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(54) **CONNECTOR FOR PRINTED CIRCUIT BOARD**

STECKVERBINDER FÜR LEITERPLATTE

CONNECTEUR POUR CARTE DE CIRCUIT IMPRIMÉ

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(56) References cited:
EP-A1- 1 447 882
DE-A1-102012 021 324
DE-U1- 8 605 937
DE-U1- 8 625 363
DE-U1- 20 108 731
DE-U1-202010 017 397

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Description

Technical field

[0001] The present invention is related to a connector for a printed circuit board, in particular to a connector for a high current connection.

Background art

[0002] A printed circuit board (PCB) requires connectors to transfer electrical power to and from the PCB to perform its function. Connectors for power connections to a PCB are known. A first kind of known connectors (e. g. DE 10 2008 024 446 A1, DE 102008 050 668 A1) are typically produced from sheet metal and are provided with pins that are fastened to the PCB. This is mostly achieved by a process called press-fitting, which is the pressing of a pin through a matched plated through-holes in the PCB that is smaller than the pin. Subsequently, the pins protruding the PCB may be soldered and/or bent to fasten the connector. This type of fastening ensures a tight connection between the connector and the PCB and thereby enables the attachment of a power connection to the connector by means of a screw connection. Nonetheless, the screw connection can only be tightened to a limited degree, because the connector pins are used for both electrical and mechanical connection to the PCB. Only limited mechanical loads can be applied without affecting the electrical connection. Another disadvantage of these type of connectors is that they require the described additional step of press fitting in the manufacturing process of the PCB that is difficult to automate and results in a higher production cost and time.

[0003] DE 10 2013 022 242 A1 describes a connector that eliminates the need for the additional step of press-fitting during the production process by providing larger surfaces that can be soldered onto the PCB without requiring pins to be press-fitted. However, the disadvantage of the described connector is that the soldering connection to the PCB is exposed to a mechanical load when applying torque to the connector. This is in particular problematic in situations where the screw connection needs to be robust (e.g. because of external vibrations) and therefore requires it to be applied using a high torque.

[0004] EP 1447882 A1 describes a connector that increases the connection reliability composed of a disk from which pins fall that are inserted into holes obtained in the printed circuits, wherein the cage is equipped with a hole for passing a screw stem.

Summary of the invention

[0005] It is an aim of the present invention to provide a PCB connector which is more robust and which does not suffer from the mechanical load used for attaching the connector, e.g. the torque that is applied to screw the connection.

[0006] According to a first aspect of the invention, there is therefore provided a connector as set out in the appended claims.

[0007] The connector comprises a first member and a second member. The first member comprises engagement means with the printed circuit board configured to transfer a torque to the printed circuit board, an abutting surface and a connecting means. The first member further comprises a flange arranged at an end thereof, wherein the flange is interposed between the abutting surface and the engagement means. The second member is made of an electrically conductive material, and comprises at least one connector pin for electrical connection to the printed circuit board and a bracket extending from the connector pin to at least partially overlap the abutting surface.

[0008] Connectors according to aspects described herein advantageously provide means for transmitting any torque exerted on the connector to the PCB and separate means for electrical connection to the PCB (via the connector pins). As a result, the electrical connections are not affected by torque during screwing of a connector plug, and a higher fastening force can be used for attaching the connector plug, such that the connector better withstands environments with high degree of vibration.

Advantageous aspects are set out in the dependent claims

Brief description of the figures

[0009] Aspects of the invention will now be described in more detail with reference to the appended drawings, wherein same reference numerals illustrate same features and wherein:

Figure 1 represents an exploded perspective view of a connector according to aspects described herein;

Figure 2 represents a cross sectional view of the connector of Fig. 1 with a connecting plug attached;

Description of embodiments

[0010] Referring to Figs. 1 - 2, a connector 10 according to aspects described herein is formed of two parts 11, 12. A first part 11 will be referred to as a locking member extending from a top end 118 to a bottom end 119. Locking member 11 comprises a surface 111 referred to as a locking surface, advantageously arranged proximal to the bottom end 119. Locking member 11 further comprises an abutting surface 113, which is advantageously flat and advantageously forms the top end of locking member 11.The abutting surface 113 may be formed as the top surface of a shoulder 112 or flange which projects radially from the locking surface 111.

