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(73) Jogosult(ak):

**OBO Bettermann GmbH & Co. KG, 58710
Menden (DE)**

(72) Feltaláló(k):

Ring, Stefan, 59192 Bergkamen (DE)

(74) Képviselő:

SBGK Szabadalmi Ügyvivői Iroda, Budapest

(54)

Villamos csatlakozókapocs

Az európai szabadalom ellen, megadásának az Európai Szabadalmi Közlönyben való meghirdetésétől számított kilenc hónapon belül, felszólalást lehet benyújtani az Európai Szabadalmi Hivatalnál. (Európai Szabadalmi Egyezmény 99. cikk(1))

A fordítást a szabadalmas az 1995. évi XXXIII. törvény 84/H. §-a szerint nyújtotta be. A fordítás tartalmi helyességét a Szellemi Tulajdon Nemzeti Hivatala nem vizsgálta.

Villamos csatlakozókapocs

The invention relates to an electric plug connector which is suitable for use at higher temperatures, such as those required for fire protection applications, comprising an electrical connecting part for holding electrical conductors to be joined together by a clamp closure, and a casing which borders the connecting part and meets the temperature requirements.

In numerous applications, electric plug connectors which must withstand certain temperature stresses are required for joining together electrical conductors. These temperature stresses may be those resulting from operation of an electrical consumer, for example a lamp. In addition, plug connectors of this type are used in order for electrical installations, for example building installations, to meet the fire protection requirements. According to the fire protection requirements, certain electrical installations such as communication installations must remain functional, at least for a certain period of time, in the event of a fire. Ceramic terminals, which are often used as modular terminals seated on a mounting rail, meet these requirements. These terminals are terminal blocks having a ceramic housing which surrounds a tubular profile made of a current-conducting material as an electrical connecting part. One or two threaded bores are introduced into this electrical connecting part, with clamping screws seated in the bores. The ends of electrical conductors to be joined together are clamped in the tubular profile by means of clamping screws, and are thus held in the electrical connecting part by a clamp closure.

In these electric plug connectors, the ceramic housing forms the casing which meets the temperature requirements. At the same time, this casing forms the electrical insulation toward the outside, and when the plug connector is designed as a modular terminal, forms the insulation between adjacent poles.

Electric plug connectors of this type meet the requirements imposed on fire protection applications. However, the connection of electrical conductors requires considerable effort, in particular when a plurality of conductors are to be joined together within a junction box. However, this is quite typical for connections of communication installations.

WO 01/09990 discloses a method for establishing a connection to an electrical cable. A section of an outer sheath of the cable is removed, and the individual wires of the cable are stripped. These wires are subsequently conductively connected to a plug-in connector part. The connection thus established is introduced into a casting mold and cast as a whole with a plastic material in order to form an insulating plug housing. In particular, the casing of the cable and the plug housing may be made of a fireproof or flame-retardant material. The plug-in connector part may be accommodated in a ceramic insert, which as a whole is cast into the plastic material in the casting mold.

JP 2009/218141 discloses an electric plug connector intended to provide improved protection from a plugged-in electrical conductor being pulled out. The plug connector includes a housing body, and a cover part which closes same and has openings for inserting conductors. A metallic connecting piece having a front wall, a base plate, and a rear wall is installed in the housing body. Spring terminals which are deflected when a conductor is inserted, thus clamping the conductor, are provided on the front and rear walls. No mention is made of the fire safety of the plug connector.

The document EP 2 263 757 A1 discloses an electric plug connector according to the preamble of Claim 1.

Based on this discussed prior art, the object of the invention is therefore to refine an electric plug connector of the type mentioned at the outset in such a way that it not only withstands the temperatures required for use at higher temperatures, in particular those required for fire protection applications, but also simplifies the effort for establishing an electrical connection between two electrical conductors.

This object is achieved according to the invention by an electric plug connector, mentioned at the outset, in which the electrical connecting part is designed as a spring-loaded terminal, and rests in a plastic housing which is situated with a positive fit in the casing made of a heat-resistant material, the electrical connecting part with its plastic housing being bordered by the heat-resistant casing in such a way that the electrical connecting part is captively held in the casing, even if the plastic housing is destroyed or burned up due to the effect of temperature.

