limit of 8 mm.

[0016] It is also possible for at least one of the surfaces of the filler which can be made to face the sleeper to be hydrophobic whereupon on the one hand, the collection of water in this region can be better prevented, and on the other hand, the water can be "squirted out" better by railway vehicles passing over it, in particular when foam is used as the filler.

[0017] In this manner, on the one hand it is possible for the filler itself to already have hydrophobic properties, and on the other hand it is possible to make the surface of the filler hydrophobic, for example to spray it with a silicone oil, wherein with cellular materials, the whole surface is preferably rendered hydrophobic. By means of this embodiment of the invention, it is even possible, for example, to use open-celled material, whereupon the spectrum of substances which can be used to accomplish this aim can be broadened.

[0018] Preferably, fillers are used which have a water absorption capacity in accordance with ASTM D 1056 (or DIN ISO 2896) which is a maximum of 7% by volume, in order to further improve the basic effect of the invention.

[0019] In this respect the maximum water absorption capacity of the filler in accordance with ASTM D 1056 (or DIN ISO 2896) may in particular be a maximum of 5% by volume, preferably a maximum of 4% by volume.

[0020] In accordance with the invention, a substance may be used as the second elastic material which is selected from a group comprising HD-PE (High Density Polyethylene), PP (Polypropylene), PUR, NR, SBR, EPDM, EPS (Expanded Polystyrene Foam), XPS (Extruded Polystyrene Foam), EVA (Ethyl Vinyl Acetate), TPE (Thermoplastic Elastomer) such as, for example, TPO (Thermoplastic Olefin), for example

EPDM/PP, or TPE-S (Polystyrene-Polydiene Block copolymer) or TPE-U (Thermoplastic Polyurethane Elastomer). In particular, very good results were obtained with these substances as regards accomplishing the object of the present invention.

[0021] Preferably, a foam is used as the filler which has a low tare weight on the one hand and on the other hand, an elasticity that can be obtained such that short-term compression of the filler does not cause it to change its shape permanently, but that after compression, the filler can return to its initial position, thereby improving the gap-filling capabilities.

[0022] Particularly preferably, a foam is used which has a mean pore size which is selected from a range with a lower limit of 10 µm and an upper limit of 3 mm, since in this manner, the elastic behaviour of this filler can be established in a particularly effective manner, in particular when the surface of the filler is rendered hydrophobic, so that ingress of water into the pores can be prevented in a more reliable manner.

[0023] Preferably, a foam is used which has a mean pore size which is selected from a range with a lower limit of 0.2 mm and an upper limit of 2 mm, in particular selected from a range with a lower limit of 0.3 mm and an upper limit of 1 mm.

[0024] In particular, however, in accordance with the invention, a closed-cell elastic foam is used because of the low water absorption capacity of foams of this type.

[0025] A further improvement can be obtained in this manner by adhesively bonding the filler with the spring elements so that it is fixed in position in the sleeper shoe and thus can be prevented from sliding out, with a simultaneous opening up of spaces. In this regard, either a

suitable adhesive, i.e. a glue, may be used, or on the other hand it is possible to produce the filler by directly foaming between the spring elements, thereby bringing about an adhesive bond to the spring elements.

[0026] In order to prevent aging due to microbial degradation of the elastic elements of the sleeper shoe in wet surroundings, in accordance with an embodiment, the filler is provided with a bactericidal or fungicidal substance. In this manner, the spring characteristics of the sleeper shoe can be maintained for a longer period when small quantities of water gain ingress into the sleeper shoe. In this regard, silver (silver ions) may, for example, be used as the bactericidal or fungicidal substances. It is also possible to modify the surface of the filler by catalytic grafting using groups of molecules or molecules having an appropriate action.

[0027] In order to fix the spring elements better in position, they may be vulcanized to the floor of the sleeper shoe, whereupon in addition, gaping of the spaces between the spring elements and filler when railway vehicles pass over them is prevented to a greater extent.

