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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))

A fordítást a szabadalmat az 1995. évi XXXIII. törvény 84/H. §-a szerint nyújtotta be. A fordítás tartalmi helyességét a Szellemi Tulajdon Nemzeti Hivatala nem vizsgálta.

POWER RAIL, MOUNTING AND DISMOUNTING METHOD AND ARRANGEMENT COMPOSED OF COMBINED POWER RAILS

Description

[0001] The invention relates to a power rail for movable power consumers, more particularly for electrically driven vehicles, preferably rail-borne vehicles, with a carrier profile, which comprises two carrier profile elements, and a head profile, which has two opposing lateral sections and which is connected to the carrier profile in a positive and/or non-positive manner

[0002] The invention furthermore relates to a system of a plurality of axially assembled power rails and to a method of mounting or dismounting a power rail.

[0003] Typically, generic power rails, which are known from the prior art, serve as supply for the electrical power, for example, in order to be able to provide power to movable power consumers, such as electrically driven rail-borne vehicles (suburban railways, underground railways, monorails, etc.). Such known power rails, however, are likewise also used in connection with further movable power consumers known from the prior art (e.g. rail-guided power consumers used in workshop halls).

[0004] In connection with electrically driven rail-borne vehicles, such as suburban railways, underground railways, monorails, etc. for example, the generic power rails are provided or mounted, respectively, at different locations, as needed. Power rails are for example often mounted on the side of the running rails of electrically driven rail-borne vehicles, so as to run next to the running rails.

[0005] In other cases, such power rails, however, can also run above the running rails. Such cases occur, for example, in workshop halls or in tunnels.

[0006] The power supply from the power rail to the electrically driven rail-borne vehicles typically takes place via power collectors, which drag along the power rail. In the case of underground and suburban railways, for example, such dragging power collectors are embodied as power collector brackets or contact shoes, in the case of power rails, which are arranged laterally next to the track. On principle, they are guided so as to drag on, laterally or below the power rail, wherein such contact shoes are often laterally attached to the bogies of the underground or suburban railways. In the case of such systems, the power is preferably returned via the wheels and the running rails.

[0007] In connection with electrically driven rail-borne vehicles, such power rails are often identified as so-called "third rail" and are designed exclusively for guiding power and not for accommodating possible rail-borne vehicle weights.

[0008] In addition to a carrier profile, which can be made for example of an electrically conductive light metal material, generic power rails comprise a retaining profile, which is connected to the carrier profile in an electrically conductive manner and which is preferably embodied as head profiled strip and which, compared to the carrier profile, is made of a wear-resistant material, in order to counteract an excessive wear of the power rail, which is caused by the power collection by means of the above-explained power collector. The excessive wear of the power rail is accordingly reduced in that the power is collected by the power collector bracket or the



contact shoes of the rail-borne vehicle at the more wear-resistant retaining profile or head profiled strip, respectively, while the carrier profile exclusively serves to guide power.

[0009] An example of a generic power rail is shown in publication DE 10 2005 004 547 A1.

[0010] The power rail described in this publication is embodied as composite profile, which has a carrier profile, which is extruded of a light metal material, and a profiled strip, which spans the head surface of the carrier profile, of a harder material, in order to reduce the wear of the power rail caused by the power collection. To fasten the profiled strip to the carrier profile, the profiled strip is welded to an insertable bar, which, in turn, engages with a slot embodied in the carrier profile.

[0011] It is thus a disadvantage of the power rail, which is known from DE 10 2005 004 547 A1, that the mounting thereof is extremely extensive. In particular, the profiled strip must always be welded to the insertable bar, in order to fasten the profiled strip to the carrier profile in this manner. The dismounting of this power rail is thus also associated with large effort.

[0012] This power rail furthermore has the disadvantage that, when connecting or coupling, respectively, a plurality of such power rails, provision must always be made in the axial direction thereof or in the longitudinal direction, respectively, for corresponding connecting flanges, in order to be able to connect adjacent or adjoining power rails, respectively, to one another. This is accomplished, for example, in that the respective carrier profiles and profiled strips are recessed at the corresponding locations and are then screwed to one another, or in that further electrically conductive profile elements are screwed to lateral surfaces of the carrier profiles of different power rails, in particular to the ends thereof.

[0013] A power rail is known from publication DE 2 219 252 A1, which has a two-part carrier profile of aluminum and a head profile, which is made of wear-resistant steel. The two carrier profiles are braced to one another in a non-positive manner by means of screws or wedges against the C-shaped head profile.

[0014] A further common power rail is described in publication DE 2 147 956 A1, the setup of which is similar to the setup known from publication DE 2 219 252 A1. Here, the two carrier profiles are also braced against one another by means of a screw connection. A generic power rail is likewise known from the post-published publication WO 2011/082311 A2.

[0015] The invention is based on the object of further developing the generic power rails and mounting or dismounting methods of such power rails in such a way that the above-mentioned disadvantages are at least partially overcome. The mounting and dismounting of such power rails is to in particular be simplified by means of the invention, and the axial connection of such power rails is to be facilitated significantly. At least some of the mounting and dismounting steps, which are typically required in the case of the generic power rails and which are extensive, are to furthermore be avoided by means of the invention, and the flexibility of such power rails with respect to the mounting/dismounting thereof is to simultaneously be increased.

[0016] This object is solved by means of the features of independent claims 1 and 14.

[0017] Advantageous embodiments and further developments of the invention follow from dependent claims 2 to 13 and 15 to 19.

[0018] The power rails according to the invention for movable power consumers, more particularly for electrically driven vehicles, preferably rail-borne vehicles, comprises a carrier profile, which comprises a first carrier profile element and a second carrier profile element, wherein the first carrier profile element has a first profile element surface and the second carrier profile element has a second profile element surface, which faces the first profile element surface, wherein the first and the second profile element surface are curved at least in sections and form a surface curved in sections, along which the carrier profile elements are coupled to one another, and a head profile, which comprises a first lateral section and an opposing second lateral section, and which is connected to the first carrier profile element and the second carrier profile element in a positive and/or non-positive manner, wherein ends of the profile element surfaces facing the head profile are arranged closer to the second lateral section than to the first lateral section. The power rail is characterized in that the two carrier profile elements are essentially of the same height and through the head profile are coupled to each other in a positive and/or non-positive manner along the surface.

[0019] The power rail according to the invention is accordingly formed by a composite power rail, which comprises a multi-part carrier profile, which is preferably made of a light metal, which conducts electricity well, formed by the respective carrier profile elements, and a head profile. More particularly on a head surface of the carrier profile, the head profile is thereby electrically connected thereto and encompasses the same in a positive and/or non-positive manner. The carrier profile is preferably embodied in two parts. However, embodiments of the carrier profile comprising more than two parts are likewise conceivable. Due to this multi-part embodiment of the carrier profile, the latter can be produced with improved technological properties from a mechanical and electrical aspect and more cost-efficiently.

[0020] The carrier profile elements are preferably inserted individually or separately, respectively, and one after the other into the head profile wherein the first carrier profile element is initially inserted into the retaining profile due to the corresponding embodiment of the carrier profile elements, and the second carrier profile element, guided by the first carrier profile element, produces the positive and/or non-positive connection between the carrier profile and the head profile by means of a "screw-in movement". In other words, a change of the position of the carrier profile elements leads to a change of the geometry, in particular of the width, of a head section of the carrier profile, behind which the head profile engages or which it encompasses, respectively. The positive and/or non-positive connection between the carrier profile and the head profile can thus be produced or removed as a function of the position of the carrier profile elements relative to one another. The position of the carrier profile elements relative to one another more particularly identifies a position, in the case of which the carrier profile elements face one another at least in sections along their longitudinal direction of extension.