In this electric plug connector, the electrical connecting part is designed as a spring-loaded terminal, often also referred to as a plug-in terminal. The connection of an electrical conductor to this electrical connecting part thus takes place without tools,

namely, solely by inserting the stripped conductor end. This electrical connecting part rests in a plastic housing, which at the same time typically also electrically insulates the spring-loaded terminal. A special feature of the claimed plug connector is that the plastic housing which contains the electrical connecting part is situated with a positive fit in the heat-resistant casing, for example a ceramic casing. The arrangement of the spring-loaded terminal with its plastic housing in the heat-resistant casing is designed in such a way that the electrical connecting part is captively held in the casing, even if the plastic housing surrounding the connecting part is destroyed, or, as is generally the case in the event of a fire, is burned up after the fire has lasted for a certain period of time, and therefore is no longer present. Thus, even in the event of a fire, the electrically conductive components remain sufficiently insulated, so that for multiple plug connectors installed in a junction box, even in such an event the risk of a short circuit is effectively avoided. Similarly, such a plug connector may also be used when the risk of damage, destruction, or a change in the material characteristics of a plastic housing within the surroundings of the arrangement of the plug connector cannot be ruled out, as is the case, for example, for use in areas with high-temperature surroundings. In such a case, the plastic housing, which sometimes becomes brittle due to the effect of temperature, remains held by the casing, between the electrical connecting part and the heat-resistant casing, and effectively forms the electrical insulator even in the event of such a state change.

For such an electric plug connector, it is particularly advantageous that standard spring-loaded terminals (plug-in terminals), around which the heat-resistant casing is mounted, may be used for manufacturing the claimed plug connector. According to one preferred exemplary embodiment, this takes place by casting over such a spring-loaded terminal with the material provided for forming the heat-resistant casing, for example a ceramic material. It is understood that at least one conductor receptacle in the housing remains free in the course of this casting process. The same applies for test openings, which are usually present on the rear side, opposite the conductor mounting side. Since spring-loaded terminals of this type are primarily mass-produced articles having a multipole design, they represent an inexpensive starting product from which the above-described plug connectors may be manufactured.

In the above-described concept of the electric plug connector, use is made of the fact that, to maintain the functionality of an electrical installation over the desired time period in the event of a fire, the insulation does not have to also meet the requirements for contact protection. In this respect, a bias that is widespread in the field has been

disregarded in the development of this electric plug connector. The underlying rationale is that in the event of a fire, when the junction box and the plastic housing of the electrical connecting part are no longer present because they have burned up, personnel are not in the vicinity anyway due to the high temperatures prevailing at this location.

According to one exemplary embodiment, it is provided that as part of the casing of the plug connector, a bar is provided on the conductor mounting side of the spring-loaded terminal, the bar extending transversely with respect to the aligned sequence of the poles and being molded onto the opposite side walls of the casing. In the event that the plastic housing is lost, this bar ensures that the electrical connecting part is not able to leave the heat-resistant casing. According to a refinement of this exemplary embodiment, the bar has an extension which protrudes into a conductor receptacle in the plastic housing. This extension may extend to the spring terminal associated with this pole. The spring terminal then rests on the bar, and as a result of this measure is held immovably, in a manner of speaking, in the casing even if the plastic housing is no longer present. Such a design is suitable for a multipole spring-loaded terminal; due to the bar, one of the poles is no longer usable for the electrical connection. It is understood that multiple bars may also be provided in such a design. If only one such bar is provided, it is possible to arrange it in the center or near the center in relation to the aligned sequence of the poles.

A ceramic material in particular is suitable as material for manufacturing the heat-resistant casing, in particular due to its property of formability by casting. Thus, in such a design a ceramic compound is cast around the typically multipole spring-loaded terminal in order to form the heat-resistant casing, and then hardens around the plastic housing.

