US 20140021746A1

(19) United States
(12) Patent Application Publication
(10) Pub. No.: US 2014/0021746 A1
(43) Pub. Date: Jan. 23, 2014
Franzpötter et al.

(54) SUPPORT USED AS A CHASSIS COMPONENT

(75) Inventors: **Thorsten Franzpötter**, Attendorn (DE); **Stephan Lagin**, Attendorn (DE)

(73) Assignee: **KIRCHHOFF AUTOMOTIVE DEUTSCHLAND GMBH**, Attendorn (DE)

(21) Appl. No.: **14/008,510**

(22) PCT Filed: **May 9, 2012**

(86) PCT No.: **PCT/EP2012/058545**

§ 371 (c)(1), (2), (4) Date: **Sep. 27, 2013**

(30) **Foreign Application Priority Data**

May 17, 2011 (DE) 20 2011 050 158.2

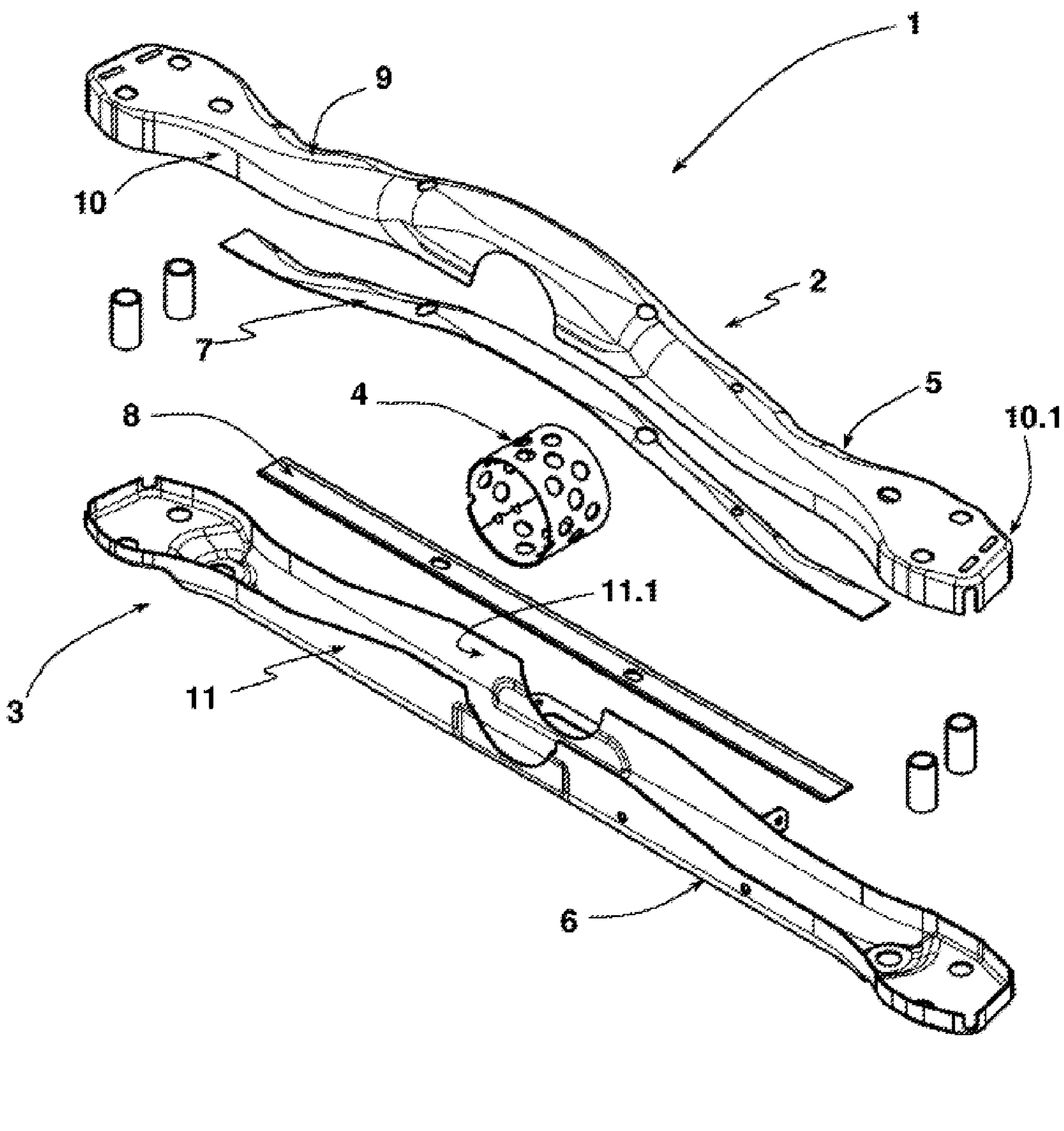
Publication Classification

(51) **Int. Cl.**
B62D 25/20 (2006.01)

(52) **U.S. Cl.**
CPC *B62D 25/20* (2013.01)
USPC **296/193.07**

(57) **ABSTRACT**

The invention relates to a support (**2**, **3**) used as a vehicle component and comprising a longitudinal extension which corresponds to a multiple of the transverse extension thereof. Said support (**2**, **3**) comprises a reinforced transverse profile section. For this purpose, the support (**2**, **3**) comprises at least one reinforced element (**7**, **8**) which follows the longitudinal extension of the support (**2**, **3**), is connected to the support in a positive and material fit manner and in a tension and shear-resistant manner, with the insertion of a separation layer (**12**) between the longitudinal extension of the support (**2**, **3**).