[0011] Locking member 11 is arranged to co-operate with PCB 30. A hole 31 with dimensions mating those of

locking surface 111 is provided in PCB 30. The (cross section) shape of locking surface 111 - and hence the shape of hole 31 - is configured to prevent rotation of locking member 11 about an axis perpendicular to the plane of PCB 30. Useful examples of locking surface 111 are surfaces having a polygonal (e.g. hexagonal) or star-shaped cross section.

[0012] Shoulder 112 advantageously prevents locking member 11 to fall through PCB 30 when the member is assembled. Therefore, shoulder 112 has a size advantageously larger than the size of hole 31 of PCB 30.

[0013] Locking member 11 further comprises a connecting means 114, in particular a connecting socket member for attachment of a connecting plug member 20 to it. Connecting means is advantageously of the type comprising screw thread, and may comprise a female (internal) or male (external) threaded connecting member. In the figures, locking member 11 is depicted with a hole comprising internal screw thread for accepting a connecting plug member 20 provided with matching external thread. Alternatively, the connecting means of the locking member may be formed as a threaded stud accepting a connecting plug member provided with internal thread.

[0014] A second part 12 of the connector 10 will be referred to as a retaining member. Retaining member 12 comprises one or more connector pins 122 for insertion in corresponding holes 32 of the PCB 30. Connector pins 122 are configured to be soldered or otherwise electrically fixed to PCB 30. In the figures, connector pins 122 are provided at opposite ends of retaining member 12, but this is not a requirement. Connector pins 122 may be provided at one end only. A bracket 121 extends from the connector pin(s) 122 to overlap the abutting surface 113 at least partially. A through hole 123 is advantageously provided through the bracket at a location corresponding to connecting socket member 114. Through hole (123) has a diameter which is advantageously substantially smaller than an external diameter or dimension of abutting surface (113), so that locking member 11 is retained by retaining member 12. In the figures, the bracket has a C-shape forming a portal structure over the locking member 11. Connector pins 122 are provided at both ends of the C-shape.

[0015] Referring to Fig. 2, when the connecting plug member 20 is screwed to the connecting socket member 114, the locking member 11 is lifted from hole 31 until the abutting surface 113 abuts against the bracket 121. By so doing, an intimate contact can be ensured between member 20 and the retaining member 12. Retaining member is advantageously made of an electrically conductive material, providing for an electrical path from member 20 to connector pin 122. Preferably, the locking member 11 is arranged such that the locking surface 111 traverses hole 31 when the abutting surface 113 abuts against the bracket 121. The mating between hole 31 and locking surface 111 can be a tight fit or a loose fit, as long as it allows for appropriate torque transmission and allows for lifting the locking member 11 towards the bracket 121.

[0016] It will be convenient to note that other kinds of engagement means can be provided for torque transmission instead of the locking surface 111, e.g. one or more pins.

[0017] With the connectors according to aspects described herein, connector plug member 20 can be fastened on connector 10 with sufficient torque, which may even exceed 8 Nm for an M6 screw connection. The torque is completely borne by the locking surface 111 and transferred to the PCB via hole 31 with no torque loading of the electrical connection at the connector pins 122.

[0018] Connectors according to aspects described herein additionally have the advantage that the connector pins can be attached to the PCB 30 using both the SMD soldering technique and the wave soldering technique. Therefore, the soldering technique can be adapted on the basis of the other components present on the PCB.

[0019] Connectors according to aspects described herein can be used for electrical connections up to 50 A or even higher.

Claims

1. Connector (10) for a printed circuit board (30), comprising:

   a first member (11) comprising engagement means (111) with the printed circuit board configured to transfer a torque to the printed circuit board, an abutting surface (113) and a connecting means (114), and
   a second member (12) made of an electrically conductive material, comprising at least one connector pin (122) for electrical connection to the printed circuit board and a bracket (121) extending from the connector pin to at least partially overlap the abutting surface,
   characterised in that the first member (11) comprises a flange (112) arranged at an end thereof, wherein the flange is interposed between the abutting surface and the engagement means (111).

