(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) **EP 4 358 313 A1**

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
24.04.2024 Bulletin 2024/17

(21) Application number: **22202773.2**

(22) Date of filing: **20.10.2022**

(51) International Patent Classification (IPC):
H01R 12/70 *(2011.01)* ***H01R 43/02*** *(2006.01)*
H01R 12/57 *(2011.01)* *H01R 12/58* *(2011.01)*

(52) Cooperative Patent Classification (CPC):
H01R 12/707; H01R 12/7052; H01R 43/0256;
H01R 12/57; H01R 12/58

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC ME MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA
Designated Validation States:
KH MA MD TN

(71) Applicants:
- **TE Connectivity Germany GmbH**
  64625 Bensheim (DE)
- **TE Connectivity Belgium B.V.**
  8020 Oostkamp (BE)

(72) Inventors:
- **PANITZ, Gregor**
  64625 Bensheim (DE)
- **DUENKEL, Dirk**
  64625 Bensheim (DE)
- **BEESE, Philipp**
  64625 Bensheim (DE)
- **WILL, Johannes**
  64625 Bensheim (DE)
- **WILD, Thomas**
  64625 Bensheim (DE)
- **REICHEL, Stefan**
  64625 Bensheim (DE)
- **STARKE, Holger**
  64625 Bensheim (DE)
- **DEVOS, Peter**
  8020 Oostkamp (DE)

(74) Representative: **Patentanwaltskanzlei WILHELM & BECK**
Prinzenstraße 13
80639 München (DE)

(54) ELECTRICAL CONNECTOR FOR A PRINTED CIRCUIT BOARD

(57) An electrical connector comprises a housing, a plurality of contact elements arranged at the housing for establishing an electrical connection with the printed circuit board by soldering, and at least one fastening element arranged at the housing for establishing a mechanical connection with the printed circuit board by soldering. The fastening element is formed in one piece from a solder.

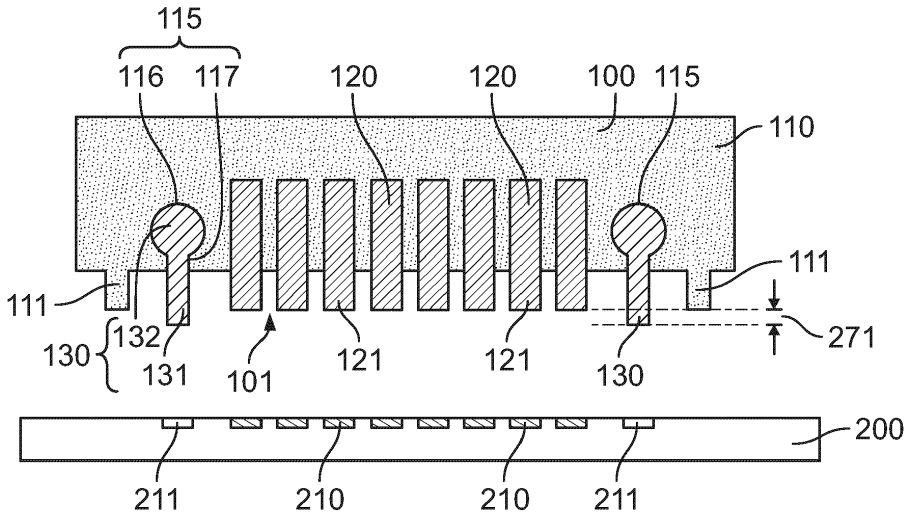

Fig. 1

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Description

[0001] The present invention relates to an electrical connector for a printed circuit board. The invention further relates to a device comprising a printed circuit board and an electrical connector, and to a method for producing such a device.

[0002] A typical electronic device may comprise a printed circuit board (PCB) and a plurality of electronic and/or electrical components mounted thereon. The components may be surfacemounted device (SMD) components and may be soldered onto the printed circuit board via solderable metallic contact elements and using a solder paste. The application procedure used here is referred to as surface-mounting technology (SMT). The printed circuit board is usually additionally equipped with an electrical connector (PCB connector, PCB header) via which signal and power connections may be made. The connector may be configured to be pluggable with a counter connector, and may be also implemented as a SMD component. In this configuration, the connector may comprise solderable contact elements and may be soldered onto the printed circuit board together with other SMD components.

[0003] Upon plugging on and removing a counter connector, a PCB connector arranged on a printed circuit board is subjected to mechanical forces. In order to protect the contact elements against these forces and to prevent the respective solder connections from being impaired or undone or even the soldered-on connector from being detached from the printed circuit board, an additional mechanical fastening may be provided. For this purpose, the connector may comprise metallic and solderable fastening elements (also referred to as metal or solder brackets) which are soldered onto the printed circuit board together with its contact elements. In this way, appropriate holding forces of the connector on the printed circuit board may be provided. In case of SMT soldering, however, there are high flatness or coplanarity requirements in order to allow a reliable soldering of all fastening and contact elements, i.e. it is necessary that soldering regions of these elements are located in a common plane. A long tolerance chain caused by a housing of the connector and its metallic fastening and contact elements makes it difficult and costly to provide the required coplanarity. If the coplanarity does not exist or exists only partially, the mounting process may be impaired or the connector may be incorrectly mounted on the printed circuit board.

[0004] The object of the present invention is to provide an improved solution for a connector for a printed circuit board.

[0005] This object is achieved by the features of the independent claims. Further advantageous embodiments of the invention are specified in the dependent claims.

[0006] According to one aspect of the invention, an electrical connector for a printed circuit board is proposed. The electrical connector comprises a housing, a plurality of contact elements arranged at the housing for establishing an electrical connection with the printed circuit board by soldering, and at least one fastening element arranged at the housing for establishing a mechanical connection with the printed circuit board by soldering. The fastening element is formed in one piece from a solder.

[0007] The proposed electrical connector is intended for mounting on a printed circuit board. In this way, respective electrical signal and/or power connections may be established with the printed circuit board using the connector. The electrical connector comprises at least one fastening element for mechanically attaching the connector to the printed circuit board. Via the fastening element, appropriate holding forces may be provided in the mounted state of the connector such that its contact elements may be protected against mechanical forces occurring when an electrical counter connector is plugged on and removed from the connector.

[0008] The at least one fastening element of the electrical connector is formed in one piece, or in other words integrally or exclusively from a solder material. With this configuration, the high coplanarity requirements present in the above-described approach using metallic and solderable fastening elements may be avoided. Instead, lower coplanarity requirements may exist to the effect that coplanarity may be required only with respect to the contact elements or sections thereof intended for soldering and, as the case may be, to the housing of the connector. The reason for this is that the fastening element made of a solder may melt due to the heat applied in soldering, and therefore undergo a change of shape and/or size in a soldering process applied in the mounting of the electrical connector. Moreover, by omitting metallic fastening elements which are typically realized as stamped and plated metal parts, the fabrication of the connector may be carried out with a lesser complexity and at lower cost. Also, the connector may be realized with a smaller product size. In addition, the mounting of the connector on a printed circuit board may be done with a higher reliability.

[0009] In the following, further possible details and embodiments are described which may be considered for the electrical connector. In this regard, it is noted that indications and features given herein with respect to a configuration of the connector comprising the or one fastening element may be correspondingly applied to a configuration of the connector comprising a plurality of fastening elements (if provided).

[0010] With respect to a plurality of fastening elements, the connector may e.g. comprise two fastening elements which may be arranged at or near opposite lateral sides of the housing of the connector. In this way, the connector may be firmly attached to a printed circuit board via the fastening elements providing multiple or two fastening points. Moreover, the plurality of fastening elements may be configured to correspond to each other. This also ap-

plies to the arrangement of the fastening elements at the connector housing.

[0011] The fastening element of the electrical connector may be provided for establishing a mechanical connection with a pad of a printed circuit board via soldering. The respective pad may be a separate or isolated pad which is not connected to a conductor or trace of the printed circuit board. Moreover, the electrical connector may be a SMD component such that the mounting of the connector on the printed circuit board may comprise carrying out a SMT or reflow soldering process using a solder paste. Here, the connector may be mounted on the printed circuit board in a joint manner together with other components or SMD components.

[0012] The solder from which the at least one fastening element of the electrical connector is integrally formed is a fusible metal alloy which may melt under the influence of heat or by applying an appropriate soldering temperature.

[0013] In a further embodiment, the solder of the fastening element is a soft solder. Such a solder may melt at a relatively low soldering temperature. In this way, the electrical connector may be reliably fixed to a printed circuit board in the course of a SMT process. In this process, the fastening element may melt and may thus be firmly connected to the printed circuit board or a pad of the same. Moreover, in the fabrication of the electrical connector with the fastening element made from a soft solder, the housing of the connector may be assembled with the fastening element in a simple and costefficient manner. The soft solder applied for the fastening element may be a tin-based or tin-lead based solder. In this configuration, the fastening element may be also referred to as solder tin fastening element or solder tin bracket.

[0014] In a further embodiment, the fastening element is form-fit connected with the housing of the electrical connector. In this way, the fastening element may be reliably and firmly connected to the housing, which in a corresponding manner, when the connector is mounted on a printed circuit board, allows the connector to be reliably and firmly attached to the printed circuit board. The form-fit connection of the fastening element at the connector housing may be realized by an appropriate and matched structural design of the fastening element and the housing, with e.g. an undercut, interlocking contours, an encompassing or embracing structure, or similar structures.

[0015] The housing of the electrical connector may be a plastic housing, and be realized e.g. as an injection molded part. The contact elements may be formed from a metallic material and comprise a metallic coating or plating.

[0016] In a further embodiment, the fastening element of the electrical connector is partially accommodated in a cavity of the housing and partially protrudes from the housing. Moreover, the fastening element is secured or anchored to the housing via the cavity of the housing. In this way, the provision of a reliable and stable attachment of the fastening element at the housing, and thus also the fixation of the connector when arranging it on a printed circuit board, may be further promoted. The cavity of the housing, which may extend to an outside or outside surface of the housing, may form-fittingly surround a portion or section of the fastening element.

[0017] The partial protrusion of the fastening element from the housing may be present in the region of a mounting side of the electrical connector via which the connector may be mounted on a printed circuit board. In the mounted state of the connector, the mounting side may face the printed circuit board.

[0018] In a further embodiment, the fastening element comprises an anchoring section and a fastening section. The anchoring section of the fastening element, which may be provided for anchoring the fastening element to the housing, is arranged in the cavity of the housing. The fastening section of the fastening element, which may be provided for making the mechanical connection with the printed circuit board via soldering, protrudes at least partially from the housing. Here, the fastening section may protrude completely or substantially completely from the housing, or may be partially disposed in the cavity of the housing.

[0019] In a further embodiment, the anchoring section of the fastening element comprises a greater cross-sectional width than the fastening section of the fastening element. In this way, the fastening element may be reliably and firmly attached to the connector housing.

[0020] The fastening section of the fastening element may e.g. comprise an elongated or rectangular cross-sectional profile. The anchoring section may e.g. comprise a circular cross-sectional profile. Other examples of cross-sectional profiles for the anchoring section may include a polygonal profile such as a triangular or rectangular profile. In the latter case, the fastening element may comprise an overall T-shaped cross-sectional profile. In a view perpendicular to the cross-section, the fastening element may e.g. comprise a plate-shaped design.

