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(54) **SHIELDED AND SEALED CONNECTOR**

ABGESCHIRMTER UND ABGEDICHTETER VERBINDER

CONNECTEUR BLINDÉ ET ÉTANCHE

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• **MENEZ, Frédéric**

78120 HERMERAY (FR)

• **MORIN, Laurent**

78120 RAMBOUILLET (FR)

• **FABRE, Jean**

28000 CHARTRES (FR)

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(74) Representative: **INNOV-GROUP**

209 Avenue Berthelot

69007 Lyon (FR)

(73) Proprietor: **Aptiv Technologies AG**

8200 Schaffhausen (CH)

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(72) Inventors:

• **EVEZARD, Maxime**

78150 LE CHESNAY (FR)

• **TROUSSIER, Julien**

28190 LANDELLES (FR)

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Description

[0001] The present disclosure relates to the field of vehicle connectivity, and in particular but not exclusively, to the field of high-power connectivity.

[0002] When cable connectors are used in high voltage/intensity applications, it is desirable to maintain, through such cable connectors, the shielding continuity that is provided at the cable level.

[0003] Further, it may be required to prevent humidity, salt spray, dust, etc. from entering into such cable connectors.

[0004] However, combining both shielding continuity and watertightness raises difficulties in terms of feasibility, manufacturing, mounting, costs, etc.

[0005] The present disclosure proposes a solution to overcome at least a partially such difficulties.

[0006] An electrical connector according to the preamble of independent claim 1 is disclosed in US 7 922 535 B1. Other relevant connectors are known from US 9 153 898 B2, US 2021/013655 A1, US 2018/351287 A1 or US 9 997 866 B1.

[0007] More particularly, it is proposed an electrical connector according to claim 1.

[0008] Indeed, the watertightness is ensured by using an outer shielding means onto which sealing means can be applied, in addition to its use to provide the shielding continuity between a braid and an inner shielding means.

[0009] The connector according to the present disclosure may possibly include any of the features of claims 2 to 7, considered separately or each combined with one or more others. According to another aspect, the present disclosure relates to a connector assembly according to claim 8.

[0010] The connector assembly according to claim 8 may possibly include any of the features of claims 9 to 13, considered separately or each combined with one or more others.

[0011] Further features and advantages will become apparent in the detailed discussion of various embodiments of the invention, the discussion being accompanied by examples and references to the attached drawings.

Figure 1 is a schematic perspective view of an embodiment example of a connector sealed and shielded connector;

Figure 2 is a schematic perspective and exploded view of the connector shown in Figure 1;

Figure 3 is a schematic longitudinal cross-section of a portion of the connector assembly comprising the connector of Figures 1 and 2, and a shielding braid; Figure 4 is a schematic longitudinal cross-section of a portion of a connector assembly according to another example of embodiment;

Figure 5 is a schematic perspective and exploded view of the connector of the connector assembly shown in Figure 4.

[0012] In this document, the term "counter-connector" generally and broadly designates any element intended to be electrically connected to a connector. It can therefore be another connector, a housing on which connection components are assembled, a wall through which an electrical connection must be made, etc.

[0013] On the figures, the same reference numbers designate identical or similar elements.

[0014] An example of an embodiment of a connector assembly 1 is illustrated in Figures 1 to 3. Other embodiments of connector assemblies can be envisaged, one of which will be disclosed below in connection with Figures 4 and 5.

[0015] The electrical connector assembly 1 of Figures 1 to 3 comprises a connector 2, cables 100 and a shielding braid 200 (not shown in Figures 1 and 2). The connector 2 is configured for being mated to a counter-connector (not shown). This example of connector 2 comprises a mate assist system.

[0016] As shown in Figure 2, this example of connector 2 comprises an inner housing 3, an outer shielding means 4, sealing means 5, an inner shielding means 6, gear cams 7 (for the mate assist system), a CPA device 8 ("CPA" stands for Connector Position Assurance), an outer housing 9, a ring cap 10, a plastic cap 11, a shunt 12 (for an interlock circuit which is not shown) and a slider 13 (for the mate assist system).