2. Connector of claim 1, wherein the connecting means (114) comprises a threaded connecting element.

3. Connector of claim 2, wherein the connecting means (114) is a female thread arranged in a hole of the first member (11).

4. Connector of claim 2, wherein the connecting means (114) is a threaded stud projecting from the abutting surface in a direction opposite the engagement means.

5. Connector of any one of the preceding claims, wherein the abutting surface (113) is located at an end of the first member (11), remote from the engagement means.

6. Connector of any one of the preceding claims, wherein the engagement means comprises a locking surface (111) enabling to transmit a torque.

7. Connector of claim 6, wherein the locking surface (111) comprises a polygonal or star-shaped cross section.

8. Connector of claim 7, wherein the locking surface (111) comprises a hexagonal cross-section.

9. Connector of any one of the preceding claims, wherein the second member (12) comprises a first through hole (123) in correspondence of the connecting means (114).

10. Connector of any one of the preceding claims, wherein the abutting surface (113) is flat and the bracket (121) comprises a flat bottom surface in correspondence of the abutting surface.

11. Connector of any one of the preceding claims, wherein the second member (12) is C-shaped and comprises at least one connector pin (122) at each end of the C-shape.

12. Kit, comprising the connector (10) of any one of the preceding claims and a printed circuit board (30) comprising a torque transmitting means (31) cooperating with the engagement means (111).

13. Kit of claim 12, wherein the torque transmitting means (31) is a second through hole configured to engage with the engagement means (111) for torque transmission.

14. Kit of claim 13, wherein the flange (112) is larger than the second through hole (31).

15. Kit of claim 13 or 14, comprising a connecting plug member (20).

Patentansprüche

1. Verbinder (10) für eine gedruckte Leiterplatte (30), aufweisend:

ein erstes Element (11), aufweisend ein Mittel (111) zum Eingriff in die gedruckte Leiterplatte, das zum Übertragen eines Drehmoments auf die gedruckte Leiterplatte ausgelegt ist, eine Stoßfläche (113) und ein Verbindungsmittel (114), und

ein zweites Element (12), das aus einem elektrisch leitenden Material hergestellt ist und mindestens einen Anschlussstift (122) zur elektrischen Verbindung mit der gedruckten Leiterplatte und eine Halterung (121) die sich so vom Anschlussstift erstreckt, dass sie die Stoßfläche wenigstens teilweise überlappt, aufweist,

dadurch gekennzeichnet, dass das erste Element (11) einen Flansch (112) aufweist, der an einem Ende davon angeordnet ist, wobei der Flansch zwischen die Stoßfläche und die Eingriffsmittel (111) eingefügt ist.

2. Verbinder nach Anspruch 1, wobei das Verbindungsmittel (114) ein mit einem Gewinde versehenes Verbindungselement aufweist.

3. Verbinder nach Anspruch 2, wobei das Verbindungsmittel (114) ein Innengewinde ist, das in einem Loch des ersten Elements (11) angeordnet ist.

4. Verbinder nach Anspruch 2, wobei das Verbindungsmittel (114) ein Gewindebolzen ist, der von der Stoßfläche in einer Richtung entgegengesetzt zum Eingriffsmittel vorsteht.

5. Verbinder nach irgendeinem der vorhergehenden Ansprüche, wobei die Stoßfläche (113) sich an einem vom Eingriffsmittel entfernten Ende des ersten Elements (11) befindet.

6. Verbinder nach irgendeinem der vorhergehenden Ansprüche, wobei das Eingriffsmittel eine Verriegelungsfläche (111) aufweist, die Übertragung eines Drehmoments ermöglicht.

7. Verbinder nach Anspruch 6, wobei die Verriegelungsfläche (111) einen vieleckigen oder sternförmigen Querschnitt aufweist.

