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DESCRIPTION

ELECTRICAL COMPONENT

The present invention relates to an electrical component with a housing and at least one plug-in contact. An electrical component of this type can comprise, for example, a battery or accumulator pack meant for interchangeable use.

Known in the prior art are battery or accumulator packs used, for example, in electric vehicles, forklifts, buses or other machines and devices, also fixed, and the like. After a time of operation or travel a new similar accumulator pack must be loaded. In order to guarantee continuous functioning, the accumulator pack can be interchanged and charged in a separate charging station, while the vehicle or similar can continue operating with another accumulator pack.

To charge said accumulator packs for use in, for example, buses or other devices, in general a high charging current is used to ensure fast charging and allow early use again. For this reason said accumulator packs are charged using currents of up to 400 amps or more, employing a design with operation currents of, for example, 500 amps or more for safety purposes. With such currents, as well as in case of low transfer resistances, there may be a high thermal load that can cause significant wear in contact surfaces. Most times these contact surfaces are designed as flat unions that are tightened as parallel as possible against a corresponding contact union in the charging station, in order to establish the best possible contact. For example, when a battery pack is removed from a bus using a forklift and carried to the charging station, a millimetre precision manoeuvre is difficult to achieve and the union of the battery pack requires more precise driving by the forklift operator. Angular deviations when approaching the battery pack to the charging station also lead to worse transfer resistances and in turn high wear and accelerated ageing.

Document US 3,521,216 A discloses a plug-in adaptor with two plug-in contacts which are held in a connector base body. A contact holder is mounted on the plug-in adaptor with an elastically displaceable contact holder. The intermediate contacts are held elastically between the contacts of the contact holder in order to establish a con-

ducting connection with the contacts of an area of the base of the contact holder when a corresponding connector is connected.

Document EP 0519264 A2 discloses an electrical connector with: a) a two-part housing, wherein the parts form a cavity in which the contacts are placed; b) wherein the contacts have a first and second contact area; c) wherein the first part of the housing has an inner opening that defines a space between the first and second parts of the housing; d) wherein the second part is projected through the opening; e) wherein the second contact areas of the contacts are placed in the second part of the housing; f) wherein the second contact areas are designed for connection to another connector, g) wherein the first contact areas must be soldered to a printed circuit board, the first contact areas of the contacts are placed in the first part of the housing, and the second contact areas are attached to the first or second part of the housing and are also provided with a device that projects therebetween, housing the contact areas and the housing parts for a limited displacement in the X, Y and Z directions in an elastically flexible manner to facilitate connecting and separating the connector exerting minimal tension on the parts of the housing and contact areas.

Document US 5,383,790 A describes a floating connector arrangement, with self-orientation between two plates that can move relative to each other. The connector arrangement comprises a connector, a connector and an external current socket. The reception flange presents a plurality of openings respectively having a conical inner surface and a cylindrical inner surface. To attach the reception flange to a plate a plurality of self-adjusting assembly arrangements are provided. Each self-adjusting attachment arrangement comprises a grommet that passes through the flange and is attached to the plate. The grommet has a conical outer surface. Each self-adjusting assembly arrangement also comprises a directional spring to provide cushioning between the reception flange and the grommet. The connector arrangement also comprises an ejection arrangement in the reception housing to exert an ejection force on the connector bushing. The plurality of self-adjusting assembly arrangements establish a correct connection between the plug-in connector and the plug-in connector, and the current socket is connected to the plug-in connector.

Document JP H07 267 020 A discloses a base connector comprising unions in which is configured a recessed inclined guide surface, attached to a plate in the vehicle body side posts. A male plug-in connector comprises unions. In addition, a protruding inclined guide surface is configured herein placed in a movable floating manner in the vertical and lateral directions of a vehicle by means of an attachment plate body with springs. The attachment body plate is attached to a front frontal surface of a sliding door. Although an adjustment of the position of the door fitting results in an offset between the two connectors, they are guided by the inclined guide surfaces and are positioned in the sliding door when same is closed.

Thus, the aim of the present invention is to provide an electrical component that allows an improved contact with simple connectivity.

This is achieved by an electrical component with the characteristics of claim 1. The dependent claims relate to preferred improvements of the electrical component. Other advantages and features of the invention can be inferred from the example of an embodiment.

An electrical component according to the invention presents a housing, a contact holder and at least one plug-in contact. In this regard the contact holder is received in a floating manner in the housing and the plug-in contact is received in a floating manner in the contact holder, whereby the floating reception enables a corresponding lateral offset and a height offset. In particular several plug-in contacts arranged in a floating manner are provided in the contact holder.

The electrical component according to the invention has many advantages. One important advantage of the electrical component according to the invention is the doubly floating housing. On one hand, the one or more plug-in contacts are arranged in a floating manner in the contact body, which for example can have the form of a plate and is used as a

holder for the plug-in contacts. On the other hand, the entire contact holder is mounted in a floating manner with all the plug-in contacts provided thereon.

The floating arrangement of the contact holder allows, for example, an approximate adaptation of the contact holder and that each individual plug-in contact can again compensate minor play resulting, for example, from its own floating arrangement. This allows a particularly reliable contact and the transfer resistances that appear can be considerably reduced. Power losses are reduced and lifetime is increased. Due to the longer lifetime, lower maintenance and assembly costs are achieved, which together results in an improved operation of the electrical component.

