

Guide plate for fastening rails for rail vehicles

The invention relates to a guide plate for the attachment of rails for rail vehicles.

In addition to a guide plate of the type in question here, a system for the attachment of rails usually comprises at least one spring element and one tensioning element for bracing the spring element against the particular base on which, with the aid of the system, an attachment point is to be created for the particular rail.

In the assembly position, the guide plate lies with a contact surface constructed on one of the long sides of the guide plate to the side of the foot of the rail to be attached.

The base on which the guide plate is mounted is typically a sleeper which is made for example from concrete, wood or another suitable material. On the base, in one embodiment, there is a support shoulder which may be produced by appropriately shaping the base or through the provision of an additional element. On the support shoulder, with a ready-mounted system, the guide plate is supported by a support surface which is provided on the long side of the guide plate that is opposite to the long side equipped with the contact surface. Alternatively, the guide plate may also be secured to the particular base by means of a separate attachment element.

In practical use, the guide plate fulfils a dual function. On the one hand, it guides the rail from the side and ensures that it has the correct longitudinal alignment. Here, when ready-mounted on the track, it deflects into the base the lateral forces arising in the particular attachment point when

the rail being supported in each case is driven over. On the other hand, with a ready-mounted rail attachment system, a spring element is supported and guided on the guide plates. This spring element exerts an elastic retaining force by means of which the rail is held pressed against the particular base.

In the event that the guide plate is constructed as an 'angle guide plate', then on the particular base, a ledge is provided on the underside of the guide plate that extends in the longitudinal direction of the guide plate, which in the assembly position locks positively with an appropriately shaped recess in the base. In this way, in addition to the support on the particular support shoulder, the position of the guide plate crosswise to the longitudinal extension of the rail is additionally secured.

In order to be able to brace the spring positioned on the guide plate against the base, then an aperture leading from its upper side to its underside is usually moulded into the guide plate. The tensioning element required for bracing the particular spring element is pushed through this aperture, whichs tensioning element is coupled with the base supporting the rail. As a rule, a screw or a bolt serves as a tensioning element, which is screwed into a dowel that has been inserted into the base. So that the spring element can, even when exposed to the forces acting in the ready-mounted state, be safely held in the particular position stipulated, there may be shaped elements such as projections or depressions provided on the upper side of the guide plate, in which or on which one section of the spring element is supported in each case.

The spring element used to hold down the rail typically has an attachment section and at least one arm section branching off

the attachment section, whose free end presses onto the rail in the ready-mounted state.

Examples of guide plates of the type previously outlined and of attachment systems or rail attachment points built for when such guide plates are used are depicted in DE 102 54 679 B4, DE 41 01 198 C1, DE 20 2004 020 816 U1, WO 2011/110454 A1 or DE 20 2009 004 399 U1 and in practice are used in a number of variations.

Guide plates of the type previously described are generally manufactured from plastics capable of withstanding high stresses. In order to be able to safely withstand the loads they are subjected to during practical use, older embodiments were generally solid in construction. It has been possible to meet the recently arising demand for weight reduction by moulding recesses into the guide plate at a suitable point. For example, in the guide plate described in DE 102 54 670 B4, recesses are moulded into the angle guide plate in the areas which are needed neither to support the spring element nor to drain off the liquid reaching the guide plate, which recesses are moulded both starting from the upper side and starting from the underside. The shape of the recesses and the shape and alignment of the wall sections of the guide plate that remain between them have been selected in such a way that on the one hand a high dimensional stability of the guide plate is guaranteed and on the other, a significant weight reduction is achieved.

In addition to its supporting and guiding function, a guide plate of the type in question here ought also to guarantee good electrical insulation, vis-à-vis the base, of the components attached on it and those coming into contact with it. In order to fulfil this requirement, it has been

suggested, for example in WO 2011/110454 A1, that the aperture of the guide plate be enclosed all the way round with a 'collar'. The collar prevents, in the manner of a protective barrier, water from entering the aperture. At the same time the collar, if the spring element is appropriately shaped, can be used as a guide for the spring element.

Even if the guide plates constructed in the way previously named show optimised performance characteristics with reduced weight, in practice the task has arisen of making available a guide plate that is capable of withstanding high stresses with further reduced weight.