[0021] With regard to the aforementioned embodiments, the cavity of the housing may comprise an anchoring region and a passage region extending from the anchoring region to an outside of the housing. The anchoring section of the fastening element may be arranged in the anchoring region of the cavity. The fastening section of the fastening element may extend from the anchoring section through the passage region of the cavity and may partially protrude from the housing. In accordance with the anchoring section and the fastening section of the fastening element, the cavity of the housing may be configured in such a way that the anchoring region comprises a greater cross-sectional width than the passage region. Moreover, the shapes mentioned above in relation to the fastening element may be also present with respect to the cavity and the anchoring region and passage region of the cavity.

[0022] In a further embodiment, the housing of the electrical connector comprises at least one stand-off pro-

vided to rest on a printed circuit board in the mounted state of the electrical connector. Via the stand-off of the housing, a defined support point or support region of the housing, and thus a predefined and reliable assembly position of the electrical connector on the printed circuit board, may be provided. The stand-off, similar to the fastening element, may protrude from the housing in the region of a mounting side of the electrical connector. Moreover, the fastening element may project over the stand-off at the mounting side, thus allowing the fastening element to be reliably connected to the printed circuit board.

[0023] In a further embodiment, each of the plurality of contact elements of the electrical connector comprises a terminal contact section in the region of a mounting side of the connector provided for establishing an electrical connection with a pad of a printed circuit board by soldering. Moreover, the fastening element projects over the terminal contact sections of the plurality of contact elements in the region of the mounting side of the connector. The terminal contact sections of the contact elements may e.g. extend laterally from the connector housing at the mounting side of the connector. Furthermore, the contact elements may be realized in such a way that the terminal contact sections may be present as flexible or spring contact sections.

[0024] The pads of the printed circuit board to be contacted by the terminal contact sections of the contact elements may be connected to conductors or traces of the printed circuit board. In this way, in a state in which the printed circuit board is assembled with the electrical connector and other components, electrical signal and/or power connections may be realized in relation to these components via the connector and its contact elements.

[0025] With respect to the aforementioned embodiment, the mounting of the electrical connector on a printed circuit board may comprise applying a solder paste on the printed circuit board in the region of its pads, placing the connector on the printed circuit board and carrying out a reflow soldering process. Due to the projection of the fastening element over the terminal contact sections of the contact elements in the region of the mounting side of the connector, the connector may be placed on the printed circuit board only with the fastening element (or a plurality of fastening elements, if provided). In the soldering process, the fastening element(s) may melt and be soldered and thus reliably connected to a pad or respective pads of the printed circuit board associated with the fastening element(s). Moreover, the electrical connector may sink towards the printed circuit board such that the terminal contact sections of the contact elements may be soldered and thus connected to respective pads of the printed circuit board associated with the contact elements.

[0026] Instead of contact elements comprising terminal contact sections to be soldered onto pads of a printed circuit board, the following alternative embodiment may be considered. In this embodiment, in the region of a mounting side of the electrical connector, each of the plurality of contact elements comprises a pin contact section provided for establishing an electrical connection with a through-contact of a printed circuit board by soldering. In this configuration, the pin contact sections may project over the fastening element at the mounting side of the connector.

[0027] The through-contacts of the printed circuit board may be realized as plated through-holes or through-holes provided with a metallic coating, and may be connected to conductors or traces of the printed circuit board. In this way, as well, in a state in which the printed circuit board is assembled with the electrical connector and other components, electrical signal and/or power connections may be established in relation to these components using the connector and its contact elements.

[0028] With respect to the aforementioned embodiment, the mounting of the electrical connector on a printed circuit may comprise applying a solder paste on the printed circuit board in the region of its pad(s) and through-contacts, placing the connector on the printed circuit board and carrying out a reflow soldering process. The connector may be placed on the printed circuit board in such a way that not only the fastening element (or a plurality of fastening elements, if provided) is placed on the printed circuit board, but also the pin contact sections of the contact elements are inserted into or pushed through respective through-contacts of the printed circuit board. In the soldering process, the fastening element(s) may melt and be soldered and thus reliably connected to a pad or respective pads of the printed circuit board associated with the fastening element(s). At the same time, the pin contact sections of the contact elements may be soldered and thus connected to respective through-contacts of the printed circuit board. Also in this process, the electrical connector or its housing may sink towards the printed circuit board. In relation to the pin contact sections of the contact elements, the mounting and soldering of the connector may be also referred to as pin-in-paste process.

[0029] With reference to the different process sequences described above, it is pointed out that the electrical connector may be mounted on the printed circuit board together with other SMD components (e.g. electronic and/or electrical components) by also placing such components on the printed circuit board provided with the solder paste, and subjecting the printed circuit board populated with the connector and these components to a reflow soldering process.

[0030] The electrical connector may be configured to be pluggable with an electrical counter connector. With regard to this, according to a further embodiment, the housing of the electrical connector comprises a receiving chamber for receiving such an electrical counter connector, the counter connector comprising counter contact elements. The counter contact elements may be pluggable with the contact elements of the electrical connector in that the counter contact elements and the contact el-

ements comprise matched contact sections such as pin contact sections and socket contact sections. The connector housing of the electrical connector may be configured in such a way that the counter connector may be plugged in a direction horizontal to or perpendicular to the mounting side of the connector. In these configurations, the connector may be also referred to as 90° or 180° connector or header.

[0031] According to a further aspect of the invention, a device is proposed. The device comprises a printed circuit board and an electrical connector. The electrical connector is configured as described above or according to one or a plurality of the above-described embodiments. The electrical connector is mounted on the printed circuit board. Here, the plurality of contact elements of the electrical connector is electrically connected to the printed circuit board via solder joints, and the fastening element of the electrical connector is mechanically connected to the printed circuit board via a solder joint.

[0032] In the device, electrical signal and/or power connections with the printed circuit board may be established via the electrical connector. In addition, the connector may be reliably and firmly attached to the printed circuit board via the at least one fastening element of the same made in one piece from a solder. Consequently, adequate holding forces may be provided and the contact elements of the connector may be protected against mechanical forces occurring when an electrical counter connector is plugged on and removed from the connector.

[0033] With regard to the device, it is pointed out that features and details described above with reference to the electrical connector may be applied in a corresponding manner to the device.

[0034] In this respect, the device may comprise at least one further component or SMD component arranged on the printed circuit board. With regard to this, the device may be also referred to as printed circuit board assembly (PCBA).

[0035] In a further embodiment, the fastening element of the electrical connector is mechanically connected to a pad of the printed circuit board. This pad may be a separate or isolated pad which is not connected to a conductor or trace of the printed circuit board.

[0036] By contrast, the contact elements of the electrical connector, i.e. terminal contact sections or pin contact sections of the same, may be electrically connected to pads or through-contacts of the printed circuit board, wherein such parts may be connected to conductors or traces of the printed circuit board.

[0037] With reference to the device, the following single or multiple features may be further present. The fastening element may be form-fit connected with the housing of the electrical connector. The fastening element may be partially accommodated in a cavity of the housing and may partially protrude from the housing. The fastening element may be anchored to the housing via the cavity of the housing. The fastening element may comprise an anchoring section and a fastening section. The anchoring section may be arranged in the cavity of the housing. The fastening section may protrude at least partially from the housing. The anchoring section may comprise a greater cross-sectional width than the fastening section.

[0038] The connector housing may comprise at least one stand-off. The at least one stand-off may rest on the printed circuit board. Moreover, the housing may comprise a receiving chamber for receiving an electrical counter connector.

[0039] According to a further aspect of the invention, a method for producing a device is proposed. The method comprises providing a printed circuit board and providing an electrical connector. The electrical connector is configured as described above or according to one or a plurality of the above-described embodiments. The method further comprises mounting the electrical connector on the printed circuit board. The mounting comprises carrying out a soldering process in which the plurality of contact elements of the electrical connector is electrically connected to the printed circuit board, and the fastening element of the electrical connector is mechanically connected to the printed circuit board.

[0040] In the method, due to the at least one fastening element of the electrical connector made integrally from a solder, the connector may be reliably and stably fixed to the printed circuit board. As a consequence, the contact elements of the connector may be protected against mechanical forces occurring when an electrical counter connector is plugged on and removed from the connector.

[0041] With respect to the production method, it is pointed out that features and details described above with reference to the electrical connector and the device may be applied in a corresponding manner to the method.

[0042] In this regard, the electrical connector may be mounted on the printed circuit board together with other SMD components.

[0043] The soldering process may be a reflow soldering process carried out using a solder paste.

[0044] The fastening element of the electrical connector may be mechanically connected to a pad of the printed circuit board.

[0045] In case the contact elements of the electrical connector comprise terminal contact sections to be soldered onto pads of the printed circuit board, the mounting of the connector on the printed circuit board may be carried out as described above. In this context, the following details of a process sequence may further come into play.

[0046] Pads of the printed circuit board may be provided with a solder paste. This process may be carried out with the aid of a mask or stencil and by using a squeegee. The solder paste may comprise a solder portion in the form of powdered solder suspended in a flux paste. Afterwards, the connector may be placed on the printed circuit board with the mounting side of the connector facing the printed circuit board such that the fastening element and the terminal contact sections of the contact elements are located in the region of respective pads of

the printed circuit board. Here, only the fastening element (or a plurality of fastening elements, if provided) projecting over the terminal contact sections may come into physical contact with the solder paste or the solder paste and the pad(s) associated with the fastening element(s), whereas the terminal contact sections may be located at a distance from the solder paste and the associated pads. In this state, the connector may be held on the printed circuit board due to an adhesive property of the solder paste.

[0047] Subsequently, a reflow soldering process may be carried out using a reflow oven in which the fastening element(s) and the terminal contact sections of the contact elements are soldered and thereby connected to the respective pads of the printed circuit board. Due to the heat applied in the soldering process, the fastening element(s) may melt to the effect that the connector may sink towards the printed circuit board and the terminal contact sections of the contact elements may come into contact with the solder paste. The solder paste may also melt as a result of the applied heat, wherein a volatile portion (flux) of the solder paste may be evaporated, and electrically conductive solder joints may be formed via a melted liquid solder portion of the solder paste. In this way, the terminal contact sections of the contact elements may be soldered and thus mechanically and electrically connected to the respective pads. In relation to the fastening element(s), the melted fastening element(s) may merge with the melted solder portion of the solder paste applied on the pad(s) associated with the fastening element(s), and the fastening element(s) may be soldered and thus mechanically attached to that/these pad(s). Here, the solder joint(s) may be formed via the fastening element(s) together with the solder portion of the solder paste.

[0048] In case the contact elements of the electrical connector comprise pin contact sections, the mounting of the connector on the printed circuit board may be carried out as described above. In this context, the following details of a process sequence may be also applied.

[0049] Pads and through-contacts of the printed circuit may be provided with a solder paste. This process may be carried out with the aid of a mask or stencil and by using a squeegee. The solder paste may comprise a solder portion in the form of powdered solder suspended in a flux paste. With regard to the through-contacts, the solder paste may be applied in such a way that the through-contacts may be at least partially filled with the solder paste. Afterwards, the connector may be placed on the printed circuit board with the mounting side of the connector facing the printed circuit board such that the fastening element (or a plurality of fastening elements, if provided) and the pin contact sections of the contact elements are located in the region of the respective pad(s) and through-contacts of the printed circuit board. Here, the pin contact sections may be inserted into or pushed through respective through-contacts of the printed circuit board, thus coming into physical contact with the solder paste or the solder paste and the trough-contacts. The fastening element(s) may also come into physical contact with the solder paste or the solder paste and the pad(s) associated with the fastening element(s).