In a preferred improvement, at least one compensating device provided for the floating reception of the contact holder in the housing. The compensating device specifically allows lateral and/or angular adaptation. An angular adaptation of the contact holder makes available a particularly advantageous electrical component, wherein the electrical component needs only to be placed close with a lower angular precision. This simplifies considerably the operation by using a similar electrical component designed as a battery pack. For example, if an electrical component designed as a battery pack is taken to a charging station using a forklift, a much smaller precision of approximation is required as it is possible to perform an angular orientation of the contact holder with respect to the housing, and therefore for the entire battery pack. In addition, the floating housing -both laterally and vertically- also allows a lateral and vertical offset.

Preferably, the compensating device, or at least one compensating device, is attached to the housing in a rigid manner. The contact holder is preferably received in the compensation direction, so that the compensating device determines a floating housing of the contact holder.

Advantageously the compensating device has at least one centring cone provided on an opening of the contact holder. Specifically, the centring cone supports the contact holder in the opening to allow a lateral and angular orientation of the contact holder through the cone. In this regard, the opening may be made in the contact holder as a hole, a slot, or the like. A centring cone can be provided on both sides of the contact holder. It is also preferably however that the centring cone is provided on one side of the contact holder and a disc on the other side thereof, such that the contact holder is arranged securely in case of losses between the centring cone and the disc.

Advantageously, the compensating device has a preload device for preloading in a base position. Specifically, the preloading device is a spring or at least comprises a spring. For example, a helical spring can press on the centring cone in the direction of the contact holder opening.

Another electrical component has a housing and at least one plug-in contact. At least one oblong guide bolt is provided to guide the electrical component in the union to another electrical component. Transversally to its length, the guide bolt has an annularly increased outer perimeter.

This electrical component also has several advantages. A particular advantage of this electrical component is the annularly increased outer perimeter, such that the centring bolt does not have an increased perimeter in its entire length but instead only at one or several points. This means that the guide bolt, which is guided in a bushing or guide bushing of another electrical component during contacting, only has a smaller play at the points with the annularly increased outer perimeter.

Before the annularly increased outer perimeter reaches the guide bushing or bushing, there is an increased play that is considerably reduced when it is reached, thereby providing a reliable and precise union.

Depending on the configuration and according to the present conditions, the outer diameter of the guide bolt may vary.

For example, when the component is used with a battery pack having a weight of 50, 100, 150 or even 200 kg or more, an outer diameter greater than 10 mm is preferred, specifically 15 mm and also preferably 20 mm. Even greater outer diameters of 25 mm, 30 mm, 40 mm or 50 mm are also possible. A given weight of the electrical component requires a corresponding stability of the guide bolt to ensure correct guidance.

If instead the weight and forces required to centre the electrical component are lower, an outer diameter considerably smaller than for example 5 mm or 2 mm can be used,

or an even smaller diameter, such that the guide bolt can also be designed, for example, as a guide pin.

In all the configurations the guide bolt is preferably designed with a tubular or cylindrical shape and with a tip preferably shaped as a cone or the like. A rounded or staggered tip is also possible.

Preferably, the annularly increased outer perimeter is obtaining by a thickening of the wall or the like. However it is also possible for the annularly increased outer perimeter to be formed by individual knots protruding from the circumference, together forming an annular or protruding outer perimeter.

Advantageously two or more annularly increased outer perimeters are provided separated from each other by at least one guide bolt. In this regard the annularly increased outer perimeters preferably have a specific separation.

In all the configurations two or more guide bolts are provided.

Preferably, the guide bolt has an annularly increased outer perimeter that has a diameter increased by at least 10%. The difference of diameter is preferably less than 10% and specifically less than 5%. Preferably, the difference in diameter is under 2% and specifically the difference in diameter is between 0.03% and 1.5%. For example, if the outer diameter is between 20 and 25 mm, the outer diameter can be increased by 0.1 to 3 mm in the annularly increased outer perimeter. Thus the normal outer perimeter already provides an adjustment of the electrical component corresponding to 0.1 to 3 mm. When the annularly increased outer perimeter now reaches the bushing or guide bushing, the play is clearly reduced thereby obtaining an additionally improved orientation of the electrical component.

In all the embodiments at least one guide bold has a rounded or conical tip. In a particularly preferred embodiment, the guide bolt is provided along its length with essentially stubby, rounded or preferably circular transverse sections.

According to another aspect of the invention a union connector is provided that has a reliable strain relief and can be assembled in a simple manner.

The union connector has a union housing and at least one plug-in connector and at least one strain relief device. In this regard the union housing has a base body and a contact body. The strain relief device comprises a strain relief fitted in the base body and secured to same by the contact body.

The union connector also comprises several advantages. Particular advantages of the plug-in connector are a simple assembly and reliable functioning. By the insertion of the strain relief in the base body and subsequent introduction of the contact body in the base body, the contact body prevents the removal of the strain relief from the base body. The fitted connection that secures the contact body in the base body provides a reliable strain relief. Preferably, the strain relief comprises a strip-shaped plate. A strip-shaped plate of this type can be manufactured in a simple manner and has only a small cut in the preferred embodiment.