This object is, according to the invention, achieved through a guide plate with the features cited in Claim 1.

Advantageous embodiments of the invention are cited in the dependent claims and will be explained in detail below, along with the general inventive idea.

A guide plate according to the invention for the attachment of rails for rail vehicles has, in conformity with the prior art outlined above, at least one recess moulded into the guide plate from the underside, on which the guide plate stands in the assembly position, a support surface provided on the upper side of the guide plate for a spring element envisaged for holding down the rail to be attached, and a contact surface provided on one face of the guide plate which extends in the longitudinal direction of the guide plate and on which contact surface the rail to be attached is, in the assembly position, guided laterally.

According to the invention, at least one reinforcing rib, that rises above the support surface and extends crosswise to the

contact surface, is now provided on the upper side of the guide plate. At the same time, the recess moulded into the guide plate from the underside extends into the area of the guide plate in which the reinforcing rib is provided.

A guide plate according to the invention shows, on its upper side that is equipped with the support surface for the spring element that is to be supported on the guide plate in each case, at least one rib, which in the manner of a bracing rib or vaulting rib increases the dimensional stability of the guide plate. This makes it possible to also expand the recess moulded into the guide plate from the underside into the volume area of the guide plate over which the reinforcing rib extends. Since even a low wall thickness is sufficient for the reinforcing rib to achieve its bracing effect, in this way the reinforcing rib can itself be constructed as far as possible with a hollowed-out design. Overall, this makes it possible to further reduce the material volume of the guide plate and as a consequence thereof its weight, without having to suffer losses with regard to the ability to withstand stresses or other mechanical properties.

Depending on the design of the adjacent shaped elements of the guide plate, the shape of the section that reaches into the swept area of the reinforcing rib corresponds to that of the recess moulded into the guide plate. Here, it follows in an optimum way the shape of the reinforcing rib in its longitudinal and transverse direction in such a manner that the reinforcing rib is hollow apart from the wall thickness required for the construction of its side wall and its top.

A guide plate according to the invention may be used in the same way as the guide plates outlined above and known from the prior art. Accordingly, a guide plate according to the

invention also typically has an aperture that leads from the upper side to the underside of the guide plate, through which a tension element provided for the bracing of the spring element can be inserted. In order, here, following the prior art, to prevent water or other liquids that reach the guide plate from entering the aperture, then, as with the prior art, a 'collar' that at least in sections rises above the support surface may enclose the 'mouth' of the aperture assigned to the support surface. This collar may simultaneously serve as a guide for a section of an appropriately shaped spring element that is to be mounted on the guide plate. An optimally bracing and at the same time, from a manufacturing point of view, easy to build design of a guide plate according to the invention results in this context when the reinforcing rib is connected to the 'collar'. The connection between the reinforcing rib and the 'collar' may be shaped smoothly so that there is an optimum flux of force and so that the 'collar', as a continuation of the reinforcing rib, brings about a stiffening of the guide plate over its entire width.

In addition to the 'collar' already mentioned, which forms a barrier against the entry of liquid into the aperture, additional shaped elements for the guiding of the spring element may be constructed in a way that is known per se on the support surface of the guide plate. These shaped elements may for example be limit stops, with which, in the assembly position, in each case one section of the spring element is in contact, or a groove, in which the spring element, in the ready mounted position, sits with another section. Also, the shaped elements in question may be a concave indentation at a low depth, by means of which a pre-assembly position is defined, in which the spring element is held pre-mounted under slight pre-tension until the rail is set at its intended

position and the spring element can be pushed into its final position.

The support surface of the guide plate may have moulded into it two grooves extending in the longitudinal direction of the guide plate, in each case at least one section of the spring element is supported in these in the assembly position. The grooves may be arranged in such a way that they are separated from one another by the reinforcing rib constructed, according to the invention, on the upper side of the guide plate. The reinforcing rib can thus, despite the grooves, extend across the whole width of the guide plate and exert its reinforcing function. If the spring element has an appropriate design, the reinforcing rib may additionally function as a guide or as a support for the particular section sitting in the groove in the assembly position. In order to ensure that no major quantities of liquid accumulate in the area of the grooves, the grooves may, at least in sections, slope down in the direction of the end of them that faces away from the reinforcing rib. In this way, the liquid entering the grooves can run out of the grooves sideways.