[0028] In embodiments of the method, the filler is manufactured as an elastic plate which has depressions formed into it the geometry of which at least approximately corresponds to the spring elements, and this plate is placed on the floor of the sleeper shoe following vulcanization, or a foamable raw material is used as the filler, which is initially arranged in the gaps prior to insertion of a sleeper, and then foamed after inserting the sleeper, or the sleeper shoe is manufactured using a 2-component method, wherein a foamable raw material for the filler is introduced into the mould into the gaps between the spring elements and foamed during vulcanization. In particular, by means of the two variations involving direct foaming of the filler in the

sleeper shoe, the gaps are completely filled; using the 2-component method, it is possible to produce the elastic coating of the sleeper in a single operational step. If both foaming variations are not possible, then the plate embodiment provides for a great deal of variability as regards the very different geometries of spring elements; if necessary, they could also be adjusted directly in situ, i.e. at the construction site.

[0029] The invention will be better understood with the aid of the discussion below, made with reference to the accompanying drawings.

[0030] In the drawings, which are all highly simplified and diagrammatic:

Fig. 1 shows a section of a track with a sleeper, sleeper shoe and rail portion disposed thereon;

Fig. 2 shows the track section of Figure 1 in side view;

Fig. 3 shows the track section of Figure 2, in sectional view along the line III-III;

Fig.4 shows a section of an embodiment of a sleeper shoe, in cross-section.

Fig.5 shows a section of a further embodiment of a sleeper shoe, in cross-section.

[0031] It should firstly be stated that in the various embodiments described, identical parts are provided with identical reference numerals or identical component descriptions, wherein the disclosures in the description as a whole can be analogously applied to identical parts with identical reference numerals or identical component descriptions. In addition, the directional information

selected for use in the description such as, for example, top, bottom, side etc., refer to the figure being described and illustrated; when the position is changed, they should be applied analogously to the new position. Furthermore, individual features or combinations of features from the various exemplary embodiments described and illustrated can also be applied to other solutions which are independent, inventive or pertaining to the invention.

[0032] All of the information provided in the present description regarding ranges of values should be understood to include any and all part ranges; as an example, the statement "1 to 10" should be understood to include all part-ranges starting from the lowest limit 1 and up to the upper limit 10, i.e. all of the part ranges beginning with a lower limit of 1 or higher and ending with an upper limit of 10 or less, for example 1 to 1.7, or 3.2 to 8.1 or 5.5 to 10.

[0033] Figures 1 to 3 show a first embodiment of a sleeper shoe 1 for a sleeper 2. In addition, Figures 1 to 3 respectively show sections of a track construction 3 for what is known as a ballastless track. This track construction 3 consists of the sleeper 2, which in this embodiment is known as a short sleeper, the sleeper shoe 1 which goes round the lower region of the sleeper 2 so that most of the volume of this sleeper 2 is accommodated in the sleeper shoe, a mounting plate 4 via which a rail 5 is fastened to the sleeper 2, wherein in order to fasten the rail 5 to this mounting plate 4, conventional mounting means which are known in the prior art can be used, for example in the form of an X- or W-fixing or hook thread fastenings. A first damping element 6 is disposed between the mounting plate 4 and the sleeper 2; a second damping element 8 in the form of a rail pad is disposed between a foot 7 of the rail and the mounting plate 4.

[0034] The sleeper 2 may be connected to a further sleeper 2 via a cross-brace to a cross-sleeper (not shown). Furthermore, the sleeper 2 is normally accommodated in a recess in a base plate, in particular formed from concrete.

[0035] This principal construction is already known in the art, in part from DE 92 02 613 U1 mentioned above.

[0036] However, the invention is not limited to short sleepers; the sleeper shoe 1 may also be used for what is known as long sleepers. Furthermore, it is possible to produce the sleeper 2 as a monoblock or twin-block sleeper, for example an H-sleeper. Still further, the invention is not limited to concrete support plates for accommodating the sleepers; ballast substrates etc. may also be employed.

[0037] As can be seen better in Figure 3, the sleeper shoe 1 comprises a floor 9 as well as lateral walls 10. Rib-like webs 12 are provided at the inner surface 11 of the lateral walls 10, which contribute to the damping characteristics of the sleeper shoe 1. These webs 12 are constructed so as to increase in height in the direction from the floor 9 to the rail 5, so that with respect to the floor 9 the lateral walls 10 - seen in cross-section - are tapered in configuration. In particular, these webs 12 are disposed all around the entire periphery of the lateral walls 10. Thus, there are no free spaces between individual segments as described, for example, in DE 698 07 031 T2 mentioned above for dewatering. Thus, although these free spaces are not entirely necessary for the purposes of the invention, they may clearly be provided. Furthermore, the described tapered configuration of the lateral walls 10 is not entirely necessary.