Advantageously at least one attachment nose engages the base body at an opening of the strain relief, to obtain the fitted connection. In this regard the connection can be established by inserting the strain relief in the base body. Application on the wall allows guiding the attachment noses through the strain relief. The subsequent insertion of the contact body in the base body prevents pivoting away and exit of the strain relief of the base body, and consequently the union connector.

More preferably the base body is designed hollow to receive therein the relief strain and the contact bodies. All embodiments comprise the individual contacts in the contact body. In this regard the contacts may be meant for data transmission and/or power transmission.

The electrical component preferably comprises several plug-in contacts and at least one union connector.

Other advantages and features follow from the description of the example embodiment explained below in reference to the enclosed drawings.

These show:

Figure 1 a highly schematic view of a vehicle with an accumulator pack as electrical component;

Figure 2 a perspective view of an electrical component according to the invention;

Figure 3 a perspective view of another electrical component according to the invention;

Figure 4 a plan view of the electrical component according to figure 2 in the base position;

Figure 5 a plan view of the electrical component according to figure 2 in the deviated position;

Figure 6 a schematic view of a guide bolt for an electrical component;

Figure 7 the cross section A-A of figure 4.

Figure 8 a union connector according to the invention in an exploded view;

Figure 9 a lateral view of the union connector according to figure 8.

Figure 10 a plan view of the union connector according to figure 8; and

Figure 11 a schematic plan view of the strain relief of the union connector according to figure 9.

An example embodiment of the present invention is described below with reference to the enclosed drawings 1 to 11.

Figure 1 shows a vehicle 70 and a charging station 60 in a highly schematic representation. The vehicle 70 has a battery pack 50, provided interchangeably in the vehicle 70. Optionally several battery packs 50 can also be provided in the vehicle.

The battery pack 50 in this case is an electrical component 1 with a housing 2 and plug-in contacts 3 on a contact holder 7.

As well as using the electrical component 1 according to an invention in a vehicle, the same can be used in a stationary device or in other mobile devices or apparatuses.

In this example of embodiment the battery pack 50 may have an electrical component 1 with a considerable weight of 100, 150 or even 200 kg. To exchange the battery pack 50 a forklift, not shown, can be used to remove the battery pack 50 from the vehicle 70 and take it to the charging station 60, which for example can be designed as a shelf and is provided with various charging spaces for battery packs 50.

The forklift or a conveyor belt or the like carries the battery pack 50 to an available charging space and connects the battery pack 50 to the charging station 60 using the plug-in contacts 3 to 6.

The electrical component 1 is thus connected in a reliable manner to the charging station 60. This is achieved by the doubly-floating arrangement of the plug-in contacts 3 to 6 on the contact holder 7 in the housing 2 of the electrical component 1.

Figure 2 shows the union area of the electrical component 1, where the plug-in contacts 3 and 5 act as positive or negative poles in DC contacts, while the plug-in contact 4 preferably acts as a PE contact. Additional plug-in contacts can also be provided. In the example of embodiment an additional plug-in contact 6 is provided that can have several poles and is designed as a union connector 28.

With regard to the housing 2, the contact holder 7 designed as a plate is received mounted in a floating manner through a total of four compensating devices 8 in the example of embodiment. The compensating devices 8 are connected in a fixed and rigid manner to the housing 2 through the screws 14. The discs 13 of the compensat-

ing devices 8 secure the contact holder 7 in case of an unforeseen separation of the housing 2.

Provided in the electrical component 1 are bushings 39 by way of guide bushings, used for a rough guidance of the electrical component when joining the electrical component 1 to an electrical component 1a.

An electrical component 1a is shown in figure 3, provided with guide bolts 18, of which there are two in the example of embodiment. It is also possible for an electrical component 1 or 1a to have a single guide bolt 18 or three or four guide bolts 18.

The electrical component 1a is also provided with plug-in contacts 3 to 6, which can be connected in a plug-in manner to the corresponding plug-in contacts of the electrical component 1. Optionally the electrical component 1a can also have a contact holder 7, which is also mounted in a floating manner with respect to the housing 2 of the electrical component 1a.

The guide bolts 18 have a tubular shape in most of their length and in this case have three annular thickenings 20 in which the outer diameter 27 is clearly greater than the other outer diameter 26. The guide bolts 18 end at a tip 23 that can be round, cone shaped or the like and which is used to achieve an initial simple centring of the electrical component 1 when the electrical component 1 with the bushings 39 is introduced by pushing on the tip 23 of the guide bolt 18. The annular thickenings 20, in which there is only a small tolerance between the outer diameter 27 of the annular thickening 20 and the inner diameter of the bushing 39, allow a highly precise and reproducible contact of the electrical component 1.

Thus the outer diameter 27 is only present in the annular thickenings 20 and reliably prevents the tilting of the electrical component 1 during the contacting. The insertion forces therefore remain small.

Figure 4 shows a plan view of the contact area of the electrical component 1 with the housing 2 at the base position 16. In the base position 16 the contact holder 7 is in the

resting position with respect to the housing 2. This means that the compensation devices 8 are not out of line.