If desired, one or more connecting members may be molded onto the heat-resistant casing of the plug connector. This may serve the purpose of connecting individual plug connectors of this type to one another, and/or to fix them in a junction box. As a result of the design of the connecting members as part of the heat-resistant casing, the mechanical connection of the spring terminals with one another is maintained, even in a high-temperature area, such as in the event of a fire. For connecting members that are connected to an additional connecting member, it is assumed that the latter also meets the temperature requirements. For example, the connecting members which are molded onto the casing may be extensions having a through opening. A screw, a pin, or a clamp, for example, may engage through the through opening for establishing the connection, depending on the design of the through opening and of the extension.

The invention is described below based on exemplary embodiments with reference to the appended figures, from which descriptions further advantages and embodiments of the invention result. The figures show the following:

Figure 1: shows a perspective view of an electric plug connector with a view of the conductor mounting side,

Figure 2: shows a perspective view of the plug connector in Figure 1, on the side opposite from the conductor mounting side,

Figure 3: shows a longitudinal section of the plug connector in Figures 1 and 2,

Figure 4: shows a cross section of the casing of the plug connector in Figures 1 to 3,

Figure 5: shows a schematic side view of two interconnected plug connectors according to a first refinement, and

Figure 6: shows a side view of two additional interconnected plug connectors according to a further refinement.

An electric plug connector 1 includes a heat-resistant ceramic casing 2. The casing 2 is made of a ceramic material which is not only heat-resistant, but also has electrical insulating properties. A standard spring-loaded terminal 3, which in the illustrated exemplary embodiment has a 5-pole design, is bordered in the casing 2. Figure 1 shows the plug connector 1 with a view of its conductor mounting side 4. The conductor mounting side 4 is the side at which electrical conductors are inserted with their stripped end into the plug connector 1 for the purpose of contacting. Therefore, the conductor mounting side 4 is open with respect to the spring-loaded terminal 3 situated in the casing 2. Thus, at least some of the five conductor receptacles in the spring-loaded terminal 3 are accessible, and are not covered by the casing 2. The side walls of the casing 2 protrude beyond the respective termination of the spring-loaded terminal 3 in the direction of the conductor mounting side 4. A bar 5 is situated between these side walls, which project beyond the termination of the spring-loaded terminal 3 on this side. The bar 5 traverses the conductor mounting side 4 of the spring-loaded terminal 3, and is situated in the area of the middle conductor receptacle in the spring-loaded terminal 3. This middle pole is therefore no longer accessible for electrical contacting. The plug connector 1 is thus usable as a 4-pole plug connector.

The spring-loaded terminal 3 is a standard terminal, also referred to as a plug-in terminal. It includes a terminal rail made of a conductive metal, a spring terminal being

associated with each pole. For this reason, the four usable poles of the plug connector 1 are associated with the same electrical conductor, and in principle may therefore also be referred to as connecting points. However, they are still referred to below as poles, as is customary in common usage.

A through opening 7 is introduced into the ceramic casing 2, at the rear side 6 opposite from the conductor mounting side 4. The test port(s) of the spring-loaded terminal 3 is/are accessible through the through opening 7.

The construction of the spring-loaded terminal 1 is apparent from the longitudinal section in Figure 3. The spring-loaded terminal 3 includes as the electrical connecting part a terminal rail 8, which in the illustrated exemplary embodiment has a 5-pole design as described above. For this reason, each pole has a spring terminal 9. The terminal rail 8 with its spring terminals 9 is inserted into a plastic housing 10. In the illustrated exemplary embodiment, the plastic housing 10 has a two-part design, and includes a first housing part 11 as a receptacle for the terminal rail 8, and a second housing part 12 which, in the manner of a closure body, fixes the terminal rail 8, inserted into the first housing part 11, therein. The plastic housing 10 has electrical insulating properties, as is the case for standard spring-loaded terminals. This spring-loaded terminal 3 is bordered in the ceramic casing 2. The configuration of the bar 5, which crosses the conductor mounting side 4 transversely with respect to the aligned sequence of the poles, is apparent from the longitudinal section in Figure 3. In the illustrated exemplary embodiment, the ceramic casing 2 is a cast part which has been cast around the spring-loaded terminal 3. A casting mold is used, through which the openings in the conductor mounting side 4, which form the bar 5, remain. The side walls of the ceramic casing 2 are inclined at a slight angle relative to one another in the direction of the rear side 6, the inclination being used as a draft angle. It is clear from the illustration in Figure 3 that the electric plug connector 1 is usable as a 4-pole plug-in terminal.