[0038] In this embodiment of the sleeper shoe 1, spring elements 13 formed from a first elastic material of the sleeper shoe are formed on the floor 9 of the sleeper shoe,

i.e. produced in one piece with the floor 9. These spring elements 13 are thus formed so as to constitute studs, with an at least approximately square cross-section (seen in top view). With the aid of these spring elements 13, the deflection characteristics and thus the damping behaviour of the system, i.e. the sleeper shoe 1 - in addition to the damping feature of the damping elements 6, 8 - are determined.

[0039] It should be understood here that the invention concerns the construction of the sleeper shoe 1 itself, and so having regard to the further damping elements 6, 8, it should be noted that, for example, that the damping element 6 does not necessarily have to be present. In addition, having regard to the damping characteristics of these damping elements 6, 8, for example by different combinations of hard and soft segments for these damping elements 6, 8, reference should be made to the appropriate prior art.

[0040] Furthermore, it is not absolutely necessary for the spring element 13 to be prepared from the material of the floor 9 of the sleeper shoe, in particular to be formed as one piece therewith. Thus, in the context of the invention, it is entirely possible for these spring elements 13 to be subsequently placed on the floor 9 of the sleeper shoe 1, for example in the form of a rubber mat. Furthermore, it is not entirely necessary for these damping elements 13 to have an at least approximately square cross-section; as an example, other cross-sections, for example round, rectangular, or polygonal cross-sections, also fall within the context of the invention; these different cross-sectional forms - even mixed shapes are possible within a single sleeper shoe 1 - can be used to adapt the spring characteristics of the sleeper shoe 1, i.e. of the track construction 3 as a whole, to the respective requirements which, for example, may be completely different over curved stretches than over straight stretches.

[0041] The scope of the invention also encompasses using spring elements 13 with different diameters – seen in top view –, and also to adapt the deflection characteristics to the respective circumstances and requirements. Thus, for example, combinations with thin and thick spring elements 13 are possible in order, for example, to accommodate curves.

[0042] The spring elements 13 also do not need to be formed as studs, even though this is the preferred embodiment, but spring elements 13 in the form of strips which at least approximately extend over the entire width of the floor 9 may be used.

[0043] Gaps 14 are formed between the individual spring elements 13 in which, in accordance with the invention, a filler 15 is disposed. This filler 15 at least approximately completely, and preferably completely fills these gaps 14.

[0044] In particular, a closed cell foam is used as the filler 15, preferably selected from a group comprising HD-PE, PP, PUR, NR, SBR, EPDM, EPS, XPA, EVA and TPE. In principle, however, open-celled foams may also be used, in particular when, as already discussed above, they have been at least superficially rendered hydrophobic or consist of a hydrophobic material. The pore size of the foam may in this regard be selected within a range with a lower limit of 10 µm and an upper limit of 3 mm. Preferably, all of the gaps 14 between the spring elements 13 in the floor 9 are filled with the filler 15. However, it is also possible, if this should be necessary, to provide the groove-like depressions between the webs 12 in the lateral walls 10 with this filler.

[0045] In a first embodiment, a fill height 16 of the filler 15 in the gaps 14 is determined in a manner such that these gaps 14 are at least approximately completely filled,

i.e. essentially correspond to the height of a spring element 17. Furthermore, in a second embodiment, this fill height 16 can be determined such that the filler 15 projects beyond the spring elements 13 in the vertical direction, i.e. the fill height 16 is higher than the filler element height 17. This means that this filler 15 is compressed when the sleeper 2 is introduced into the sleeper shoe 1, and thus the gaps 14 are more securely filled.

[0046] In accordance with the invention, the filler 16 has a secant stiffness the maximum of which - as a function of the first elastic material used for the spring elements 13 and possibly the floor 9 as well as the lateral walls 10 - is such that the deflection characteristics via the spring elements 13 when loaded by a railway vehicle passing over it are not or are only affected to an insignificant extent, i.e. the overall "sleeper shoe 1" system is not stiffened.