Each individual contact 3, 4, 5 and 6 is arranged respectively in a floating manner with respect to the contact holder 7. In at least one direction, in this case both in the lateral and vertical directions, a certain displacement is possible of the individual plug-in contact 3 to 6 with respect to the contact holder 7. For example, the possible displacement can be in the range 0.1 to 0.5 mm. Thus, after orienting the contact holder 7 using the guide bolt 18 an exact adaptation of each individual plug-in contact 3 to 6 can be performed, thereby avoiding particularly high insertion forces when placing in contact. The contact holder 7 can instead preferably be deviated by a few millimetres.

Figure 5 represents the deviated position 17 wherein the contact holder 7 is deviated with respect to the resting position 16. In this regard there has been a displacement in the vertical and lateral directions by a distance 38 of up to 5 mm respectively. In other specific embodiments smaller or larger compensation movements are possible.

Figure 6 shows a highly schematic view of a guide bolt 18 with annular outer perimeters 20 and 25.

In this regard, an outer perimeter 20 or 25 of this type can be obtained by an annular thickening or by individual knots 24 arranged distributed on the circumference, shown schematically in cross section. It is essential that at the points of the annularly increased outer perimeters 20 or 25there is an increased outer diameter 27 that is for example larger by more than 0.1 to 0.5 mm than the outer diameter 26 of the true outer surface of the guide bolt 18. The guide bolt 18 extends along a length 19 where the annularly increased outer diameters 20 or 25 are provided at certain predetermined distances.

Specifically, the first annularly increased outer perimeter 20 or 25 is provided such that it allows a simple contact with the plug-in contacts 3-6. When the plug-in contacts make contact, the annularly increased outer perimeter 20 or 25 provides a narrower seat in the bushing 39.

Figure 7 shows the cross section A-A of figure 5. In this regard, the deviated position 17 is shown in which the contact holder 7 is displaced laterally by a distance 38 and where, as can be seen in figure 7, the contact holder 7 is deviated by an angle 37 with respect to the housing 2. This allows an angular deviation by an angle 37 that can be 1 degree, 5 degrees or the like, in the union of the electrical component 1 to, for example, a charging station 60. In this way a clearly more flexible contact is enabled for an electrical component 1 which, particularly for heavy and large electrical components such as battery packs 50, leads to a considerable simplification of the contact.

As can be inferred from figure 7, each compensating device 8 has a centring cone 9 arranged on a side 11 of the contact holder 7. Arranged on the other side 12 is a disc 13 that covers the opening 10 of the contact holder 7 and therefore holds the contact holder secure on the housing 2, although a lateral and angular orientation is possible. The preload devices 15 in the form of helical springs allow preloading the compensating device in the base position 16.

Figure 8 shows a union connector 28, shown here as a plug-in contact 6 in the previous figures. The union connector 28 comprises a base body 31 and a contact body 32 for receiving several plug-in contacts. In addition a strain relief device 30 is provided, herein comprising a strain relief 33 and an attachment nose 35 to the base body 31.

The strain relief 33 is embodied as a flat plate 34 in the form of a strip, so that it is easily manufactured by punching with little cutting.

Near one end of the strain relief 33 are the openings 36 of the strain relief 33, which cooperate with the attachment noses 35 of the base body 31 to establish a fitted connection between the strain relief 33 and the base body 31 or the union housing 29.

The union connector 28 is shown in figure 9 in a side view and in figure 10 in a plan view. The union connector 28 can have in addition to power unions -shown larger- a series of data connection connectors, so that for example an electronic unit or a small computer or a charging unit or the like can be powered with the required energy while the data generated or processed can be interchanged at the same time.

While the attachment noses 35 are provided on the openings 36 in the assembled state or on the base body 31, the other end of the strain relief 33 protrudes from the base body 31. At the other end there can be additional slots 40 meant to hold a cable tie or other components. To assemble the union connector 28 on the base body 31, the strain relief 33 with the openings 36 must first be introduced in the base body 31. Then the openings 36 are placed on the attachment noses 35 inside the base body 31 and the strain relief 33 is applied to an inner wall of the base body 31. The contact body 32 can then be introduced with the contact casings, not shown, in the hollow base body 31, such that the contact body 32 and the strain relief 33 are fitted in the base body 31. The assembly of the union connector 28 on a printed circuit board or the contact holder 7 also causes the reception of the contact body 32 such that it is secure against losses in the base body 31.

The invention as a whole allows using an electrical component 1, such as battery or accumulator packs 50 or other electrical components in which a reliable and secure contact is established with small transfer resistances, wherein the tolerances required when establishing the plug-in connection are relatively small as the contact holder 7 and the individual plug-in contacts 3 to 6 are respectively received in a floating manner. This reduces greatly the insertion forces required when establishing the connection as well as the separation forces required to separate the plug-in connection, while also providing a high contact surface to transmit the current. While the tolerances of the plug-in contacts in contact with each other are respectively 1/10 or 1/100 mm, for example, the tolerances when establishing the connection can be selected to be considerably larger, such that a lateral offset of 5 mm or the like can be compensated.

Each individual plug-in contact 3 to 6 can be arranged, for example, in an orifice with extra space and thereby move in all lateral directions to an extent.