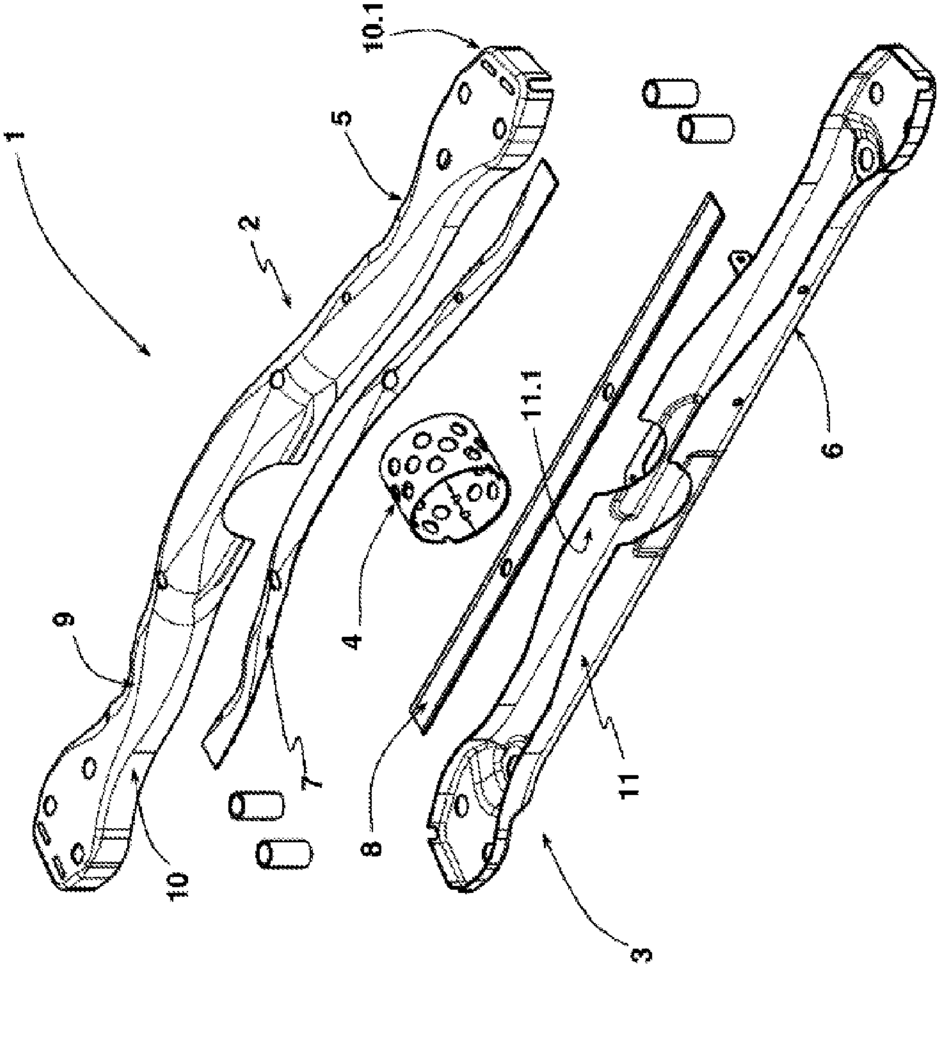


Fig. 1

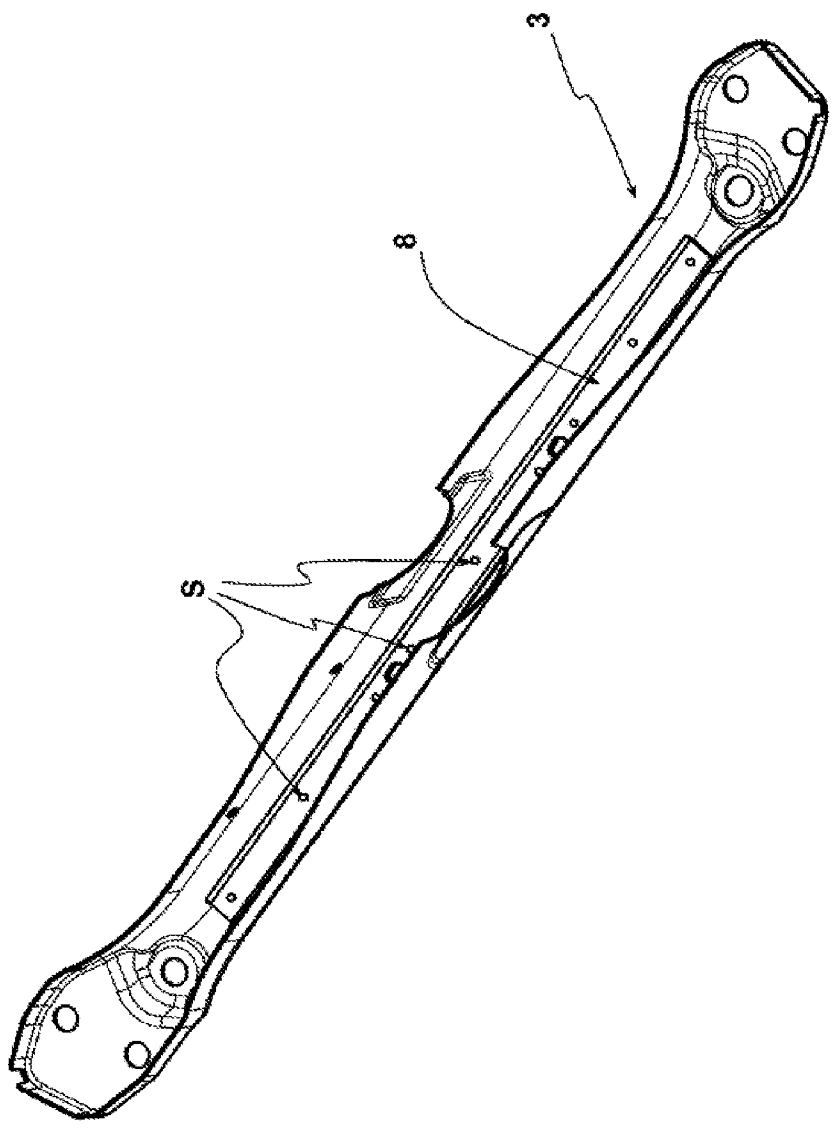


Fig. 2

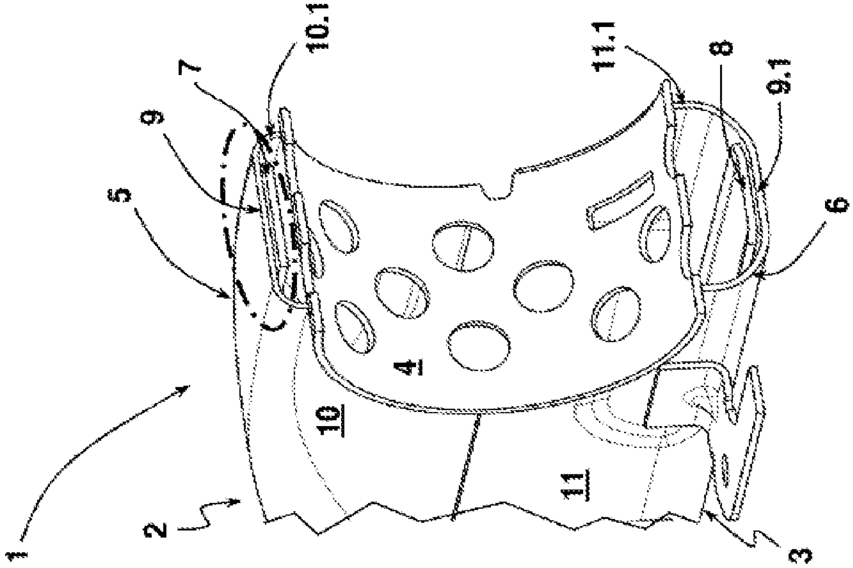


Fig. 3

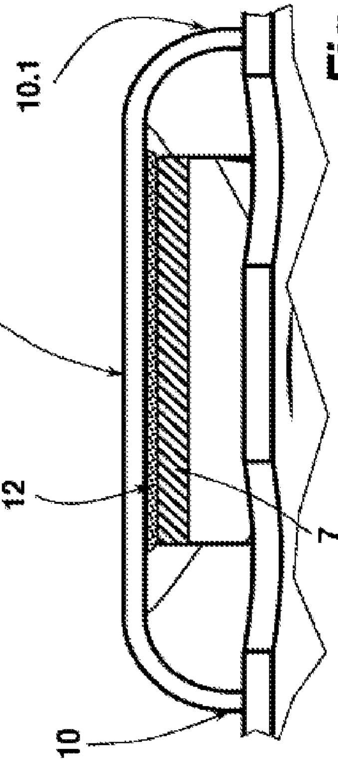


Fig. 4

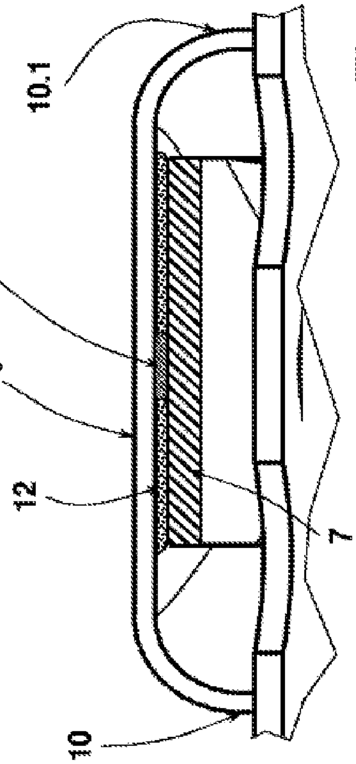


Fig. 5

SUPPORT USED AS A CHASSIS COMPONENT

[0001] The invention relates to a support used as a vehicle component, comprising a longitudinal extension which corresponds to a multiple of the transverse extension thereof, and comprising a transverse profile section reinforcing the support.