[0047] The term "affected to an insignificant extent" as used in the context of the invention means that the deflection characteristics of the spring elements 13 are deteriorated by the filler 15 by a maximum of 10% under quasi-static loading (DIN 45673).

[0048] In particular, the filler 15 has a secant stiffness which is a maximum of 1% to 10% of the secant stiffness of the spring element 13.

[0049] In general, it should be noted here that the secant stiffness of the spring element 13 under quasi-static loading may be selected from a range with a lower limit of 5 kN/mm and an upper limit of 300 kN/mm in accordance with DIN 45673.

[0050] Figure 4 shows a sectional view of a further embodiment of the sleeper shoe 1 in cross-section. Here, the spring elements 13 are of different heights. In this manner,

the deflection, i.e. the damping behaviour of these spring elements 13 or of the sleeper shoe 1, are adapted appropriately. As an example, in this embodiment - and in all other embodiments - it is possible for the spring elements 13 to exhibit a different secant stiffness, i.e. for example, for the spring elements 13 with a larger spring element height 17 to have a greater stiffness than the spring elements 13 with a smaller spring element height 17. With a variation of this type, it is possible, under normal loads, for damping to be carried out by the spring elements 13 with the larger spring element height 17, and only under greater loads for the spring elements 13 with smaller spring element heights 17 to come into effect. By adopting highly progressive spring characteristics, the spring elements 13 can be protected from being overloaded.

[0051] As can be seen in Figure 4, in this embodiment the filler 15 of the sleeper shoe 1 comes up to a spring element height 17 or slightly beyond it which is smaller than the maximum spring element height 17.

[0052] As shown by the dashed lines in Figure 4, it is also possible for the entire gap 14 between spring elements 13 of equal heights to be filled to the larger spring element height 17.

[0053] Figure 5 shows an embodiment of the sleeper shoe 1 in cross-section, in which the spring elements 13 again have different spring element heights 17, similar to that of Figure 4. In contrast to the embodiment of Figure 4, however, the smaller spring elements 13 are completely covered by the filler 15, so that essentially the sleeper 2 lies on a flat surface. This is particularly possible with the invention because, due to the filler 15, the spring characteristics of the spring elements 13, i.e. even that of the shorter spring elements, are not or are substantially insignificantly affected by the overlaid filler 15.

[0054] For this reason, in a further embodiment, shown as dashed lines in Figure 5, it is possible to cover all of the spring elements 13 with the filler 15 in the horizontal direction, whereupon the ingress of water into the floor region of the sleeper shoe 1 can be still further reduced.

[0055] In order to produce the sleeper shoe 1 of the invention, the floor 9 and the lateral walls 10 are prepared in a mould from an elastic material by means of vulcanization. This elastic material may, for example, be NR, SBR, EPDM, etc. A production process of this type is already known in the art, and so there is no need to make reference thereto herein.

[0056] The spring elements 13 may be produced from the same substance in the mould used for the floor 9 and the lateral walls 10. On the other hand, it is possible for the spring elements 13 to consist of another elastic material, whereupon these spring elements 13 are preferably vulcanized onto the surface of the floor 9.

[0057] In accordance with a first embodiment of the manufacturing method, an at least approximately flat plate is produced from the second elastic material - as mentioned above - into which appropriate recesses or apertures are introduced, for example by stamping or cutting, which correspond to the geometry of the spring elements 13, so that after vulcanization, this pre-prepared plate can be positioned on the spring elements 13, i.e. in the gaps 14.

[0058] In accordance with another variation of the method, the filler 15 can be foamed in situ, i.e., as an example, at the construction site, and to this end, a foamable raw material is used for the filler 15, for example a single-component or a two-component polyurethane. This raw material is introduced into the gaps 14, then the sleeper 2

is placed in the sleeper shoe 1 and finally, the raw material for the filler 15 is foamed, whereupon the gaps 14 are at least approximately completely filled.

[0059] Finally, it is also possible for the sleeper shoe 1 to be produced by what is known as a two-component method, in which the filler 15 is injected, for example, into the gaps 14 during vulcanization of the sleeper shoe 1 and is foamed during vulcanization, whereupon again, the gaps 14 are at least approximately completely filled. The latter method has the advantage that the sleeper shoe can be produced in a single step, reducing the need for further assembly steps, for example at the construction site.

