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(54) **SOCKET WITH MOVABLE COVER**

(57) Socket in a plug-and-socket connection, said socket being essentially cup shaped and having a guided cover plate movable in axial direction to close the socket in a nonoperating state, said cover plate being guided in the socket, taking a springloaded first position in its non-operating state, and being movable axially and/or rotatory to a second position at a bottom bearing surface of the socket when inserting a plug into the socket, whereby

a first guiding means to guide said cover plate while axially and/or rotatory moving down into the socket is provided by the peripheral surface area of said cover plate slidably interacting with the inner surface of the socket being essentially cylindrical, said peripheral surface area of the cover plate forming a spherical profile with its diameter tapering towards the bottom of the socket.

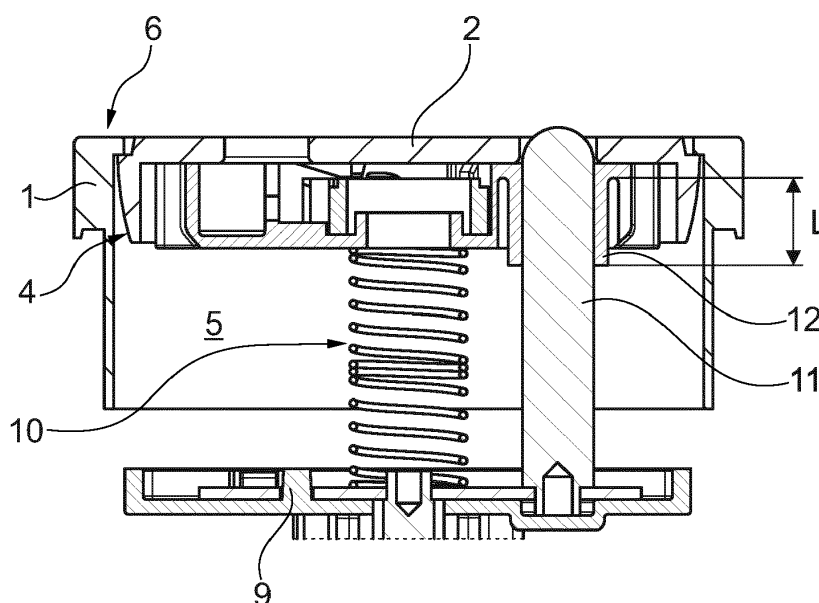


Fig. 6

Description

Background of the invention

[0001] The invention relates to a socket in a plug-and-socket connection, said socket being essentially cup shaped and having a guided cover plate movable in axial direction to close the socket in a nonoperating state with no plug being connected to the socket. The cover plate is guided in the socket, taking a spring-loaded first position in its nonoperating state and is movable axially and/or rotatory to a second position within the socket when pushing down the plug into the socket until the pins of the plug fully engage the electrical contacts.

[0002] Plug-and-socket connections as customarily known in the art nowadays need to satisfy safety regulations as well as aesthetic requirements concerning design and aesthetic appearance. In trying to fulfill all expectations developers often have to face a tradeoff or a conflict of design ideas. On the one hand electrical sockets, respectively plug-and-socket connections have to be provided with safety devices, in particular relating to child-safety. It is therefore necessary to ensure that unintentional contact with voltage carrying components is prevented, notably without correctly inserting a plug into a socket. On the other hand, insertion of a plug into a socket should not be too difficult and should not require a handling, that is complicated and undue.

[0003] In this respect a question arises quite frequently: How can undesirable electrical contacts be precluded by a socket design that easily blocks any unintentional insertion of a plug into a socket while the same design should allow smooth and easy insertion when needed?

[0004] From US 3,980,372 an electrical socket is known that has a safety device comprising a shutter member with at least a pair of lugs engageable by respective pins of an electric connector plug inserted into the socket. In a rest position of the shutter member the lugs mask apertures of the body of the socket. The lugs are deflected by the contact pins of the inserted plug and the shutter member is rotatably displaced by means of inclined surfaces on the lugs. This device however is of complex structure and function, and requires increased force to displace the lugs by rotating the shutter member when inserting the plug into the socket.

Summary of the invention

[0005] It is an object of the invention to provide a socket in a plug-and-socket connection that may easily be adapted to its operation purpose and can either be aligned with an emphasis on safety or a focus on easy handling or both, while being realized within the very same device.

[0006] To achieve the above and other objects, a cup shaped socket in a plug-and-socket connection has a guided cover plate movable in axial direction to close the socket in a nonoperating state, i.e., with no plug being

connected to the socket. The cover plate is guided in the socket by guiding means and takes a spring-loaded first position in a nonoperating state. The cover plate as such may also comprise any subset of functional means, e.g., rotatable shutters for plug pin holes etc., which are not object of this invention.

