

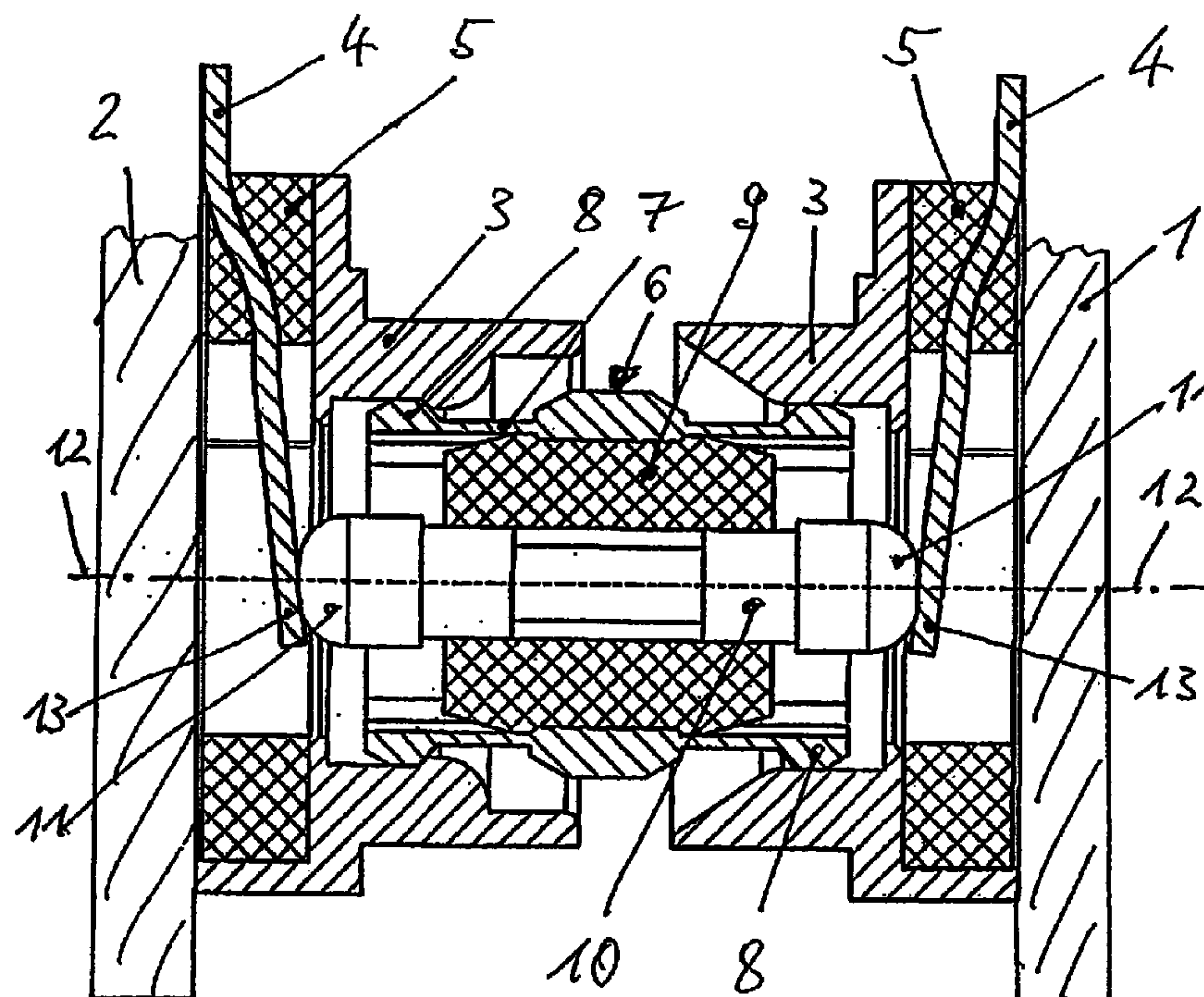


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(54) Titre : CONNECTEUR COAXIAL AVEC FICHE ET EMBASE, DOTE DE MOYENS DE COMPENSATION A
TOLERANCES SOUPLES

(54) Title: COAXIAL PLUG-AND-SOCKET CONNECTOR HAVING RESILIENT TOLERANCE-COMPENSATING MEANS



(57) Abrégé/Abstract:

Disclosed is a coaxial plug-in connection, particularly for printed circuit boards (board-to-board connection), comprising an outer and an inner conductor (3, 4) that are assigned to each board (1 or 2) and can be electrically connected to the outer or inner conductor (3, 4) of the other respective board (2, 1) via an adapter which is provided in the form of a sleeve-shaped plug-in coupling (6) and encompasses a corresponding outer conductor piece (7) and inner conductor piece (10). The arrangement is designed in such a way that the inner conductor of the printed board (1, 2) is embodied as a spring metal sheet (4), one end of which is fixed to the board (1, 2) or an insulating element (5) while the other, free end (13) thereof can be made to engage with the inner conductor piece of the plug-in coupling (6), which is configured as a contact pin (10).