[0060] The exemplary embodiments indicate possible embodiments of the sleeper shoe 1; it should be noted here that the invention is not limited to the exemplary embodiments thereof which have been described, but rather, various combinations of the individual exemplary embodiments are possible and these variations, because of the technical teaching in the present invention, are within the purview of the person skilled in the art. Thus, any and all exemplary embodiments which may be envisaged which are possible by combining individual details of the exemplary embodiments described and illustrated are included within the scope of the invention.

[0061] Finally, for the sake of completion, it should be noted that for better comprehension of the construction, the illustrations of the sleeper shoe 1 and/or its components have not always been drawn to scale and/or have been enlarged and/or reduced in size.

[0062] The inventive subject matter of the present invention can be discerned from the description.

[0063] Moreover, the embodiments indicated in Figures 1, 2, 3; 4; 5 constitute the inventive subject matter of the present invention. The appropriate objects of the invention and the inventive subject matter can be discerned from the detailed description of these figures.

List of reference numerals

[0064]

1	sleeper shoe
2	sleeper
3	track construction
4	mounting plate
5	rail
6	damping element
7	rail foot
8	damping element
9	floor
10	lateral wall
11	surface
12	web
13	spring element
14	gap
15	filler
16	fill height
17	spring element height

Sínalj papucs

Szabadalmi igénypontok

1. Sínalj papucs (1) fenékkel (9) és oldalfalakkal (10), amelyek rugalmas anyagból vannak, amely fenéken (9) abból kiemelkedő rugóelemek (13) vannak elrendezve és a rugóelemek (13) között közbenső terek (14) vannak kialakítva, **azzal jellemezve, hogy** a közbenső terek (14) HD-PE-t, PP-t, PUR-t, NR-t, SBR-t, EPDM-t, EPS-t, XPS-t, EVA-t, TPE-t tartalmazó csoportból kiválasztott második rugalmas anyagból lévő töltőanyaggal (15) vannak legalább megközelítőleg teljesen kitöltve, amely második rugalmas anyag szekáns merevsége legfeljebb olyan nagyságú, hogy a berugózási karakterisztikát a rugóelemek (13) terhelésekor nem, illetve csak jelentéktelen mértékben befolyásolja.

2. Az 1. igénypont szerinti sínalj papucs (1), **azzal jellemezve, hogy** a töltőanyag (15) töltési magassága (16) nagyobb, mint ebben az irányban az adott esetben a legalacsonyabb rugóelem(ek) (13) rugóelem magassága (17).

3. Az 1. vagy 2. igénypont szerinti sínalj papucs (1), **azzal jellemezve, hogy** a töltőanyag (15) a rugóelemeknek (13) legalább egy részét, amelyek a legnagyobb rugóelem magasságánál (17) kisebb rugóelem magasságra (17) vannak kialakítva, vízszintes irányban lefedően van elrendezve.

4. A 2. vagy 3. igénypont szerinti sínalj papucs (1), **azzal jellemezve, hogy** a töltőanyag (15) a rugóelemeket (13) olyan magassági értékkel haladja meg, amely 1 mm-es alsó határral és 10 mm-es felső határral rendelkező tartományból van kiválasztva.

5. Az előző igénypontok bármelyike szerinti sínalj papucs (1), **azzal jellemezve, hogy** a legalább egy, a töltőanyagnak (15) sínalj (2) felé fordítható felülete hidrofób.

6. Az előző igénypontok bármelyike szerinti sínalj papucs (1), **azzal jellemezve, hogy** a töltőanyag (15) habanyag.

7. A 6. igénypont szerinti sínalj papucs (1), **azzal jellemezve, hogy** a töltőanyag (15) habanyagja 10 µm alsó határú és 3 mm felső határú tartományból kiválasztott közepes pórusnagysággal rendelkezik.

8. A 6. vagy 7. igénypont szerinti sínalj papucs (1), **azzal jellemezve, hogy** a töltőanyag (15) különösen zártcellás rugalmas habanyag.

9. Az előző igénypontok bármelyike szerinti sínalj papucs (1), **azzal jellemezve, hogy** a töltőanyag (15) a rugóelemekhez (13) adhéziósan van kötve.