[0017] The outer shielding means 4 is formed as a single annular band. The outer shielding means 4 is made of an electrically conductive material. The outer shielding means 4 is made of metal. For example, it is a deep drawn piece, i.e. it is formed by a deep-drawing process. Such a deep drawn piece as the advantage of providing seamless inner and outer surfaces. This ensures more flexibility in terms of sealing material that can be used for manufacturing and mounting the sealing means 5.

[0018] The inner 3 and outer 9 housings are made of dielectric material. For example, they are made of moulded plastics. The inner housing 3 comprises at least one cavity (two cavities in the example shown in the Figures). At least one conductive terminal is accommodated in each cavity. Each cavity is located in a sealed area of the connector 2.

[0019] The inner shielding means 6 is formed as an annular band. The inner shielding means 6 is made of an electrically conductive material. The inner shielding means 6 is made of metal. The inner shielding means 6 has flexible blades 14 that are protruding on the outer surface of the annular band forming the inner shielding means 6. These blades 14 are configured to make an electrical contact with the inner surface of the annular band forming the outer shielding means 4.

[0020] The sealing means 5 is formed as a single annular band made of elastomeric material. The sealing means 5 has at least two ribs 15a, 15b each of which is respectively at one of its longitudinal ends (two or more ribs can be located at each longitudinal end). A front rib

15a is located at a front end of the sealing means 5 (i.e. close the mating interface of the connector). A rear rib 15b is located at a rear end of the sealing means (i.e. to a cable side of the connector 2). Between the two ribs 15, the sealing means has a central strip 16 comprising openings 17. Each opening 17 is configured to allow the passage of a blade 14.

[0021] In the connector 2, the sealing means 5 is mounted between the inner shielding means 6 and the outer shielding means 4. The front rib 15a is in sealing contact at least with the outer housing 9 and the inner surface of the outer shielding means 4. The rear rib 15b is in sealing contact at least with the inner housing 3 and the inner surface of the outer shielding means 4. Therefore, watertightness is provided between the inner housing 3 and the outer housing 9, with the outer shielding means 4 in between. In other words, a sealing barrier is formed by the outer housing 9, the front end of the sealing means 5, the outer shielding means 4, the rear end of the sealing means 5 and the inner housing 3.

[0022] Then a shielding braid 200 can be mounted on the cable side of the connector 2 so as to be in electrical contact with the outer surface of the outer shielding means 4. Advantageously, the shielding braid 200 is maintained on the outer shielding means 4 with a taping 19 and a tie wrap 20. The taping 19 is wound around the outer housing 9 and the shielding braid 200. The taping 19 is placed astride the outer housing 9 and the shielding braid 200. The tie wrap 20 sandwiches the taping 19, the braid 200, the outer shielding means 4, possibly the sealing means 5, the inner shielding means 6 and the inner housing 3.

[0023] A further example of an embodiment of a connector assembly 1 is illustrated in Figures 4 and 5.

[0024] As shown in Figure 5, the connector 2 comprises a cap 21 for the outer shielding means 4, an outer shielding means 4, a cap 22 for an outer seal 23, an inner housing 3, an inner seal 24, an inner shielding means 6 and an outer housing 9 (mate assist elements are not shown).

[0025] As for the previous embodiment example, the outer shielding means 4 is formed as a single annular band. The outer shielding means 4 is made of an electrically conductive material. The outer shielding means 4 is made of metal. For example, it is a deep drawn piece, i.e. it is formed by a deep-drawing process. Such a deep drawn piece as the advantage of providing seamless inner and outer surfaces. This ensures more flexibility in terms of sealing material that can be used for manufacturing and mounting the sealing means 5.

[0026] As for the previous embodiment example, the inner 3 and outer 9 housings are made of dielectric material. For example, they are made of moulded plastics. The inner housing 3 comprises at least one cavity (two cavities in the example shown in the Figures). At least one conductive terminal is accommodated in each cavity. Each cavity is located in a sealed area of the connector 2.