The union connector according to the invention has a simple construction and can be mounted and dismounted easily, thereby guaranteeing reliable operation with a low assembly cost.

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Outer diameter	27
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PATENTKRAV

1. 1. Elektrisk komponent (1) omfatter et hus (2), en kontaktbærer (7) og mindst en stikkontakt (3, 4, 5, 6), hvor kontaktbæreren (7) holdes på en flydende måde på huset (2), kendetegnet ved at

tikkontakten (3-6) holdes på en flydende måde på kontaktbæreren (7), hvor både en lateral forskydning og en højdeforskydning er mulige som følge af den flydende holder.

2. Den elektriske komponent (1) ifølge krav 1, hvor der for den flydende holder af kontaktbæreren (7) har mindst en kompenseringsindretning (8) på huset (2).

3. Den elektriske komponent (1) ifølge krav 2, hvor kompenseringsindretningen (8) er fastgjort til huset (2), og hvor kontaktbæreren (7) er fastholdt på kompenseringsindretningen (8).

4. Den elektrisk komponent (1) ifølge krav 2 eller 3, hvor kompenseringsindretningen (8) har mindst en centreringskegle (9), som er anbragtved en åbning (10) af kontaktbæreren (7).

5. Den elektriske komponent (1) ifølge krav 4, hvor centreringskeglen (9) er anbragt på den ene side (11) af åbningen (10), og en skive (13) er anbragt på den anden side (12).

6. Den elektriske komponent (1) ifølge mindst et af de foregående krav 2 til 5, hvor der er anbragt mindst en forspændingsindretning (15) til forladning af kompenseringsindretningen (8) i en startposition (15).

ELEKTRISK KOMPONENT

1. Elektrisk komponent (1) omfatter et hus (2), en kontaktbærer (7) og mindst en stikkontakt (3, 4, 5, 6), hvor kontaktbæreren (7) holdes på en flydende måde på huset (2), kendetegnet ved at tikkontakten (3-6) holdes på en flydende måde på kontaktbæreren (7), hvor både en lateral forskydning og en højdeforskydning er mulige som følge af den flydende holder.

2. Den elektriske komponent (1) ifølge krav 1, hvor der for den flydende holder af kontaktbæreren (7) har mindst en kompenseringsindretning (8) på huset (2).

3. Den elektriske komponent (1) ifølge krav 2, hvor kompenseringsindretningen (8) er fastgjort til huset (2), og hvor kontaktbæreren (7) er fastholdt på kompenseringsindretningen (8).

4. Den elektrisk komponent (1) ifølge krav 2 eller 3, hvor kompenseringsindretningen (8) har mindst en centreringskegle (9), som er anbragtved en åbning (10) af kontaktbæreren (7).

5. Den elektriske komponent (1) ifølge krav 4, hvor centreringskeglen (9) er anbragt på den ene side (11) af åbningen (10), og en skive (13) er anbragt på den anden side (12).

6. Den elektriske komponent (1) ifølge mindst et af de foregående krav 2 til 5, hvor der er anbragt mindst en forspændingsindretning (15) til forladning af kompenseringsindretningen (8) i en startposition (15).