10. Az előző igénypontok bármelyike szerinti sínalj papucs (1), **azzal jellemezve, hogy** a töltőanyag (15) baktericid vagy fungicid hatóanyagot tartalmaz.

11. Az előző igénypontok bármelyike szerinti sínalj papucs (1), **azzal jellemezve, hogy** a rugóelemek (13) a fenékhez (9) vannak vulkanizálva.

12. Eljárás sínalj papucs (1) előállítására, amelynek során a sínalj papucs (1) fenekét (9) és oldalfalait (10) rugalmas anyagból vulkanizálással formára alakítjuk, amely fenéken (9) rugóelemeket (13) úgy rendezünk el, hogy ezek között közbenső terek (14) szabadon maradjanak, **azzal jellemezve, hogy** a közbenső terekben (14) HD-PE-t, PP-t, PUR-t, NR-t, SBR-t, EPDM-t, EPS-t, XPS-t, EVA-t, TPE-t tartalmazó csoportból kiválasztott második rugalmas anyagból lévő, a közbenső tereket (14) legalább megközelítőleg teljesen kitöltő töltőanyagot (15) rendezünk el, amely második rugalmas

anyag szekáns merevsége legfeljebb olyan nagyságú, hogy a berugózási karakterisztikát a rugóelemek (13) terhelésekor nem, illetve csak jelentéktelen mértékben befolyásolja.

13. A 12. igénypont szerinti eljárás, **azzal jellemezve, hogy** a töltőanyagot (15) rugalmas lapként állítjuk elő és ebben bemélyedéseket képezünk ki, amelyek a geometriájuk szempontjából legalább megközelítően a rugóelemeknek (13) felelnek meg, és ezt a lapot a vulkanizálás után a fenékre (9) ráfektetjük.

14. A 12. igénypont szerinti eljárás, **azzal jellemezve, hogy** töltőanyagként (15) habosítható nyersanyagot használunk, amelyet sínalj (2) behelyezése előtt a közbenső terekbe (14) rendezzük és a sínalj (2) behelyezése után habosítjuk.

15. A 12. igénypont szerinti eljárás, **azzal jellemezve, hogy** a sínalj papucsot (1) kétkomponenses eljárás szerint állítjuk elő, amelynél a vulkanizálás alatt a töltőanyaghoz (15) a rugóelemek (13) közötti közbenső terek (14) formájába habosítható nyersanyagot viszünk be és habosítunk.

16. A 12-15. igénypontok bármelyike szerinti eljárás, **azzal jellemezve, hogy** a rugóelemeket (13) a sínalj papucs (1) fenekére (9) rávulkanizáljuk.