[0050] Subsequently, a reflow soldering process may be carried out using a reflow oven in which the fastening element(s) and the pin contact sections of the contact elements are soldered and thereby connected to a respective pad or pads and respective through-contacts of the printed circuit board. Due to the heat applied in the soldering process, the fastening element(s) may melt to the effect that the connector or connector housing may sink towards the printed circuit board. The solder paste may also melt as a result of the applied heat, wherein a volatile portion (flux) of the solder paste may be evaporated, and electrically conductive solder joints may be formed via a melted liquid solder portion of the solder paste. In this way, the pin contact sections of the contact elements may be soldered and thus mechanically and electrically connected to the respective through-contacts of the printed circuit board. With regard to the fastening element(s), the melted fastening element(s) may merge with the melted solder portion of the solder paste applied on the pad(s) associated with the fastening element(s), and the fastening element(s) may be soldered and thus mechanically attached to that/these pad(s). Here, the solder joint(s) may be formed via the fastening element(s) together with the solder portion of the solder paste.

[0051] The advantageous configurations and developments of the invention explained above and/or presented in the dependent claims may - apart from, for example, in cases of clear dependencies or incompatible alternatives - be employed individually or else in any desired combination with one another.

[0052] The above-described properties, features and advantages of the invention and the way in which they are achieved will become clearer and more clearly understood in association with the following description of exemplary embodiments which are explained in greater detail in association with the schematic drawings, in which:

Figure 1 shows a lateral view of an electrical connector and a printed circuit board, wherein the connector comprises a housing and a plurality of contact elements and fastening elements, the fastening elements being formed in one piece from a solder;

Figures 2 to 5 show lateral views of the electrical connector and the printed circuit board of figure 1, illustrating steps of a method of mounting the connector on the printed circuit board;

Figure 6 shows an enlarged view of figure 5 with the electrical connector mounted on the printed circuit board;

Figure 7 shows a lateral view of the electrical con-

nector comprising T-shaped fastening elements;

Figures 8 and 9 show lateral views of configurations of the electrical connector comprising a receiving chamber for receiving an electrical counter connector;

Figure 10 shows a lateral view of the electrical connector and the printed circuit board according to a configuration in which the electrical connector comprises contact elements with pin contact sections and the printed circuit board comprises through-contacts;

Figures 11 to 13 show lateral views of the electrical connector and the printed circuit board of figure 10, illustrating steps of a method of mounting the connector on the printed circuit board; and

Figure 14 shows an enlarged view of figure 13 with the electrical connector mounted on the printed circuit board.

[0053] Possible configurations of an electrical connector 100 for mounting on a printed circuit board 200, hereinafter referred to as PCB 200, and of a method of producing a device 290 including mounting the connector 100 on the PCB 200, are described with reference to the following schematic figures. It is pointed out that the schematic figures may not be true to scale. Therefore, components, elements and structures shown in the figures may be illustrated with exaggerated size or size reduction in order to afford a better understanding. In addition, it is pointed out that features and details described in relation to one configuration may be also applied to another configuration.

[0054] Figure 1 depicts a schematic lateral illustration of an electrical connector 100 according to an implementation and of a PCB 200. The connector 100 is configured as a SMD component to be mounted on the PCB 200 via soldering such that respective electrical signal and power connections may be established with the PCB 200 (and other components to be arranged on the PCB 200, not shown) using the connector 100. In this way, the PCB 200 may be provided with electrical energy, and a signal or data transfer to and from the PCB 200 may be enabled. With regard to this, the connector 100 is further configured to be pluggable with an electrical counter connector 300, as will be described in more detail below with reference to figures 8 and 9. The electrical connector 100 may be also referred to as PCB connector or PCB header.

[0055] As illustrated in figure 1, the electrical connector 100 comprises a plastic housing 110 and a plurality of solderable metallic contact elements 120 arranged at the housing 110. The contact elements 120 are formed from a metallic material and may comprise a metallic coating or plating (not shown). The contact elements 120 are provided for establishing an electrical connection with the PCB 200, i.e. with metallic pads 210 of the PCB 200, via soldering, in order to realize the aforementioned electrical signal and power connections. The contact elements 120 are partially arranged or accommodated in the housing 110, and are partially present outside the housing 110. With respect to the latter, each contact element 120 comprises a terminal contact section 121 which is located outside the housing 110 in the region of a mounting side 101 of the connector 100. Via the terminal contact sections 121 of the contact elements 120, the electrical connection between the contact elements 120 of the electrical connector 100 and respective pads 210 of the PCB 200 is made. The mounting side 101 of the connector 100 represents the side by which the connector 100 is mounted on the PCB 200 or on a main side of the PCB 200, and which faces the PCB 200 in the mounted state of the connector 100 (see figure 5). The pads 210 of the PCB 200 to be contacted by the contact elements 120 may be further connected to conductors or traces of the PCB 200 (not shown). The PCB 200 comprises, apart from the pads 210 and traces (and further pads 211 described below), an insulating base or carrier material such as FR4 (flame-retardant).

[0056] As further illustrated in figure 1, the connector housing 110 comprises optional stand-offs 111 protruding from the housing 110 in the region of the mounting side 101 of the connector 100. The stand-offs 111 are intended to rest on the PCB 200 in the mounted state of the connector 100 (see figure 5), thus providing a support structure and allowing a predefined assembly position of the connector 100 on the PCB 200. As indicated in figure 1, two stand-offs 111 may be provided which are located in the region of lateral sides of the connector 100 or connector housing 110.

[0057] Further constituent parts of the electrical connector 100 depicted in figure 1 are fastening elements 130 arranged at the housing 110. The fastening elements 130 are provided for establishing a mechanical connection with the PCB 200, i.e. with metallic pads 211 of the PCB 200, via soldering. The pads 211 of the PCB 200, which, in contrast to the pads 210 provided for contacting by the contact elements 120 of the connector 100, are only provided for mechanical fixation. Consequently, these pads 211 may be isolated pads which are not further connected to conductors or traces of the PCB 200. As indicated in figure 1, the connector 100 may comprise two fastening elements 130 which are located in the region of or near lateral sides of the connector 100. The fastening elements 130 project over the contact elements 120 and their terminal contact sections 121 and also the stand-offs 111 of the housing 110 in the region of the mounting side 101 of the connector 100. To this end, a corresponding overlap 271 of the fastening elements 130 with respect to the terminal contact sections 121 and the stand-offs 111 is shown in figure 1. In the mounted state of the connector 100 on the PCB 200 (see figure 5), the fastening elements 130 may provide appropriate holding forces. In this way, the contact elements 120 of the elec-

trical connector 100 may be protected against mechanical forces occurring when an electrical counter connector 300 (see figures 8 and 9) is plugged on and removed from the connector 100. This allows to avoid the solder connections between the contact elements 120 of the connector 100 and the pads 210 of the PCB 200 from being impaired or undone, or the mounted connector 100 from being detached from the PCB 200.

[0058] Each of the fastening elements 130 is formed in one piece, or in other words is made integrally or completely from a solder, i.e. a meltable metal alloy which may melt under the influence of heat or by applying an appropriate soldering temperature. The solder material from which the fastening elements 130 are made is a soft solder. This may be a tin-based or tin-lead based solder. In this configuration, the fastening elements 130 may be also referred to as solder tin fastening elements or solder tin brackets.

[0059] Due to the fastening elements 130 made in one piece from a solder, there are lower coplanarity requirements with regard to a mounting of the electrical connector 100 than in the case of a connector comprising metallic fastening elements in the form of solderable stamped metal parts. In the connector 100 depicted in figure 1, the coplanarity is required with respect to the contact elements 120 or their terminal contact sections 121 and the stand-offs 111 of the housing 110. The fastening elements 130 projecting over the contact elements 120 and the stand-offs 111 at the mounting side 101 of the connector 100, however, do not fall under this requirement. This condition is based on the fact that the fastening elements 130 integrally made from a solder may melt in the soldering carried out in the mounting of the connector 100 on the PCB 200, and may therefore change their shape and size in this process. Moreover, due to the fact that the electrical connector 100 for mechanically fixing comprises, instead of stamped metal parts, the fastening elements 130 made from a solder, the mounting of the connector 100 may be also done with a high(er) reliability. In addition, the fabrication of the connector 100 may be carried out with a less(er) complexity and at low(er) cost, and the connector 100 may be realized with a small(er) size.

[0060] In order to allow the fastening elements 130 to be reliably and firmly connected to the connector housing 110 as well as to enable a firm and secure mechanical fixation of the electrical connector 100 to the PCB 200, the fastening elements 130 are form-fit connected with the housing 110. To this end, as illustrated in figure 1, the housing 110 comprises, for each fastening element 130, a respective cavity 115. The fastening elements 130 are partially accommodated in the associated cavities 115 of the housing 110 and partially protrude from the housing 110 in the region of the mounting side 101 of the connector 100. Each cavity 115 is configured to hold and anchor the respective fastening element 130 to the housing 110 by form-fittingly embracing a portion of the respective fastening element 130.

[0061] To this end, each cavity 115 comprises an anchoring region 160 and a passage region 117 extending from the anchoring region 116 to the outside of the housing 110. Each fastening element 130 comprises an anchoring section 132 and a fastening section 131. The fastening section 131 is provided for making the mechanical connection with the PCB 200 via soldering. The anchoring section 132 is arranged in the anchoring region 116 of the respective cavity 115, and the fastening section 131 extends from the anchoring section 132 through the passage region 117 of the respective cavity 115 and partially protrudes from the housing 110. With respect to the form-fit connection, each fastening element 130 is configured in such a way that the anchoring section 132 comprises a greater cross-sectional width than the fastening section 131. Corresponding to this, in each cavity 115 of the housing 110, the anchoring region 116 comprises a greater cross-sectional width than the passage region 117. In the exemplary configuration shown in figure 1, the anchoring section 132 comprises a circular cross-sectional profile, and the fastening section 131 comprises an elongated rectangular cross-sectional profile. The housing cavities 115 comprise shapes adapted to this with an anchoring region 116 comprising a likewise circular cross-sectional profile and a passage region 117 comprising a rectangular cross-sectional profile. In a view perpendicular to the cross-section depicted in figure 1, i.e. in a view of figure 1 rotated by 90°, the fastening elements 130 may e.g. comprise a plate-shaped design as indicated, for example, in figures 8 and 9.

[0062] In the following, with reference to schematic figures 2 to 5, an assembly of the electrical connector 100 on the PCB 200, i.e. on a main side of the same intended for mounting, is described, thus producing a device 290. Here, in addition to the connector 100, other components or SMD components may be mounted on the PCB 200 together with the connector 100 (not shown). The device 290 may be also referred to as printed circuit board assembly or PCBA.

[0063] In the method, as shown in figure 2, a solder paste 240 is applied on the PCB 200 in the region of its connection pads 210, 211. The solder paste 240 comprises a solder portion in the form of solder particles suspended in flux paste. Applying the solder paste 240 on the PCB 200 may be carried out with the aid of a mask or stencil and by using squeegee (not shown in each case).

[0064] Afterwards, as illustrated in figure 3, the electrical connector 100 is placed on the PCB 200 with the mounting side 101 of the connector 100 facing the PCB 200 such that the fastening elements 130 and the terminal contact sections 121 of the contact elements 120 are located in the region of the respective pads 210, 211 of the PCB 200. In this process, the connector 100 is placed on the PCB 200 only with the fastening elements 130 projecting over the terminal contact sections 121 such that only the fastening elements 130 or their fastening sections 131 get into physical contact with the solder

paste 240 or the solder paste 240 and the pads 211 associated with the fastening elements 130. In contrast, the terminal contact sections 121 of the contact elements 120 are located at a distance from the solder paste 240 and the pads 210 associated with the contact elements 120. In the state depicted in figure 3, the connector 100 is held on the PCB 200 by the sticky solder paste 240. The placing of the connector 100 on the PCB 200 may be carried out by a pick-and-place process using a pick-and-place machine or robot (not shown).