Figure 4 shows the ceramic casing 2 in an enlarged illustration. It is apparent from this illustration that the bar 5 bears an extension F which protrudes into the conductor receptacle in the housing 10 for the spring-loaded terminal 3, in the middle pole. This results in additional positional fixing between the spring-loaded terminal 3 and the ceramic casing 2.

It is clear from the description of the ceramic casing 2, in particular the manner in which it borders the spring-loaded terminal 3, that the spring-loaded terminal 3 is held therein

with a positive fit. The bar 5 with its extension 6 serves the purpose that the terminal rail 8 situated in the plastic housing 10 is then also present with a positive fit within the chamber formed by the ceramic casing 2 when the plastic housing 10 is no longer present. In the event of a fire, it is thus expected that the plastic housing 10 has burned up or melted away within a few minutes. The terminal rail 8 made of metal, together with its spring terminals 9, remains. In such a state of the plug connector 1, the electrically conductive terminal rail 8 with its spring terminals 9 is still captively accommodated in the ceramic casing 2. This means that even in the event of a fire, in which the electrically insulating plastic housing 10 has been destroyed, the electrical conductors are still not exposed, thus effectively avoiding the risk of short-circuiting.

Since a standard spring-loaded terminal 3 having a terminal rail 8 as the electrical connecting part is used in the plug connector 1, the connection of electrical conductors may readily be carried out without tools. Lastly, the stripped conductor ends, whether they are cables or litz wires, need only be inserted into the conductor receptacles of the plug connector 1 and pushed into the respective spring terminal 9. These stripped conductor ends under pretensioning act vertically on the inserted conductor end, specifically, in the manner of a barbed hook, thus further increasing the clamping force acting on the particular conductor when mechanical tensile stress is applied to the conductor.

In the exemplary embodiment described above, the ceramic casing 2 has been produced by means of casting. This production method is appropriate for molding connecting members onto the ceramic casing 2 if desired. Such connecting members may serve the purpose of joining together individual plug connectors. This may take place in the transverse direction and/or also in the longitudinal direction of the plug connectors.

Figure 5 shows, in a first exemplary embodiment, a plug connector 1.1 which in each case bears a connecting extension 13, 13.1 on the ceramic casing 2 as a connecting member at its oppositely situated transverse sides. The connecting extensions 13, 13.1 each have a through opening 14, 14.1, respectively. The connecting extensions 13, 13.1 are arranged point-symmetrically relative to one another with respect to the plug connector 1.1. This means that in the illustrated exemplary embodiment, the connecting extension 13 is molded onto the ceramic casing 2.1 in alignment with the rear side 6 and extends to the mid-height of the casing 2.1, while the connecting extension 13.1 with its one side is provided in alignment with the conductor mounting side 4, and with regard to the height likewise extends to the middle of the ceramic casing 2.1. In this way, multiple

plug connectors 1.1 of this type may be lined up in a row, as shown in Figure 5. A metal pin 15 is used for fixing the plug connectors 1.1 to one another. Since this metal pin is also fire-resistant, the mechanical aligned sequence of the plug connectors 1.1 is maintained, even in the event of a fire.

Figure 6 shows two further plug connectors 1.2 that are connected to one another. These plug connectors have a connecting extension 13.2 and 13.3, respectively, which extends over the entire height. A through opening 14.2, 14.3 is likewise introduced in the connecting extensions 13.2, 13.3, respectively. Two such plug connectors 1.2 having adjoining transverse sides may be held together with a connecting clamp 16, as shown in Figure 6. The connecting clamp 16 is made of metal, for which reason this connection is also maintained in the event of a fire.

The same or also different connecting members may bear such a plug connector, or may bear same only at their longitudinal walls, so that a plurality of such plug connectors may be joined together. Since in principle, these types of plug connectors need be accessible only from one side, the available space in a junction box may be utilized essentially completely by such interconnected plug connectors.