[0007] The first position may be defined by a design that provides an inwardly orientated protrusion at the socket's outer opening to be engaged by the cover plate in the nonoperating state, i.e., where the socket is closed by the cover plate. The engaging parts may also be reversed, i.e., the protrusion may be provided at or on the cover plate and may engage with corresponding structures of the socket's base part. The cover plate is movable axially and/or rotatory with respect to the socket and may be moved to a second position at a bottom bearing surface of the socket when pushing down the plug into the socket until the pins of the plug fully engage the electrical contacts in the socket. The cup shaped socket as such may have an integral base part or may be designed to build a complete cup only when inserted or connected to a separate base component, e.g., a component of a multiple socket outlet.

[0008] According to the invention the socket comprises a first guiding means to guide said cover plate while axially and/or rotatory moving down into the socket. This first guiding means may be provided by the peripheral surface area of said cover plate slidably interacting with the inner surface of the socket being essentially cylindrical, i.e., corresponding to the inner circumference of the socket. Said peripheral surface area of the cover plate is forming a disc-like cut from a spherical profile with its diameter tapering towards the bottom of the socket.

[0009] Thereby the slidable interaction between the spherically profiled peripheral surface area of said cover plate and the inner cylindrical surface of the socket cannot cause any stick-slip effect while the cover plate is moving down into the socket. Even though the thickness of the cover plate may be very small in relation to its diameter, which approximately corresponds to the socket's inner diameter, no jamming or blocking of the cover plate can take place. Therefore, one object of the invention, i.e., to allow smooth and easy insertion of a plug, is already met by the layout of the first guiding means. The cut spherical shape avoids the blocking during movement and allows both, rotative and vertical sliding.

[0010] It is advantageous to design the peripheral surface area of said cover plate to follow a spherical profile, in particular a cut-off spherical shape. Tools for such a profile may be manufactured without difficulties as they can be milled quite easily by curve-guided cutting/milling machinery.

[0011] In a further development of the invention said cover plate, in its first position in the nonoperating state, is spring loaded by a helical compression spring and/or torsion spring acting between said cup shaped socket and said cover plate. This is a simple and very effective way to have the cover plate spring loaded in any position

between the first and the second position. Other kinds of springs or resilient means may be used instead of a helical compression spring, depending on given design features, e.g., resiliently compressible members or the like.

[0012] In another advantageous embodiment of the invention said cover plate, when engaging said inwardly orientated protrusion at the socket's outer opening in its first position, said cover plate's outer or front-facing surface is essentially flush with the edge of said socket's outer opening. Such engagement leads to a plain outer appearance of the socket, whereby another object of the invention is achieved, i.e., an agreeable and pleasing design of the socket, when not in use.

[0013] In a further development of the invention at least one second guiding means is provided to guide said cover plate while axially and/or rotatory moving down into the socket, said second guiding means acting independently with respect to the first guiding means, said second guiding means being provided by sliding interaction between a guide bushing having a guide length L and a guide pin received in said guide bushing, said guide pin outwardly protruding from a bottom of said cup-shaped socket, parallel to a central axis of the cup-shaped socket. With such an independent second guiding means it is possible to adjust both guiding means in their mutual reaction in a way to exactly follow a given strategy of blocking any unintentional insertion of a plug and at the same time allowing smooth and easy insertion when needed. Thereby a third object of the invention is achieved.

[0014] In another advantageous embodiment of the invention said cover plate, when in a nonoperating state, e.g., when engaging said inwardly orientated protrusion at the socket's outer opening in its first position, is spring loaded by a helical spring disposed coaxially around the said guide pin and acting between the cup-shaped socket and the cover plate. Thereby the guide pin is also a guide element for the helical compression spring and prevents buckling of the spring. The guide pin may also be an electrical contact, e.g., a PE contact.

[0015] In a further development of the invention said guide length L of said guide bushing is larger than the outer diameter of the guide pin, such diameter of course approximating the inner diameter of said guide bushing. Such a relation between guide length L and diameter of the pin supports the prevention of blocking or stick-slip effects while the cover plate is moving down into the socket. This feature allows for smooth and easy insertion of a plug while safety aspects, e.g., child safety can easily be approached by raising the necessary pressure to compress the helical spring, or by providing blocking means that permit moving the cover plate into the socket only when the blocking is released by two or more pins of a plug simultaneously acting on a release mechanism.