Fig.1

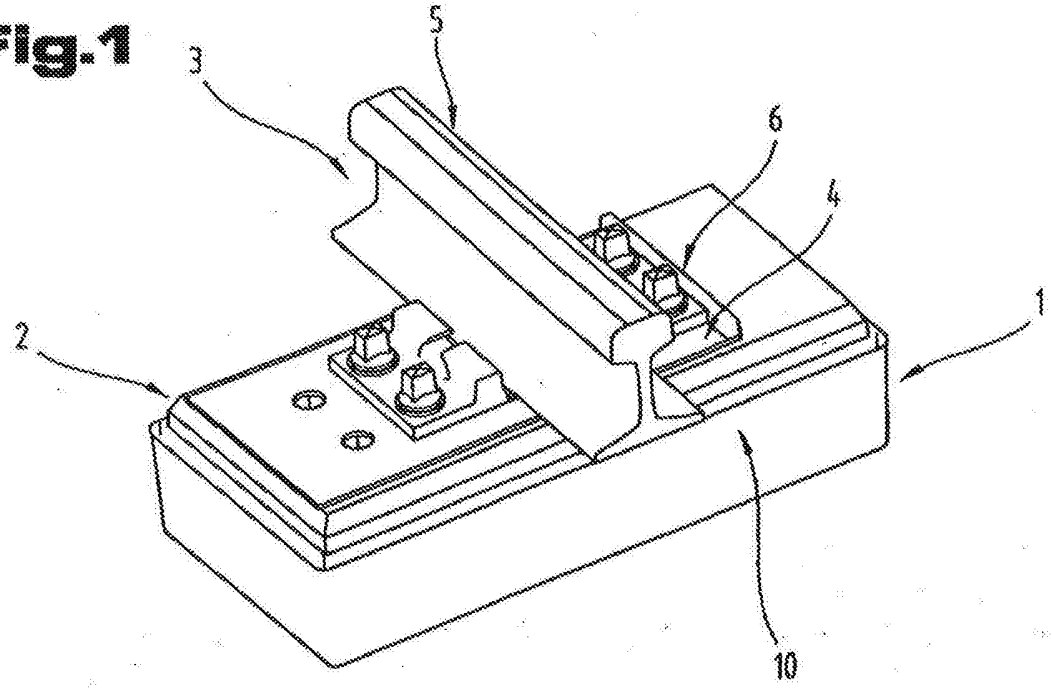
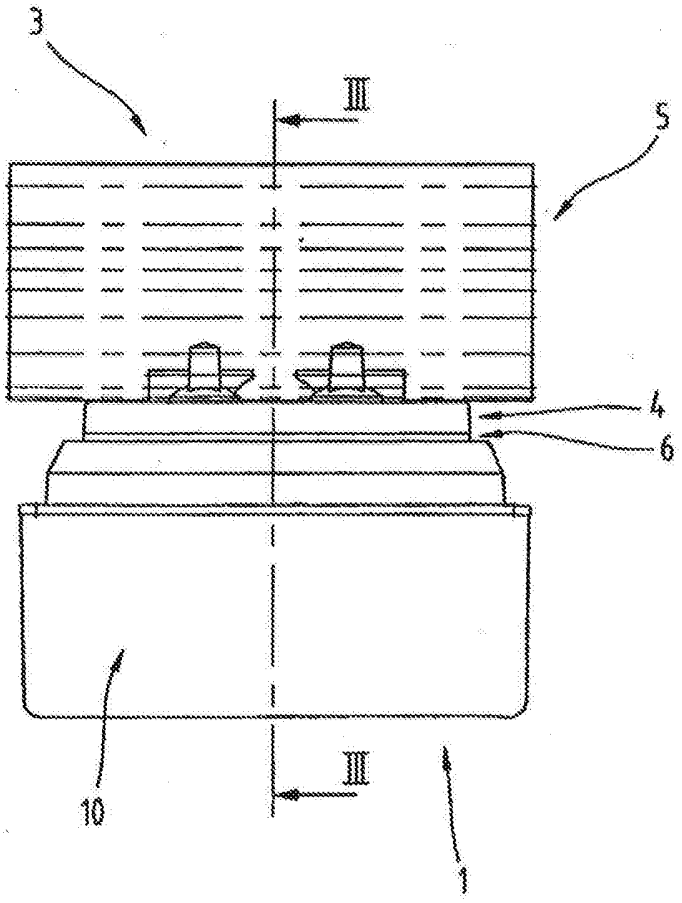