[0021] In the context of this disclosure, the positive connection is to be understood as a connection, in the case of which one of the connecting partners quasi stands in the way of another connecting partner. The carrier profile elements, which are inserted into the head profile, thus produce the positive connection with the retaining profile in a corresponding position relative to one another, and cannot be removed from the head profile, at least in the corresponding position. In this context, the non-positive connection is to be understood as a connection, which requires a normal force onto the surfaces, which are to be connected to one another; i.e., in the case at hand between the adjoining surfaces of the carrier profile elements, as well as between the adjoining surfaces of the carrier profile elements and the head profile. The mutual displacement thereof is thus prevented, as long as

the counter force, which is effected by the static friction, is not exceeded. The non-positive connection is to thus be understood to be a jamming or bracing at least in sections between the carrier profile elements and the head profile, whereby the non-positive connection is ultimately effect.

[0022] The power rail according to the invention can easily be separated into its individual parts by means of the embodiment of the carrier profile elements according to the invention, for example in the case of a highly worn head profile. The recyclability of some elements of the power rail according to the invention is thus significantly increased. For example, either the carrier profile elements or the head profile can be replaced. In other words, the assembly profile of the power rail is highly simplified, in this case by a combination of three profile parts, namely the carrier profile elements and the head profile, with the result of a positive and non-positive connection by means of a type of screw-in mechanism and a subsequent single fixing mechanism between the carrier profile elements. The fixing connection process between the carrier profile elements must thereby preferably be chosen in such a way that it does not impact the material properties in the transition between the head profile and the carrier profile in any way. The carrier profile elements are inserted into the head profile, more particularly vertically to a longitudinal direction of the carrier profile or of the head profile.

[0023] The power rail according to the invention can be further developed in an advantageous manner in such a way that the positive connection between the carrier profile elements and the head profile is embodied only when the carrier profile elements fulfill a first certain positional relationship relative to one another in response to being inserted into the head profile. In response to the insertion of the first carrier profile element into the head profile and subsequent insertion of the second carrier profile element into the head profile, the positive connection is thus only accomplished, when the second carrier profile element reaches a certain position with respect to the first carrier profile element. In this position, the carrier profile elements cannot be removed from the head profile any longer, because the positive connection blocks the removal of the carrier profile elements. Due to the fact, however, that a non-positive connection is not yet at hand in this position, this is a loose positive connection.

[0024] The power rail according to the invention can furthermore be realized in such a way that the non-positive connection between the carrier profile elements and the head profile is embodied only when the carrier profile elements fulfill a second certain positional relationship relative to one another in response to insertion into the head profile. When the second carrier profile element finally reaches into a further certain position with respect to the first carrier profile element, a non-positive connection (in addition to the positive connection) is also produced between these components due to a bracing or jamming, respectively, of both carrier profile elements and the head profile.

[0025] The power rail according to the invention is furthermore implemented in such a way that the first carrier profile element and the second carrier profile element are designed in such a way that the carrier profile elements adjoin one another when embodying the carrier profile via respective profile element surfaces, wherein the respective profile element surfaces of the carrier profile elements are curved at least in sections. The curved surfaces of the carrier profile element are preferably embodied in such a way that the second carrier profile element can glide across the curved surface thereof along the curved surface of the first carrier profile element, which has already been inserted into the retaining profile, so as to be inserted into the retaining profile as a

follow-up to the first carrier profile element, until the positive and non-positive connection with the retaining profile is finally attained.

[0026] At least the curved surfaces of the carrier profile elements thus represent gliding surfaces of guide surfaces, respectively, which determine the screw-in guide movement of the second carrier profile element relative to the first carrier profile element. By means of the embodiment of the curved surfaces of the carrier profile elements, the type or the course, respectively, of the screw-in movement of the second carrier profile element is thus provided.

[0027] The power rail according to the invention can furthermore be embodied in such a way that the carrier profile, which is embodied by the carrier profile elements, has a section, which is at least partially engaged behind or encompassed by the retaining profile, in order to form the positive connection and/or the non-positive connection between the carrier profile and the retaining profile. In this case, a particularly stable connection can be attained between the carrier profile elements and the retaining profile, because the carrier profile elements can enter into a positive connection as well as into a non-positive connection with the retaining profile.

[0028] The power rail according to the invention can further be embodied in such a way that the carrier profile is formed by a double T profile and/or the retaining profile is formed by a C profile. The C-shaped retaining profile or head profile, respectively, thus encompasses or engages behind, respectively, a section of the double T profile, in particular the head section of the carrier profile or the head sections, respectively, of the carrier profile elements. On the one hand, the C-shaped retaining profile or head profile, respectively, can preferably surround the carrier profile and, on the other hand, it can be embodied in such a way that it claws into the carrier profile. A longitudinal displacement of the carrier profile elements relative to the head profiled strip can thus be avoided for the most part.

[0029] The power rail according to the invention can furthermore be further developed in such a way that the material of the head profile with respect to the material of the carrier profile, in particular of the carrier profile elements, is more wear-resistant. The wear-resistant head profile is embodied in a C-shaped manner and is preferably also designed so to be spring-elastic to a certain extent, whereby the production of the positive and/or non-positive connection between the carrier profile elements and the retaining element is promoted. Provision can be made for example for the C-shaped head profile to extend slightly elastically in response to the insertion of the second carrier profile element, or deforms, respectively, until the positive connection and/or the non-positive connection is produced.

[0030] The power rail according to the invention can furthermore be realized in such a way that a conductive layer for promoting an electrically conductive connection between the carrier profile and the retaining profile and/or the carrier profile elements is arranged between the carrier profile and the head profile and/or between the carrier profile elements. The conductive layer can in particular be present in solid, paste-like or liquid form and can be applied or plated, respectively, to the head profile or to the carrier profile or between the carrier profile elements, respectively, for example ahead of time.

[0031] The power rail according to the invention can furthermore be provided in such a way that the carrier profile elements are coupled to one another via a bonded connection and/or positive connection and/or a

non-positive connection. After being screwed-in and pretensioned, the two carrier profiles are fixedly connected to one another via a fixing connecting method, preferably "Friction Stir Welding" (FSW). In order to separate the finally mounted power rail into its individual components, it is then only necessary to carry out a separating step at the weld seam. The carrier profile elements are thermally stressed by means of the friction stir welding slightly less than it is the case in at least some other known welding methods. The energy required for this is also reduced.

[0032] The method according to the invention for mounting or dismounting the power rail according to the invention has the following steps:

Producing or removing the positive and/or non-positive connection between the carrier profile elements and the head profile by changing the position of the second profile element, whereas the first carrier profile element does not change its position in relation to the head profile.

[0033] The properties and advantages discussed in connection with the power rail according to the invention thus follow in the same or in a similar manner, which is why, in order to avoid repetitions, reference is made to the above explanations in connection with the power rail according to the invention.

[0034] The same applies analogously for the following preferred embodiments of the method according to the invention, which is why reference is also made with regard to this to the corresponding explanations in connection with the power rail according to the invention.

[0035] The method according to the invention can be further developed in an advantageous manner in that at least one positive connection is first produced between at least the carrier profile elements and the head profile by arranging the carrier profile elements in a first certain positional relationship relative to one another in response to the insertion of the carrier profile elements into the head profile.

[0036] The method according to the invention can furthermore be embodied in such a way that a non-positive connection between the carrier profile elements and the head profile is first produced by arranging the carrier profile elements in a second certain positional relationship relative to one another in response to the insertion of the carrier profile elements into the head profile.

[0037] The method according to the invention can furthermore be implemented in such a way that the first carrier profile element and the second carrier profile element are arranged in such a way that, when embodying the carrier profile via respective profile element surfaces, which are at least curved in sections, the carrier profile elements adjoin.

[0038] The method according to the invention can furthermore be realized in such a way that the head profile at least partially engages behind or encompasses a section of the carrier profile, which is embodied by the carrier profile elements, in order to form the positive connection and/or non-positive connection between the carrier profile and the head profile.

[0039] The method according to the invention can further be carried out in that a conductive layer is arranged between the carrier profile and the head profile and/or between the carrier profile elements in order to promote an electrically conductive connection between the carrier profile and the head profile or between the carrier profile elements, respectively.