[0016] In another advantageous embodiment of the invention said guide length L of said guide bushing is smaller than the outer diameter of said guide pin. In such an embodiment any slight eccentricity in pushing the cover plate into the socket will cause immediate blocking of the

plate through sticking interaction between bushing and pin. In this embodiment the focus is on a safety aspect while smooth insertion is only possible by very precise or careful handling.

[0017] Of course, each of the guide means, i.e., the spherical outer surface of the cover plate in relation to the cylindrical inner surface of the socket and the guide bushing and pin may be combined in synergistic way as to reach the object of the invention, i.e., to block unintentional insertion of a plug and allow smooth and easy insertion when needed.

[0018] It is advantageous to design said guide bushing to be an interchangeable and discrete component of said cover plate. Thereby the guide bushing may not only be a spare part but a return or exchange part to adapt the plug and socket connection to its operation purpose.

[0019] For easy adaption of the plug and socket connection to different electrical distribution systems another advantageous embodiment of the invention is appropriate, whereby a plurality of boreholes in said cover plate and a corresponding plurality of electrical contacts of said cup shaped socket are foreseen, said boreholes and electrical contacts corresponding to a plurality of contact pins of a plug.

[0020] Of course, a multiple socket outlet also may advantageously contain at least one socket according to the invention.

Description of a preferred embodiment:

[0021] Referring to FIG.1 reference numeral 1 denotes a socket according to the invention, said socket 1 being essentially cup shaped. Socket 1 has a guided cover plate 2 to close the socket in a nonoperating state, i.e., with no plug being inserted into the socket. This state is shown in FIG.1. This is the first position of the cover plate 2.

[0022] Cover plate 2 is movable in axial direction depicted by arrow 3. Cover plate 2 is guided in the socket by its peripheral surface area 4, which slidably interacts with the essentially cylindrical inner surface 5 of the socket, being likewise essentially cylindrical. The peripheral surface area 4 of the cover plate follows a spherical profile with its diameter tapering towards the bottom part of the socket 1. In this embodiment the peripheral surface area 4 forms a spherical profile of a ball race shape. The cut-spherical peripheral surface area 4 of the cover plate 2 and the cylindrical inner surface 5 of the socket 1 thereby form the first guide means, when interacting with each other.

[0023] Still referring to FIG.1, a protrusion 6 at the socket's outer opening extends inwardly of the socket's cylindrical insertion well and thus is orientated inwardly to be engaged by the cover plate's outer rim 7. When engaging said inwardly orientated protrusion 7 at the socket's outer opening in its first position, the cover plate 2 provides a smooth outer appearance of the socket and the cover plate's outer surface 8. The outer surface 8 of

the cover plate in its first position is flush with the outer or front-facing edge of the sockets outer opening.

[0024] Referring now to FIG. 2, the cover plate 2 has been moved axially to a second position at the bottom of the socket, i.e., a bottom bearing surface 9 of the socket, as depicted only in FIG. 3 to 6, 8 and 9. This happens when a plug is inserted into the socket and pushed down until the contact pins of the plug fully engage electrical contacts in the socket. For reasons of clarity plug and electrical contact pins are not shown in the figures.

[0025] In FIG. 3 a view of a detail of the first guide means is displayed. The spherical peripheral surface area 4 of the cover plate 2 and the cylindrical inner surface 5 of the socket 1 are shown in the first and the second position of the cover plate 2.

[0026] Referring to FIG. 4, the cover plate 2 again is displayed in two of its possible positions, i.e., an upper position where the cover plate 2 is tilted according to eccentric pressure 3.1 to the outer surface 8 and in a lower position, where the cover plate 2 has reached its second position. Due to said first guide means the cover plate is not blocked in the upper position and can still be moved down to the second position by pressing it in direction of arrow 3.1.

[0027] FIG. 5 is a view of a socket 2 wherein a cover plate 2 in its first position in the nonoperating state is spring loaded by a helical compression spring 10 acting between said cup shaped socket 1 and said cover plate 2, e.g., between a bottom bearing surface 9 of the socket 5 and the cover plate 2. In FIG. 5 the helical spring 10 is disposed coaxially around a guide pin 11, while in FIG. 6 the helical spring 10 is disposed coaxially to the socket centerline. Guide pin 11 outwardly and coaxially protrudes from said cup shaped socket, here respectively from the bottom bearing surface 9 of the socket 1, and may be a PE pin that engages with a corresponding PE contact of the plug (not shown in the figure).