Fig.2



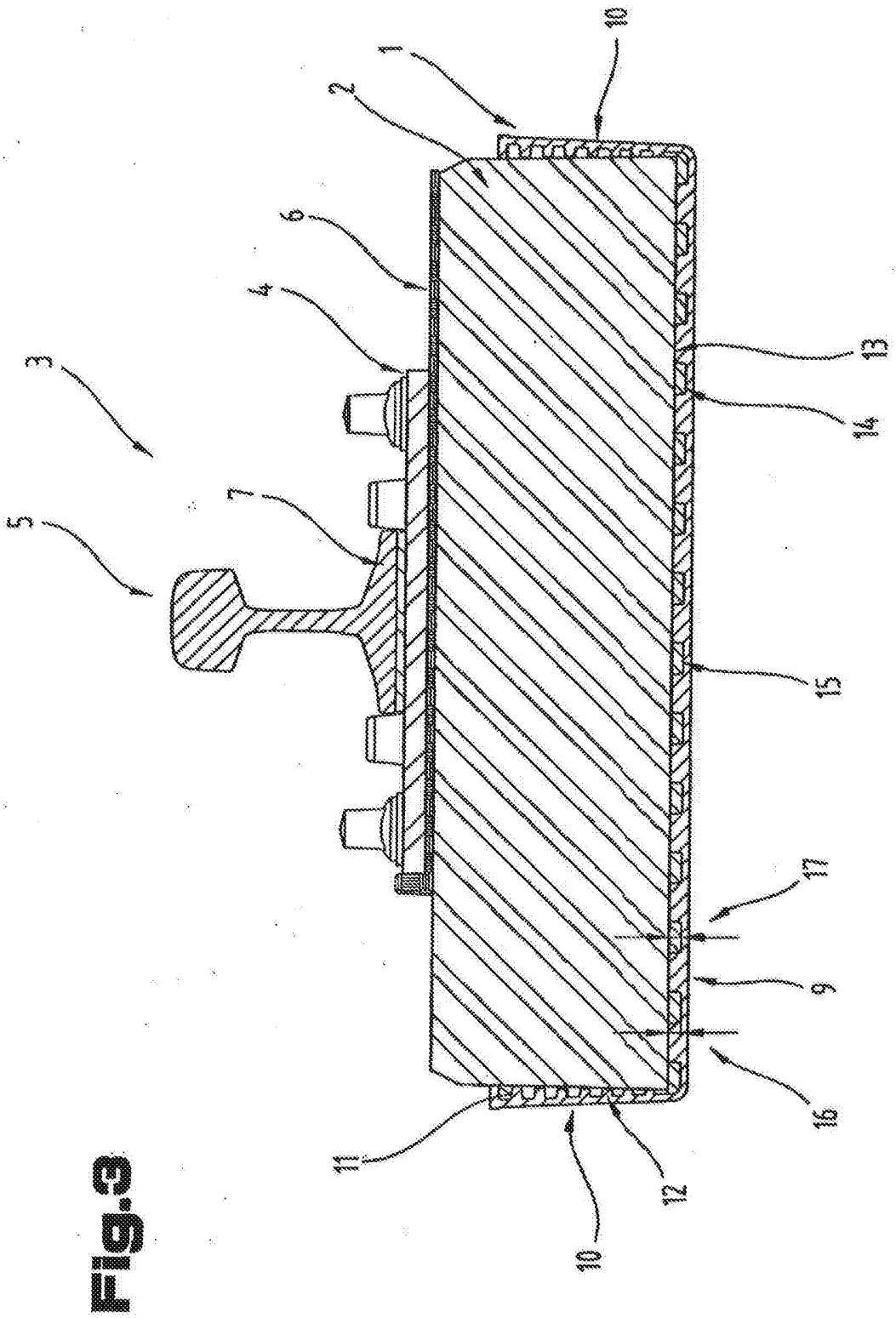


Fig.3

Fig.4

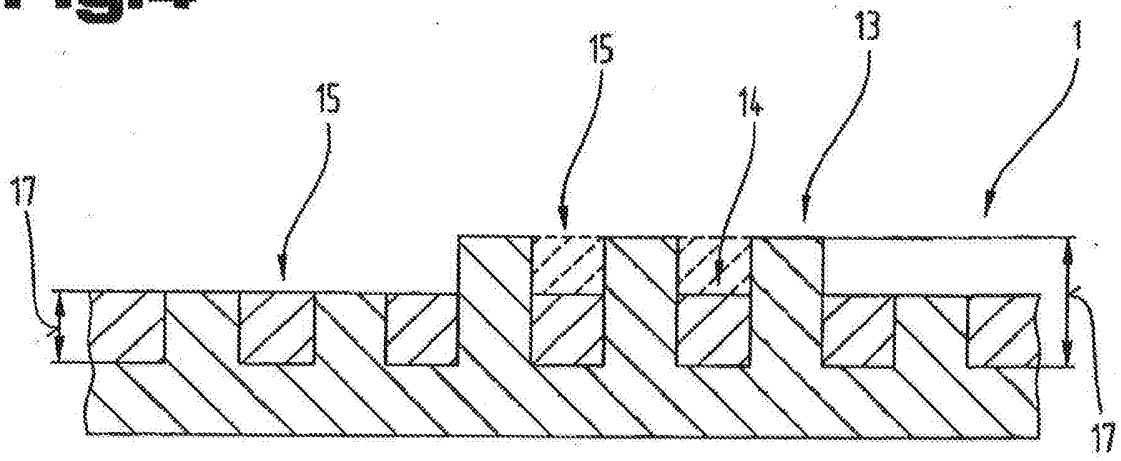


Fig.5