[0040] The method according to the invention can furthermore be further developed in such a way that the carrier profile elements are coupled to one another via a bonded connection and/or a positive connection and/or a non-positive connection.

[0041] The power rail according to the invention for movable power consumers according to a further embodiment comprises a carrier profile and a head profile, which retains the carrier profile, preferably in a positive and/or non-positive manner, wherein provision is made according to the invention for the carrier profile to be embodied by a first carrier profile element and a second carrier profile element, which can be coupled to the first carrier profile element and the respective ends of which preferably have an axial offset.

[0042] The characteristics and advantages discussed in connection with the power rail according to the invention thus follow at least partially in the same or in a similar manner, which is why, to avoid repetitions, reference is made to the above explanations in connection with the power rail according to the invention. The power rail according to the invention thus promotes the connection of power rails in the longitudinal direction thereof in a particularly advantageous manner, i.e. the axial coupling of a plurality of power rails is facilitated. The head profile is preferably embodied with a miter cut or also with step-like sections on the end side. Provision is preferably made on the corresponding ends of the respective carrier profile elements for flange connections, which are known to the person of skill in the art, in order to be able to connect a carrier profile element of the one power rail to another carrier profile element of the other power rail. The power rails can thus be connected to one another in a fixed or movable manner in an advantageous manner via the step-like design of the carrier profiles due to the axial offset. In the case of a movable connection, an endless alternative without additional components for an expansion joint between different power rails is possible. A conventional expansion joint without processing of the power rail ends is possible as well. A power transition takes place through the flange surfaces of carrier profile elements, which are connected to one another, of different power rails, takes place without necessarily requiring separate conductors for producing an electrical connection between the carrier profile elements. The cross section of the flange surfaces for the power transition is thereby variable and can be determined by means of the axial offset of the carrier profile elements of a power rail. In this case, a conductive transition layer in solid paste-like or liquid form can also be located between the flange surfaces in order to promote the electrical conductivity between the power rails. The stepped ends of the carrier profile are in particular determined by means of the offset of the carrier profile elements in response to the assembly. The individual parts can thereby be designed in such a way that no further processing is required for a connection of two rails after the assembly, as it is made for example in the prior art by obliquely cutting the carrier profile ends.

[0043] The arrangement according to the invention of at least two power rails according to the invention provides for the end of one of the carrier profile elements of the one power rail to be coupled to an end of the respective other one of the carrier profile elements of the other power rail for axially coupling the power rails.

[0044] Preferred exemplary embodiments of the invention will be discussed below by means of the figures.

[0045]

Fig. 1 shows a perspective illustration of a power rail according to the invention according to a first exemplary embodiment of the invention;

Fig. 2 shows an illustration of the power rail of Fig. 1 according to the invention in cross section;

Figs. 3a)-c) show various perspective illustrations of the power rail of Fig. 1 according to the invention at different mounting steps;

Figs. 4a)-c) show various illustrations of the power rail of Fig. 1 according to the invention in cross section at different mounting steps;

Fig. 5 shows a perspective illustration of a power rail according to the invention according to a second exemplary embodiment of the invention;

Fig. 6 shows an enlarged illustration of the area identified in Fig. 5;

Fig. 7 shows a perspective illustration of an arrangement according to the invention of power rails of Figure 5 according to the invention prior to the axial coupling of the power rails according to the invention; and

Fig. 8 shows a perspective illustration of the arrangement according to the invention of power rails of Figure 5 according to the invention after the axial coupling of the power rails according to the invention.

[0046] Fig. 1 shows a perspective illustration of a power rail 10 according to the invention according to a first exemplary embodiment of the invention, while Fig. 2 shows an illustration of the power rail 10 of Fig. 1 according to the invention in cross section. According to the first exemplary embodied, the power rail 10 according to the invention is provided for movable power consumers. In this case, such movable power consumers are preferably electrically driven vehicles, such as rail-borne vehicles (underground railways, suburban railways, etc.).

[0047] As is shown in Figs. 1 and 2, according to the first exemplary embodiment, the power rail 10 according to the invention comprises exactly three profile parts, namely a carrier profile (part) comprising two carrier profile elements 12, 14, and a head profile (part) or retaining profile 16, respectively, which is connected to the carrier profile (part) in a positive and non-positive manner and which thus encompasses the carrier profile (part) at least in sections. As can be gathered in particular from Figure 1, all profile parts 12, 14 and 16 of the power rail 10 according to the invention are elongated components, which can be formed for example by steel profiles, construction profiles, roll-formed sheet metals, etc..

[0048] In this exemplary embodiment, the carrier profile is, i.e. the carrier profile elements 12, 14 are formed by an electrically conductive light metal material and serves or serve, respectively, in particular for

carrying power along the power rail 10 according to the invention. The head profile 16 is formed by a head profiled strip, the material of which is embodied to be more wear-resistant as compared to the material of the respective carrier profile elements 12 and 14, i.e. to the material of the carrier profile. The head profile 16 thus serves for power collection of the power guided by the carrier profile along the power rail 10 according to the invention. To promote the electrical conductivity between the head profile 16 and the carrier profile and/or between the carrier profile elements 12 and 14, a conductive layer, which is not illustrated in the figures, is arranged between the carrier profile and the head profile 16. Said conductive layer can be present in solid, paste-like or liquid form and can be applied or plated, respectively, to respective sections of the carrier profile elements and/or of the head profile 16 ahead of time.

[0049] As can in particular be seen from Figure 2, the carrier profile comprises the first carrier profile element 12 and the second carrier profile element 14, which is coupled to the first carrier profile element 12, which approximately form a double T profile in the intended assembled state. It can further be gathered from Figure 2 that the head profile 16 approximately has the shape of a C profile, i.e. the head profile 16 has an upper planar section and two opposing lateral, preferably curved sections 16a, 16b. In the intended assembled state, the head profile 16 encompasses or engages behind, respectively, at least the head sections of the carrier profile elements 12, 14. A positive and non-positive connection between the carrier profile and the head profile 16 is produced in particular by means of the design or geometry, respectively, of the carrier profile elements 12, 14, which are assembled in the intended state, as well as by means of the design and geometry of the head profile 16. More details relating to the production of this positive and non-positive connection between the carrier profile and the head profile 16 will be explained in more detail below.

[0050] As can in particular be seen in the cross sectional illustration of the power rail 10 according to the invention shown in Figure 2, the first carrier profile element 12 of the carrier profile comprises a foot section 22, a middle or web section 24, respectively, adjoining the foot section 22, and a head section 26 adjoining the middle or web section 24, respectively. The first carrier profile element 12 thus forms approximately on half of the double T profile with respect to an axis of symmetry (axis running from bottom to top in the illustration of Figure 2) of the double T profile. The second carrier profile element 14 of the carrier profile likewise comprises a foot section 32, a middle or web section 30, respectively, adjoining the foot section 32, and a head section 28 adjoining the middle or web section 30, respectively. The second carrier profile element 14 thus also forms approximately the other half of the double T profile with respect to the axis of symmetry of the double T profile. In the case of carrier profile elements 12, 14, which are assembled as intended, the carrier profile thus comprises a foot section, formed by the foot sections 22, 32, a middle or web section, respectively, formed by the middle or web sections 24, 30, and a head section, formed by the head sections 26, 28.