The invention has been described with reference to the figures, based on a plug connector which is usable with four poles. Similarly, it is understood that spring-loaded terminals having a different number of poles and encased with a ceramic casing are suitable for use at higher temperatures, such as those required for fire protection applications. Likewise, it is possible to situate multiple or a plurality of standard spring-loaded terminals in a casting mold in order to subsequently accommodate them in a shared ceramic casing.

List of reference numerals

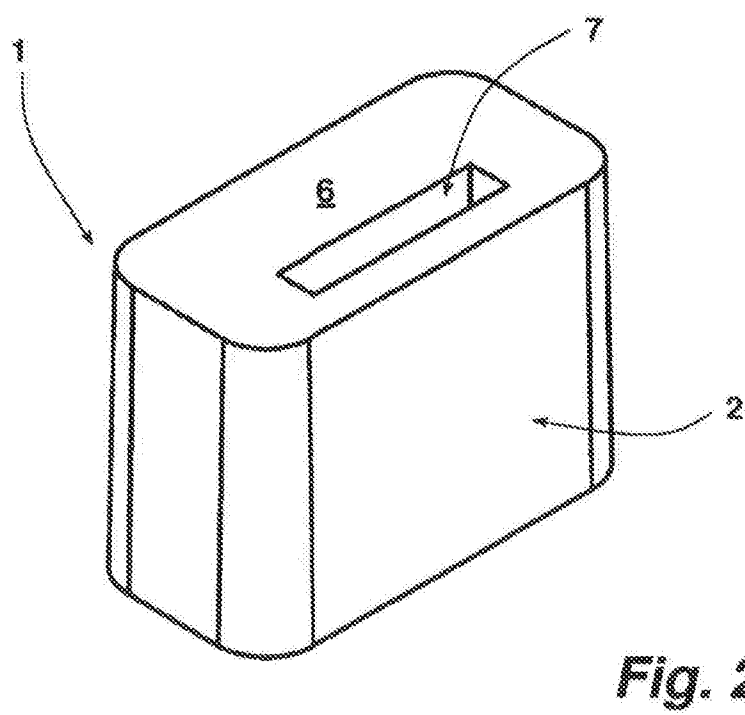
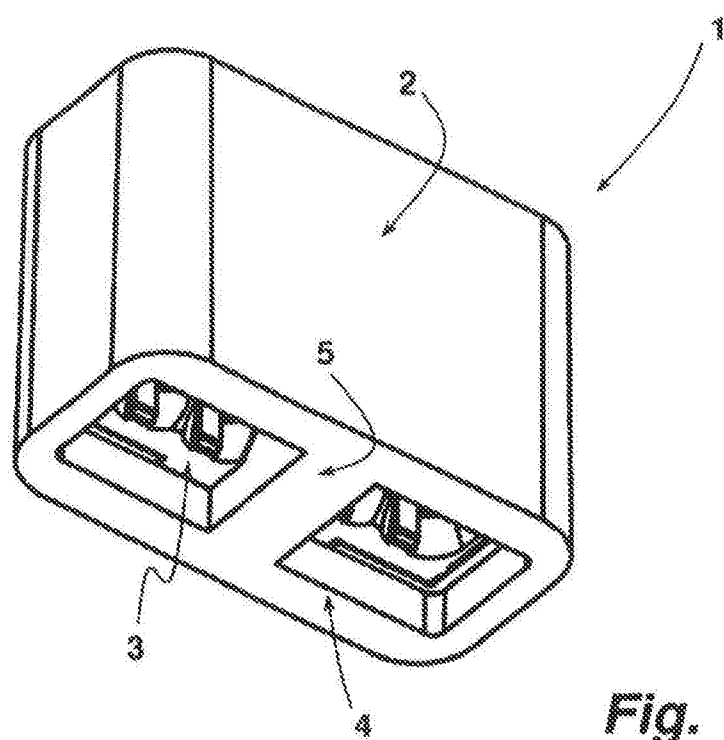
- 1, 1.1, 1.2 Plug connector
- 2, 2.1 Ceramic casing
- 3 Spring-loaded terminal
- 4 Conductor mounting side
- 5 Bar
- 6 Rear side
- 7 Through opening
- 8 Terminal rail
- 9 Spring terminal
- 10 Housing
- 11 First housing part
- 12 Second housing part
- 13, 13.1, 13.2, 13.3 Connecting extension
- 14, 14.1, 14.2, 14.3 Through opening
- 15 Metal pin
- 16 Connecting clamp
- F Extension