[0027] As for the previous embodiment example, the inner shielding means 6 is formed as an annular band. The inner shielding means 6 is made of an electrically conductive material. The inner shielding means 6 is made of metal. The inner shielding means has flexible blades 14 that are protruding on the outer surface of the annular band forming the inner shielding means 6. These blades 14 are configured to make an electrical contact with the inner surface of the annular band forming the outer shielding means 4.

[0028] But, the sealing means of this embodiment differs from the sealing means of the previous one. For this example, the sealing means comprises two seals: an outer seal 23 and an inner seal 24. For example, these outer seal 23 and inner seal 24 are seals of the O-ring type, made of elastomeric material.

[0029] An electrical contact is provided between the inner shielding means 6 (with elastic blades) and the inner surface of the outer shielding means 4, in a region extending longitudinally between the outer seal 23 and the inner seal 24. The inner seal 24 is in watertight contact with the inner surface of the outer shielding means 4 and the inner housing 3. The cap 21 maintains both the inner shielding means 6 and the inner seal 24 in position mounted on the inner housing 3. The outer seal 23 is in watertight contact with the outer surface of the outer shielding means 4 and the outer housing 3. The cap 22 maintains the outer seal 23 in position mounted on the outer housing 9. In other words, a sealing barrier is formed by the outer housing 9, the outer seal 23, the outer shielding means 4, the inner seal 24 and the inner housing 3.

[0030] Then a shielding braid 200 can be mounted on the cable side of the connector 2 so as to be in electrical contact with the outer surface of the outer shielding means 4. Advantageously, the shielding braid 200 is maintained on the outer shielding means 4 with a taping 19 and a tie wrap 20. The taping 19 is wound around a portion of the cap 22 and the shielding braid 200. The taping 19 is placed astride this portion of the cap 22 and the shielding braid 200. The tie wrap 20 sandwiches the taping 19, the braid 200, the outer shielding means 4, the inner shielding means 6 and the inner housing 3.

[0031] In the disclosed embodiments given as examples, there are both an electrical continuity between the shielding braid 200 and the connector shielding means 4, 6, and a watertight region inside the inner housing 3.

Claims

1. An electrical connector (2) comprising

- an inner housing (3) and an outer housing (9),
- inner shielding means (6) and outer shielding means (4), the inner shielding means (6) being in electrical contact with the outer shielding means (4),

- annular sealing means (5, 23, 24),

characterized in that the outer shielding means (4) is formed as a single annular band, the sealing means (5, 23, 24) are in sealing contact, on the one hand, with both the outer housing (9) and the outer shielding means (4), and on the other hand with both the inner housing (3) and the outer shielding means (4).

2. The electrical connector (2) according to claim 1, wherein the outer shielding means (4) is a deep drawn piece.
3. The electrical connector (2) according to claim 1 or 2, wherein the annular sealing means are two independent pieces: an outer seal (23) and an inner seal (24).

4. The electrical connector (2) according to claim 3, comprising a first cap (22) configured to maintain the outer seal (23) in sealing contact between the outer housing (9) and the outer shielding means (4).

5. The electrical connector (2) according to claim 3 or 4, comprising a second cap (21) configured to maintain the inner seal (24) in sealing contact between the inner housing (3) and the outer shielding means (4).

6. The electrical connector (2) according to claim 1 or 2, wherein the sealing means (5) are formed as a single piece.

7. The electrical connector (2) according to claim 6, wherein openings (17) are arranged in the sealing means (5), between longitudinal ribs (15a, 15b) of the sealing means (5), these openings (17) being configured to pass resilient contact blades (14) formed in the inner shielding means (6) and are configured to make electrical contact with the outer shielding means (4).

8. An electrical connector assembly (1) comprising

- a connector (2) according to any of claims 1 to 7, and
- a shielding braid (200) in electrical contact with the outer shielding means (4).

9. The electrical connector assembly (1) according to claim 8, comprising a first cap (22) configured to maintain the outer seal (23) in sealing contact between the outer housing (9) and the outer shielding means (4).