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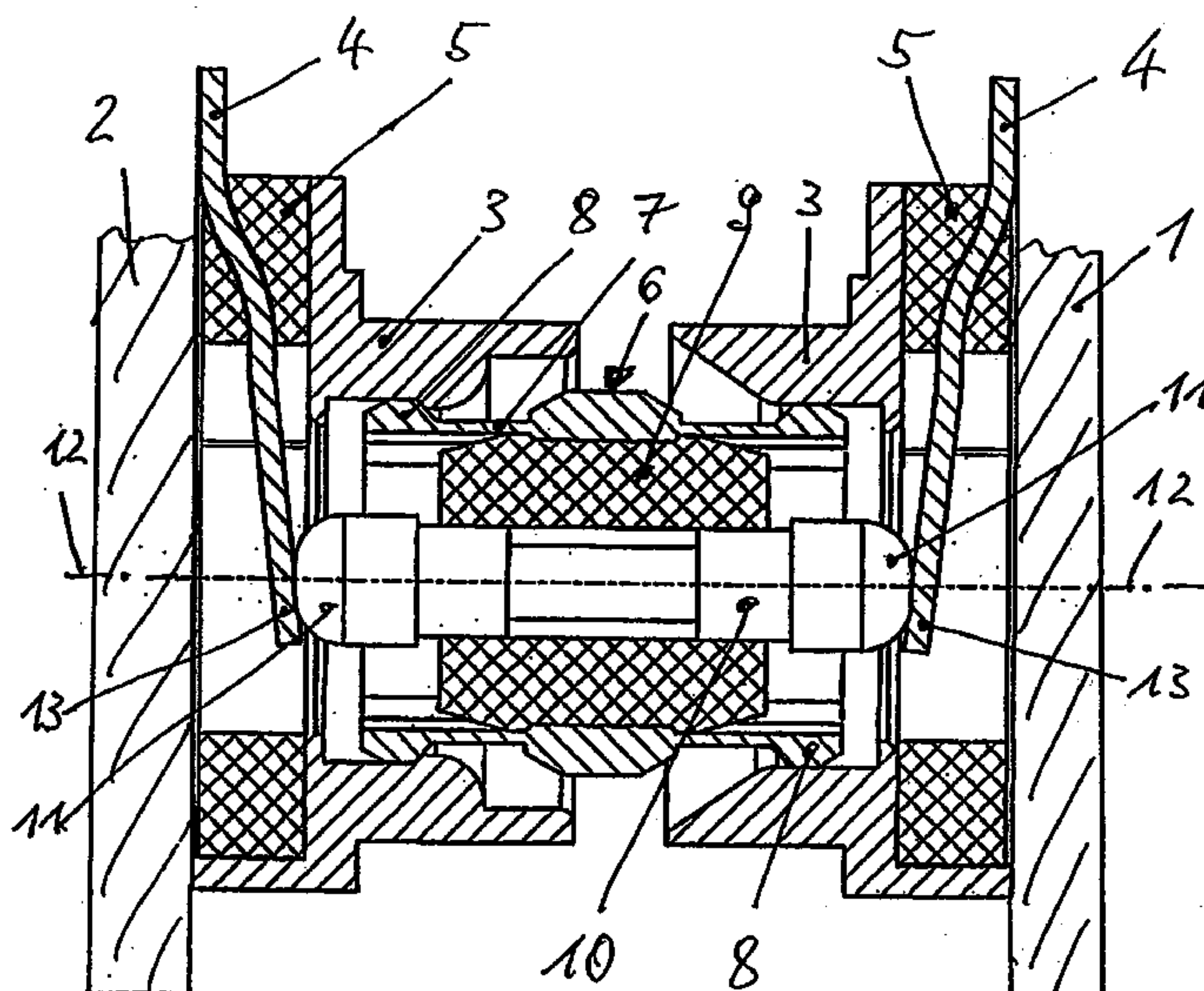
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[Fortsetzung auf der nächsten Seite]