8. Verbinder nach Anspruch 7, wobei die Verriegelungsfläche (111) einen sechseckigen Querschnitt aufweist.

9. Verbinder nach irgendeinem der vorhergehenden Ansprüche, wobei das zweite Element (12) ein erstes Durchgangsloch (123) in Übereinstimmung mit dem Verbindungsmittel (114) aufweist.

10. Verbinder nach irgendeinem der vorhergehenden Ansprüche, wobei die Stoßfläche (113) flach ist, und die Halterung (121) eine flache Unterseite in Übereinstimmung mit der Stoßfläche aufweist.

11. Verbinder nach irgendeinem der vorhergehenden Ansprüche, wobei das zweite Element (12) C-förmig ist und mindestens einen Anschlussstift (122) an je-

dem Ende der C-Form aufweist.

12. Kit, aufweisend den Verbinder (10) nach irgendeinem der vorhergehenden Ansprüche und eine gedruckte Leiterplatte (30), die ein Drehmomentübertragungsmittel (31) aufweist, das mit dem Eingriffsmittel (111) zusammenwirkt.

13. Kit nach Anspruch 12, wobei das Drehmomentübertragungsmittel (31) ein zweites Durchgangsloch ist, das so ausgelegt ist, dass es zur Drehmomentübertragung in das Eingriffsmittel (111) eingreift.

14. Kit nach Anspruch 13, wobei der Flansch (112) größer als das zweite Durchgangsloch (31) ist.

15. Kit nach Anspruch 13 oder 14, aufweisend ein Verbindungssteckerelement (20).

Revendications

1. Connecteur (10) pour une carte de circuit imprimé (30) comprenant :

un premier élément (11) comprenant un moyen (111) de mise en prise avec la carte de circuit imprimé, configuré pour transférer un couple à la carte de circuit imprimé, une surface de butée (113) et un moyen de raccordement (114), et
un second élément (12) réalisé avec un matériau électriquement conducteur, comprenant au moins une broche de connecteur (122) pour le raccordement électrique à la carte de circuit imprimé et un support (121) s'étendant à partir de la broche de connecteur pour chevaucher au moins partiellement sur la surface de butée,
caractérisé en ce que le premier élément (11) comprend une bride (112) agencée au niveau de son extrémité, dans lequel la bride est intercalée entre la surface de butée et le moyen de mise en prise (111).

2. Connecteur selon la revendication 1, dans lequel le moyen de raccordement (114) comprend un élément de raccordement fileté.

3. Connecteur selon la revendication 2, dans lequel le moyen de raccordement (114) est un filetage femelle agencé dans un trou du premier élément (11).

4. Connecteur selon la revendication 2, dans lequel le moyen de raccordement (114) est un goujon fileté faisant saillie de la surface de butée dans une direction opposée au moyen de mise en prise.

5. Connecteur selon l'une quelconque des revendications précédentes, dans lequel la surface de butée (113) est positionnée au niveau d'une extrémité du premier élément (11), à distance du moyen de mise en prise.

6. Connecteur selon l'une quelconque des revendications précédentes, dans lequel le moyen de mise en prise comprend une surface de verrouillage (111) permettant de transmettre un couple.

7. Connecteur selon la revendication 6, dans lequel la surface de verrouillage (111) comprend une section transversale polygonale ou en forme d'étoile.

8. Connecteur selon la revendication 7, dans lequel la surface de verrouillage (111) comprend une section transversale hexagonale.

9. Connecteur selon l'une quelconque des revendications précédentes, dans lequel le second élément (12) comprend un premier trou débouchant (123) en correspondance du moyen de raccordement (114).

10. Connecteur selon l'une quelconque des revendications précédentes, dans lequel la surface de butée (113) est plate et le support (121) comprend une surface inférieure plate en correspondance de la surface de butée.

11. Connecteur selon l'une quelconque des revendications précédentes, dans lequel le second élément (12) est en forme de C et comprend au moins une broche de connecteur (122) au niveau de chaque extrémité de la forme de C.

12. Kit comprenant le connecteur (10) selon l'une quelconque des revendications précédentes et une carte de circuit imprimé (30) comprenant un moyen de transmission de couple (31) coopérant avec le moyen (111) de mise en prise.