10. The electrical connector assembly (1) according to claim 9, wherein a taping (19) is placed astride a portion of the first cap (21) and the shielding braid (200).

11. The electrical connector assembly (1) according to claim 10, wherein a tie-wrap (20) is tightened over a sandwich comprising portions of the taping (19), the shielding braid (200) and the outer shielding means (4).

12. The electrical connector assembly (1) according to claim 8, comprising a taping (19) placed astride a portion of the outer housing (9) and the shielding braid (200).

13. The electrical connector assembly (1) according to claim 12, wherein a tie-wrap (20) is tightened over a sandwich comprising portions of the taping (19), the shielding braid (200) and the outer shielding means (4).

Patentansprüche

1. Elektrischer Steckverbinder (2) mit

- einem Innengehäuse (3) und einem Außengehäuse (9),
- einer inneren Abschirmung (6) und einer äußeren Abschirmung (4), wobei die innere Abschirmung (6) in elektrischem Kontakt mit der äußeren Abschirmung (4) steht,
- einer ringförmigen Dichtung (5, 23, 24),

dadurch gekennzeichnet, dass die äußere Abschirmung (4) als ein einzelnes ringförmiges Band ausgebildet ist, wobei die Dichtung (5, 23, 24) einerseits mit sowohl dem äußeren Gehäuse (9) als auch der äußeren Abschirmung (4) und andererseits mit sowohl dem inneren Gehäuse (3) als auch der äußeren Abschirmung (4) in dichtendem Kontakt stehen.

2. Elektrischer Steckverbinder (2) nach Anspruch 1, wobei die äußere Abschirmung (4) ein tiefgezogenes Teil ist.

3. Elektrischer Steckverbinder (2) nach Anspruch 1 oder 2, wobei die ringförmigen Dichtungen zwei unabhängige Teile sind: eine äußere Dichtung (23) und eine innere Dichtung (24).

4. Elektrischer Steckverbinder (2) nach Anspruch 3, der eine erste Kappe (22) umfasst, die so konfiguriert ist, dass sie die äußere Dichtung (23) in dichtendem Kontakt zwischen dem äußeren Gehäuse (9) und der äußeren Abschirmung (4) hält.

5. Elektrischer Steckverbinder (2) nach Anspruch 3 oder 4 umfasst eine zweite Kappe (21), die so konfiguriert ist, dass sie die innere Dichtung (24) in dichtendem Kontakt zwischen dem inneren Gehäuse (3)

und der äußeren Abschirmung (4) hält.

6. Elektrischer Steckverbinder (2) nach Anspruch 1 oder 2, wobei die Dichtung (5) als ein einziges Stück ausgebildet ist.

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7. Elektrischer Steckverbinder (2) nach Anspruch 6, wobei Öffnungen (17) in der Dichtung (5) zwischen Längsrippen (15a, 15b) der Dichtung (5) angeordnet sind, wobei diese Öffnungen (17) so konfiguriert sind, dass sie in den inneren Abschirmungen (6) ausgebildete federnde Kontaktlamellen (14) passieren lassen und so konfiguriert sind, dass sie einen elektrischen Kontakt mit den äußeren Abschirmungen (4) herstellen.

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8. Elektrische Steckverbinderanordnung (1), umfassend

- einen Steckverbinder (2) nach einem der Ansprüche 1 bis 7 und
- ein Abschirmgeflecht (200) in elektrischem Kontakt mit der äußeren Abschirmung (4).

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9. Elektrische Steckverbinderanordnung (1) nach Anspruch 8, umfassend eine erste Kappe (22), die so konfiguriert ist, dass sie die äußere Dichtung (23) in dichtendem Kontakt zwischen dem äußeren Gehäuse (9) und der äußeren Abschirmung (4) hält.

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10. Elektrische Steckverbinderanordnung (1) nach Anspruch 9, wobei ein Band (19) rittlings auf einem Abschnitt der ersten Kappe (22) und dem Abschirmgeflecht (200) angeordnet ist.