[0051] When assembled as intended, the carrier profile elements 12, 14 adjoin one another via conjugated surfaces, which face one another, as can furthermore be gathered from Fig. 2. In other words, the adjoining surfaces define a contact surface (if provision is made for an electrically conductive intermediate layer, the contact surface is not a contact surface as understood by the wording, but is in fact a surface, along which or via which, respectively, the coupling of the carrier profile elements takes place), along which the two carrier profile elements 12, 14 are coupled to one another in a flat manner. The contact surface 13b is embodied so as to be flat or planar, respectively, on the foot sections 22, 32 of the carrier profile elements 12, 14. The same applies

substantially also for the web sections 24 and 30 of the carrier profile elements 12, 14, with the exception that the conjugated surface of the first carrier profile element 12 forms a protrusion 30 in the web section 24, while the conjugated surface of the second carrier profile element 14 forms a recess 18 in the web section 30. In the case of carrier profile elements 12, 14, which are assembled as intended, the protrusion 20 is thereby inserted into the recess 18. The protrusion 20 and the recess 18 preferably run in a straight line along the longitudinal direction of the carrier profile elements 12, 14, whereby a centering of the carrier profile elements 12, 14 can be attained by means of a centering of the carrier profile elements 12, 14, when being assembled with the head profile 16 as intended. The contact surface 13a is curved in the area of the head sections 26, 28 of the carrier profile elements 12, 14. The curvature radius in this section 13a of the contact surface is preferably location-dependent and provides for a screw-in mechanism 34, which will be explained in more detail below. At the head section of the first carrier profile element 12, the conjugated surface is in particular concave, so that it forms a further protrusion, which protrudes in the direction of the second carrier profile element 14. In contrast, the conjugated surface at the head section of the second carrier profile element 14 is convex, so that it forms a further recess, wherein at least the gliding interaction of the curved surfaces of the head sections 26, 28 of the carrier profile elements 12, 14, provides for the function of the screw-in mechanism 34 in cooperation with the head profile 16, as will be explained in more detail below.

[0042] On their outer surfaces, both head sections 26, 28 in each case have a step 15, the depth of which substantially corresponds to the thickness of the head profile 16b. This step facilitates in particular the screw-in mechanism of the carrier profile element 14, which will be explained below, because the step can quasi serve as attachment point or fulcrum point, respectively, for the screw-in movement (Fig. 4b).

[0053] The curved section 13a of the contact surface extends from the underside of the head profile 16, i.e. from the end 3c shown in Fig. 2, substantially to a horizontally running, hypothetical line, which is not illustrated in Fig. 2 and which connects the inner edges of the steps 15 of the head part 16. The end 13c is arranged closer to the laterally curved section 16b than to the laterally curved section 16a.

[0054] The screw-in mechanism 34 is thus provided by the carrier profile elements 12 and 14, at least by the head sections 26 and 28 thereof, which are designed in such a way that the carrier profile elements 12 and 14 enter into or remove the positive and non-positive connection with the head profile 16 as a function of their respective position relative to one another, provided that the carrier profile elements are inserted into the C-shaped head profile via the open side of the C (i.e. vertically to the longitudinal axis of the head profile). At least the geometry, in particular the width of the head section of the carrier profile can in particular be adjusted by means of the position of the carrier profile elements 12, 14 relative to one another. In other words, a gliding of convex surface along the head section 28 of the second carrier profile element 14 on the concave surface on the head section 26 of the first carrier profile element 12, depending on the positional change of the carrier profile elements 12, 14 relative to one another, leads to an enlargement or reduction of the geometry, in particular of the width of the head section of the carrier profile. It goes without saying that the position of the middle section and of the foot section of the carrier profile elements 12, 14 thus also changes relative to one another, which, however, does not directly contribute to the production of the positive and/or non-positive connection with the head profile 16 in this exemplary embodiment. The carrier profile elements 12 and 14 are in particular designed in such a way that the positive connection between the carrier profile elements 12 and 14 and the head profile 16

is embodied only when the carrier profile elements 12, 14 fulfill a first certain positional relationship relative to one another when being inserted into the C-shaped head profile 16. The geometry of the head section of the carrier profile is such in this case that the head section is arranged inside the C-shaped head profile 16 with play to the head profile 16 and can thus be moved inside the C-shaped head profile 16, but cannot be pulled out of the C-shaped head profile 16.

[0055] The carrier profile elements 12 and 14 are further embodied in such a way that a non-positive connection (in addition to the positive connection) is additionally embodied between the carrier profile elements 12 and 14 and the head profile 16 only when the carrier profile elements fulfill a second certain positional relationship relative to one another when being inserted into the C-shaped head profile 16. In this case, the geometry of the head section of the carrier profile is such that the head section inside the C-shaped head profile 16 is arranged without play to the head profile 16 at least in sections and is thus immovable and jammed inside the C-shaped head profile 16. The head section of the carrier profile can thus also not be pulled out of the C-shaped head profile 16. Provided that the positive and non-positive connection of the carrier profile with the head profile 16 is thus produced, the carrier profile elements 12, 14 are preferably in their state, which is assembled as intended.

[0056] It is important thereby that the positive and non-positive connection of both carrier profile elements 12, 14 along the section 13a, and preferably also via an upper area of the section 13b of the contact surface is effected exclusively by the head profile 16.

[0057] Even if this is not illustrated explicitly in Fig. 2, the foot sections 22, 32 of the carrier profile elements 12, 14 are on principle additionally fixedly connected to one another by means of a bonded connection, preferably via a welded connection, more preferably via a FSW weld seam. This bonded connection effects a coupling of both carrier profile elements 12, 14 only in the area of the foot sections 22, 32, but not in the section 13a of the contact surface. In the alternative, positive or non-positive connections, in particular destruction-free releasable connections or nondestruction-free releasable connections, can also be used in the area of the foot sections 22, 32.

[0058] The mounting of the power rail 10 according to the invention will be described below by referring to Figs. 3a)-3c) and 4a)-c). Figs. 3a)-c) show various perspective illustrations of the power rail 10 of Fig. 1 according to the invention at different mounting steps, while Figs. 4a)-c) show various illustrations of the power rail 10 of Fig. 1 according to the invention in cross section at different mounting steps.

[0059] As can in particular be gathered from Figs. 3a) and 4a), the first carrier profile element is initially arranged in the C-shaped head profile 16 (from the open side of the C-shaped head profile 16) in such a way that the head section 26 thereof is encompassed or engaged behind, respectively, by a section of the head profile 16, and the head profile 16 and the first carrier profile element 12 adjoin one another (via a conjugated outer surface of the first carrier profile element 12 and a conjugated inner surface of the C-shaped head profile 16). In this mounting state, however, a positive or non-positive connection is not yet present between the carrier profile element 12 and the head profile 16, because the first carrier profile element can easily be removed from the C-shaped head profile 16 again.

[0060] Via its head section 28, the second carrier profile element 14 is subsequently inserted into the head profile 16 quasi via a "turning movement" due to the embodiment of the conjugated curved surfaces of the carrier profile elements 12, 14, so that the head section 28 of the second carrier profile element 14 is gradually encompassed by the remaining section of the C-shaped head profile 16 in response to a further screw-in movement of the second carrier profile element 14. That is, the head section of the carrier profile gradually becomes wider or the geometry of the head section is increased, respectively, or changed in certain directions, respectively, due to the changes of the positional relationship between the carrier profile elements 12 and 14.

[0061] Figs. 3b) and 4b) show a position of the carrier profile elements 12 and 14, in the case of which the carrier profile elements 12 and 14 are in the first certain positional relationship relative to one another when being inserted into the C-shaped head profile 16 and thus at least produce the positive connection to the head profile 16. The positive connection between the carrier profile elements 12, 14 and the head profile 16 is produced in particular, because, in this position of the carrier profile elements 12, 14, the head sections 26, 28 thereof cannot be pulled out of the C-shaped head profile 16, but are blocked by the C-shaped head profile 16, in particular by the sections of the C-shaped head profile 16, which engage behind or encompass, respectively, the head sections 26, 28 of the carrier profile elements 12, 14. In other words, the geometry of the head section of the carrier profile was changed or was enlarged in certain directions, respectively, in such a way that the head section of the carrier profile inside the C-shaped head profile 16 enters into a positive connection with the head profile 16.