Szabadalmi igénypontok

1. Villamos csatlakozókapocs, amely alkalmas például a tűzvédelmi alkalmazásoknál szükséges magasabb hőmérsékletek melletti felhasználásra, és amely tartalmaz egy villamos csatlakozó részt (3) az egymással összekötendő villamos vezetékek tartására egy szorítókapoccsal és a hőmérsékleti követelményeknek megfelelő, a csatlakozó részt (3) befogadó palástartal (2, 2.1), ahol a villamos csatlakozó rész (3) rugós szorítócsatlakozóként van kialakítva, azzal jellemezve, hogy a villamos csatlakozó rész (3) egy műanyag házban (10) foglal helyet, ahol a hőálló anyagú műanyag ház (10) alakzáróan helyezkedik el a palástartban (2, 2.1), ahol a villamos csatlakozó részt (3) a műanyag házával (10) úgy veszi körül a hőálló palástart (2, 2.1), hogy a villamos csatlakozó rész (3) akkor is elveszíthetetlenül van a palástartban (2, 2.1) tartva, ha a műanyag ház (10) hőhatás következtében roncsolódik vagy elég.
2. Az 1. igénypont szerinti csatlakozókapocs, azzal jellemezve, hogy a villamos csatlakozó rész (3) többpólusú kivitelű, és a palástart (2, 2.1) részét képezi egy a pólusok sorával keresztirányban elhelyezkedő, a palástart (2, 2.1) szemközti oldalfalához (6) illeszkedő retesz (5).
3. A 2. igénypont szerinti csatlakozókapocs, azzal jellemezve, hogy a retesz (5) a többpólusú villamos csatlakozó rész (3) egyik pólusához való hozzáférést lefedően van elrendezve, és a ház (10) vezetékbe fogadó terébe benyúló nyúlványa (F) van.
4. A 3. igénypont szerinti csatlakozókapocs, azzal jellemezve, hogy a nyúlvány (F) a villamos csatlakozó rész (3) ehhez a pólushoz hozzárendelt rugós szorítókapocsáig (9) ér.
5. Az 1 - 4. igénypontok egyike szerinti csatlakozókapocs, azzal jellemezve, hogy a hőálló palástart (2, 2.1) kerámia anyagból van kialakítva.
6. Az 5. igénypont szerinti csatlakozókapocs, azzal jellemezve, hogy a palástart (2, 2.1) öntési eljárással, a rugós szorítócsatlakozót (3) tartalmazó műanyag ház (10) körülöntésével van kialakítva.
7. Az 1 - 6. igénypontok egyike szerinti csatlakozókapocs, azzal jellemezve, hogy a palástarton (2, 2.1) egy vagy több csatlakozóelem (13, 13.1; 13.2, 13.3) van kialakítva.
8. A 7. igénypont szerinti csatlakozókapocs, azzal jellemezve, hogy több

csatlakozókapocs (1.1, 1.2) van összefogva a csatlakozóelemekkel (13, 13.1; 13.2, 13.3) és egy járulékos, szintén a hőmérsékleti követelményeknek megfelelő összekötő elemmel (15, 16).

9. A 8. igénypont szerinti csatlakozókapocs, azzal jellemezve, hogy csatlakozóelemek áttörést (14, 14.1; 14.2, 14.3) tartalmazó csatlakozó nyúlványként (13, 13.1; 13.2, 13.3) vannak kialakítva, és a legalább két csatlakozókapcsot (1.1, 1.2) összekötő összekötő elemek (15, 16) legalább két összekötő nyúlvány (13, 13.1; 13.2, 13.3) áttörésébe (14, 14.1; 14.2, 14.3) benyúlnak.