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11. Elektrische Steckverbinderanordnung (1) nach Anspruch 10, wobei ein Kabelbinder (20) über einem Sandwich festgezogen wird, das Teile des Bandes (19), das Abschirmgeflecht (200) und die äußeren Abschirmungen (4) umfasst.

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12. Elektrische Steckverbinderanordnung (1) nach Anspruch 8, umfassend eine Bandage (19), die rittlings auf einem Abschnitt des Außengehäuses (9) und dem Abschirmgeflecht (200) angeordnet ist.

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13. Elektrische Steckverbinderanordnung (1) nach Anspruch 12, wobei ein Kabelbinder (20) über einem Sandwich festgezogen ist, das Abschnitte des Bandes (19), das Abschirmgeflecht (200) und die äußeren Abschirmungen (4) umfasst.

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Revendications

1. Connecteur électrique (2) comprenant

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- un boîtier intérieur (3) et un boîtier extérieur (9),

◦ des moyens de blindage intérieur (6) et des moyens de blindage extérieur (4), les moyens de blindage intérieur (6) étant en contact électrique avec les moyens de blindage extérieur (4),

◦ des moyens d'étanchéité annulaires (5, 23, 24), **caractérisé en ce que** le moyen de blindage extérieur (4) est formé d'une seule bande annulaire, les moyens d'étanchéité (5, 23, 24) sont en contact étanche, d'une part, avec le boîtier extérieur (9) et le moyen de blindage extérieur (4), et d'autre part, avec le boîtier intérieur (3) et le moyen de blindage extérieur (4).

2. Connecteur électrique (2) selon la revendication 1, dans lequel le moyen de blindage extérieur (4) est une pièce emboutie.

3. Connecteur électrique (2) selon la revendication 1 ou 2, dans lequel les moyens d'étanchéité annulaires sont deux pièces indépendantes : un joint extérieur (23) et un joint intérieur (24).

4. Connecteur électrique (2) selon la revendication 3, comprenant un premier capuchon (22) configuré pour maintenir le joint extérieur (23) en contact étanche entre le boîtier extérieur (9) et le moyen de blindage extérieur (4).

5. Connecteur électrique (2) selon la revendication 3 ou 4, comprenant un second capuchon (21) configuré pour maintenir le joint intérieur (24) en contact étanche entre le boîtier intérieur (3) et le moyen de blindage extérieur (4).

6. Connecteur électrique (2) selon la revendication 1 ou 2, dans lequel les moyens d'étanchéité (5) sont formés d'une seule pièce.

7. Connecteur électrique (2) selon la revendication 6, dans lequel des ouvertures (17) sont disposées dans les moyens d'étanchéité (5), entre les nervures longitudinales (15a, 15b) des moyens d'étanchéité (5), ces ouvertures (17) étant configurées pour passer des lames de contact élastiques (14) formées dans les moyens de blindage intérieur (6) et sont configurées pour établir un contact électrique avec le moyen de blindage extérieur (4).

8. Ensemble de connecteurs électriques (1) comprenant

◦ un connecteur (2) selon l'une des revendications 1 à 7, et

◦ une tresse de blindage (200) en contact électrique avec le moyen de blindage extérieur (4).

9. Ensemble de connecteurs électriques (1) selon la

revendication 8, comprenant un premier capuchon (22) configuré pour maintenir le joint extérieur (23) en contact étanche entre le boîtier extérieur (9) et le moyen de blindage extérieur (4).

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- 10.** Connecteur électrique (2) selon la revendication 9, dans lequel un ruban (19) est placé à cheval sur une partie du premier capuchon (22) et de la tresse de blindage (200).

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- 11.** Connecteur électrique (2) selon la revendication 10, dans lequel un lien (20) est serré sur un sandwich comprenant des portions du ruban (19), de la tresse de blindage (200) et du moyen de blindage extérieur (4).

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- 12.** Connecteur électrique (2) selon la revendication 8, comprenant un ruban (19) placé sur une partie du boîtier extérieur (9) et de la tresse de blindage (200).