13. Kit selon la revendication 12, dans lequel le moyen de transmission de couple (31) est un second trou débouchant configuré pour se mettre en prise avec le moyen (111) de mise en prise pour la transmission de couple.

14. Kit selon la revendication 13, dans lequel la bride (112) est plus grande que le second trou débouchant (31).

15. Kit selon la revendication 13 ou 14, comprenant un élément de bouchon de liaison (20).

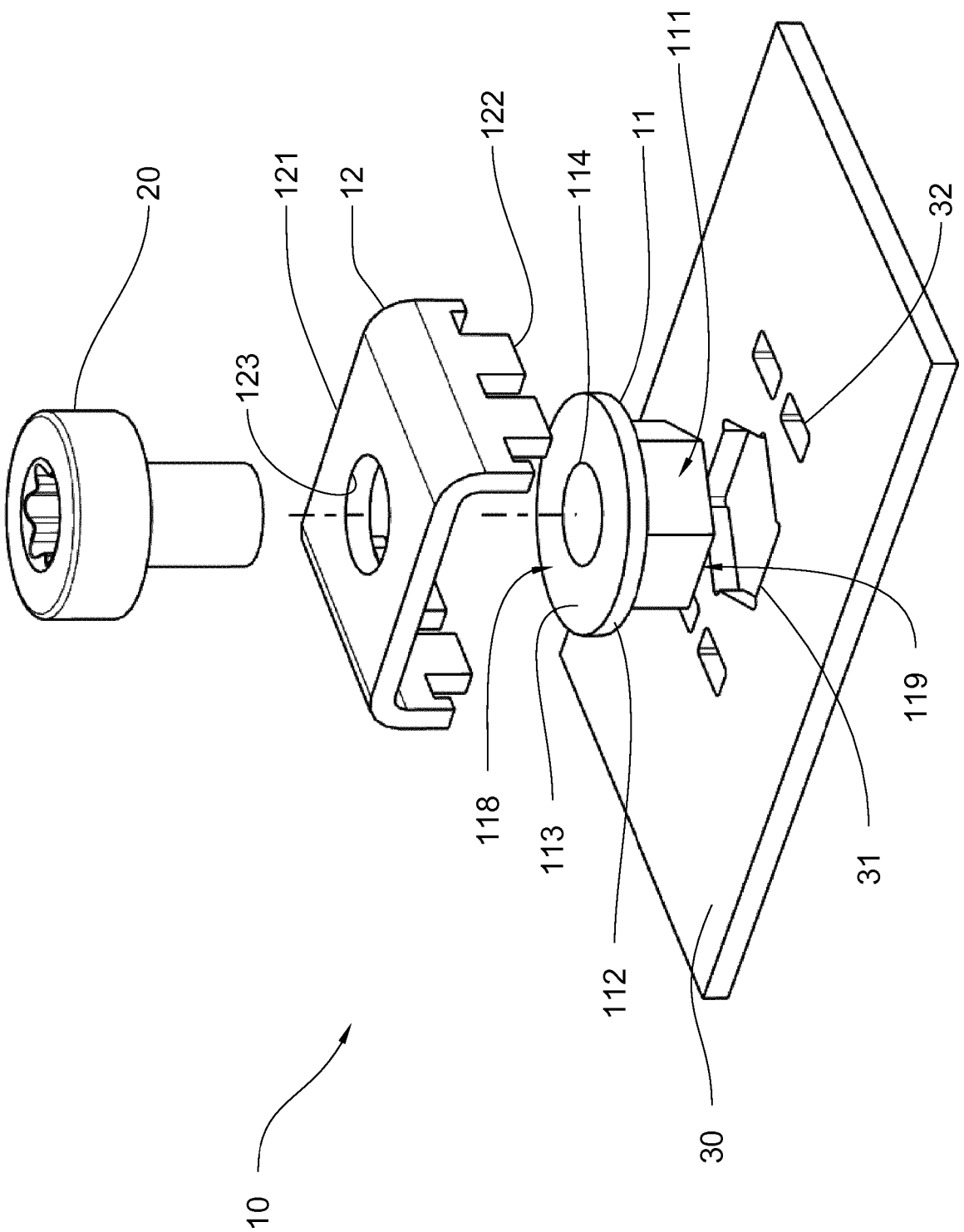

FIG 1

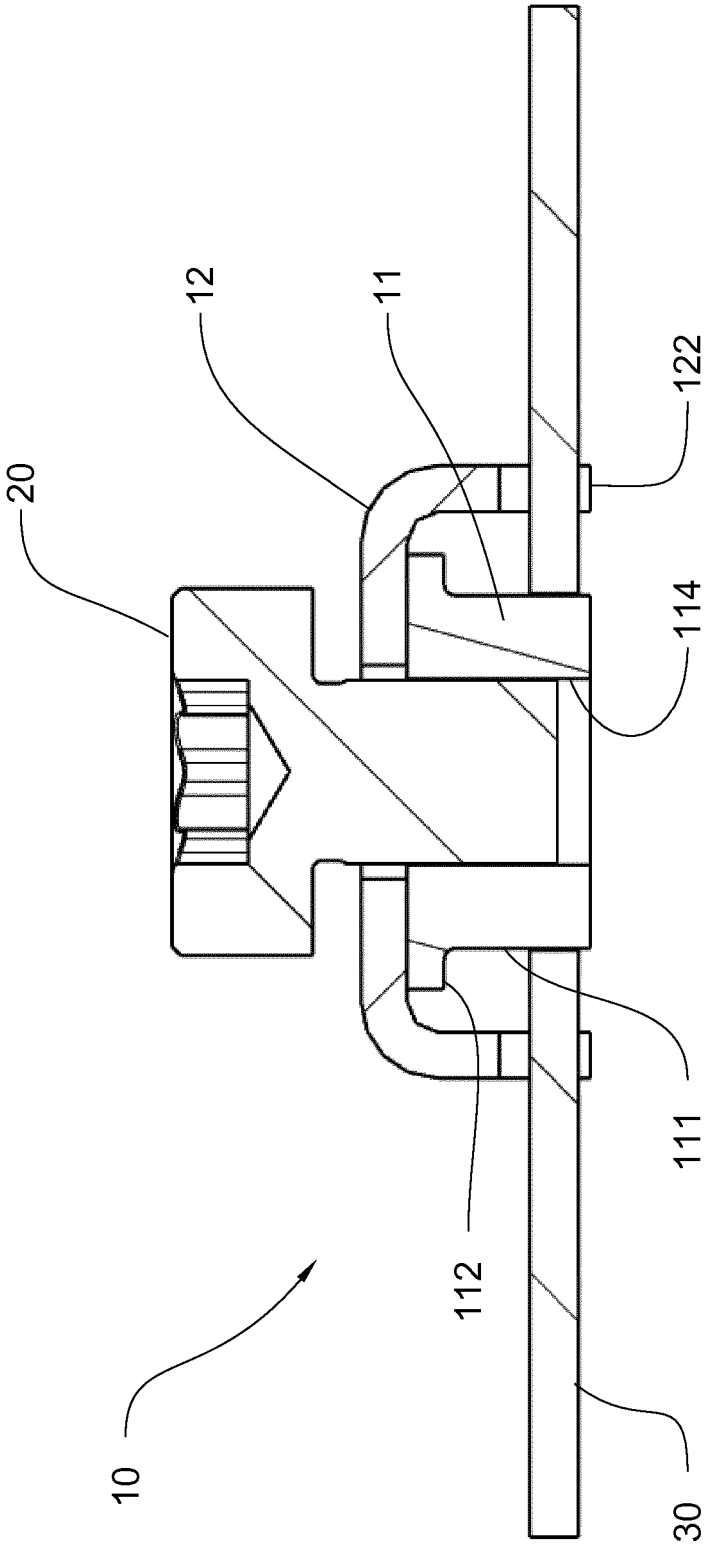

FIG 2

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- DE 102008024446 A1 **[0002]**
- DE 102008050668 A1 **[0002]**
- DE 102013022242 A1 **[0003]**
- EP 1447882 A1 **[0004]**