[0065] Subsequently, as illustrated in figure 4, the PCB 200 populated with the electrical connector 100 is subjected to a reflow soldering process with the purpose of soldering and thus connecting the fastening elements 130 and terminal contact sections 121 of the contact elements 120 to the respective solder pads 210, 211 of the PCB 200. This process is carried out using a reflow oven 250, with the aid of which a respective heat 251 and thus an appropriate soldering temperature may be provided. In this process, due to the applied heat 251, the fastening elements 130 integrally made from a solder may melt to an appropriate height and to the effect that the connector 100 sinks towards the PCB 200 and thereby the terminal contact sections 121 of the contact elements 120 get into contact with the solder paste 240. The solder paste 240 may also melt as a result of the applied heat 251, wherein the flux portion of the solder paste 240 is evaporated and electrically conductive solder joints 272 are formed via the melted solder portion of the solder paste 240.

[0066] In this way, as shown in figure 5, the terminal contact sections 121 of the contact elements 120 are soldered and thereby mechanically and electrically connected to the respective pads 210 of the PCB 200. In figure 5 (and also figure 6), the respective solder 241 originating from the solder paste 240, via which the solder joints 272 between the terminal contact sections 121 of the contact elements 120 and the pads 210 of the PCB 200 are established, is shown. With respect to the fastening elements 130, the melted fastening elements 130 may merge with the melted solder portion of the solder paste 240 applied on the pads 211, and the fastening elements 130 are soldered and thus mechanically fixed to the pads 211 of the PCB 200. In the region of the pads 211, respective solder joints 272 are formed via the fastening elements 130 together with the solder portion of the solder paste 240. After the solder 241 and the fastening elements 130 have cooled and thus solidified, the electrical connector 100 is electrically and mechanically firmly connected to the PCB 200.

[0067] With regard to the above-mentioned sinking of the electrical connector 100 towards the PCB 200 occurring in the soldering process, the connector 100 or its housing 110 may sink up until the stand-offs 111 of the housing 110 touch the PCB 200 and rest on it. This movement may be due to the influence of gravity together with a suction force caused by a wetting of the pads 210, 211 of the PCB 200 with the melted solder 241 and melted fastening elements 130.

[0068] As indicated above, other components or SMD components may be assembled on the PCB 200 together with the electrical connector 100 in order to produce the device 290 shown in figure 5. These components may be electronic and/or electrical components. With regard to this, such components may be also placed on the PCB 200 provided with the solder paste 240, and the PCB 200 populated with the connector 100 and these components may be subjected to the reflow soldering process (not shown in each case).

[0069] Figure 6 depicts an enlarged schematic illustration of a section of the device 290 shown in figure 5 comprising the electrical connector 100 mounted on the PCB 200 in order to indicate a possible appearance of the solder joints 272. In the solder joints 272, which in relation to the terminal contact sections 121 of the contact elements 120 and the pads 210 of the PCB 200 are realized with the solder 241 resulting from the solder paste 240, the solder 241 may be present between the terminal contact sections 121 and the pads 210, and may also laterally cover or wet the terminal contact sections 121 so that the solder 241 comprises a curved surface or meniscus in this region. With respect to the fastening elements 130 and the associated pads 211 of the PCB 200, the solder joints 272 are realized via the fastening elements 130 integrally made from solder and the merged solder of the solder paste 240. In this case, too, a curved surface or meniscus may be present in the region of the pads 211.

[0070] Deviating from the schematic representation of figure 6, the fastening elements 130 soldered and mechanically attached to the pads 211 of the PCB 200 may comprise a shape differing from the one shown. In this regard, it is also possible that the cavities 115 of the housing 110, deviating from figure 6, are no longer completely filled with the fastening elements 130 and their sections 131, 132, wherein the fastening elements 130 continue to be form-fit connected with the housing 110 (not shown in each case).

[0071] With respect to the electrical connector 100 and the fastening elements 130, other shapes and cross-sectional profiles may be provided with regard to the fastening elements 130 and cavities 115 of the housing 110 in order to secure the fastening elements 130 to the housing 110. For exemplary illustration, figure 7 shows a schematic lateral view of the connector 100 with a configuration in which the fastening elements 130 form-fit connected with the housing 110 comprise a T-shaped cross-sectional profile in that both the anchoring section 132 and the fastening section 131 comprise a rectangular cross-sectional profile. Corresponding to this, the cavities 115 of the housing 110 comprise a matched shape with a T-shaped cross-sectional profile in that the anchoring region 116 and the passage region 117 comprise a rectangular cross-sectional profile. Apart from this difference, the connector 100 with the configuration depicted in figure 7 may be identical to the connector 100 described above, and may likewise be mounted on a PCB 200 in a manner corresponding to that of figures 2 to 5.

[0072] Other examples of shapes which may be considered with regard to the fastening elements 130 of the electrical connector 100 may include fastening elements 130 with other anchoring sections 132 polygonal in cross-section, such as triagonal anchoring sections 132. Such shapes may also apply to the anchoring regions 116 of the cavities 115. Moreover, with regard to the cavities 115 of the housing 110, variants may be considered in which the cavities 115 only comprise an anchoring region 116 such as a circular or polygonal anchoring region 116 in cross-section, the anchoring region 116 being adjacent to or merging to the outside of the housing 110, wherein no additional passage region 117 is present (not shown in each case).

[0073] As indicated above, the electrical connector 100 is configured to be pluggable with an electrical counter connector 300 so that respective electrical signal and power connections may be established with the PCB 200 (and other components arranged thereon). For this purpose, the connector housing 110 may comprise a receiving chamber 119 for receiving such a counter connector 300.

[0074] For exemplary illustration, figure 8 shows a schematic lateral illustration of the electrical connector 100 implemented in this way. The view shown here may represent a view of the connector 100 depicted in figure 1 rotated by 90°. As shown in figure 8, the housing 110 of the electrical connector 100 comprises a receiving chamber 119 provided for receiving an electrical counter connector 300, i.e. a counter connector housing 310 of the same. The counter connector 300, which may be connected to a cable 330, comprises counter contact elements 320.

[0075] As further indicated in figure 8, the contact elements 120 of the electrical connector 100 which are arranged at the housing 110 comprise a stepped shape, wherein the terminal contact sections 121 form one end of the contact elements 120 and extend laterally from the housing 110 at the mounting side 101 of the connector 100. In this regard, the contact elements 120 may be realized in such a way that the terminal contact sections 121 are spring contact sections.

[0076] As further shown in figure 8, each contact element 120 comprises a plug contact section 125 located in the receiving chamber 119 of the housing 110 which forms another end of the contact elements 120. The plug contact sections 125 are provided to be engaged and thus contacted by the counter contact elements 320 of the electrical counter connector 300 when the counter connector 300 is plugged on the electrical connector 100. For this purpose, the plug contact sections 125 of the contact elements 120 and respective counter contact sections of the counter contact elements 320 are realized in the form of matched pin and socket contact sections. In the present exemplary case shown in figure 8, the plug contact sections 125 are realized as pin contact sections, and the counter contact sections are realized as socket contact sections.

[0077] Figure 8 represents a configuration in which the electrical counter connector 300 may be plugged on the electrical connector 100 in a direction, indicated by an arrow in figure 8, perpendicular to the mounting side 101 of the connector 100. In this configuration, the connector 100 may be also referred to as 90° connector or 90° header.

[0078] Deviating from this, another implementation may be considered with respect to the electrical connector 100. For exemplary illustration, figure 9 shows a schematic lateral illustration of the connector 100 and of an electrical counter connector 300 which may be plugged on the connector 100 in a direction, indicated by an arrow in figure 9, horizontal to the mounting side 101 of the connector 100. Here, the connector 100 may be also referred to as 180° connector or 180° header. In this configuration, as well, the connector housing 110 comprises a receiving chamber 119 for receiving the counter connector 300 or a counter connector housing 310 of the same. The counter connector 300 comprises counter contact elements 320, and may be assembled with a cable 330.

[0079] In the configuration shown in figure 9, again, the contact elements 120 of the electrical connector 100 comprise a stepped shape, wherein the terminal contact sections 121 form one end of the contact elements 120 and extend laterally from the housing 110 at the mounting side 101 of the connector 100. At this, a two-row arrangement of contact elements 120 may be provided, wherein in each row, the contact elements 120 are arranged next to each other in a direction perpendicular to the drawing plane of figure 9. For the two rows, the terminal contact sections 121 extend into opposite directions (left and right in figure 9).

[0080] In the electrical connector 100 shown in figure 9, similar to the configuration depicted in figure 8, the contact elements 120 comprise a plug contact section 125 located in the receiving chamber 119 of the housing 110 which forms another end of the contact elements 120. The plug contact sections 125 of the contact elements 120 and respective counter contact sections of the counter contact elements 320 are realized in the form of matched pin and socket contact sections such that the contact elements 120 of the connector 100 may be engaged and thus contacted by the counter contact elements 320 of the counter connector 300 when the counter connector 300 is plugged on the electrical connector 100.

[0081] Instead of contact elements 120 comprising terminal contact sections 121 to be soldered onto pads 210 of a PCB 200, a configuration of the electrical connector 100 comprising contact elements 120 with a pin contact section 122 may be employed.

[0082] For further illustration, figure 10 shows a schematic lateral view of the electrical connector 100 and a PCB 200 according to a configuration, in which the contact elements 120 of the connector 100 that are arranged at and partially accommodated in the housing 110 comprise pin contact sections 122, and the PCB 200 com-

prises through-contacts 220 corresponding to the pin contact sections 122. The pin contact sections 122 of the contact elements 120 are located outside the housing 110 in the region of the mounting side 101 of the connector 100. The pin contact sections 121 are applied to make an electrical connection between the contact elements 120 of the connector 100 and respective through-contacts 220 of the PCB 200 into which the pin contact sections 122 may be inserted. The through-contacts 220 of the PCB 200 are realized as plated through-holes, i. e. as through-holes which comprise a metallic coating or plating 221. As indicated in figure 10, the metallic coating 221 may be present not only at inner walls of the through-holes, but also at the opposite main sides of the PCB 200. The through-contacts 220 of the PCB 200 to be contacted by the contact elements 120 may be further connected to conductors or traces of the PCB 200 (not shown).

[0083] Apart from this difference, the electrical connector 100 and the PCB 200 with the implementation depicted in figure 10 may correspond to the connector 100 and PCB 200 described above. This relates to the configuration of the connector 100 with the fastening elements 130 integrally formed from a solder, the connector housing 110 comprising cavities 115 for partially accommodating the fastening elements 130 and comprising the optional stand-offs 111, and the metallic pads 211 of the PCB 200 provided for fixation with the fastening elements 130. In this regard, reference is made to the above description. In the connector 100 depicted in figure 10, the pin contact sections 122 of the contact elements 120 project over the fastening elements 130, and the fastening elements 130 project over the stand-offs 111 of the housing 110 in the region of the mounting side 101 of the connector 100.