[0002] In vehicles, various supports are used as vehicle components. Such supports, as the word suggests, can be used, for example, as supports for supporting certain components. An example of such a support is a transmission carrier. Supports, as vehicle components, are also used in a function wherein said supports are used in particular also for the articulated connection of vehicle components. This is the case, for example, with the chassis frame. Here, in the sense of these explanations, connecting rods are used as supports, for example, transverse links or stabilizers.

[0003] Supports of the above-mentioned type can be manufactured as steel metal plate components. These supports have, for the purpose of increasing their stiffness, a transverse profile section, and they are therefore profiled transversely to their longitudinal extension. The profile section is typically designed as a U-shaped profile section. The longitudinal extension of these supports corresponds to a multiple of the transverse extension thereof. In certain designs, it is also possible to assemble two or more such supports to a vehicle component. This is the case, for example, in a transmission carrier of the previously known type, in which two U-shaped profiled supports are welded to each other to form a closed box profile.

[0004] Such supports are produced from steel as material by way of a shaping process, usually a deep-drawing process, by means of which a metal plate blank is shaped to the three-dimensional geometry of the support. The material cost in this regard is not low. A tool set up for producing a support is adjusted not only exactly to the geometry of the support which is to be obtained, but also to the strength of the metal plate blank to be shaped.

[0005] Even if supports of the above-mentioned type meet these requirements, there still remains a demand for supports with greater bending stiffness, particularly supports that can be produced at only relatively low additional costs and with a justifiable measure of increased manufacturing cost.

[0006] The invention is therefore based on the problem of proposing such a support.

[0007] The problem is solved according to the invention by a support of the type mentioned at the start in the preamble, wherein the support comprises at least one reinforcing element along the longitudinal extension of the support, which, with the insertion of a separation layer in the longitudinal extension of the support, is connected to said support in a positive and/or material fit manner and in a tension- and shear-resistant manner.

[0008] In this support design, conventional supports, for example, supports made of profiled steel can be used, to which, for the purpose of increasing their bending stiffness, a reinforcing element along the longitudinal extension of the support is connected. Here, it is provided that a separation layer is arranged between the reinforcing element and the surface of the support. This separation layer spaces the reinforcing element from the surface of the support. What is achieved with this design is the formation of an upper flange and of a lower flange spaced from the former flange, as a result of which the bending stiffness is considerably increased, especially also in the vertical direction relative to the extension of the base element. Here it is of no importance for the invention if the spacing between the reinforcing element and the surface of the support is just small, for example, a few tenths of a millimeter. The connection in a positive and/or material fit manner to the support can be achieved, for example, by welding, where welding spots produced at intervals are preferable, or also by mechanical connection elements, such as, for example, clinching or riveting. In the case of clinching or rivets as well, the tension- and shear-resistant connection of the reinforcing element to the support is carried out at spaced connection spots along the longitudinal extension of the reinforcing element.

[0009] In this design, conventional supports can be used as base bodies which, depending on the requirements placed on them, for example, with regard to bending stiffness, are retrofitted with a reinforcing element designed to that effect, in order to form a support in the sense of the present invention. Such a support thus has a modular structure and it comprises the base body, for example, the conventional support, and at least one reinforcing element which is connected in the prescribed manner to the support. For designing the support, it is thus possible to use in each case a different reinforcing element depending on the respective requirements. The possibility therefore also exists of using reinforcing elements that are made of different materials compared to the base body material depending on the desired connection design. Even when using reinforcing elements made of an identical material or of similar materials, the desired bending stiffness of the support can be achieved by the selection of the width of the reinforcing element, the thickness thereof, and/or also by a profiled section of the reinforcing element itself The thickness of the separation layer can also enter as a variable in the design of the support.