(54) Title: COAXIAL PLUG-IN CONNECTION FOR PRINTED BOARDS, FEATURING SPRING-LOADED TOLERANCE COMPENSATION

(54) Bezeichnung: KOAXIALSTECKVERBINDUNG FÜR LEITERPLATTEN MIT GEFEDERTEM TOLERANZAUSGLEICH



(57) Abstract: Disclosed is a coaxial plug-in connection, particularly for printed circuit boards (board-to-board connection), comprising an outer and an inner conductor (3, 4) that are assigned to each board (1 or 2) and can be electrically connected to the outer or inner conductor (3, 4) of the other respective board (2, 1) via an adapter which is provided in the form of a sleeve-shaped plug-in coupling (6) and encompasses a corresponding outer conductor piece (7) and inner conductor piece (10). The arrangement is designed in such a way that the inner conductor of the printed board (1, 2) is embodied as a spring metal sheet (4), one end of which is fixed to the board (1, 2) or an insulating element (5) while the other, free end (13) thereof can be made to engage with the inner conductor piece of the plug-in coupling (6), which is configured as a contact pin (10).

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— mit internationalem Recherchenbericht

Zur Erklärung der Zweibuchstaben-Codes und der anderen Abkürzungen wird auf die Erklärungen ("Guidance Notes on Codes and Abbreviations") am Anfang jeder regulären Ausgabe der PCT-Gazette verwiesen.

(57) Zusammenfassung: Bei einer Koaxialsteckverbindung, insbesondere für Leiterplatten (Board-to-Board-Verbindung), mit einem jeder Leiterplatte (1 bzw. 2) zugeordneten Aussen- und Innenleiter (3, 4), die über einen Adapter in Form einer hülsenförmigen Steckkupplung (6), welcher ein entsprechendes Aussenleiterteil (7) sowie Innenleiterteil (10) aufweist, mit dem Aussen- bzw. Innenleiter (3, 4) der betreffenden anderen Leiterplatte (2, 1) elektrisch verbindbar sind, ist die Anordnung derart getroffen, dass der Innenleiter der Leiterplatte (1, 2) als Federblech (4) ausgestaltet ist, das mit seinem einen Ende an der Leiterplatte (1,2) bzw. an einer Isolierung (5) festgelegt und an seinem anderen freien Ende (13) mit dem als Kontaktstift (10) ausgebildeten Innenleiterteil der Steckkupplung (6) in Eingriff bringbar ist.

Coaxial plug-and-socket connector having resilient
tolerance-compensating means

The invention relates to a coaxial plug-and-socket
5 connection, particularly for printed circuit boards .

In known coaxial plug-and-socket connectors of this
kind (DE 202 08 425.6), at least one socket forming an
outer conductor and having an associated centre conductor
10 is usually fixed to each printed circuit board. The centre
conductor has, in this case, a contact pin, normally
cylindrical, which can be plugged, in such a way as to be
held in place resiliently, into a correspondingly shaped
recess in the end-face of the centre-conductor member of an
15 adapter in the form of a sleeve-like plug-in coupler. The
design is such that a defined air-gap is left between the
outer-conductor socket and the end-face of the plug-in
coupler.

Although coaxial plug-and-socket connectors of this
20 kind normally meet the requirements they are called upon to
meet sufficiently well, it has nevertheless been found that
certain serious disadvantages do occur, doing so
particularly at the high transmission frequencies which can
be expected today, which may be as much as 60 GHz or more.

25 These disadvantages arise because even slight relative
movements between the printed circuit boards which are
connected together, both in the axial direction of the
contact pins and also transversely thereto, cause an
unwanted change in the contact zone between the contact pin
30 of the centre conductor and the centre-conductor member of
the female coupler. This in turn results in an unwanted
change in the field resistance preset by the defined air-

gap, which has a definite adverse effect on the quality of the electrical transmission.

These relative movements between the printed circuit boards, slight though they are, cannot be avoided and because of them there is no assurance, even with the known plug-and-socket connectors, that what is called repeatability of mating will remain the same, which is likewise considered a disadvantage.

Added to this, there is also the fact that the manufacture of coaxial plug-and-socket connectors of this kind involves a relatively high outlay in terms of time and money because there are always certain tolerances that have to be met in the connector, which has a commensurate effect on the cost of manufacture.