Of course, should this for example be convenient from a manufacturing point of view or for reasons of statics, two or more recesses may be moulded into the guide plate from the underside. Recesses arranged adjacent to each other may be bounded by crosspieces which are arranged in the manner of a truss and therefore have optimum load-bearing capacity with minimised material volume.

In the event that the particular recess extends over a large volume of the guide plate, it may also be appropriate to construct at least one vaulting rib for example on the roof covering the particular recess to the upper side of the guide

plate, which likewise acts as a reinforcement. It is also possible to mould recesses into the guide plate from the upper side in order to save on material. Alternatively, for the same purpose, it is also conceivable to introduce openings which lead from the upper side to the underside of the guide plate. The openings in question may be constructed in such a way that they lead to the recess moulded into the guide plate from the underside.

A guide plate according to the invention typically has an elongated, cuboid-like basic form whose long sides aligned parallel to the rail to be attached in the assembly position are longer than its narrow sides that are arranged crosswise to this.

Protection of the guide plate according to the invention from liquid that may arise - in particular water, which when it rains collects in the vicinity of the guide plate - and consequently its insulating effect may be increased by the guide plate having, in a way that is known per se, projections extending from it from the side, whose surfaces assigned to the underside of the guide plate form a continuation of the contact area formed on the lower side of the guide plate, with which the guide plate, in the assembly position, stands on the particular base.

The projections may extend along the narrow sides and along the long side of the guide plate opposite the contact surface. On the long side in question a support surface may also be constructed, in a likewise known way, with which the guide plate is, in the assembly position, supported on a shoulder of the base on which the guide plate is mounted. Here, the projections may be constructed in the manner of thin 'tabs' which, in the assembly position, lie close to the upper side

of the base. For this, it is sufficient if the thickness of the projections is only a small fraction of that of the main body of the guide plate onto which they have been moulded.

The design according to the invention of a guide plate is particularly suitable for being made from a plastic. For example, the reinforcing rib envisaged according to the invention can be easily manufactured from plastics using a conventional manufacturing method, which is already being used today for the production of guide plates.

The advantages of the invention have just as positive an impact on conventional guide plates envisaged for assembly on a level surface as with guide plates built in the manner of angle guide plates, for the assembly of which a countersink must be provided on the particular base in which the assigned angular section of the guide plates locks positively in the assembly position.

In the following, the invention shall be explained in more detail with the aid of exemplary embodiments. The schematic drawings show the following:

Fig. 1 an attachment point for a rail, side view with partial cross section;

Fig. 2 a tensioning clamp, perspective view;

Fig. 3 a guide plate used in the system according to Fig. 1 in a perspective view from above;

Fig. 4 the guide plates in a perspective view from below.

In the attachment point B illustrated in Fig. 1, a rail S is attached to a sleeper U, of which only sections are shown here, cast from concrete, which forms a firm base that supports the rail S. The sleeper U which is positioned at right angles to the longitudinal side of rail S has had a smooth contact area U1 moulded into it which on its narrow sides is in each case bounded by a shoulder U2, U3. In the area of transition from the contact area U1 to the particular shoulder U2, U3, a groove-like depression U4, U5 has been formed in the sleeper U, which extends across the measured width of the sleeper U in the longitudinal direction of the rail S to be attached and with ready-mounted attachment point B is aligned parallel to the rail S.

The attachment point B is formed from a system for the attachment of rail S, which comprises two tensioning clamps 1,2 that serve as spring elements, two guide plates 3,4, two clamping bolts 5,6 required as clamping devices to tension the particular tensioning clamps 1, 2, and one base plate 7.