[0062] By further screwing the second carrier profile element 14 into the head profile 16, the protrusion 20 of the first carrier profile element 12 gradually reaches into the recess 18 of the second carrier profile element 14, which is shown in Figs. 3c) and 4c), whereby the centering of the carrier profile elements 12, 14 is accomplished gradually. The positive connection between the carrier profile elements 12, 14 and the head profile 16 is furthermore maintained, wherein a non-positive connection between the carrier profile elements 12, 14, in particular the head section of the carrier profile, and the head profile 16 is established gradually. That is, the head section of the carrier profile is now encompassed by the C-shaped head profile 16 in such a way that a certain tensioning or jamming, respectively, is present between the carrier profile and the C-shaped head profile 16. That is, as soon as the carrier profile elements 12 and 14 adjoin one another completely, the head sections thereof are encompassed by the head profile 16 in such a way that a positive as well as a non-positive connection is present between the carrier profile elements 12, 14 and the head profile 16. In other words, the geometry of the head section of the carrier profile was changed or was enlarged in certain directions, respectively, in such a way that the head section of the carrier profile enters into a positive and non-positive connection with the head profile 16 inside the C-shaped head profile 16.

[0063] To maintain the positive and non-positive connection, in particular the tensioning or jamming, respectively, between the carrier profile elements 12 and 14 and the head profile 16, the carrier profile elements 12 and 14 are preferably welded to one another on their foot sections 22 and 32. The mounting of the power rail 10 is thus initially concluded.

[0064] To now be able to dismount the power rail according to the invention again, it is only necessary to remove the welding of both carrier profile elements 12 and 14, for example by means of a separating step, and to

carry out the above-mentioned mounting steps in reverse order. First, the non-positive connection and then the positive connection are thus removed again in an analogous manner.

[0065] Fig. 5 shows a perspective illustration of a power rail 10 according to the invention according to a second exemplary embodiment of the invention, while Fig. 6 shows an enlarged illustration of the area identified in Fig. 5. To avoid repetitions, we will only discuss the differences as compared to the power rail 10 according to the first exemplary embodiment in more detail, when describing this second exemplary embodiment.

[0066] The power rail 10 according to the invention according to the second exemplary embodiment substantially corresponds to the power rail 10 according to the first exemplary embodiment. The carrier profile of the power rail 10 according to the invention according to the second exemplary embodiment is embodied by means of the first carrier profile element 12 and by means of the second carrier profile element 14, which is coupled to the first carrier profile element 12, which axially have the same length, wherein the carrier profile elements 12, 14 in this case are arranged so as to be axially offset relative to one another in such a way that an axial offset between the respective ends of the carrier profile elements 12 and 14 is effected at the respective ends of the carrier profile elements 12 and 14. As can in particular be seen in Figs. 5 and 6, the end section of the first carrier profile element 12, which protrudes beyond the end section of the second carrier profile element 14, can accordingly be used as connecting location for a further correspondingly embodied power rail 10 according to the invention. For this purpose, provision is made for the first carrier element 12 comprising a connecting device 34, which, in the illustrated case, is embodied by holes, for example by round boreholings and elongated boreholings, for a screw-nut connection. It goes without saying that other connecting devices, which are known to the person of skill in the art, can be used for coupling the respective carrier profile elements of different power rails.

[0067] By suitably selecting the axial length of the offset of both carrier profile elements 12, 14, the power density can be variably designed in this area.

[0068] The head profile 16 in the axial offset area runs diagonally to the longitudinal direction of the power rail. The angle to the longitudinal direction is preferably 45° , but can also be in a range of between 30° and 60° . As can be seen in Fig. 6, the part of the head profile 16, which encompasses the axially protruding carrier profile element 12, protrudes axially from the latter, and the part of the head profile 16, which encompasses the axially recessed carrier profile element 14, stands back axially from the latter. The head section 26 of the carrier profile element 12 is thus partially covered by the head profile 16, while the head section 28 of the carrier profile element 14 is partially exposed by means of the head profile 16, which stands back axially in this area.

[0069] The front surface or contact surface 16d, respectively, can furthermore have a phase, which runs diagonally inwards. The head profile of a further power rail, which is to be axially attached to this front surface 16d, has a phase, which is complementary thereto, whereby forces acting vertically, i.e. along the gravity or in height direction of the power rail, can be absorbed well by axially assembled power rails, and a vertically continuous gap between two axially assembled power rails is avoided.

[0070] The axial end of the head profile 16 represents a miter cut, which is associated with a plurality of advantages. Compared to a cut, which runs vertically to the longitudinal direction, the contact surface 16d is

enlarged, and the head part can also better absorb forces acting laterally to the longitudinal direction. In addition, the power collector, which drags on the power rail, experiences less of this transition area when passing over, because it does not pass over this transition area all at once, but quasi only piece by piece, at a given point in time.

[0071] Fig. 7 shows a perspective illustration of an arrangement according to the invention of the power rails 10 of Figure 5 according to the invention prior to the axial coupling of the power rails 10 according to the invention. Fig. 8 shows a perspective illustration of the arrangement according to the invention of power rails 10 of Figure 5 according to the invention after the axial coupling of the power rails 10 according to the invention.

[0072] As can be gathered from Figs. 7 and 8, different power rails 10 according to the invention can be coupled to one another. For the axial coupling of the power rails 10, the end of one of the carrier profile elements 12 or 14 of the one power rail 10 is coupled to an end of the respective other one of the carrier profile elements 12 or 14 of the other power rail 10. As mentioned above, the connecting device 34 in the form of holes is provided for coupling the respective carrier profile elements 12 and 14 of different power rails 10, so that preferably the middle sections 24, 32 can be fixedly connected to one another by means of a screw-nut connection. A carrier profile element, preferably the middle section thereof of a power rail 10, is preferably provided with round boreholings, while the respective other carrier profile element, preferably the middle section thereof of the other power rail 10 is provided with elongated boreholings. An expansion joint between power rails 10, which are coupled to one another, can thus be adjusted in a particularly advantageous manner, so that material movements of the respective components of the power rail 10 can be compensated. As can further be seen from Figs. 7 and 8, the head profiles 16 of different power rails 10 according to the invention are embodied with corresponding miter cuts, so that a flush joining of the different power rails 10 according to the invention is made possible. As an alternative to the miter cuts, however, corresponding stepped sections of the head profile 16 of different power rails 10 can also be provided, in order to be able to connect two different power rails 10 so as to be flush (in the alternative also with an expansion joint).

[0073] The features of the invention disclosed in the above description, in the drawings as well as in the claims, can be significant for the realization of the invention, both alone as well as in any combination.

List of Reference Numerals

[0074]

10	power rail
12	first carrier profile element
13a-c	contact surface
14	second carrier profile element
15	step
16	head profile or retaining profiled strip, respectively
16a	first curved section -- head profile
16b	second curved section -- head profile

16c	end of the head profile
16d	front surface -- head profile
18	recess
20	protrusion
22	foot section -- first carrier profile element
24	middle section -- first carrier profile element
26	head section -- first carrier profile element
28	head section -- second carrier profile element
30	middle section -- second carrier profile element
32	foot section -- second carrier profile element
34	connecting device