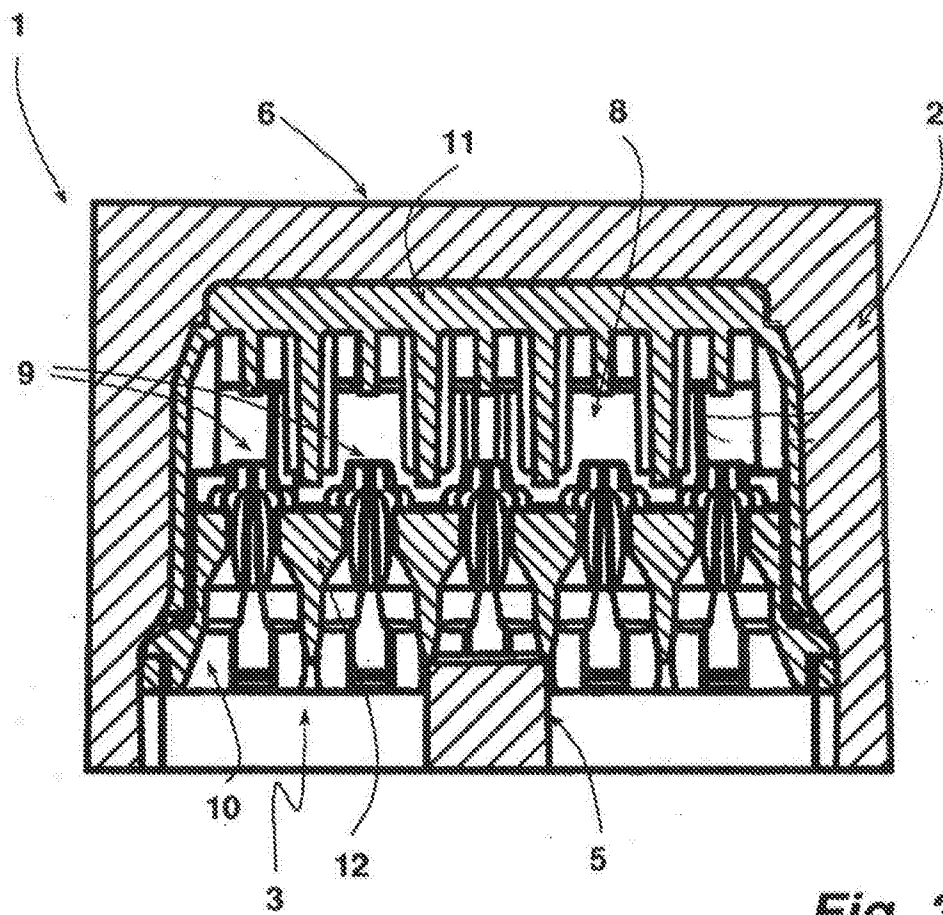


Fig. 3

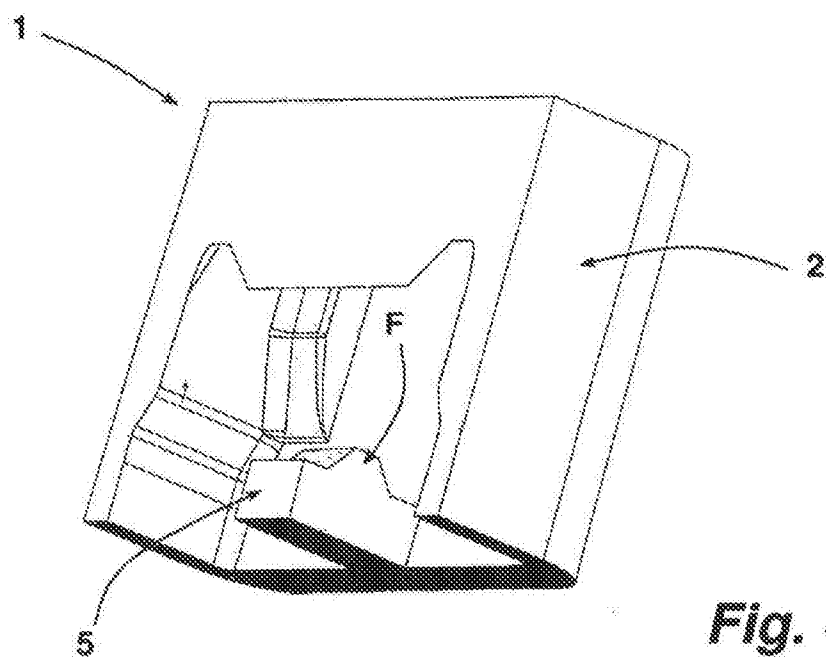


Fig. 4