[0010] The result is that such a support is more resistant to bending than previous supports, while only a relatively small additional weight needs to be tolerated. Moreover, the additional stiffening can be carried out using simple process-technological means, so that the additional costs can be kept within limits, when using conventional supports as base body for the support to be designed. Above all, no additional costs need to be invested for new matrices and countersinking.

[0011] The separating layer is preferably simultaneously a corrosion layer, in order to protect the mutually facing surfaces of reinforcing elements and supports. Thus, such a support with its at least one reinforcing element can be subjected to an immersion painting process, wherein it is ensured that no unprotected surface areas remain. This is essential, particularly with supports made of a material that is at risk for corrosion, such as, for example, steel.

[0012] The at least one reinforcing element can also be connected, depending on the design of the support or of its base body, to the inner side or to the outer side. However, in the case of a U-shaped profiled support as base body, it is preferable to design the reinforcing elements as an insert, and to connect it to the inner side of the bottom connecting the two side arms.

[0013] According to an additional preferred design, the separating layer is designed as an adhesive layer, therefore as a layer which adheres by adhesion and thus with friction connection both to the surface of the base body and also to the upper surface of the reinforcing element. As adhesives for forming such a separating layer, it is particularly suitable to use adhesives which cure due to the effect of the temperature, for example, a crash-stable structural adhesive, since they have special binding forces. The heating step, to which an immersion-painted support has been subjected in any case for the purpose of curing the immersion paint, can be used for curing the adhesive.

[0014] It is understood that such a support can be a portion of a vehicle component which comprises several supports, in particular also several such supports, as can be the case, for example, with a transmission carrier, when the latter is designed as a closed box profile.

[0015] Additional advantages and designs of the invention can be obtained from the following description of an embodiment example in reference to the appended figures.

[0016] FIG. **1**: shows an exploded view of a transmission carrier,

[0017] FIG. **2**: shows a perspective representation of a portion of the transmission carrier of FIG. **1**,

[0018] FIG. **3**: shows a cross section through the support of FIG. **1** in the assembled state,

[0019] FIG. **4**: shows an enlarged cross section through a section of the support of FIG. **3**, outlined using a chain-dotted line, and

[0020] FIG. **5**: shows a cross section corresponding to that of FIG. **4** at a location which is offset with respect to the cutting line of FIG. **4**.

[0021] A transmission carrier **1** for a vehicle comprises a first support **2** and a second support **3**. The supports **2**, **3** are designed in order to receive a sleeve-like transmission casing **4**, to which the transmission is secured. The supports **2**, **3** each consist of a base body **5** or **6**, and of an insert **7** or **8**, which is connected for the purpose of increasing the bending stiffness in the z direction to said base body, as a reinforcing element. The base bodies **5**, **6** are steel metal plate reshaped parts, namely parts which are conventionally used for producing a transmission carrier. Each base body **5**, **6** comprises a longitudinal extension which corresponds to a multiple of the transverse extension. In the transverse direction, the two supports **5**, **6** are profiled, in particular they have a U-shaped profile in cross section. The insert **7** or **8** is connected to the inner side of the respective bottom **9** or **9**.**1**, in particular to the bottom **9** or **9**.**1** which connects the side walls **10**, **10**.**1** or **11**, **11**.**1** of the respective base body **5** or **6**, walls which are beveled relative to the bottom **9** or **9**.**1**. The contour of the respective insert **7** or **8**, at its top side facing the bottom **9** or **9**.**1**, follows the inner contour of the respective base body **5** or **6**. The adaptation of the side of the insert **7** facing the base body **5** can be seen clearly in FIGS. **1** and **3**.

[0022] In its assembled state, the two base bodies **5**, **6** of the transmission carrier **1** are welded to each other by means of their mutually facing front sides. In the represented embodiment example, the transmission carrier **1** does not differ externally from a conventional one.