ÁRAMVEZETŐ SÍN, ÖSSZESZERELÉSI ÉS SZÉTSZERELÉSI ELJÁRÁS, VALAMINT ELRENDEZÉS ÖSSZEILLESZTETT ÁRAMVEZETŐ SÍNEKBŐL

Szabadalmi igénypontok

1. Áramvezető sín (10) mozgó áramfogyasztók, főként villamos hajtású járművek, különösen sínen közlekedő járművek számára, egy hordozóprofilal, amely egy első hordozóprofil-elemet (12) és egy második hordozóprofil-elemet (14) tartalmaz, ahol az első hordozóprofil-elem egy első profilelem-felülettel, míg a második hordozóprofil-elem egy második profilelem-felülettel rendelkezik, amely az első profilelem-felület felé néz, ahol az első és a második profilelem-felület legalább szakaszonként ívelt és egy szakaszonként ívelt felületet (13a, 13b) képez, amelynek mentén a hordozóprofil-elemek (12, 14) egymással össze vannak kapcsolva, emellett az áramvezető sínnek van egy fejprofilja (16), amely egy első oldalsó szakasszal (16a) és egy ezzel szemközi második oldalsó szakasszal (16b) rendelkezik és amely az első hordozóprofil-elemmel (12) és a második hordozóprofil-elemmel (14) alakzáróan és/vagy erőzáróan van összekötve, emellett a profilelem-felületek fejprofil (16) felé néző végei közelebb vannak a második oldalsó szakaszhoz (16b) elrendezve, mint az első oldalsó szakaszhoz (16a), *azzal jellemezve*, hogy a két hordozóprofil-elem (12, 14) lényegében azonos magassággal rendelkeznek és a fejprofil (16) által a felület (13a, 13b) mentén alakzáróan és/vagy erőzáróan van egymással összekapcsolva.
2. Az 1. igénypont szerinti áramvezető sín (10), ahol a felület (13a, 13b) egy szakasza (13a) egy helytől függő görbületi sugárral rendelkezik.
3. A 2. igénypont szerinti áramvezető sín (10), ahol a felületszakasz (13a), a hordozóprofil-elemek (12, 14) magassági irányát tekintve, lényegében egy síkba esik a fejprofil (16) oldalsó szakaszainak (16a, 16b) egyik végével (16c).
4. A 2. vagy 3. igénypont szerinti áramvezető sín (10), ahol, a hordozóprofil-elemek (12, 14) magassági irányát tekintve, a felületnek (13) a felületszakaszhoz (13a) lefelé csatlakozó szakasza (13b) lényegében sík.
5. Az 1-4. igénypontok bármelyike szerinti áramvezető sín (10), ahol a fejprofilnak (16) az első oldalsó szakasza (16a) és a második oldalsó szakasza (16b) a hordozóprofil-elemeket (12, 14) legalább részben átfogja, hogy alakzárást és/vagy erőzárást képezzenek a hordozóprofil és a fejprofil (16) között.



6. Az 1-5. igénypontok bármelyike szerinti áramvezető sín (10), ahol a hordozóprofil-elemek (12, 14) egy-egy, a fejprofil (16) felé néző fejszakaszt (26, 28) tartalmaznak, amely egy beugrással (15) rendelkezik, amelynek mélysége lényegében a fejprofil (16) vastagságának felel meg.
7. Az 1-6. igénypontok bármelyike szerinti áramvezető sín (10), ahol a hordozóprofil egy kettős T profillal és/vagy a fejprofil (16) egy C profillal rendelkezik.
8. Az 1-7. igénypontok bármelyike szerinti áramvezető sín (10), ahol a hordozóprofil és a fejprofil (16) közötti és/vagy a hordozóprofil-elemek (12, 14) között egy villamosan vezetőképés réteg van elrendezve.
9. Az 1-8. igénypontok bármelyike szerinti áramvezető sín (10), ahol a hordozóprofil-elemek (12, 14) egy-egy talpszakaszt (22, 32) tartalmaznak, és ahol a talpszakaszok (22, 32) egy anyagzáró kapcsolaton keresztül vannak egymással összekötve.
10. Az 1-9. igénypontok bármelyike szerinti áramvezető sín (10), ahol az áramvezető sín (10) hosszirányában a hordozóprofil-elemek (12, 14) axiális végekkel rendelkeznek, amelyek axiálisan egymáshoz képest el vannak tolvá.
11. A 10. igénypont szerinti áramvezető sín (10), ahol a fejprofil (16) egyik axiális vége ferdén van kiképezve és a hordozóprofil-elemek (12, 14) axiálisan eltolt végei között húzódik.
12. Rendszer számos axiálisan összeillesztett, az 1-11. igénypontok bármelyike szerinti áramvezető sínből, ahol két axiálisan szomszédos áramvezető sín (10) mozgathatóan van összeillesztve, oly módon, hogy egy távulási hézag van a két áramvezető sín (10) fejprofiljai (16) között előirányozva.
13. Rendszer számos axiálisan összeillesztett, az 1-11. igénypontok bármelyike szerinti áramvezető sínből, ahol a fejprofil (16) egyik axiális vége ferdén van kiképezve és a hordozóprofil-elemek (12, 14) axiálisan eltolt végei között húzódik, és ahol két axiálisan szomszédos áramvezető sín (10) oly módon van összeillesztve, hogy az egyik áramvezető sín első hordozóprofil-elemének (12) középső szakasza (24) a másik áramvezető sín második hordozóprofil-elemének (14) középső szakaszával (30) erőzáróan van összekötve.
14. Eljárás egy, az 1-11. igénypontok bármelyike szerinti áramvezető sín (10) összeszerelésére vagy szétszerelésére, az alábbi lépésekkel:
- az alakzáró és/vagy erőzáró kapcsolatot a hordozóprofil-elemek (12, 14) és a fejprofil (16) között a második hordozóprofil-elem (14) helyzetének változtatásával hozzuk létre vagy szüntetjük meg, miközben az első hordozóprofil-elem (12) fejprofilhoz (16) képesti helyzetét nem változtatjuk.
15. A 14. igénypont szerinti eljárás, amelynél az alakzárást a hordozóprofil-elemek (12, 14) és a fejprofil (16) között akkor hozzuk létre, ha a második hordozóprofil-elem (14) egy első meghatározott helyzetviszonyt foglal el az első hordozóprofil-elemhez (12) és a fejprofilhoz (16) képest.
16. A 14. vagy 15. igénypont szerinti eljárás, amelynél az erőzárást a hordozóprofil-elemek (12, 14) és a fejprofil (16) között akkor hozzuk létre, ha a második hordozóprofil-elem (14) egy második meghatározott helyzetviszonyt foglal el az első hordozóprofil-elemhez (12) és a fejprofilhoz (16) képest.
17. A 15. vagy 16. igénypont szerinti eljárás, amelynél a második hordozóprofil-elem (14) az első és a második helyzetviszonyt úgy foglalja el, hogy elforgatjuk.

18. A 14-17. igénypontok bármelyike szerinti eljárás, amelynél a hordozóprofil és a fejprofil (16) között és/vagy a hordozóprofil-elemek (12, 14) között egy villamosan vezetőképés réteget rendezünk el.

19. A 14-18. igénypontok bármelyike szerinti eljárás, amelynél a hordozóprofil-elemek (12, 14) talpszakaszait (22, 32) egy anyagzáró kapcsolaton keresztül kötjük össze egymással.