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- 13.** Connecteur électrique (2) selon la revendication 12, dans lequel un lien (20) est serré sur un sandwich comprenant des portions du ruban (19), de la tresse de blindage (200) et du moyen de blindage extérieur (4).

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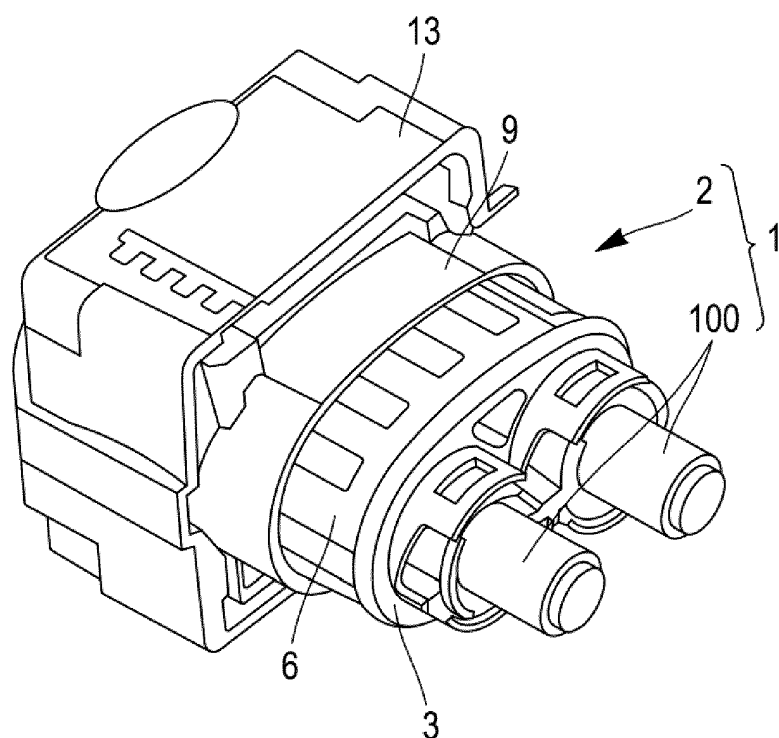
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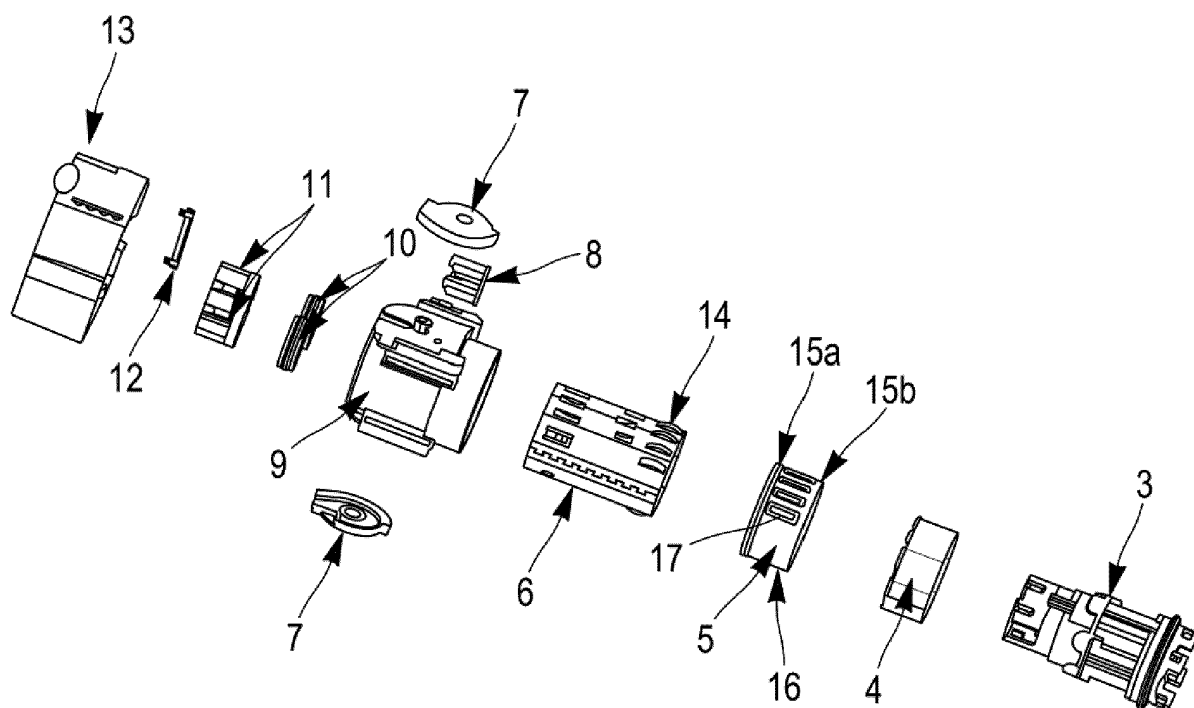
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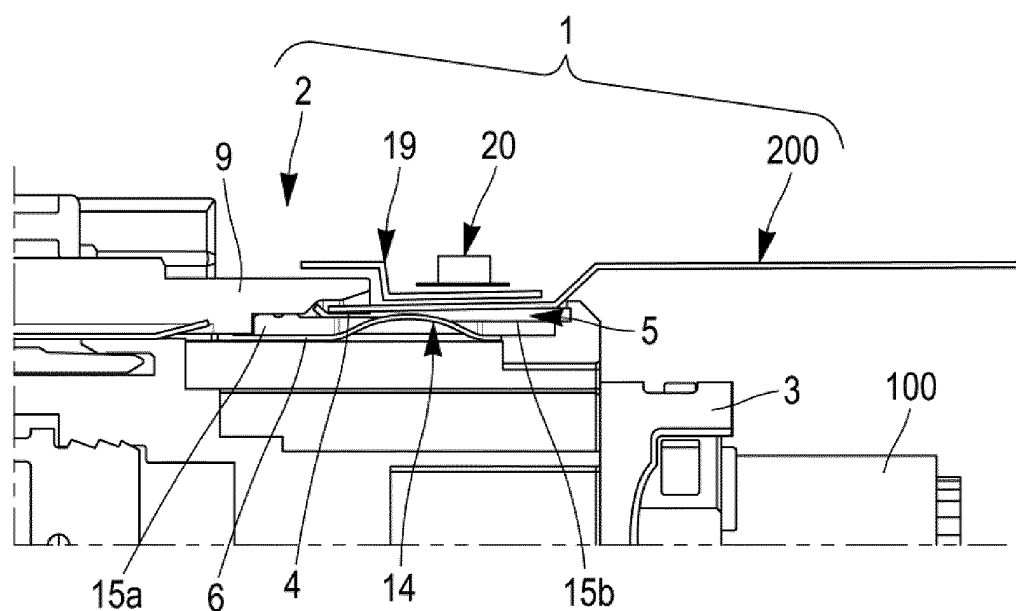
[Fig. 1]