[0028] Both embodiments shown in FIG. 5 and 6 display a second guiding means to guide said cover plate 2 while axially moving down into the socket. Said second guiding means act independent from the first guiding means. Said second guiding means are provided by sliding interaction between a guide bushing 12 having a guide length L and the guide pin 11 received in said guide bushing.

[0029] FIG. 7 is a detailed three-dimensional view of the guide bushing 12 fixed in cover plate 2, having a guide length L for the guide pin. Here, said guide length L of the guide bushing is larger than the outer diameter of the guide pin. For providing smooth and easy insertion of a plug the second guide means complement the first guide means and allow sliding movement of the cover plate even with pressure applied off-centre on the cover plate.

[0030] The combination between spherical profile and the pin guided in the bushing guarantees a smooth movement of the cover plate without blocking or tilting.

[0031] Quite contrary thereto it is also possible to immediately block the movement of the cover plate 2

through sticking interaction between the insertion well and the cover plate and/or the bushing and pin if any slight eccentricity in pushing the cover plate 2 into the socket 1 occurs. This can easily be achieved by another embodiment of the invention, wherein said guide length L of a guide bushing 13 is less than the outer diameter of said guide pin 11, as depicted in FIG. 8 and 9.

[0032] Both guide bushes 12 and 13 are interchangeable and discrete components of the cover plate 2.

Reference Numerals

[0033] (part of the specification)

15	1	socket
	2	cover plate arrow of applied force to move down the cover
	3	plate arrow of eccentric force to move down the cover
20	3.1	plate
	4	peripheral surface area 4
	5	cylindrical inner surface of socket
	6	protrusion
	7	cover plate's outer rim
25	8	cover plate's outer surface
	9	bottom bearing surface of socket
	10	helical compression spring
	11	guide pin
	12	guide bushing
30	13	guide bushing
	L	guide length of guide bushing

Claims

1. Socket (1) in a plug-and-socket connection, said socket being essentially cup shaped and having a guided cover plate (2) movable in axial direction to close the socket in a nonoperating state with no plug being inserted to the socket, said cover plate (2) being guided in the socket, taking a spring-loaded first position in its nonoperating state, said first position defined by an inwardly orientated protrusion (6) at the socket's outer opening engaging with the cover plate, said cover plate (2) being movable axially and/or rotatory to a second position at a bottom bearing surface (9) of the socket when inserting and pushing a plug into the socket until contact pins of the plug fully engage electrical contacts in the socket, wherein a first guiding (4, 5) means is provided for guiding said cover plate while axially and/or rotatory moving into the socket, the first guiding means comprising the peripheral surface area (4) of said cover plate slidably interacting with the essentially cylindrical inner surface (5) of the socket, said peripheral surface area of the cover plate following a spherical profile with its diameter tapering towards the bottom of the socket.

2. The socket of claim 1, wherein said peripheral surface area of said cover plate (2) forms a spherical profile of a ball race shape.

3. The socket of claim 1 or 2, wherein said cover plate (2) in its first position in the nonoperating state is spring loaded by a helical compression spring (10) and/or torsional spring acting between said cup shaped socket (1) and said cover plate (2). 5
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4. The socket of one of the preceding claims 1 to 3, wherein, in its first position, an outer surface of the cover plate (2) is flush with an outer or front-facing edge of the cover plate's outer opening when said cover plate (2) engages said inwardly orientated protrusion (6) at the socket's outer opening. 15

5. The socket of one of the preceding claims 1 to 4, wherein at least one second guiding means (11, 12, 13) is provided for guiding said cover plate while axially and/or rotatory moving into the socket, said second guiding means acting independently with respect to the first guiding means, said second guiding means comprising sliding interaction between a guide bushing (12, 13) having a guide length L and a guide pin (11) received in said guide bushing, said guide pin (11) outwardly protruding from said cup shaped socket (1), parallel to a central axis of the cup-shaped socket. 20
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6. The socket of claim 5, wherein said cover plate, when engaging said inwardly orientated protrusion (6) at the socket's outer opening in its first rest position, is spring loaded by a helical spring (10) disposed coaxially around the said guide pin (11) and acting between cup shaped socket (1) and cover plate (2). 35

7. The socket of claim 5 or 6, wherein said guide length L of said guide bushing (12) is larger than the outer diameter of said guide pin. 40

8. The socket of claim 5 or 6, wherein said guide length L of said guide bushing (13) is smaller than the outer diameter of said guide pin. 45

9. The socket of claim 7 or 8, wherein said guide bushing (12, 13) is an interchangeable and discrete component of said cover plate.