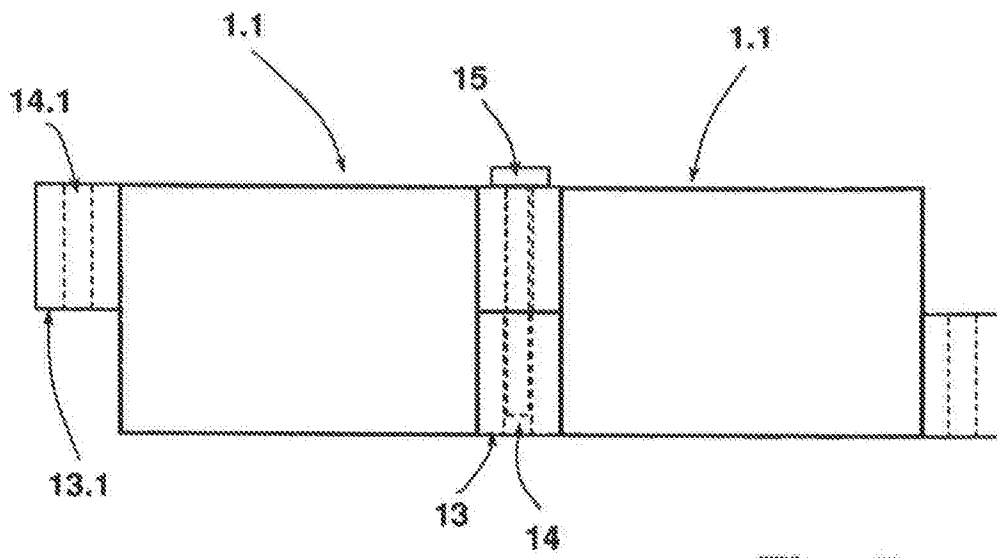


Fig. 5

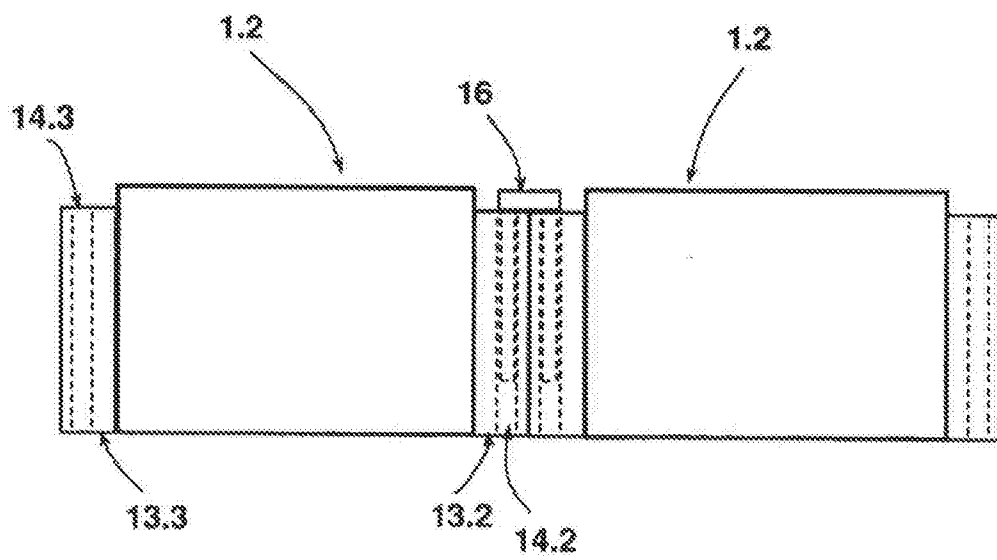


Fig. 6