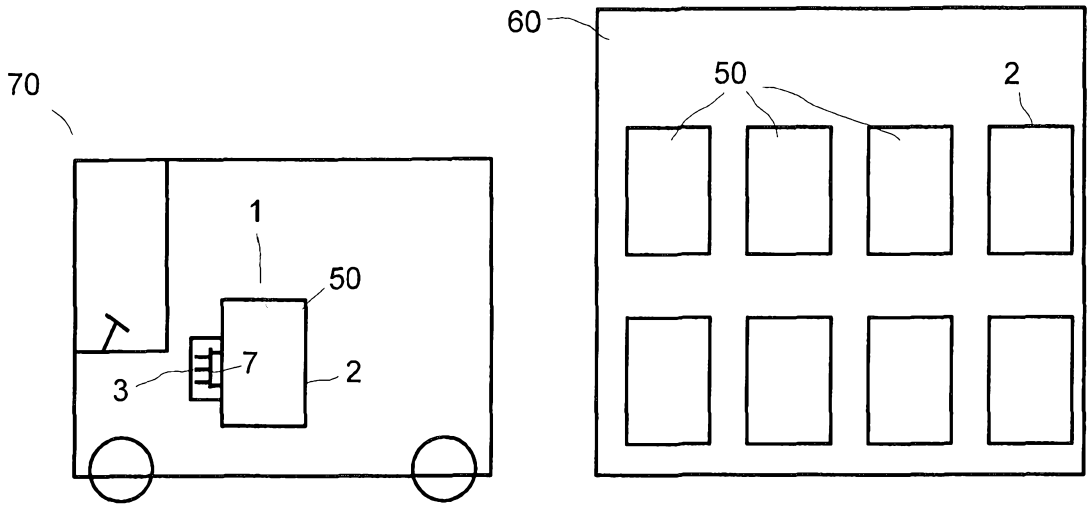

Fig. 1

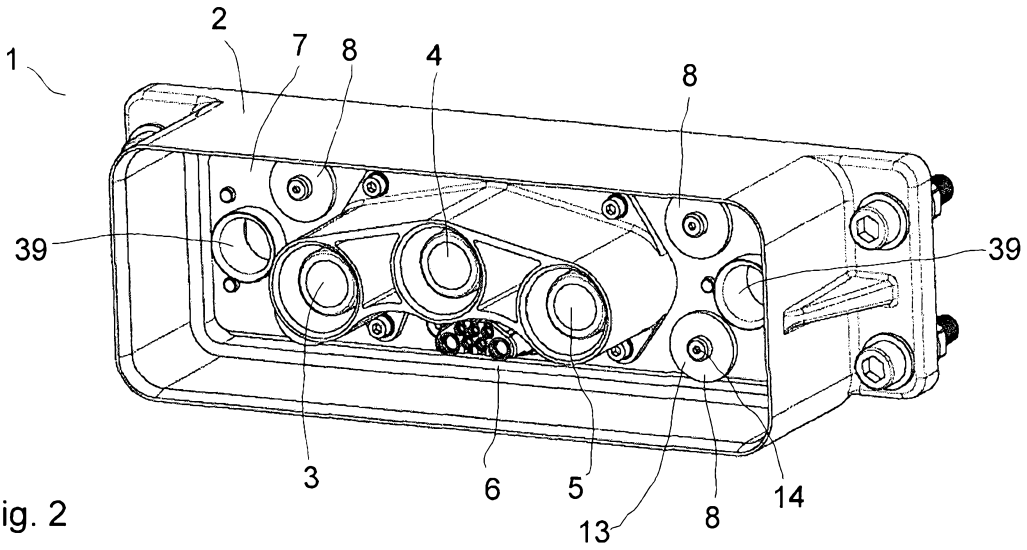

Fig. 2

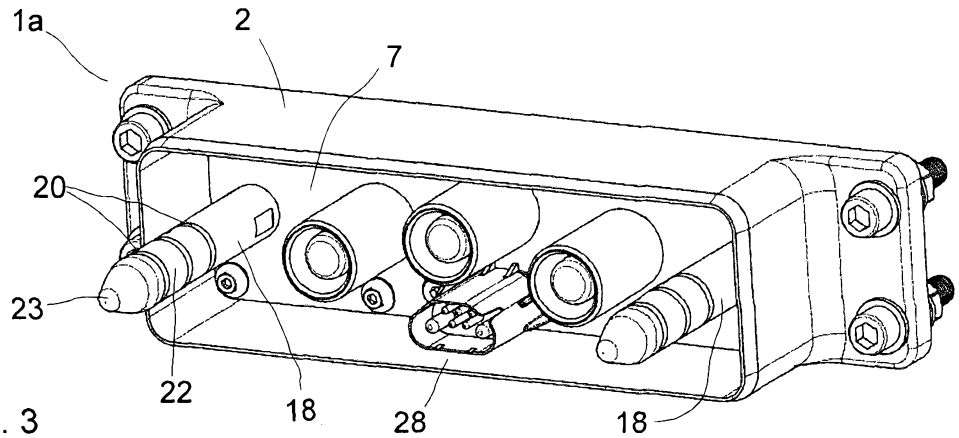

Fig. 3

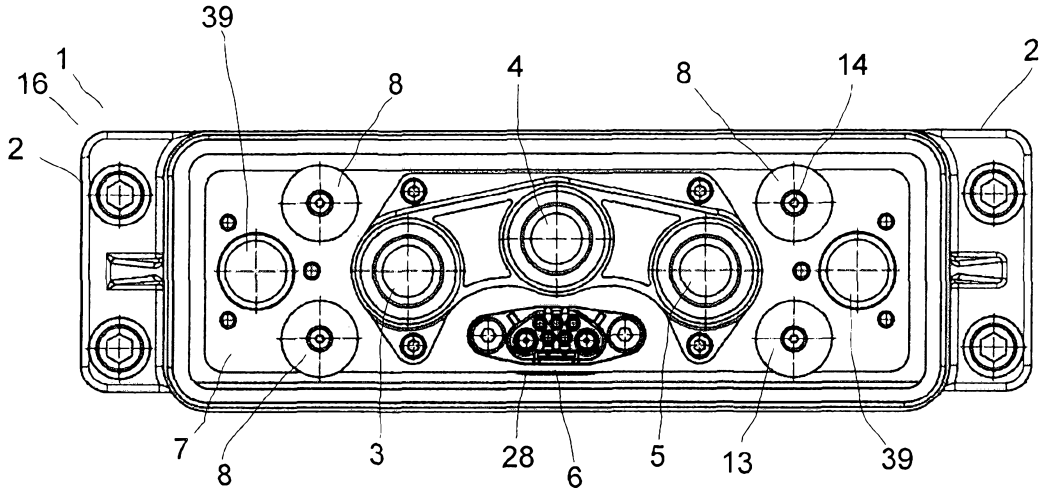