[0084] In the following, with reference to schematic figures 11 to 13, an assembly of the electrical connector 100 comprising pin contact sections 122 and the PCB 200 comprising through-contacts 220 is described, thus producing a device 290. In the method, as depicted in figure 11, a solder paste 240 is applied on the PCB 200 in the region of its through-contacts 220 and pads 211. This process may be carried out with the aid of a mask or stencil and by using a squeegee (not shown). With regard to the through-contacts 220, the solder paste 240 may be applied on the PCB 200 in such a way that the through-contacts 220 are filled with the solder paste 240, as indicated in figure 11.

[0085] Subsequently, as illustrated in figure 12, the electrical connector 100 is placed on the PCB 200 with the mounting side 101 of the connector 100 facing the PCB 200 such that the fastening elements 130 and the pin contact sections 122 of the contact elements 120 are located in the region of the respective pads 211 and through-contacts 220 of the PCB 200. Here, the pin contact sections 122 are inserted into and through respective through-contacts 220 of the PCB 200, thus coming into physical contact with the solder paste 240 or the solder paste 240 and the trough-contacts 220. The placing is carried out such that the fastening elements 130 or their fastening sections 131 also get into physical contact with the solder paste 240 or the solder paste 240 and the pads 211 associated with the fastening elements 130. The placing of the connector 100 on the PCB 200 may be carried out by a pick-and-place process using a pick-and-place machine or robot (not shown).

[0086] Afterwards, as also illustrated in figure 12, the PCB 200 populated with the electrical connector 100 is subjected to a reflow soldering process using a reflow oven 250 in order to solder and thereby connect the fastening elements 130 and the pin contact sections 122 of the contact elements 120 to the respective pads 211 and through-contacts 220 of the PCB 200. Due to the heat 251 provided in this process by the oven 250, the fastening elements 130 integrally formed from a solder may melt to the effect that the connector 100 or connector housing 110 sinks towards the PCB 200. The solder paste 240 may also melt as a result of the applied heat 251, wherein the flux portion of the solder paste 240 is evaporated and electrically conductive solder joints 272 are formed via the melted solder portion of the solder paste 240.

[0087] In this way, as shown in figure 13, the pin contact sections 122 of the contact elements 120 are soldered and thus mechanically and electrically connected to the respective through-contacts 220 of the PCB 200. With regard to the pin contact sections 122, the mounting and soldering of the connector 100 may be also referred to as pin-in-paste process. In figure 13 (and also figure 14), the respective solder 241 resulting from the solder paste 240, via which the solder joints 272 between the pin contact sections 122 and the through-contacts 220 are made, is depicted. In relation to the fastening elements 130, the melted fastening elements 130 may merge with the melted solder portion of the solder paste 240 applied on the pads 211, and the fastening elements 130 are soldered and thereby mechanically attached to the pads 211 of the PCB 200. In the region of the pads 211, the respective solder joints 272 are formed via the fastening elements 130 together with the solder portion of the solder paste 240. When the solder 241 and the fastening elements 130 have cooled and thus solidified, the electrical connector 100 is electrically and mechanically firmly connected to the PCB 200.

[0088] As can be seen from figure 13, the sinking of the electrical connector 100 or its housing 110 towards the PCB 200 occurring in the soldering process takes place up until the stand-offs 111 of the housing 110 touch the PCB 200 and rest on it. The sinking may be caused by gravity and a suction force due to a wetting of the pads 211 of the PCB 200 with the melted fastening elements 130.

[0089] With regard to the method described with reference to figures 11 to 13, it is also possible to mount other components or SMD components on the PCB 200 together with the electrical connector 100. Such compo-

nents may be also placed on the PCB 200 provided with the solder paste 240, and the PCB 200 populated with the connector 100 and these components may be subjected to the reflow soldering process (not shown in each case).

[0090] Figure 14 shows an enlarged schematic illustration of a section of the device 290 depicted in figure 13 comprising the electrical connector 100 mounted on the PCB 200 in order to indicate a possible appearance of the solder joints 272. In the solder joints 272, which in relation to the pin contact sections 122 of the contact elements 120 and the through-contacts 220 of the PCB 200 are realized with the solder 241 originating from the solder paste 240, the solder 241 may be present between the pin contact sections 122 and the metallic coating 221 of the through-contacts 220, and may also cover the metallic coating 221 at the main sides of the PCB 200 and laterally cover the pin contact sections 122 so that the solder 241 comprises a curved surface or meniscus in this region. In relation to the fastening elements 130 and the pads 211 of the PCB 200, the solder joints 272 are realized via the fastening elements 130 made from solder and the merged solder of the solder paste 240, wherein a curved surface or meniscus may be present in the region of the pads 211.

[0091] Also in the case of the electrical connector 100 comprising pin contact sections 122, the above-described details, modifications and further implementations may be applied in a corresponding manner. In this regard, the fastening elements 130 may comprise, deviating from figure 10, other shapes and cross-sectional profiles such as a T-shaped profile as shown in figure 7. Moreover, the connector 100 may be realized with a configuration corresponding to figures 8 and 9. Here, the contact elements 120 may comprise, in addition to the pin contact sections 122 forming one end, plug contact sections 125 located in the receiving chamber 119 of the housing 110 and forming another end of the contact elements 120 (not shown in each case).

[0092] Besides the embodiments described above and depicted in the figures, further embodiments are conceivable which may comprise further modifications and/or combinations of features.

[0093] Such modifications may, in deviation from the figures and the above description, relate to different shapes and/or numbers of constituent parts or structures of the electrical connector 100 such as the fastening elements 130, contact elements 120, stand-offs 111 etc.

[0094] As an example, the electrical connector 100 may be realized with only one or a greater number of fastening elements 130 integrally made from a solder. Moreover, a connector housing 110 may be realized without stand-offs 111.

[0095] Although the invention has been more specifically illustrated and described in detail by means of exemplary embodiments, nevertheless the invention is not restricted by the examples disclosed and other variations may be derived therefrom by a person skilled in the art, without departing from the scope of protection of the invention.

[0096] Reference symbols

100	electrical connector
101	mounting side
110	housing
111	stand-off
115	cavity
116	anchoring region
117	passage region
119	receiving chamber
120	contact element
121	terminal contact section
122	pin contact section
125	plug contact section
130	fastening element
131	fastening section
132	anchoring section
200	printed circuit board
210	pad
211	pad
220	through-contact
221	metallic coating
240	solder paste
241	solder
250	reflow oven
251	heat
271	overlap
272	solder joint
290	device
300	counter connector
310	counter connector housing
320	counter contact element
330	cable

Claims

1. An electrical connector (100) for a printed circuit board (200) comprising:

   a housing (110);
   a plurality of contact elements (120) arranged at the housing (110) for establishing an electrical connection with the printed circuit board (200) by soldering; and
   at least one fastening element (130) arranged at the housing (110) for establishing a mechanical connection with the printed circuit board (200) by soldering,
   wherein the fastening element (130) is formed in one piece from a solder.

2. The electrical connector according to claim 1, wherein the solder of the fastening element (130) is a soft solder.

3. The electrical connector according to any one of the preceding claims,
wherein the fastening element (130) is form-fit connected with the housing (110).

4. The electrical connector according to any one of the preceding claims,
wherein the fastening element (130) is partially accommodated in a cavity (115) of the housing (110) and partially protrudes from the housing (110), and wherein the fastening element (130) is secured to the housing (110) via the cavity (115) of the housing (110).

5. The electrical connector according to claim 4,
wherein the fastening element (130) comprises an anchoring section (132) and a fastening section (131), wherein the anchoring section (132) is arranged in the cavity (115) of the housing (110), and wherein the fastening section (131) protrudes at least partially from the housing (110).

6. The electrical connector according to claim 5,
wherein the anchoring section (132) of the fastening element (130) comprises a greater cross-sectional width than the fastening section (131) of the fastening element (130) .

7. The electrical connector according to any one of the preceding claims,
wherein the housing (110) comprises at least one stand-off (111) provided to rest on the printed circuit board (200) in a mounted state of the electrical connector (100) .

8. The electrical connector according to any one of the preceding claims,
wherein, in the region of a mounting side (101) of the electrical connector (100), each of the plurality of contact elements (120) comprises a terminal contact section (121) provided for establishing an electrical connection with a pad (210) of the printed circuit board (200) by soldering and the fastening element (130) projects over the terminal contact sections (121) of the plurality of contact elements (120).

9. The electrical connector according to any one of claims 1 to 7,
wherein, in the region of a mounting side (101) of the electrical connector (100), each of the plurality of contact elements (120) comprises a pin contact section (122) provided for establishing an electrical connection with a through-contact (220) of the printed circuit board (200) by soldering.

10. The electrical connector according to any one of the preceding claims,
wherein the housing (110) comprises a receiving chamber (119) for receiving an electrical counter connector (300) comprising counter contact elements (320).

11. A device (290) comprising a printed circuit board (200) and an electrical connector (100) according to any one of the preceding claims,

wherein the electrical connector (100) is mounted on the printed circuit board (200),
wherein the plurality of contact elements (120) of the electrical connector (100) is electrically connected to the printed circuit board (200) via solder joints (272),
and wherein the fastening element (130) of the electrical connector (130) is mechanically connected to the printed circuit board (200) via a solder joint (272).

12. The device according to claim 11,
wherein the fastening element (130) of the electrical connector (100) is mechanically connected to a pad (211) of the printed circuit board (200).

13. A method for producing a device (290) comprising:

providing a printed circuit board (200);
providing an electrical connector (100) according to any one of claims 1 to 10;
mounting the electrical connector (100) on the printed circuit board (200), wherein the mounting comprises carrying out a soldering process in which the plurality of contact elements (120) of the electrical connector (100) is electrically connected to the printed circuit board (200) and the fastening element (130) of the electrical connector (100) is mechanically connected to the printed circuit board (200).

14. The method according to claim 13,
wherein the soldering process is a reflow soldering process.

15. The method according to any one of claims 13 and 14, wherein the fastening element (130) of the electrical connector (100) is mechanically connected to a pad (211) of the printed circuit board (200).