As illustrated in Fig. 2 with the aid of tensioning clamp 1, the identically shaped tensioning clamps 1, 2, are formed like a W in a way that is known per se and in each case have a middle loop 1a whose arms 1b, 1c are connected at one end via a semi-circular bend 1d and at their other end turn into a torsion section 1e,1f facing outwards, to which is connected, in each case, a spring arm 1g, 1h that curves upwards. The spring arms 1g, 1h each become an end section 1i, 1j, which points in the direction of the middle loop 1a such that the ends of the end sections 1i, 1j are positioned facing one another. With its end sections 1i, 1j, the tensioning clamp presses, in the ready-mounted state, on the side of the foot F of the rail S assigned to it.

In each case, one of the tensioning clamps 1, 2, one of the guide plates 3, 4 and one of the clamping bolts 5,6 are positioned on one of the long sides of the rail S, whilst the base plate 7 is located between the guide plates 3,4 and lies on the contact area U1 of the sleeper U. The rail S stands with its foot F on the base plate 7.

The guide plates 3,4 are in this case built in the manner of angle guide plates and on their underside assigned to the sleeper U have a ledge which extends across their width measured in the longitudinal direction of rail S which, with the guide plate 3 in assembly position in each case locks positively with the assigned, correspondingly shaped depression U4, U5 of sleeper U. In addition, the guide plates 3,4, in the assembly position, are in each case supported with a support surface 8 constructed on the long side facing away from the rail S on the allocated shoulder U2, U3 of the sleeper U. On their opposite long side which is assigned to the rail foot F and constitutes a face of the guide plate 3, the guide plates 3,4 each have a contact surface 9 against which the rail foot F is supported with its longitudinal edge. Thus the lateral forces Q arising from the rail S when a rail vehicle, not shown here, drives over it, are absorbed by the guide plates 3, 4 and diverted into the sleeper U.

The identical design of the guide plates 3,4 is outlined using the example of the guide plate 3 shown in Figures 3 and 4.

Guide plate 3 has had moulded into it from its upper side 10 an aperture 12 in the shape of an elongated hole which leads to the opposing underside 11 which is assigned to the contact area U1 of sleeper U. This aperture, in relation to the length L of the guide plate 3,4, is positioned in the middle and in the direction of but not directly level with the long side of

the guide plate 3,4 equipped with contact surface 9. The assigned clamping bolt 5 is pushed through the aperture 12 during assembly of the attachment point B to for bracing the tensioning clamp 1 positioned on the guide plate 3, which clamping bolt 5 subsequently is screwed into a dowel which has been sunk into the sleeper U but which is not visible here.

On the upper side 10 of guide plate 3, a support surface 13 is formed on which the assigned tensioning clamp 1 is supported in the assembly position. Here, the supporting surface 13 is not formed so as to be smooth but has a variety of shaped elements which serve to guide and support the tensioning clamp 1. These include two stop faces 14, 15 which rise with the long side of the guide plate 3 equipped with contact surface 9 and are adjacent to this long side, of these one in each case is, viewed in a longitudinal direction, positioned to the side of each side of the aperture 12. Over and above this, there are two limit stops 16, 17 present on the support surface 13 of which in each case one is assigned to the contact surfaces 14, 15. The limit stops 16, 17 form, together with the contact surfaces 14, 15, a seat in which the end sections 1i, 1j of the tensioning clamp 1 are provisionally held in a pre-assembly position, until, after the positioning of rail S they are, for the purpose of finished assembly, pushed over the contact surfaces 14, 15 onto the foot F of rail S.

In addition, on support surface 13 a 'collar' 18 is constructed that encloses the 'mouth' of the aperture 12 all the way round. This collar 18 prevents, on the one hand, liquids that reach the support surface 13 from entering the aperture 12. Collar 18 has a thin-walled elevation 18a which serves to additionally protect the internal screw thread of clamping bolt 5, 6 which in the assembly position lies beneath the level of the support surface 13 from dirt and

simultaneously to increase the electrical resistance. On the other hand, the collar 18 serves, in its raised area which is assigned to the long side of the guide plate 3 that is equipped with contact surface 9, as a guide for the bend 1d of tensioning clamp 1.

In addition, two grooves 19,20 are moulded into the support surface 13 which in the longitudinal direction are aligned with each other and adjacent to the long side equipped with the support surface 8 and are positioned parallel to the latter. Here, the grooves 19,20 each end on the narrow side 3a, 3b of guide plate 3 assigned to them. At the same time, they are tapered in such a way as to slope away in the direction of their end that is in each case assigned to the narrow side 3a, 3b in question, so that liquid ending up in the grooves, such as water, runs off out of the grooves 19, 20 to the side via the narrow sides.