The object underlying the invention is therefore, in order to overcome the disadvantages described, to design the coaxial plug-and-socket connector of the generic kind in such a way that there is a crucial improvement in its repeatability of mating, particularly when the transmission frequencies are up to 60 GHz or more, and at the same time, while manufacture is considerably simplified and unwanted abrupt changes in the diameter of the contact pin are avoided, it is ensured that there is a contact zone which is good and remains equally good.

This object is achieved by the invention by virtue of the features of claim 1. Advantageous embodiments thereof are specified in the other claims.

In the case of the coaxial plug-and-socket connector according to the invention, the design is such that the centre conductor of the printed circuit board is in the form of a resilient member of planar form which is held in place at the printed circuit board or at an insulator at one of its ends and at its other, free end can be brought

into engagement with the centre-conductor member of the plug-in coupler, which centre-conductor member is in the form of a contact pin.

In an advantageous embodiment of the invention, the resilient member of planar form is of a tongue-like or strip-like form, which ensures that manufacture will be easy.

It is ensured that the contact between the centre conductor of the printed circuit board and the centre-conductor member, in the form of a contact pin, of the plug-in coupler is always good when, as is provided for in accordance with the invention, the resilient member of planar form is held in place under preloading.

The free end of the resilient member of planar form usefully projects onto the axis of the contact pin of the plug-in coupler at an angle. Because of this, no special steps need to be taken to ensure that there is always contact between the resilient member of planar form of the printed circuit board and the contact pin of the plug-in coupler.

If, as described, the resilient member of planar form is of a tongue-like or strip-like form, the free end of the resilient member of planar form usually makes contact with the given end of the contact pin by point contact. It is within the scope of the invention in this case for there to be provided at the free end of the resilient member of planar form a perforation which is largely in line with the axis of the contact pin. This then produces linear, and usually circular, contact between the resilient member of planar form and the contact pin.

A further definite reduction in the cost of manufacturing the coaxial plug-and-socket connector according to the invention is made when, in a further

embodiment of the invention, the contact pin of the plug-in coupler has rounded or spherical and in particular hemispherical ends. A contact pin of this kind can be produced with an outlay on manufacture which is as low as possible and at the same time ensures that the contact between its ends and the free ends of the respective resilient members of planar form is always made with very high efficiency.

The contact pin is usefully of a length such that, when the plug-in coupler is inserted and held in the outer conductor in socket form of the printed circuit board, the said contact pin will engage resiliently, at whichever of its free ends is considered, with the free end of the resilient member of planar form.

A definite further improvement is made in the flexibility with which contact is made between the resilient member of planar form and the contact pin when, as is provided for in accordance with the invention, the contact pin is arranged to be axially displaceable in the plug-in coupler or rather within the insulator of the latter. This makes it possible, automatically as it were, for the contact between the contact pin and the resilient member of planar form to be centred at all times because, as dictated by the axial load coming from one or other side, the contact pin is capable of shifting to suit within its plug-in coupler. Contact between the resilient member of planar form and the end of the contact pin is ensured in this way at all times and with complete effectiveness.

The design according to the invention of the coaxial plug-and-socket connector can be implemented with considerably reduced manufacturing costs. At the same time, it affords the definite advantage that, if the possible relative movements that were mentioned occur between the

printed circuit boards in the direction of the longitudinal axis of the contact pin and/or transversely thereto, a contact zone which is good and remains equally good is always ensured. This is due to the fact that, because of the form mentioned that the contact between the resilient member of planar form and the contact pin takes in accordance with the invention, the desired contact zone is always maintained even in the event of the contact pin tilting and/or being displaced longitudinally.

10 Finally, not only is the repeatability of mating of the coaxial plug-and-socket connector as a whole improved by this means but it is also ensured that the quality of the mating will always remain the same.

The invention is explained in detail below by reference to the drawings. In the drawings:

Fig. 1 shows a preferred embodiment of the coaxial plug-and-socket connector according to the invention in cross-section and,

Fig. 2 shows a detail of a modified embodiment.

20 The coaxial plug-and-socket connector which can be seen in Fig. 1 of the drawings, which is also known as a board-to-board connector, is used to connect two printed circuit boards 1,2.