Fig. 4

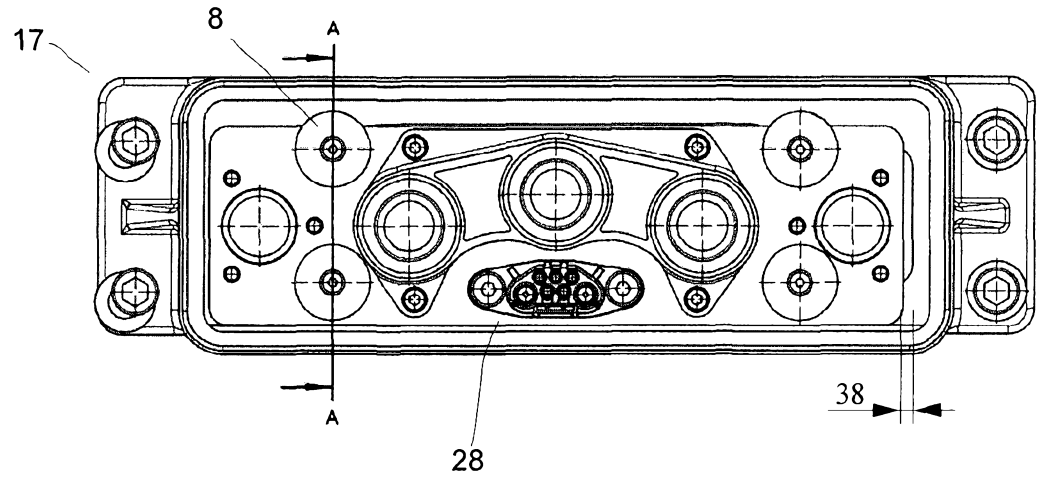

Fig. 5

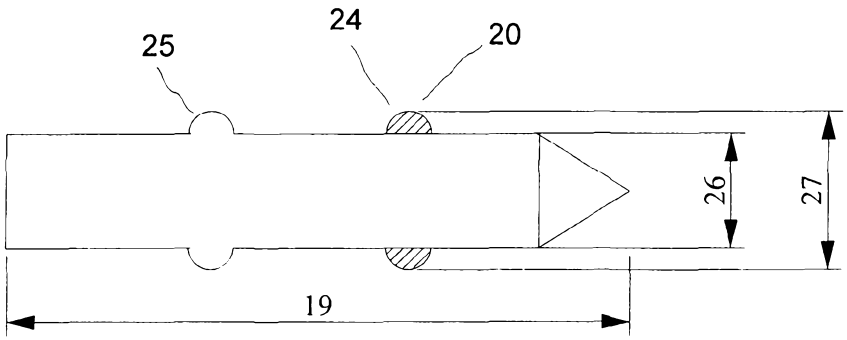

Fig. 6

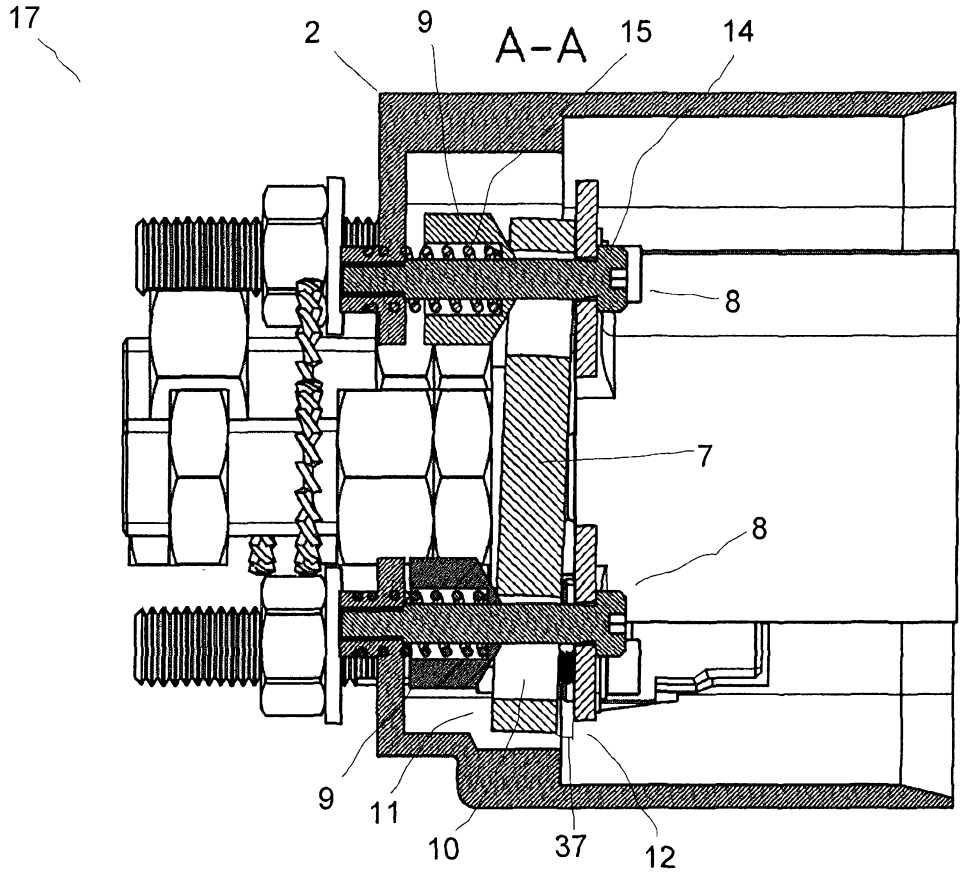

Fig. 7