Through a reinforcing rib 21 which, relative to the length L is positioned in the middle on support surface 13 and, in the width direction of the guide plate 3 extends crosswise to the long sides of the guide plate 3 that are provided with support surface 8 and contact surface 9, the grooves 19,20 are separated from one another. Starting with the long side of the guide plate 3 equipped with support surface 8, reinforcement rib 21 runs up to the collar 18 which encloses the 'mouth' of the aperture 12. Here, the width of the reinforcing rib 21 constantly decreases in the direction of the collar 18, until, with its side surfaces 22, 23, it merges, in an internal radius, into the assigned circumferential surface 24,25 of the collar 18 in each case. The collar 18 thus forms a continuation of the reinforcing rib 21 and supplements the bracing effect of the reinforcing rib 21 in the area of the edge surrounding the aperture 12 of guide plate 3.

Tab-like projections 26, 27, 28 have been moulded onto the narrow sides 3a, 3b and the long side of guide plate 3 equipped with support surface 8, which projections 26,27,28 stick out from the sides of the guide plate 3 and, in the assembly position, begin to bear on the sections of sleeper U surrounding the guide plate 3. In this way, shielding of the upper side of the guide plate 3 from water that is on or about to reach the sleeper U is increased. Here, the thickness D' of the projections 26-28 is a maximum of a tenth of the thickness D'' of the main body 29 of the guide plate 3.

From its underside 11, a large number of recesses 30, 31, 32, 33, 34 have been moulded into the guide plate 3. The one recess 30 is moulded into the area in the guide plate 3 in which, on the upper side 10, the reinforcing rib 21 has been constructed. The shape of the recess 30 assigned to the reinforcing rib 21 is adapted to the shape of the reinforcing rib 21. Correspondingly, recess 30 starting from its wide edge which is allocated to the long side equipped with support surface 8 runs up to aperture 12, until, between the recess 30 and aperture 12, only a thin bridge 35 is present. In this way, the reinforcing rib 21 is, on its side which is assigned to the underside 11, by and large hollowed out apart from a thin wall thickness.

Viewed in the longitudinal direction, the other recesses 31-34 are in each case arranged mirror-symmetrically to the middle of the guide plate 3. Here, adjacent recesses 31-34 are separated from one another by means of crosspieces, which are in each case, in the manner of timber framing braces, aligned in such a way that the guide plate 3 is also highly rigid in its area equipped with recesses 31-34.

Through the reinforcing rib 21 and the recess 30 which has been moulded into it, the precondition has thus been created for the identically designed guide plates 3,4 to be manufactured with minimum material volume and consequently minimum weight; at the same time the requirements placed on the load-bearing capacity of such guide plates 3, 4 can be safely fulfilled.

The decrease in rigidity accompanying the material saving has been compensated for by the reinforcing rib 21, which significantly increases the area moment of inertia in the middle area, equipped with the reinforcing rib 21, of the particular guide plate 3, 4. In this way, the guide plates 3, 4 are reinforced and achieve a generally higher load-bearing capacity. In order to lead the flux of force around the aperture 12 which has been built as an elongated hole, the widened collar 18 is drawn around the elongated hole which merges fluidly into the reinforcing rib 21. Another factor in making the design suitable for making from plastic is that the reinforcing rib 21 is hollowed out from the underside 11 and that in the area of the reinforcing rib 21 a constant wall thickness is guaranteed.