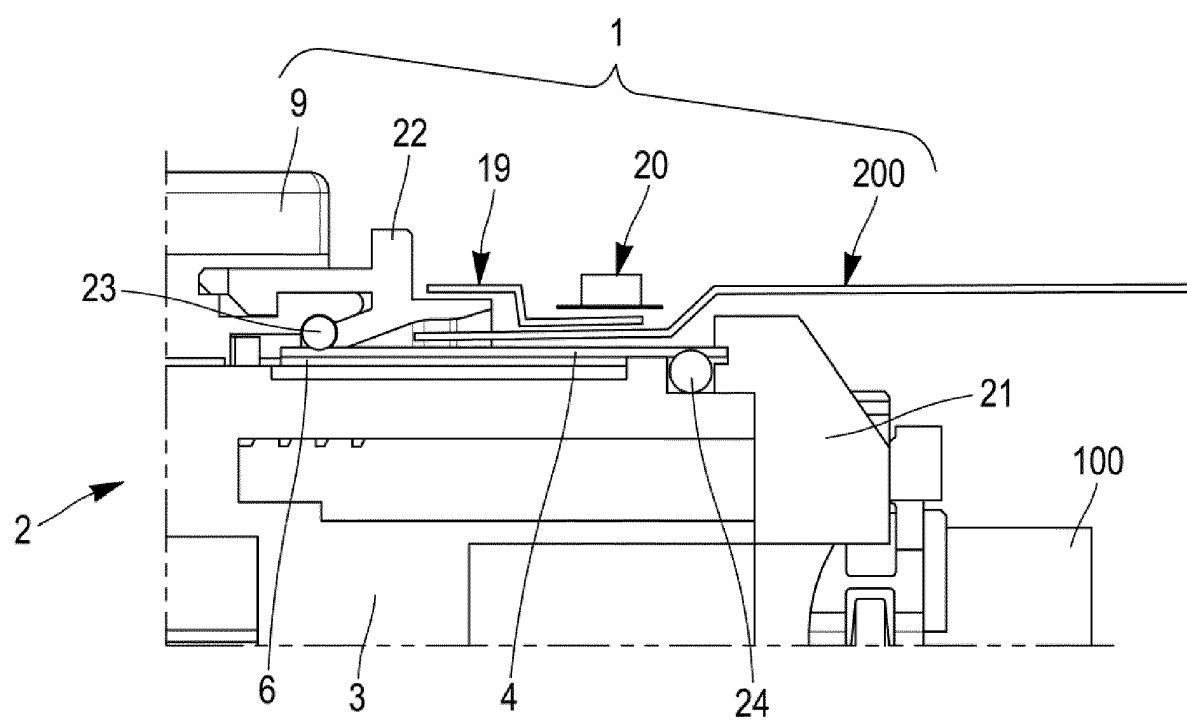
[Fig. 2]