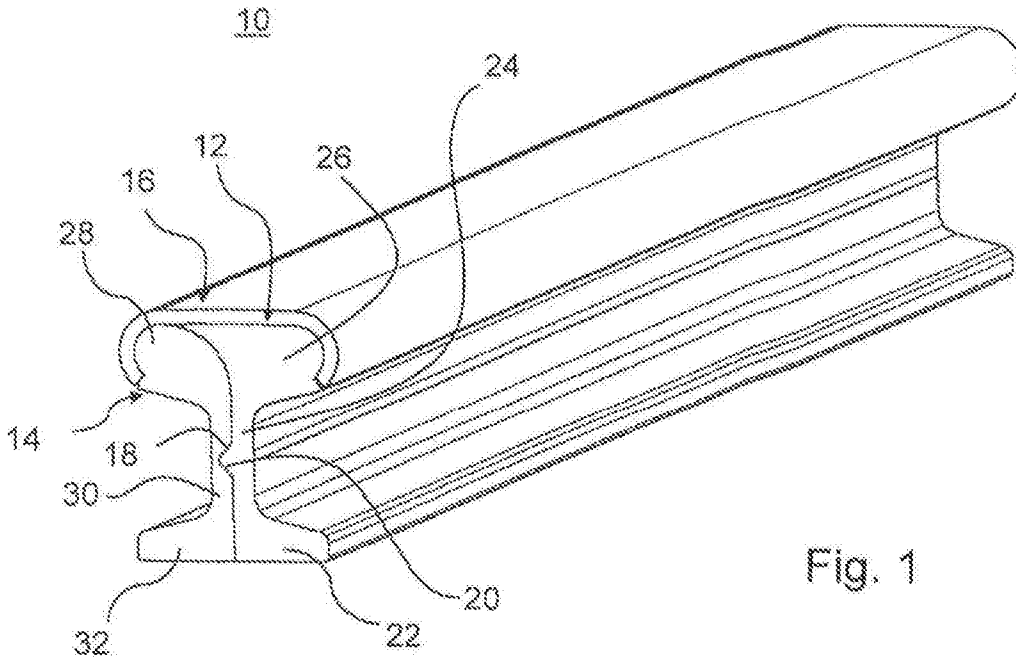


Fig. 1

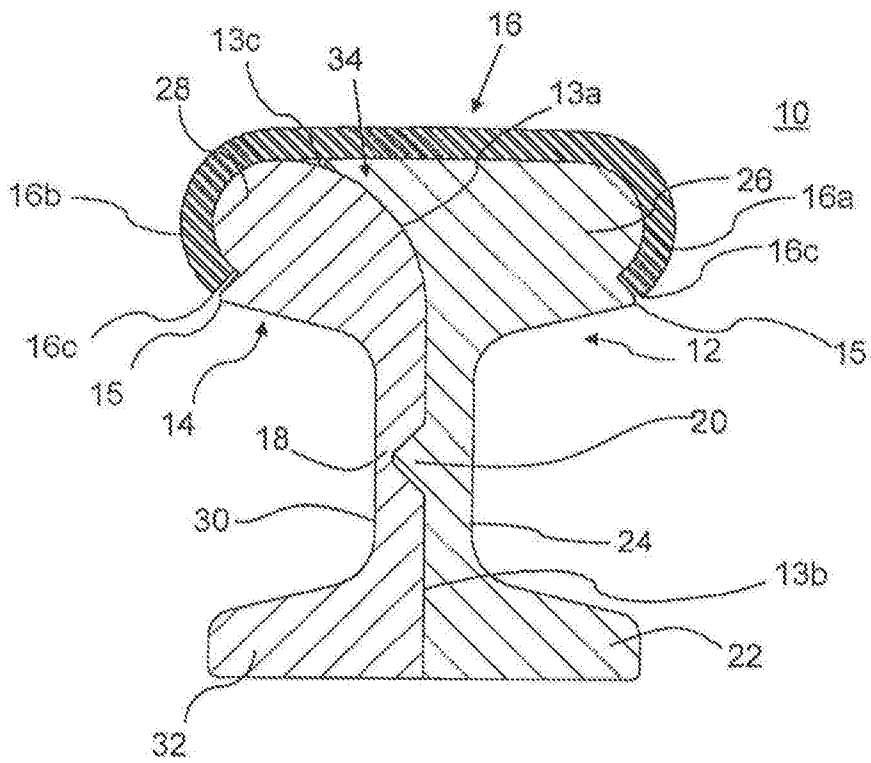


Fig. 2



Fig. 3

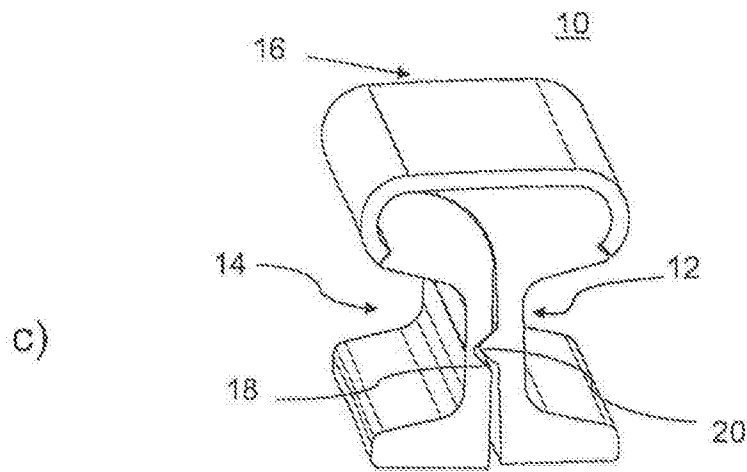
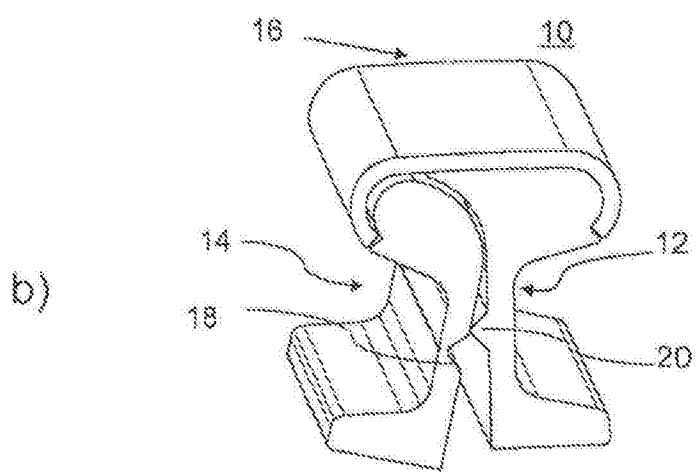
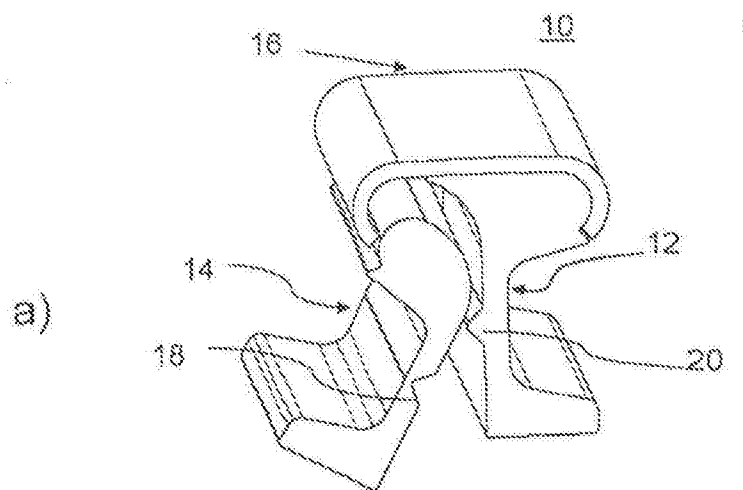
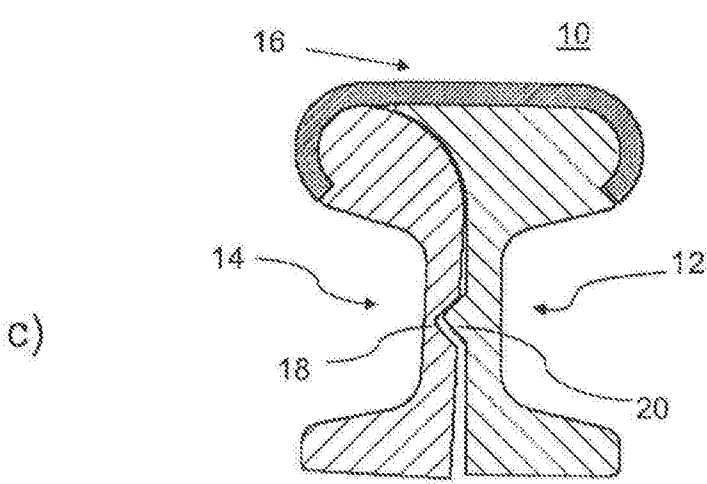
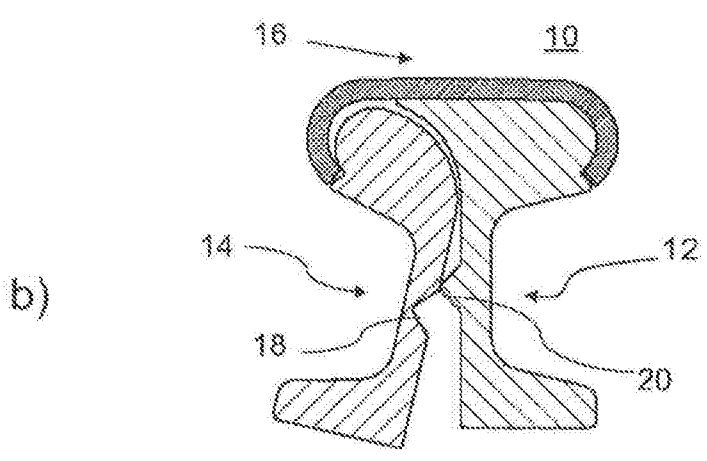
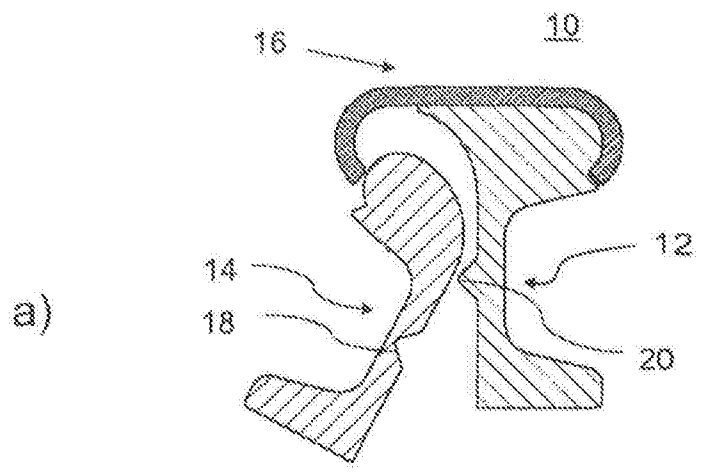