In this case an outer conductor 3, in the form of an outer-conductor socket, and a centre conductor 4 are held in place on each of the printed circuit boards 1 and 2. The centre conductor 4 is insulated from the outer-conductor socket 3 by means of an insulating part 5.

30 The printed circuit boards 1, 2 can be connected electrically by means of an adapter 6, this adapter 6 taking the form of a sleeve-like plug-in coupler. On its outside, the plug-in coupler 6 has a sleeve-like outer-conductor member 7 which, at its leading ends, can be

brought into engagement and held in engagement, in the manner shown, with the respective outer-conductor sockets 3 of the printed circuit boards 1 and 2 by means of an surrounding annular bead 8.

5 The plug-in coupler 6 also has, with an insulator 9 interposed in relation to its sleeve-like outer-conductor member 7, a centre-conductor member 10 which extends axially within the plug-in coupler 6 at the centre thereof and which forms a contact pin. The special design of this
10 contact pin 10 is such that it is hemispherical in form at both its ends 11 and projects out of the plug-in coupler 6 at each of the hemispherical ends in the manner shown.

 In the embodiment shown, the contact pin 10 is arranged to be axially displaceable within the insulator 9.

15 The centre conductor 4 of each of the printed circuit boards 1 and 2 takes the form of a strip-like resilient member of planar form which at one of its ends is held in place under preloading at the printed circuit board 1 or 2 or at the insulator 5 and which at its free end 13 projects
20 onto or beyond the longitudinal centre axis 12 of the coaxial plug-and-socket connector at an angle. When the plug-in coupler 6 is inserted and held in the outer-conductor sockets 3 of the printed circuit boards 1 and 2, this results in the contact pin 10 being in resilient
25 engagement, at its hemispherical ends 11, with the free ends 13 of the respective resilient members of planar form 4 of the printed circuit boards 1 and 2.

 Because of the constant elastically resilient connection which is obtained in this way between the free
30 end 13 of the resilient member of planar form 4 and the spherical end 11 of the contact pin 10, it is thus ensured that effective contact, and hence an electrical connection, is always obtained regardless of the relative movements

which always occur between the printed circuit boards 1, 2 in both the longitudinal direction and also the transverse direction. The effect is further increased by the fact of the contact pin 10 being, as mentioned, arranged to be axially displaceable within the plug-in coupler 6.

In the modified embodiment shown in Fig. 2, the free end 13 of the resilient member of planar form 4 has a perforation 14 which largely lines up with the axis 12 of the contact pin 10. In contrast to the embodiment shown in Fig. 1, where the contact obtained between the free end 13 of the resilient member of planar form 4 and the rounded end 11 of the contact pin 10 is largely point contact, this produces a contact between the edges of the perforation 14 in the resilient member of planar form 4 and the rounded end 11 of the contact pin 10 which is more or less in the form of a circular line. What is always ensured at the same time however is the flexibility of the contact and the centering thereof, which derives on the one hand from the basic arrangement of the resilient member of planar form 4 and on the other hand from the axial displaceability of the contact pin 10.

For features of the invention which are not explained in detail above it is explicitly pointed out that reference should be made to the drawings and the claims.

CLAIMS

1. Coaxial plug-and-socket connector for printed circuit boards, having an outer conductor and centre conductor (3, 4) associated with each printed circuit board (1 and 2) which can be connected electrically to the outer conductor and centre conductor (3, 4) respectively of the other printed circuit board (2 and 1) concerned by means of an adapter in the form of a sleeve-like plug-in coupler (6) which has a corresponding outer-conductor member (7) and centre-conductor member (10), characterised in that

the centre conductor of the printed circuit board (1, 2) is in the form of a resilient member of planar form (4) which is held in place at the printed circuit board (1, 2) or at an insulator (5) at one of its ends and at its other, free end (13) can be brought into engagement with the centre-conductor member (10) of the plug-in coupler (6), which centre-conductor member is in the form of a contact pin having an axis (12).

2. Coaxial plug-and-socket connector according to claim 1, characterised in that the resilient member of planar form (4) is of a tongue-like or strip-like form.
3. Coaxial plug-and-socket connector according to claim 1 or claim 2, characterised in that the resilient member of planar form (4) is held in place under preloading.
4. Coaxial plug-and-socket connector according to any one of claims 1 to 3, characterised in that the free end (13) of the resilient member of planar form (4) projects onto the axis (12) of the centre-conductor member (10) of the plug-in coupler (6) at an angle.
5. Coaxial plug-and-socket connector according to any one of claims 1 to 4, characterised in that the free end (13) of the resilient member of planar form (4) has a perforation (14) which is largely in line with the axis (12) of the centre-conductor member (10).
6. Coaxial plug-and-socket connector according to any one of claims 1 to 5, characterised in that the centre-conductor member (10) has ends (11) which are one of rounded, spherical and hemispherical.