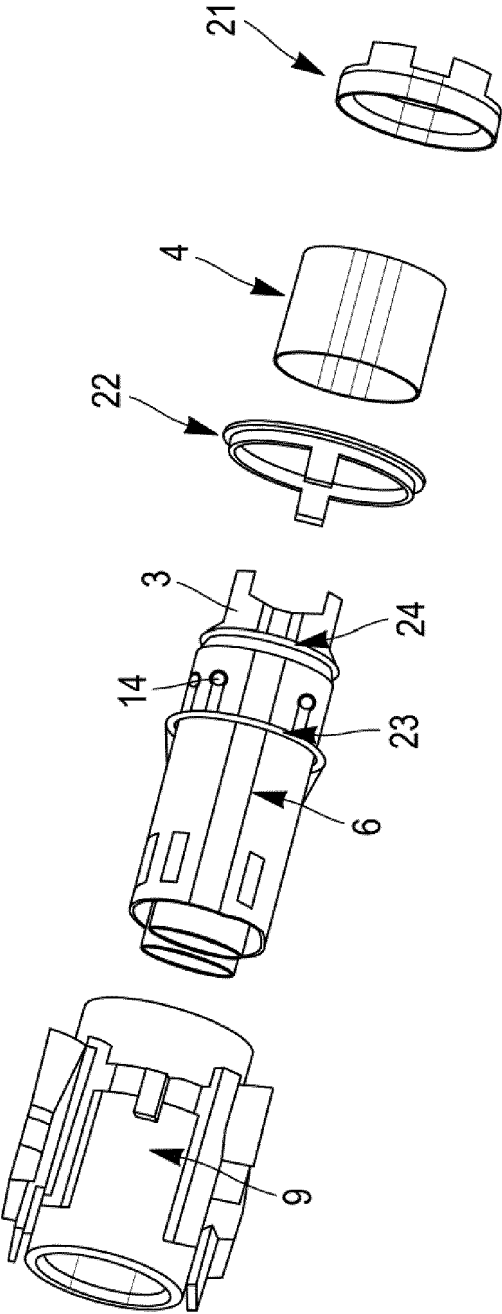
[Fig. 3]



[Fig. 4]



[Fig. 5]



REFERENCES CITED IN THE DESCRIPTION

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