Fig. 4



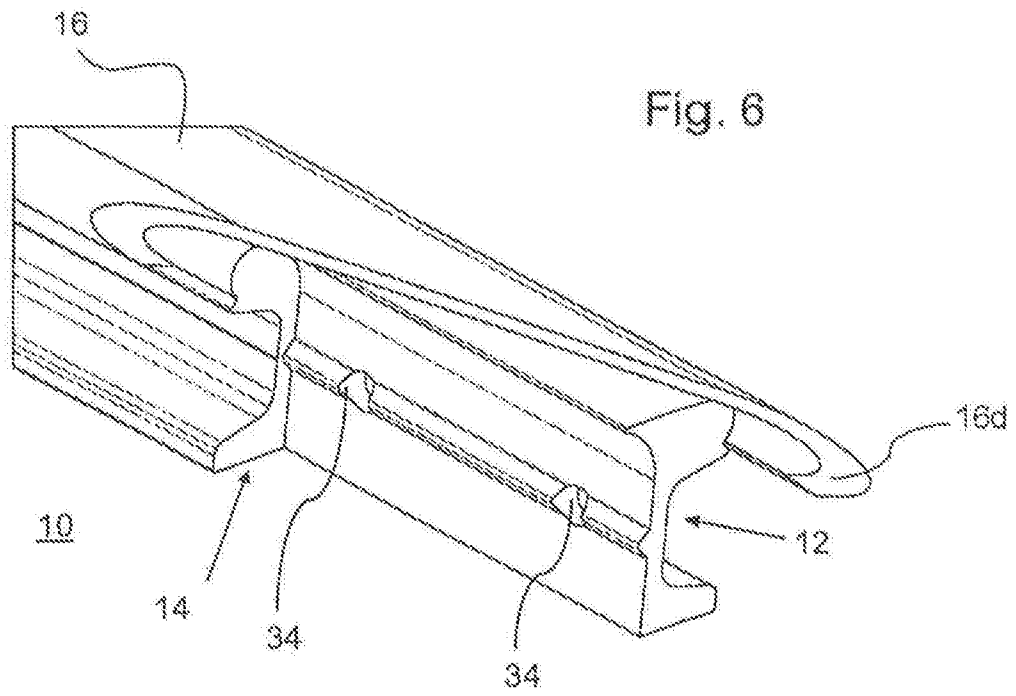
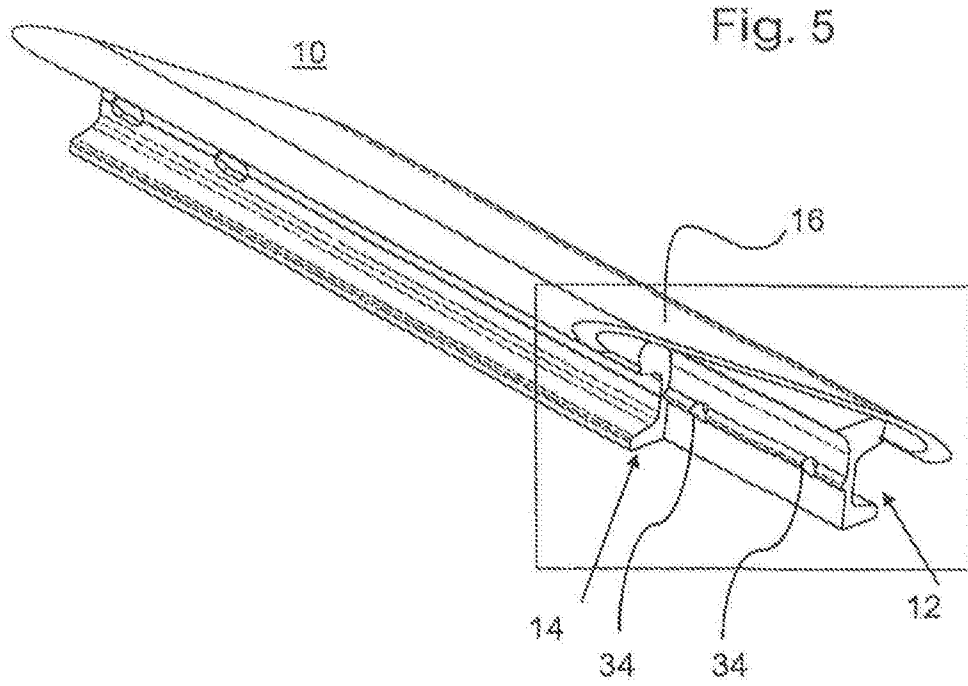


Fig. 7

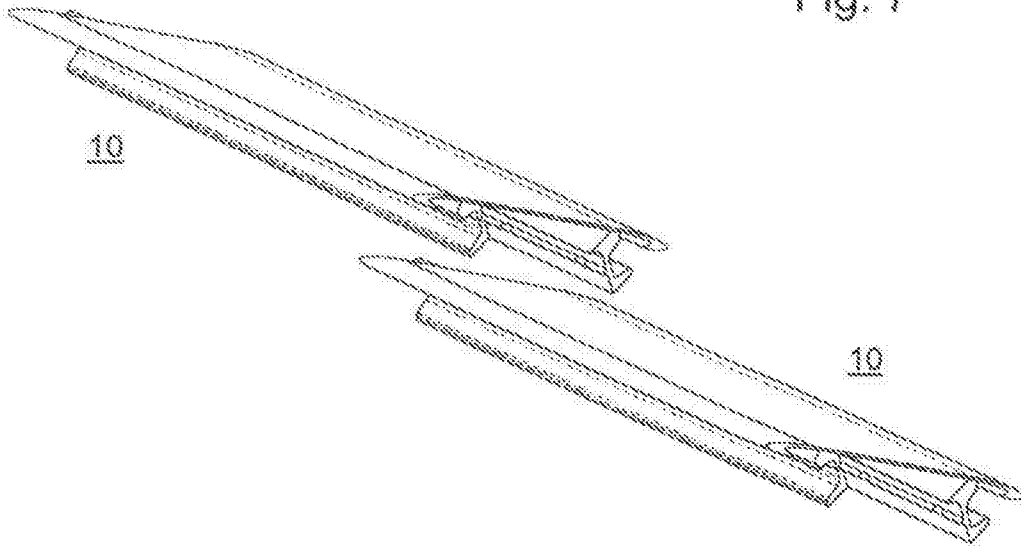


Fig. 8