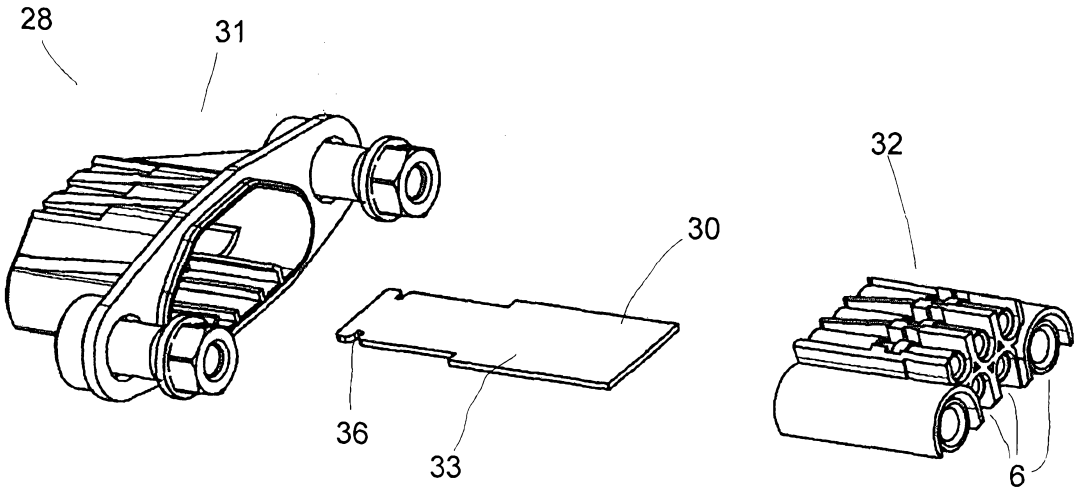

Fig. 8

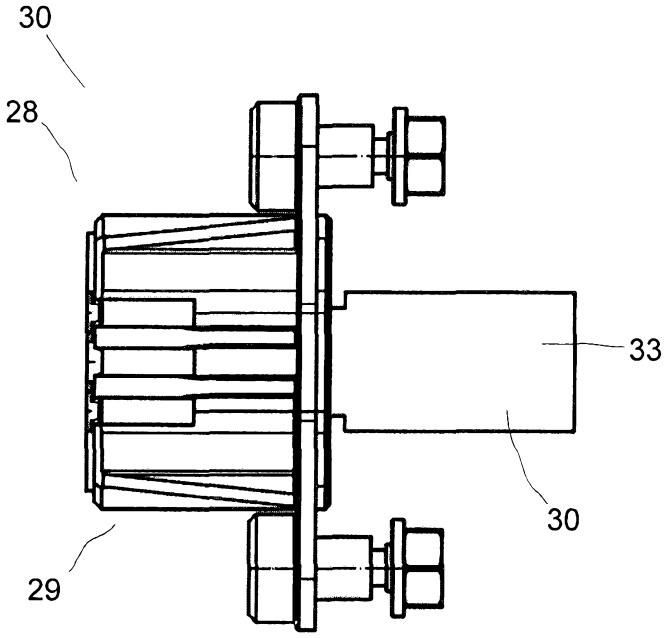

Fig. 9

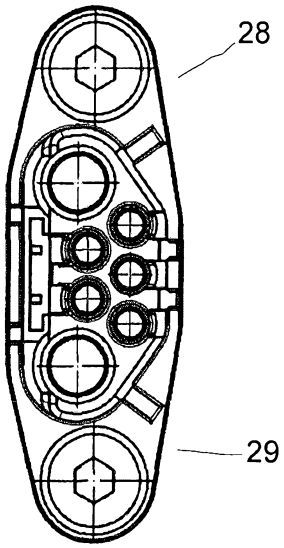

Fig. 10

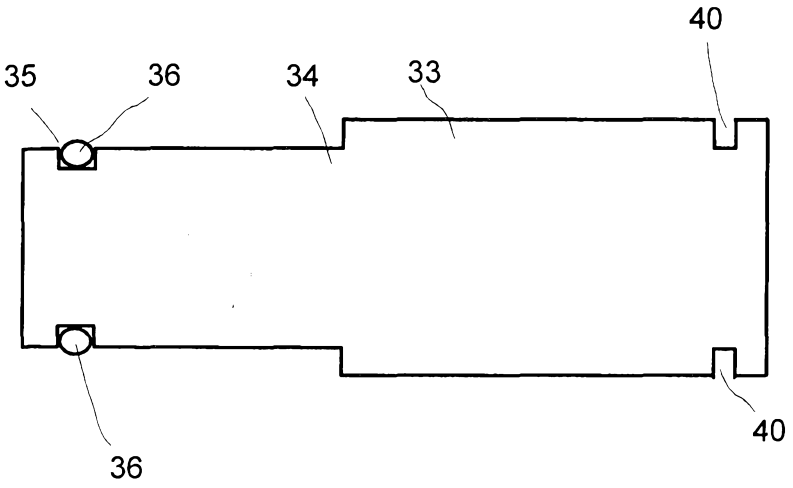

Fig. 11