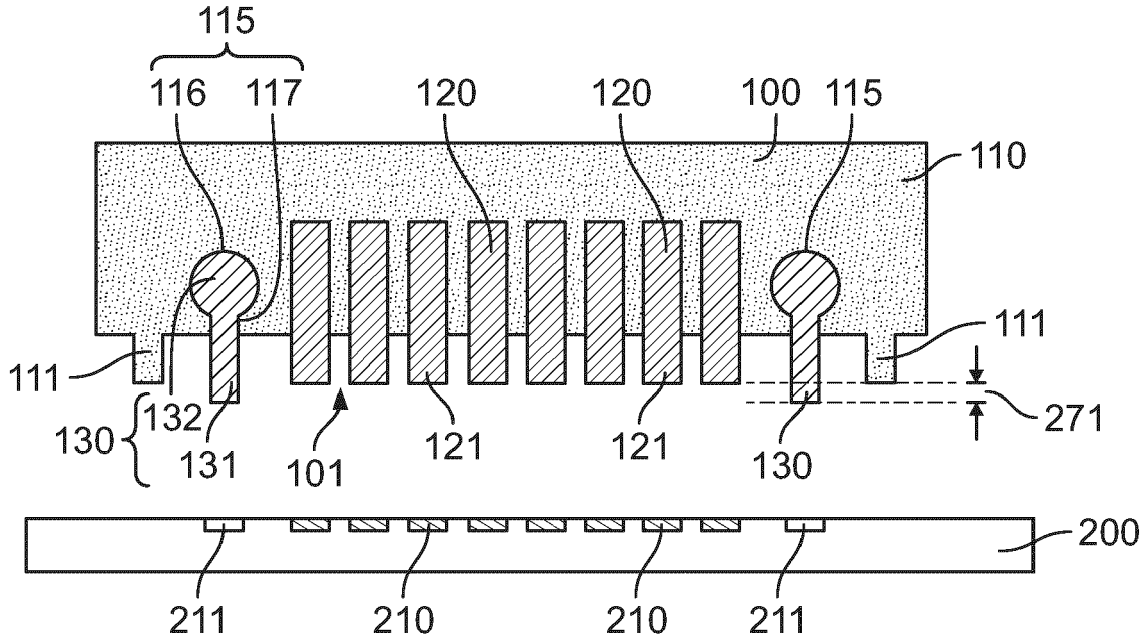
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Fig. 1

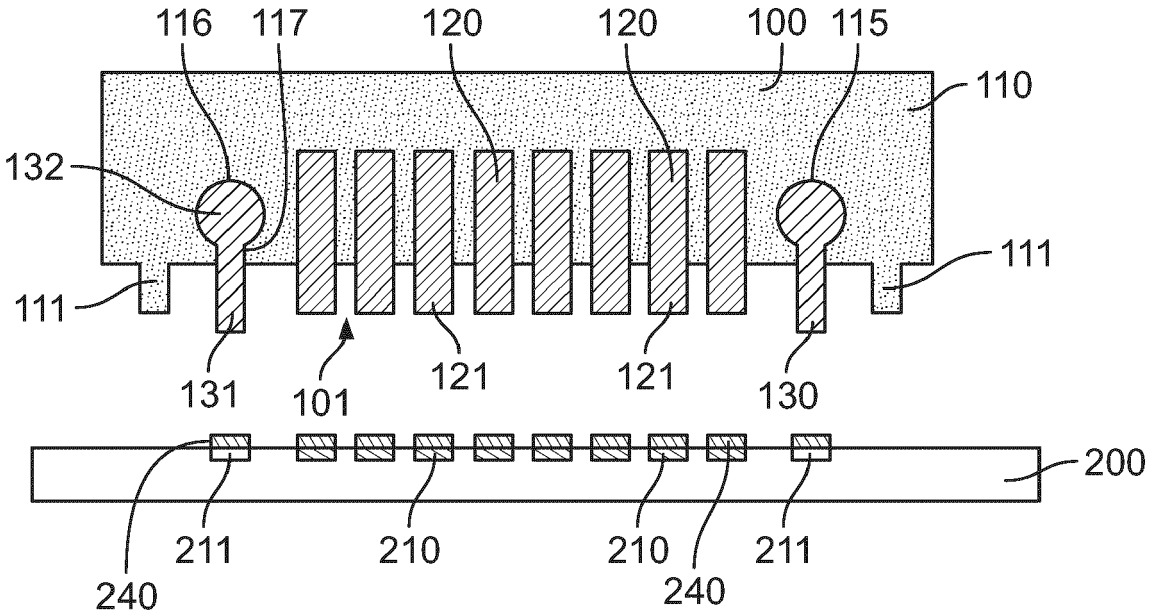
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Fig. 2

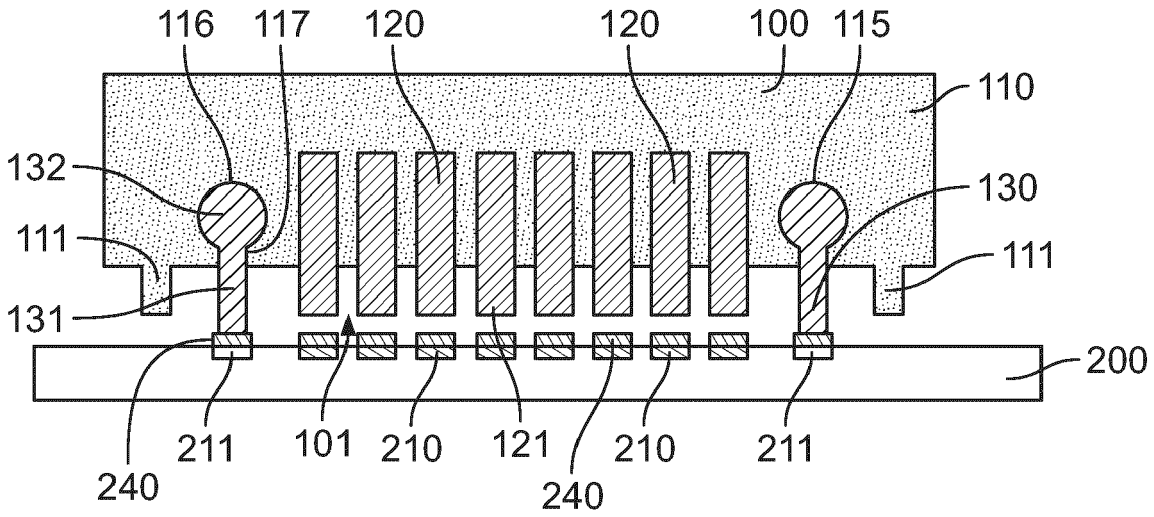
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Fig. 3

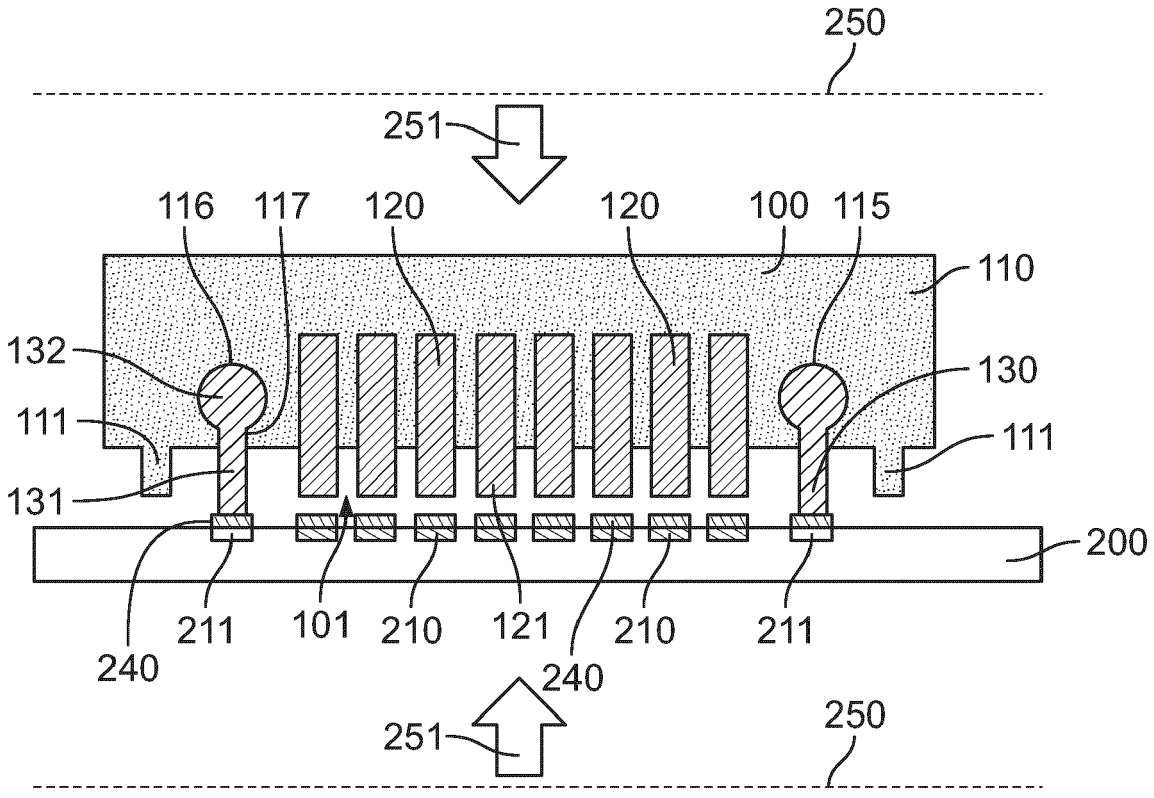
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Fig. 4

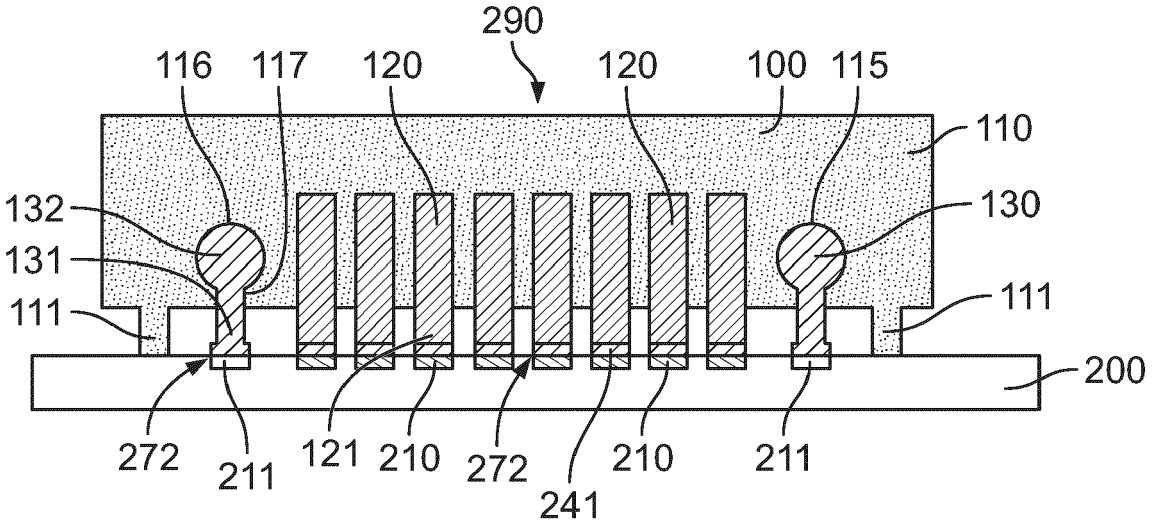
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Fig. 5

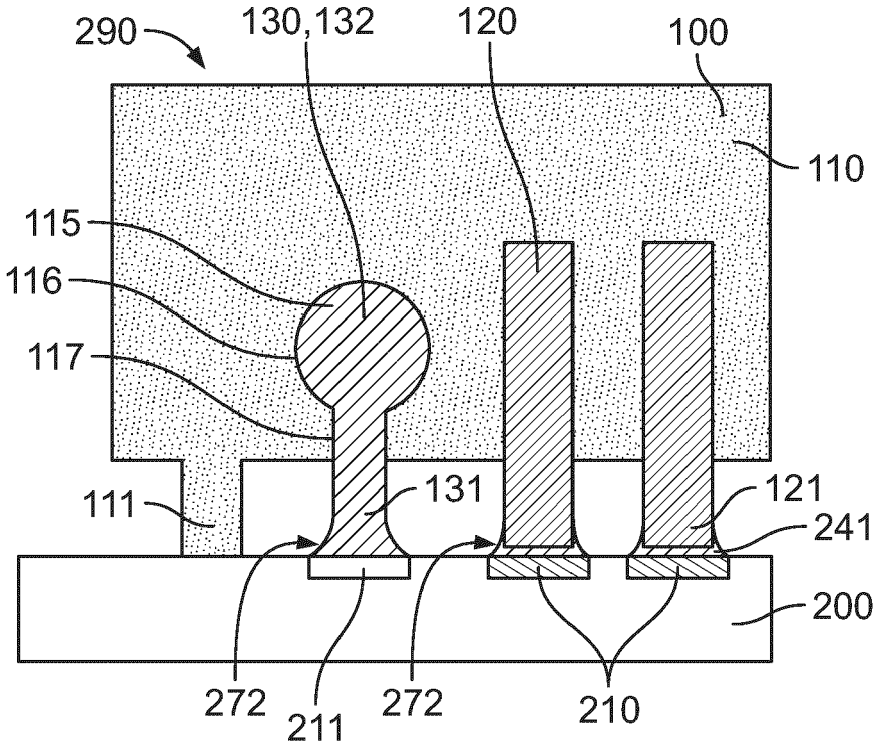
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Fig. 6