7. Coaxial plug-and-socket connector according to any one of claims 1 to 6, characterised in that the centre-conductor member (10) is of a length such that, when the plug-in coupler (6) is inserted and held in the outer conductor (3) in socket form of the printed circuit board (1, 2), the said centre-conductor member (10) engages resiliently, at whichever of its ends (11) is considered, with the free end (13) of the resilient member of planar form (4).
8. Coaxial plug-and-socket connector according to any one of claims 1 to 7, characterised in that the centre-conductor member (10) is arranged to be axially displaceable in the plug-in coupler (6).

Fig. 1

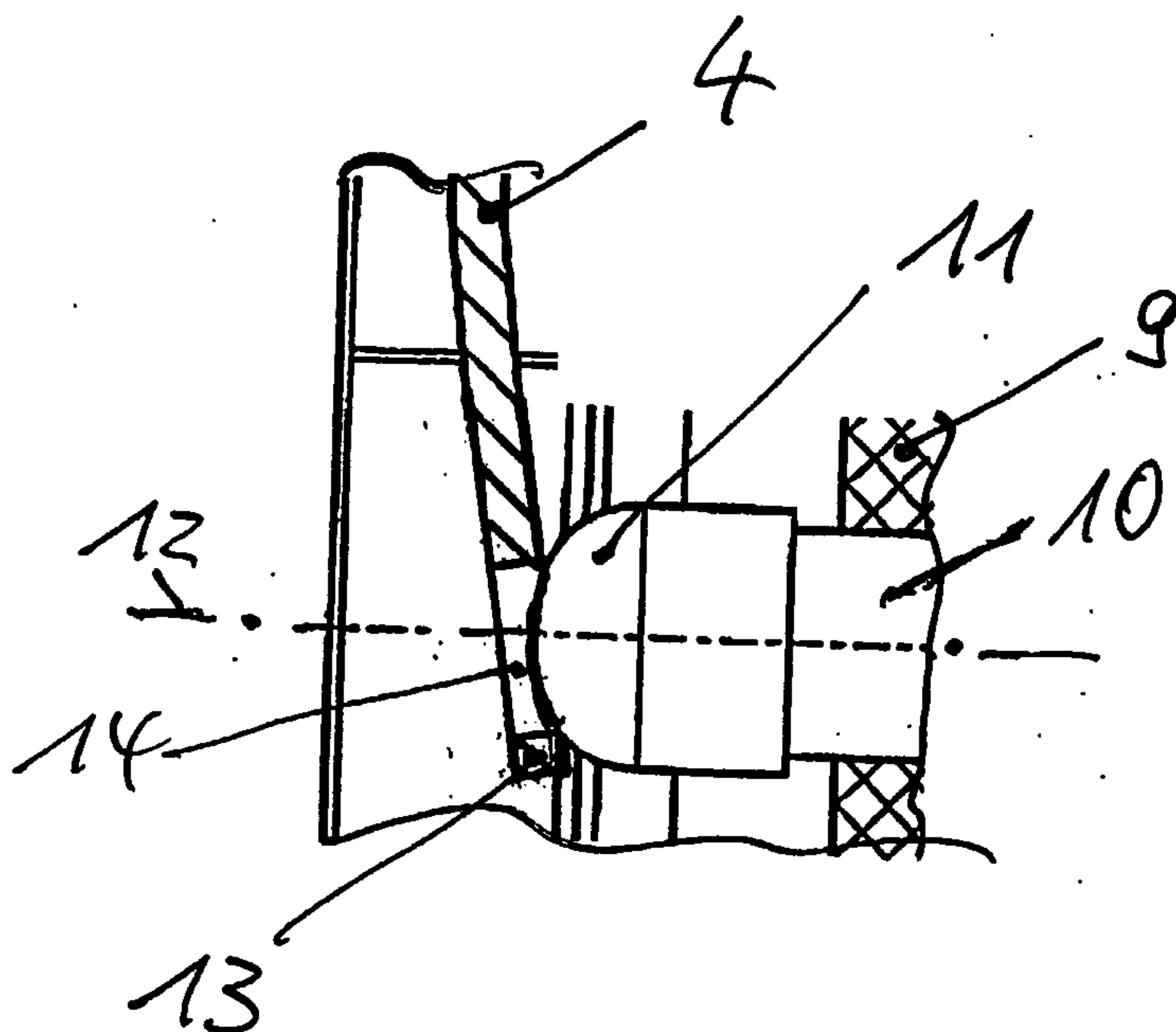
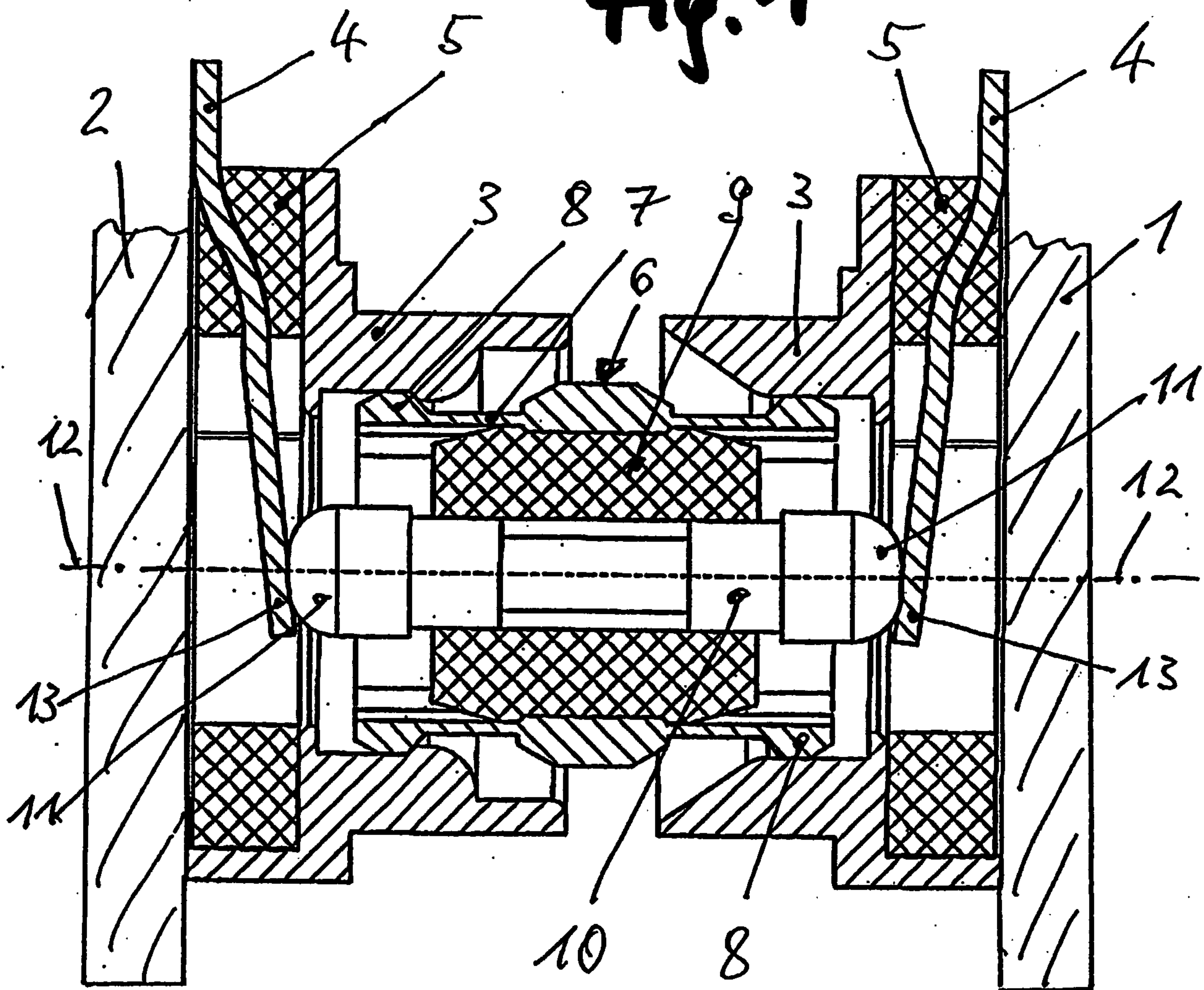


Fig. 2