10. The socket of one of the preceding claims 1 to 9, wherein a plurality of boreholes in said cover plate and a corresponding plurality of electrical contacts of said cup shaped socket are provided, said boreholes and electrical contacts corresponding to a plurality of contact pins of a plug. 50
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11. Multiple socket outlet containing at least one socket according to one of the preceding claims 1 to 10.

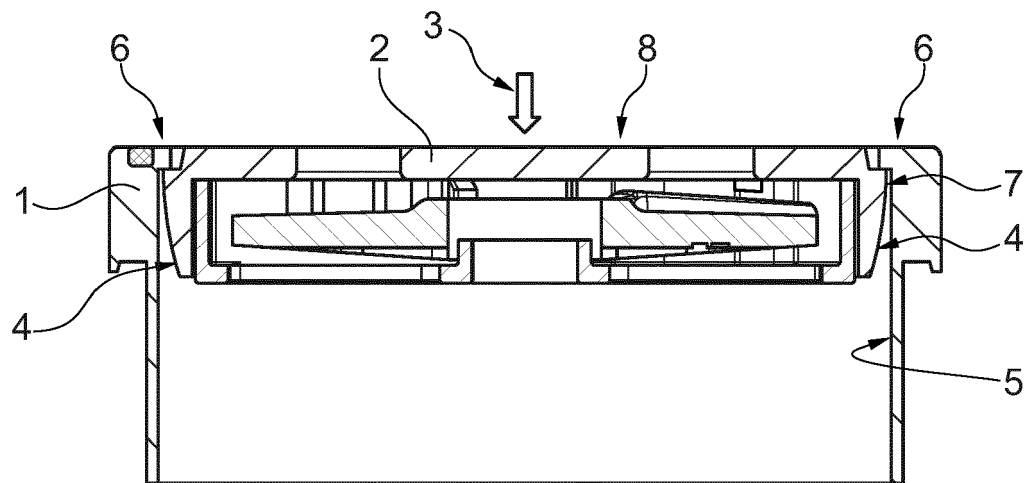


Fig. 1

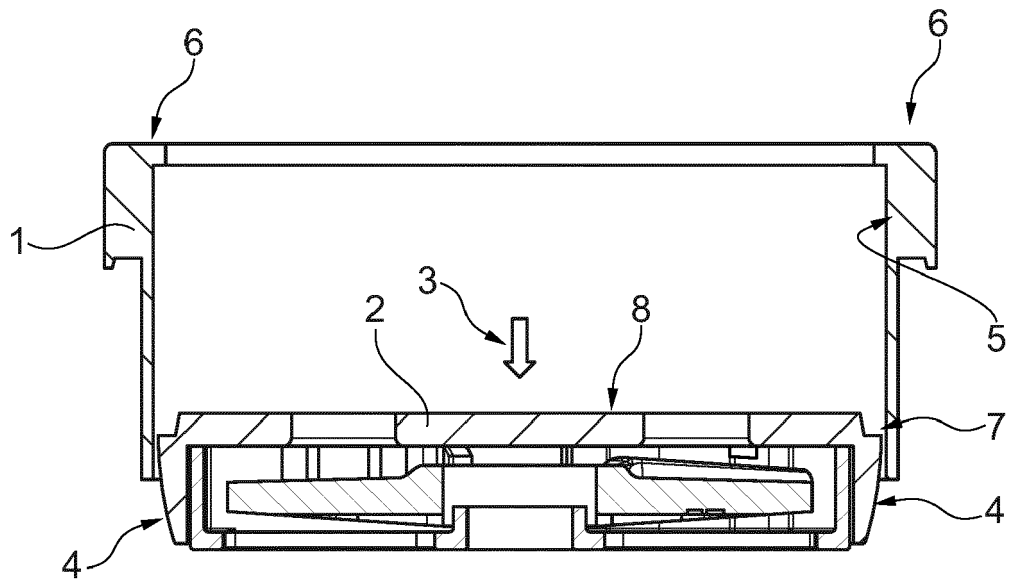


Fig. 2

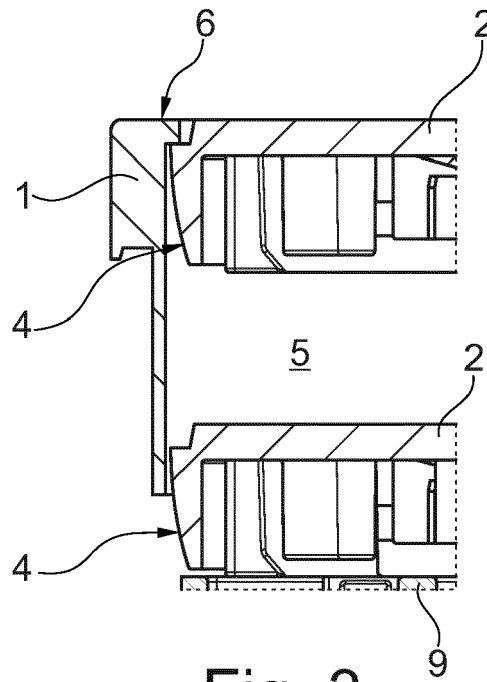


Fig. 3

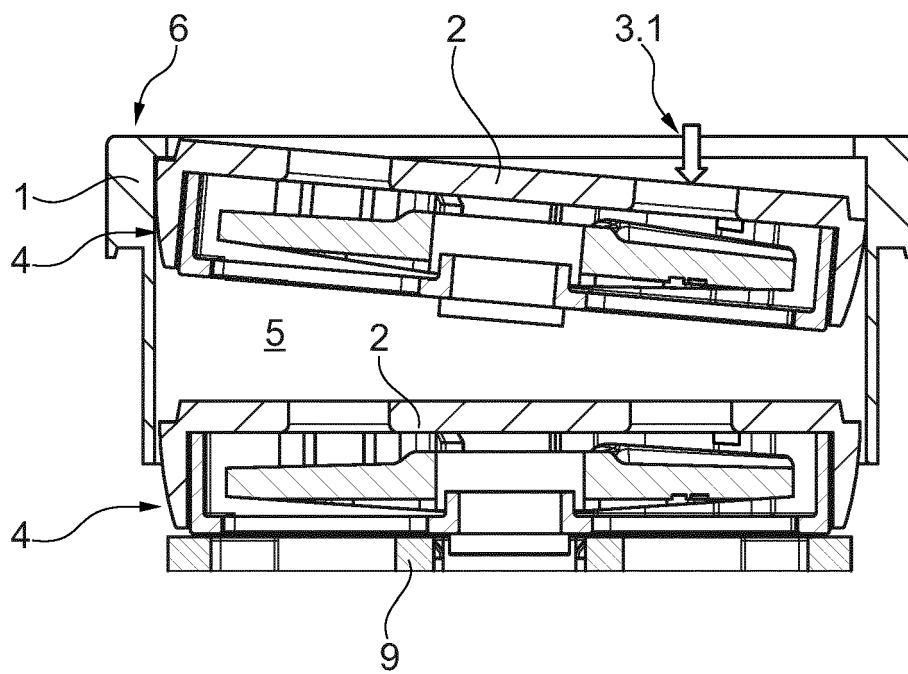


Fig. 4

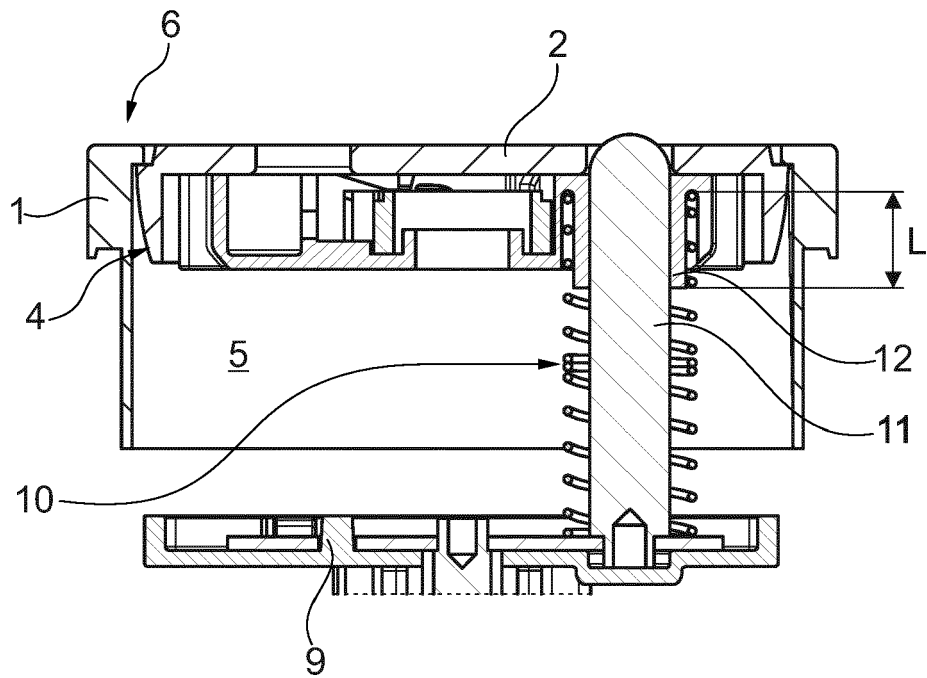


Fig. 5

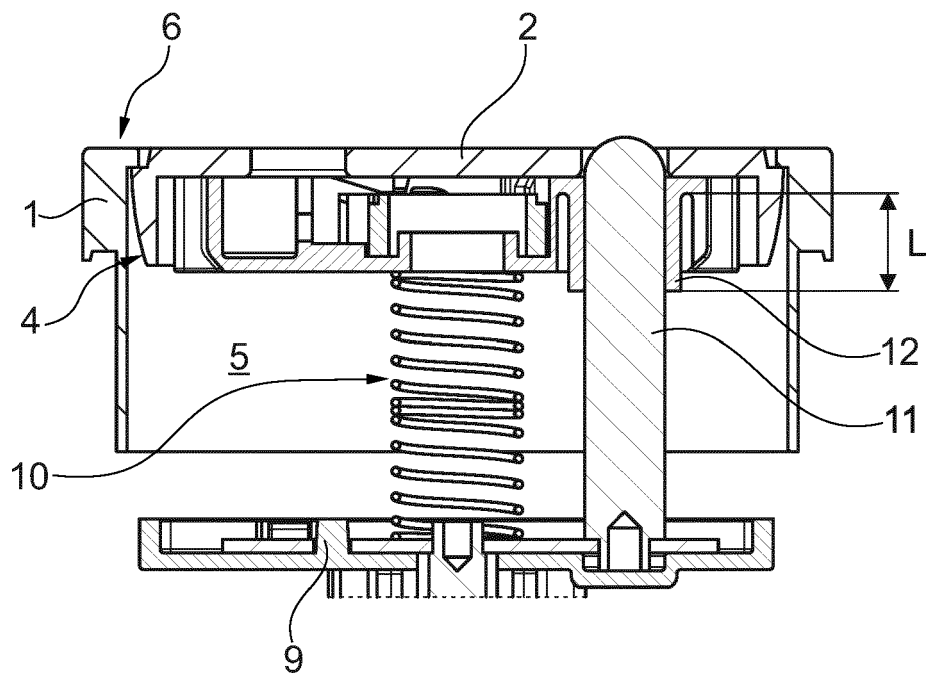


Fig. 6

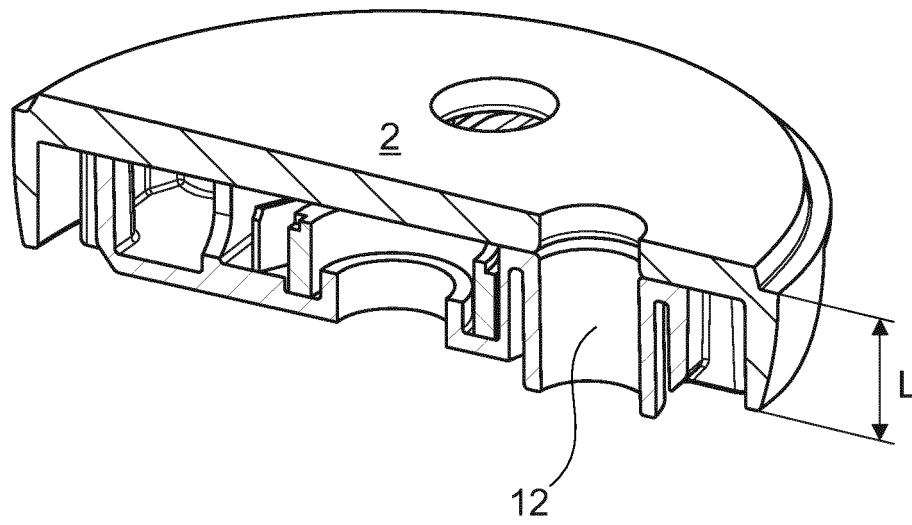


Fig. 7

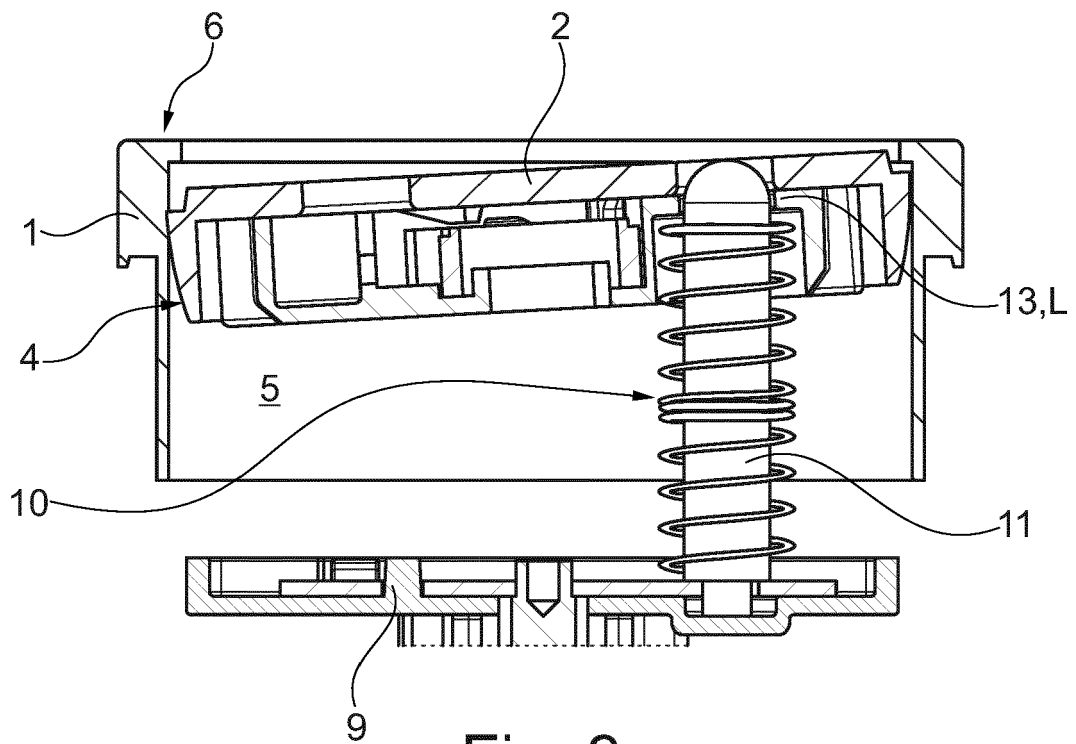


Fig. 8

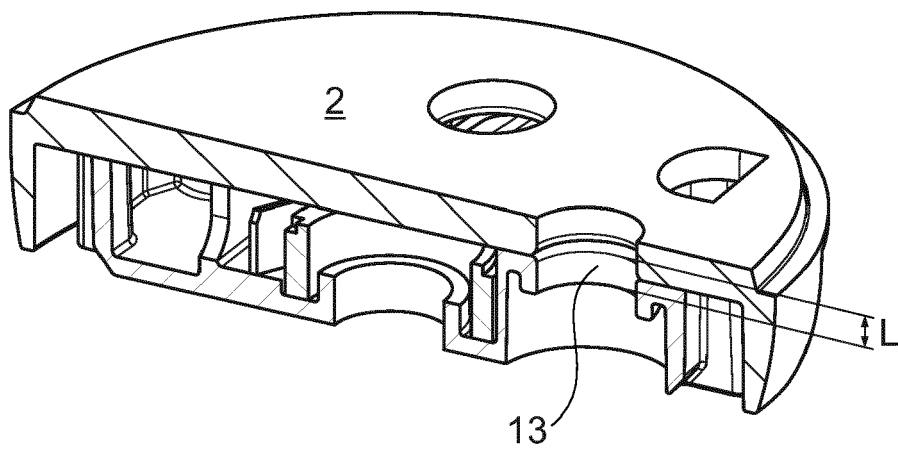


Fig. 9



EUROPEAN SEARCH REPORT

Application Number

EP 21 18 9931

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DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A	US 5 944 542 A (LEE HAN YOUNG [US]) 31 August 1999 (1999-08-31) * figures 1-8 * * columns 1-5 *	1-11	INV. H01R13/453
A	US 8 075 325 B1 (KAO SELVIN [US] ET AL) 13 December 2011 (2011-12-13) * figures 1A-10 * * columns 4-8 *	1	
A	DE 27 01 188 A1 (SAUER ARTUR) 20 July 1978 (1978-07-20) * figures 1-7 * * pages 1-11 *	1	
			TECHNICAL FIELDS SEARCHED (IPC)
			H01R
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 18 January 2022	Examiner Kandyla, Maria
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10	Patent document cited in search report	Publication date	Patent family member(s)	Publication date
	US 5944542	A	31-08-1999	NONE
	US 8075325	B1	13-12-2011	NONE
15	DE 2701188	A1	20-07-1978	NONE
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Patent documents cited in the description

- US 3980372 A [0004]