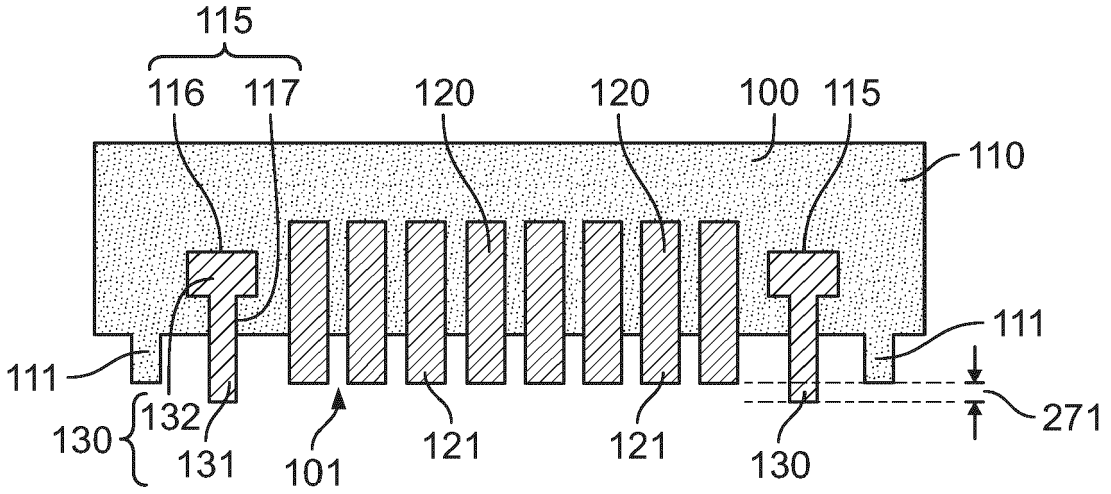
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Fig. 7

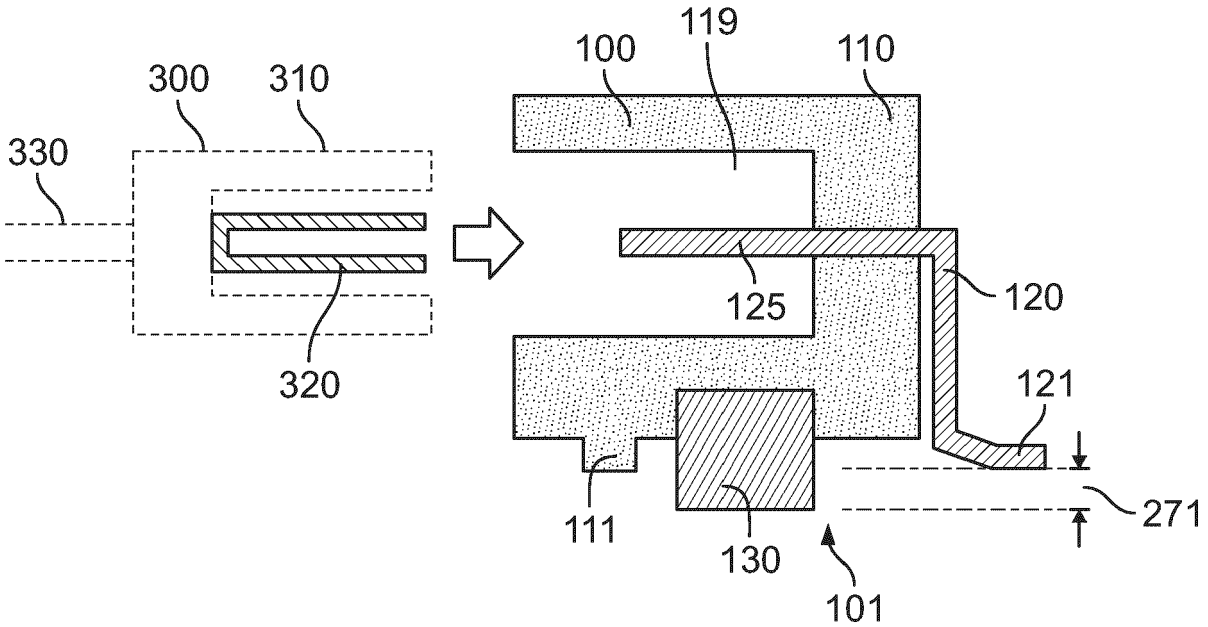
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Fig. 8

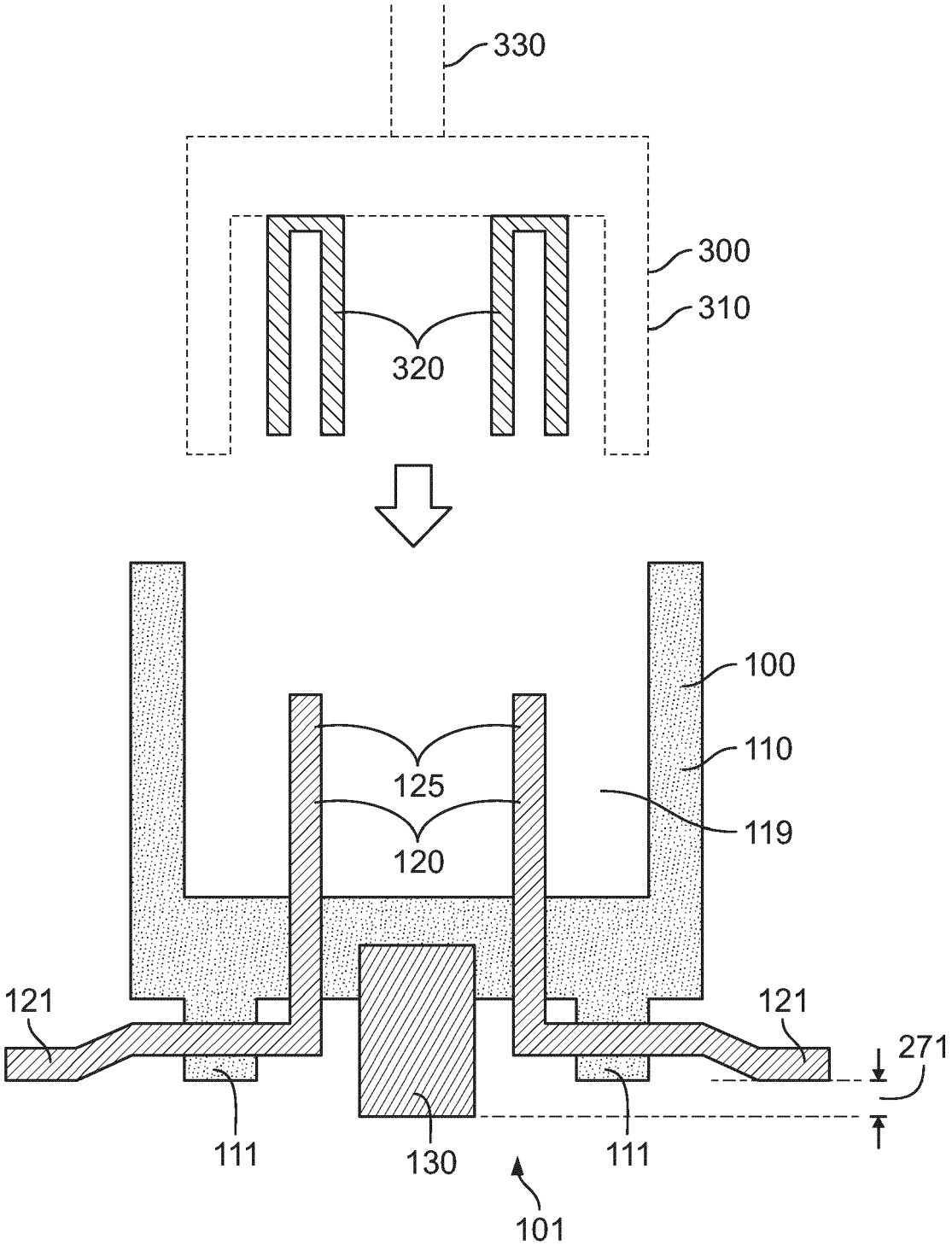

Fig. 9

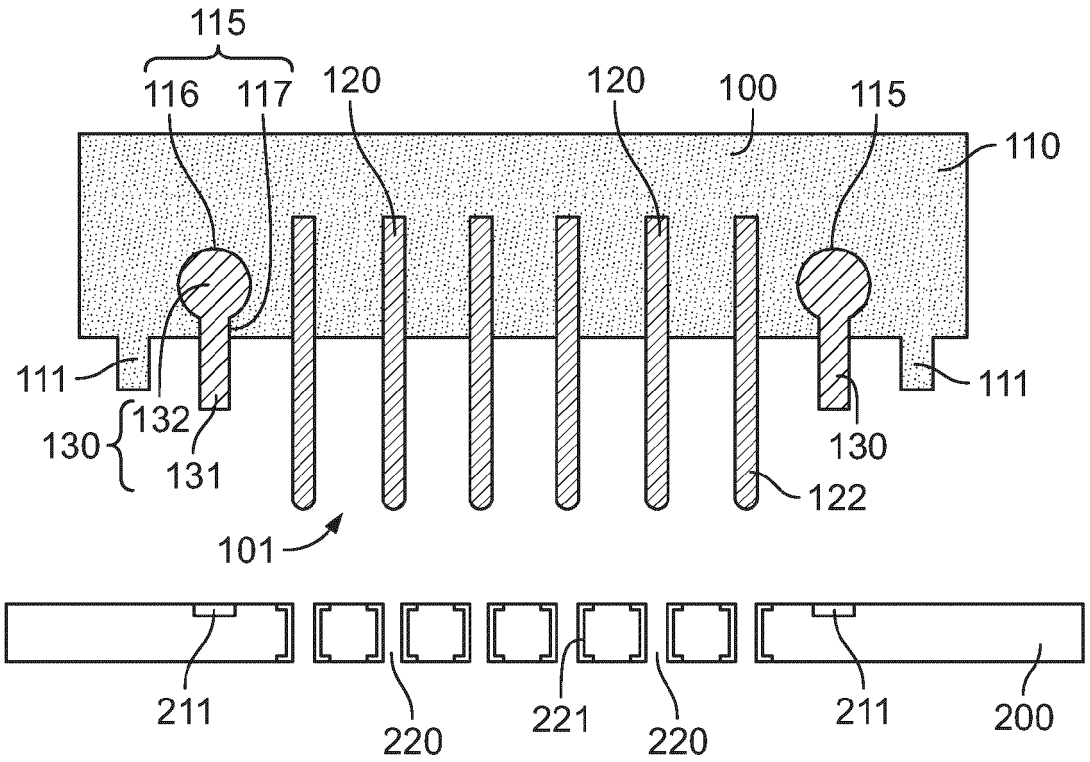
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Fig. 10