[0023] The two inserts **7**, **8** are used to increase the bending stiffness. Below, the connection of the insert **7** to the base body **5** for the formation of the first support **2** is described. The insert **8** is connected in the same manner to the base body **6**.

[0024] The base body **5** is a steel metal plate shaped part. The insert **7** is also made of steel, where the insert **7** can also be made of a steel of lower quality than the one used for the manufacture of the base body **5**. Thus, the materials of base body **5** and of the insert **7** are similar materials and they can in any case be welded to each other.

[0025] The insert **7** is connected with insertion of a separating layer **12** to the inner side of the bottom **9** (see FIGS. **4** and **5**; in FIG. **3**, the separating layer is not represented). In the embodiment example represented, the separating layer **12** is configured as an adhesive layer. The adhesive layer **12** extends over the entire surface of the insert **7** facing the bottom **9**. As can be seen in FIGS. **3** and **4**, the insert **7** is spaced by the adhesive layer **12** from the bottom **9** of the base body **5**. The adhesive layer **12** is cured when exposed to a temperature of approximately 200° C. The insert **7** is connected to the base body **5** by several welding spots in a tension- and shear-resistant manner. This can be seen, for example, with regard to the insert **8**, which is inserted in the base body **6** and welded to the latter, in FIG. **2**. The welding spots here are marked with the reference numeral S. The insert **7** is secured in the same manner to the base body **5**. Over the longitudinal extension of the insert **7**, the latter is connected, in the represented embodiment example, in a material fit manner at nine welding spots arranged with approximately the same spacing from each other, to the base body **5** or to the bottom **9** thereof. FIG. **5** shows a cross section through a base body **5**, with the insert **7** arranged therein, for the formation of the first support **2** in the area of such a welding spot connection.

[0026] Due to the separating layer **12**, the insert **7** is arranged with a spacing from the bottom **9** of the base body **5**, spacing which remains the same over the length of the insert. At the same time, this layer **12** is used as a corrosion protection layer. The separating layer **12** is designed so that no gap remains between bottom **9** and the insert **7**.

[0027] For connecting the insert **7** to the base body **5** for the formation of the first support **2**, on the upper side of the insert **7** facing the bottom **9** of the base body **5**, a bead of adhesive composition is applied centrally over the entire length of the insert **7**. Subsequently, the insert is positioned within the base body **5**, so that subsequently the spot welding can be carried out for the point-like connection in a material fit manner of the insert **7** to the base body **5**. The spot welding also occurs centrally with respect to the width of the insert **7**. In order to be able to transfer the required welding current from the bottom **9** of the base body **5** to the insert **7** or vice versa, the adhesive composition is electrically conductive in the embodiments represented in the figures. In the course of the welding process, or also as a result of a preliminary positioning of the parts that are to be connected to each other in a material fit manner, while moving the insert **7** closer to the inner side of the bottom **9**, the adhesive composition bead is pushed apart, so that it is distributed over the entire upper side of the insert **7** facing the bottom **9**. The adhesive composition bead is preferably dimensioned such that no excessive quantity of adhesive material swells out from the spacing gap between the insert **7** and the bottom **9**.

[0028] After the two supports **2**, **3** have been produced in the described manner, they are welded to each other—as is conventionally done—also on the front sides of their side walls **10**, **10**.**1**, **11**, **11**.**1**, front sides which point towards each other. In the next step, the transmission carrier **1** produced in this manner is subjected to an immersion painting process, and subsequently it is subjected to a heat treatment in order to cure the paint and the adhesive composition that has not cured so far.

[0029] In the same manner, as described in relation to the transmission carrier **1**, other vehicle support components can also be reinforced, for example, transverse links or the like. It is understood that, depending on the desired degree of reinforcement, in the case of a transmission carrier as well, as claimed it is possible to design only one of the two base bodies as support, as has been described above.