REFERENCE SYMBOLS

B	Attachment point
D'	Thickness of projections 26-28
D''	Thickness of main body 29
F	Foot of rail S
L	Length of guide plate 3
Q	Lateral forces
S	Rail
U	Sleeper
U1	Contact area of sleeper U
U2, U3	Shoulders of sleeper U
U4, U5	Depressions in sleeper U
1a	Middle loop of tensioning clamp 1
1b, 1c	Arm of middle loop 1a
1d	Bend of middle loop 1a
1e, 1f	Torsion sections of tensioning clamp 1
1g, 1h	Spring arm of tensioning clamp 1
1i, 1j	End sections of tensioning clamp 1
1, 2	Tensioning clamps (spring element)
3, 4	Guide plates
3a, 3b	Narrow sides of guide plate 3
5, 6	Clamping bolts
7	Base plate
8	Support surface
9	Contact surface
10	Upper side of guide plate 3
11	Underside of guide plate 3
12	Aperture of guide plate 3
13	Support surface of guide plate 3
14, 15	Stop faces of guide plate 3
16, 17	Limit stops of guide plate 3
18	Collar of guide plate 3
18a	Elevation of collar 18
19, 20	Grooves of guide plate 3
21	Rib of guide plate 3
22, 23	Side surfaces of reinforcing rib 21
24, 25	Circumferential surfaces of collar 18
26, 27,	Projections
28	
29	Main body
30-34	Recesses
35	Crosspiece

CLAIMS

1. Guide plate for the attachment of rails (S) for rail vehicles,
 - with at least one recess (30-24) moulded into it from the underside (11) on which the guide plate (3) stands in the assembly position,
 - with a support surface (13) constructed on the upper side (10) of the guide plate (3) for a spring element (1, 2) envisaged for holding down the rail (S) to be attached, and
 - with a contact surface (9) provided on one face of the guide plate (3) which extends in the longitudinal direction of the guide plate (3) and on which contact surface (9) the rail (S) to be attached is, in the assembly position, guided laterally ,characterised in that on the upper side (10) of the guide plate (3), at least one reinforcing rib (21) is provided which rises above the support surface (13) and extends crosswise to the contact surface (9) and that the recess (30) moulded into the guide plate (3) from the underside (11) extends into the area of the guide plate (3) in which the reinforcing rib is provided (21).
2. Guide plate according to Claim 1, **characterised in that** it has an aperture (12) that leads from the upper side (10) to the underside (11) of the guide plate (3) through which a tensioning element (5,6) envisaged for the tensioning of the spring element (1,2) can be pushed through, **that** the 'mouth' of the aperture (12) assigned to the support surface (13) is, at least in sections, encircled by a collar (18) that rises above the support

surface (13), and **that** the reinforcing rib (21) is connected to the collar (18).

3. Guide plate according to any one of the preceding claims, **characterised in that** on the support surface (13) shaped elements are provided for the guiding of the spring element (1,2).
4. Guide plate according to Claim 2 and 3, **characterised in that** a section of the collar (18) is constructed in such a way as to guide a loop (1a) of the spring element (1,2) that encircles the section in the assembly position.
5. Guide plate according to any one of Claims 3 or 4, **characterised in that** two grooves (19,20) are moulded into the support surface (13) which extend in the longitudinal direction of the guide plate (3) and in which at least one section (1e, 1f) of the spring element (1,2) is supported in the assembly position and **that** the grooves (19,20) are separated from one another through the reinforcing rib (21).
6. Guide plate according to Claim 5, **characterised in that** the grooves (19,20) slope away, at least in sections, in the direction of their end which is facing away from the reinforcing rib (21).
7. Guide plate according to any one of the preceding claims, **characterised in that** more than two recesses (30-34) are moulded into the guide plate (3) from the underside (11).
8. Guide plate according to Claim 7 **characterised in that** adjacently positioned recesses (30-34) are limited by

crosspieces (35) which are arranged in the manner of a truss.

9. Guide plate according to any one of the preceding claims, **characterised in that** it has projections (26-28) sticking out from it to the side whose surfaces assigned to the underside (11) of the guide plate (3) form a continuation of the contact area (U1) formed on the underside (11) of the guide plate (3) with which the guide plate (3) stands, in the assembly position, on the particular base.
10. Guide plate according to any one of the preceding claims, **characterised in that** the projections (26-28) extend along the narrow sides (3a,3b) and along the long side of the guide plate (3) which is opposite to the contact surface (13).
11. Guide plate according to Claim 9 or 10, **characterised in that** the projections (26-28) have a smaller thickness (D') than the main body (29) of the guide plate (3).
12. Guide plate according to any one of the preceding claims, **characterised in that** it is made from a plastic.