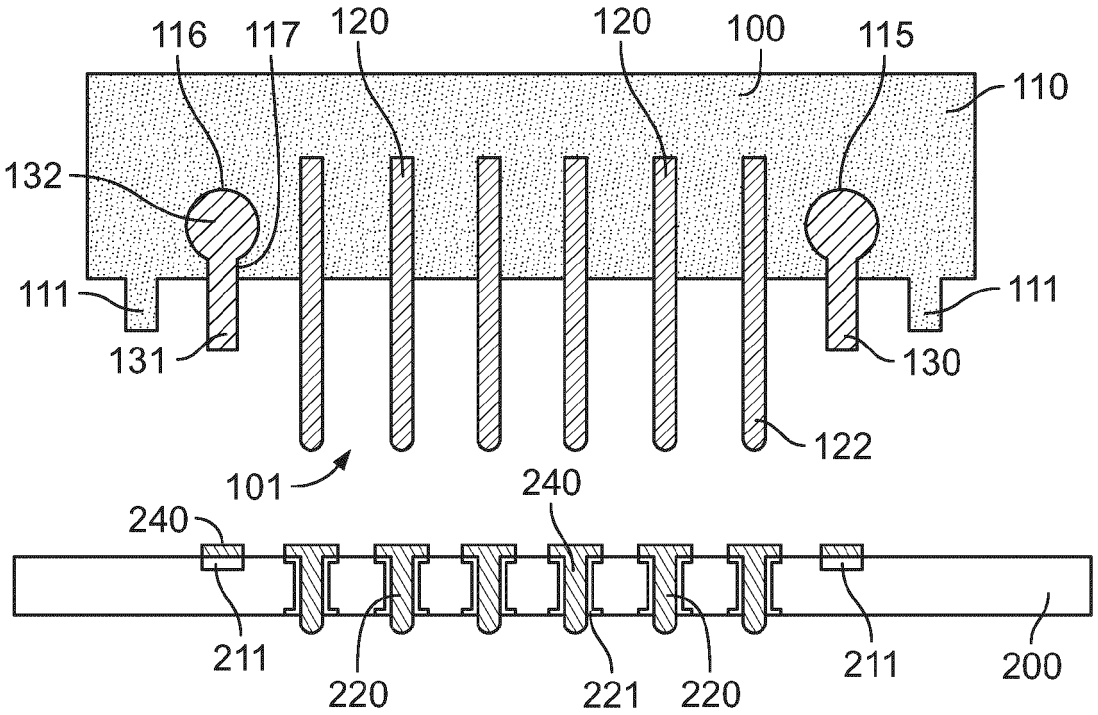
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Fig. 11

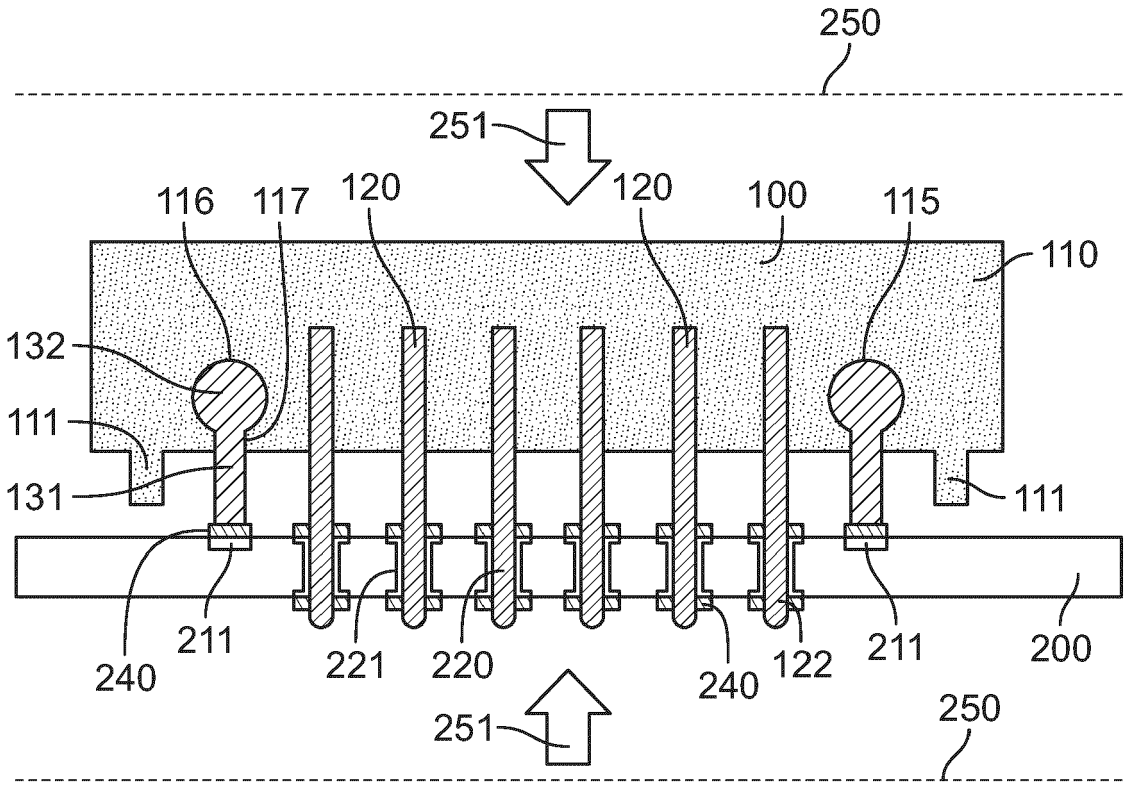
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Fig. 12

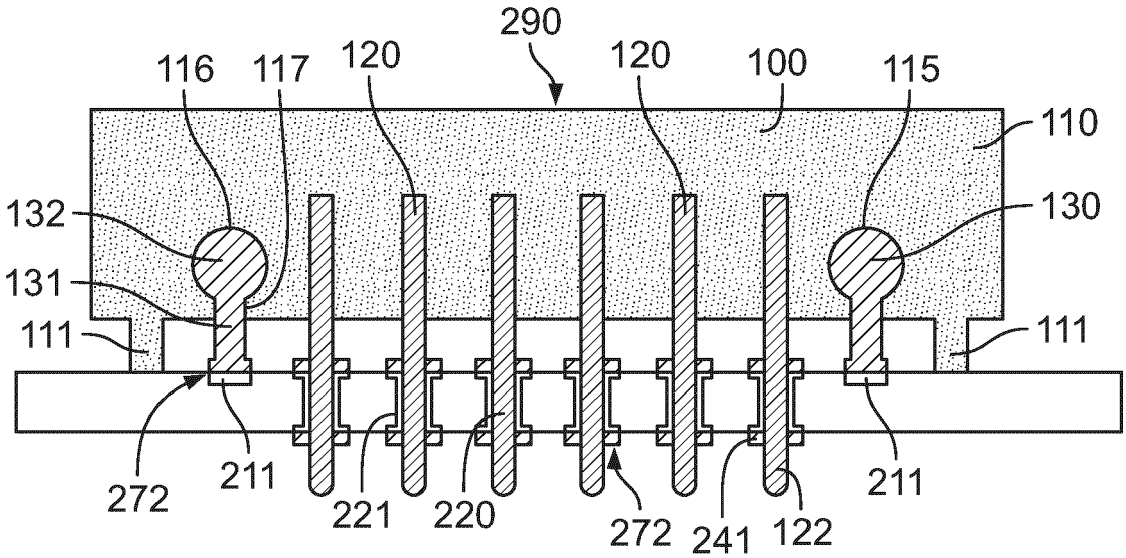
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Fig. 13

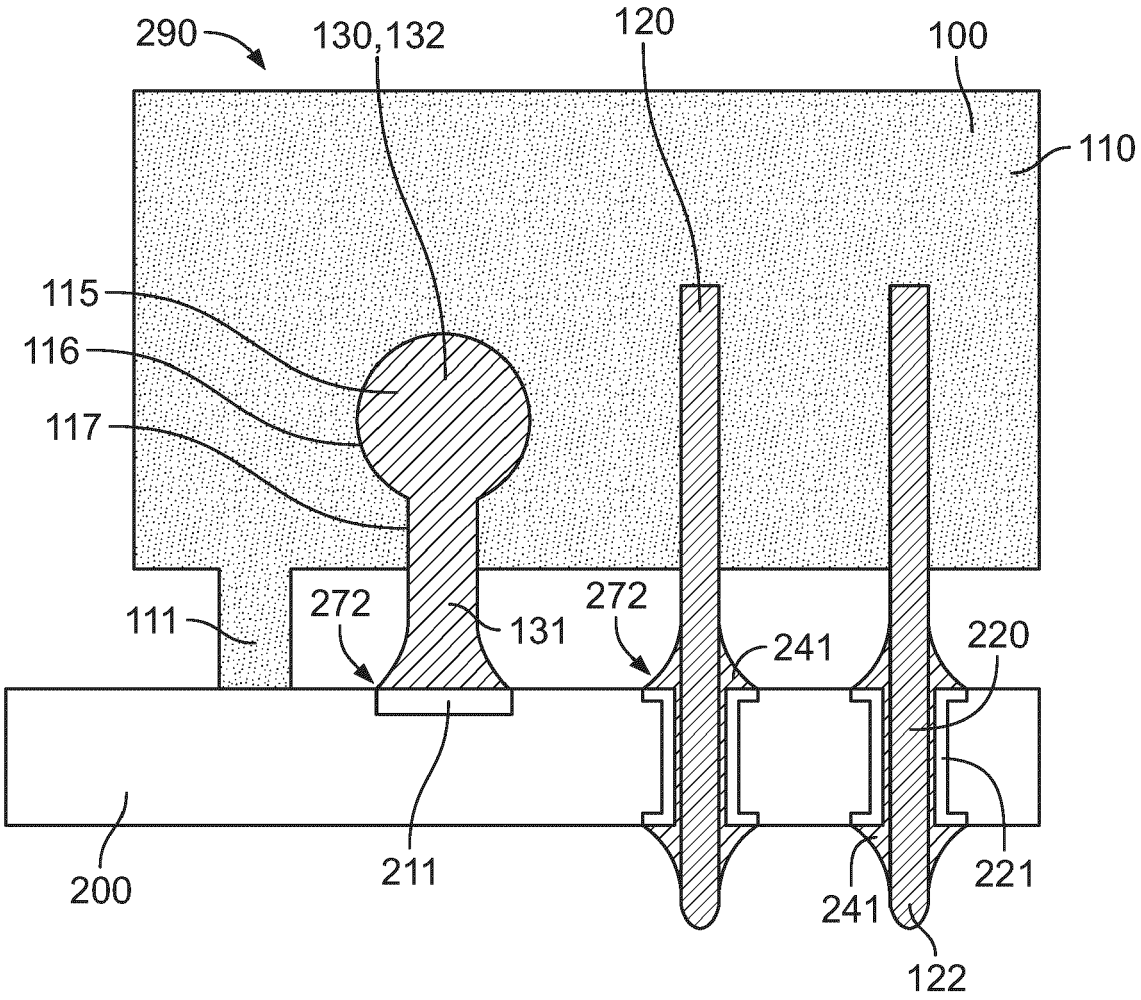
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Fig. 14

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EUROPEAN SEARCH REPORT

Application Number
EP 22 20 2773

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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	28 March 2023	Kandyla, Maria

CATEGORY OF CITED DOCUMENTS

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