[0030] The above-described design and the embodiment given as an example, with connection of the insert by welding spot connections to the respective base body, is possible with the greatest variety of geometries of the base body or of the insert. In addition, in the described spot welding, it is advantageous if the base bodies undergo no distortion in the process. Therefore, straightening of the supports **2** or **3** is not necessary.

[0031] Investigations have shown that a noteworthy increase in the bending stiffness in the z direction occurs in the case of a support already when the insert is connected to the base body in a tension- and shear-resistant manner and in a positive and material fit manner, that is to say if the separating layer is not designed as an adhesive layer. Similarly, a considerable increase in the bending stiffness can be achieved if the separating layer is designed as an adhesive layer.

LIST OF REFERENCE NUMERALS

[0032] **1** Transmission carrier
[0033] **2** First support
[0034] **3** Second support
[0035] **4** Transmission casing
[0036] **5** Base body
[0037] **6** Base body
[0038] **7** Insert
[0039] **8** Insert
[0040] **9**, **9.1** Bottom
[0041] **10**, **10.1** Side wall
[0042] **11**, **11.1** Side wall
[0043] Separating layer
[0044] S Welding spot

1. Support used as vehicle component, comprising a longitudinal extension which corresponds to a multiple of the transverse extension thereof, and comprising a transverse profile section reinforcing the support (**2**, **3**), characterized in that the support (**2**, **3**) comprises at least one reinforcing element (**7**, **8**) along the longitudinal extension of the support (**2**, **3**), which is connected to the latter in a positive and/or material fit manner, and in a tension- and shear-resistant manner, with the insertion of a separating layer (**12**) in the longitudinal extension of the support (**2**, **3**).

2. Support according to claim **1**, characterized in that, as a result of the transverse profile section, the support (**2**, **3**) has a substantially U-shaped cross-sectional geometry, and the reinforcing element (**7**, **8**) is connected to the bottom (**9**, **9.1**) connecting the two side arms (**10**, **10.1**; **11**, **11.1**) of the support (**2**, **3**).

3. Support according to claim **2**, characterized in that the reinforcing element is configured as an insert (**7**, **8**), and it is connected to the inner side of the bottom (**9**, **9.1**) of the support (**2**, **3**).

4. Support according to one of claims **1-3**, characterized in that the reinforcing element (**7**) comprises a transverse profile section.

5. Support according to one of claims **1-4**, characterized in that the support (**2**, **3**) consists of a first weldable material and the stiffening element (**7**, **8**) consists of a second material which can be welded to the first material, and the stiffening element (**7**, **8**) is connected by several welding spots, which are produced by spot welding, to the support (**2**, **3**).

6. Support according to claim **5**, characterized in that the support (**2**, **3**) is made of a first metal material, in particular of steel, and the reinforcing element (**7**, **8**) is made of the same or another metal material which can be welded to the first material, in particular steel.

7. Support according to one of claims **1-6**, characterized in that the separating layer (**12**) extends over the entire surface of the reinforcing element (**7**, **8**) facing the support (**2**, **3**) and not needed for the connection of the reinforcing element (**7**, **8**) to the support (**2**, **3**).

8. Support according to claim **7**, characterized in that the spacing between reinforcing element (**7**, **8**) and support (**2**, **3**), caused by the separating layer (**12**), is at least largely constant over the longitudinal extension of the reinforcing element (**7**, **8**) outside of the connection spots between reinforcing element (**7**, **8**) and support (**2**, **3**).

9. Support according to claim **7** or **8**, characterized in that the separating layer (**12**) is configured as an adhesive layer.

10. Support according to claim **9**, characterized in that the adhesive layer is a layer which is cured under exposure to heat.

11. Support according to one of claims **1-10**, characterized in that the support (**2**, **3**) is a portion of a vehicle component comprising an additional support, for example, a transmission carrier (**1**).

12. Support according to claim **11**, characterized in that the at least one additional support is also a support according to one of claims **1-10**.

* * * * *