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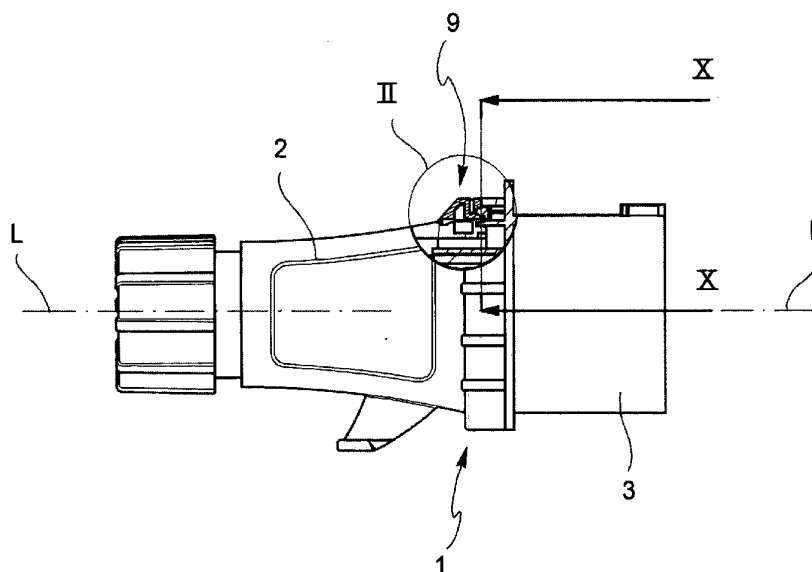
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(54) **Body for electrical socket or plug**

(57) A body (1) for electric plug or socket comprises a gripping member (2); a modular device-holding member (3); and rotative coupling means (5, 6, 7, 8); as well as a locking device (9) with an engaging portion (10) connected to one of the gripping (2) and modular device-holding (3) elements; a locking member (11) connected

to the other of the gripping (2) and modular device-holding (3) elements, and which can be moved between a locking position and a release position. The locking device (9) comprises detent means (18) which, upon a rotative coupling in the closing position, prevent a return of the locking member (11) from the release position to the locking position.



**FIG. 1**

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**Description**

**[0001]** The present invention generally relates to electrical sockets or plugs for industrial or service sector use, and particularly relates to the body of such sockets or plugs.

**[0002]** The known electrical sockets or plugs for use in the industrial or service sector comprise a body and a connecting modular device received in the body and provided with pins for the electric contact coupling with the alveoluses of a complementary socket, or alveoluses for the electric contact coupling with the pins of a plug.

**[0003]** The body is usually composed of a gripping member and a modular device-holding member mutually constrained in the axial direction through a bayonet coupling.

**[0004]** In the known devices, such bayonet coupling is locked by the return of a leaf spring between the parts of the two members to be coupled, which is intended to prevent an unintentional or accidental disengagement of the two co-jointed members.

**[0005]** However, the leaf spring return involves production and assembling problems for the electrical socket or plug.

**[0006]** A further known solution provides the mutual locking of the two coupled members by means of an elastic tongue which is manufactured as one piece with one of the body plug members, and adapted to snap engage a resting shoulder of the other body plug member. Such solution, while being advantageous from the manufacturing point of view, turns out to be hardly unblocked, due to the need to press a screwdriver tip against the elastic tongue, while concomitantly performing a relative rotation of the two body plug members.

**[0007]** Therefore, the object of the present invention is to propose a body for electric plug or socket having such characteristics as to obviate at least some of the drawbacks cited with reference to the prior art.

**[0008]** Within the scope of the main object, a particular object of the present invention is to propose a body for electric plug or socket, in which the coupling of the gripping and modular device-holding members can be locked and unlocked by means of simple manual operations, which do not require a particular dexterity.

**[0009]** This and other objects are achieved by a body for electric plug or socket for industrial or service sector use, comprising:

- a gripping member;
- a modular device-holding member adapted to receive a connecting modular device;
- rotative coupling means, e.g., of the bayonet or threaded type, formed on said gripping member and said modular device-holding member in order to carry out a coupling thereof in an axial direction of the body;
- a locking device adapted to lock said rotative coupling in a closing position, in which said locking de-

vice comprises:

- an engaging portion connected to one of the gripping and modular device-holding members;
- a locking member connected to the other of the gripping and modular device-holding members, and which can be moved between a locking position in which it can engage the engaging portion such as to prevent a relative rotation of the gripping and modular device-holding members in an opening direction of the rotative coupling, and a release position in which it does not prevent said relative opening rotation,

**15** **characterized in that** said locking device comprises detent means which, upon a rotative coupling in the closing position, prevent a return of the locking member from the release position to the locking position.

**[0010]** Due to the holding of the locking member in the release position thereof, it is possible to release the anti-rotation locking with a first movement and, by a movement which is successive and independent from the first one, to unscrew the rotative coupling in order to separate the modular device-holding member from the gripping member.

**[0011]** The dependant claims relate to advantageous embodiments.

**[0012]** In order to better understand the invention, and appreciate the advantages thereof, a detailed description of some exemplary, non-limiting embodiments will be given herein below, with reference to the annexed drawings, in which:

**[0013]** Fig. 1 is a partially sectional side view of a body for electrical socket or plug according to an embodiment of the invention;

**[0014]** Fig. 2 is an enlarged sectional view of the detail II in Fig. 1 in a locking configuration;

**[0015]** Fig. 3 is the enlarged sectional view of the detail II in Fig. 1 in a release configuration;

**[0016]** Figs. 4, 5, and 6 illustrate an opening sequence of the body for electrical socket or plug according to an embodiment of the invention;

**[0017]** Figs. 7, 8, and 9 illustrate a closure sequence of the body for electrical socket or plug according to an embodiment of the invention;

**[0018]** Fig. 10 is a partially sectional front view according to the line X-X in Fig. 1;

**[0019]** Fig. 11 is a front view of a modular device-holding member of the body for electrical socket or plug according to an embodiment;

**[0020]** Fig. 12 is a side view of the modular device-holding member in Fig. 11;

**[0021]** Fig. 13 is a side view of a modular device-holding member according to a further embodiment;

**[0022]** Fig. 14 is a side view of a modular device-holding member according to a still further embodiment;

**[0023]** Fig. 15 is an enlarged view of a detail in Fig. 14;

**[0024]** Fig. 16 is a top view of a locking member of the

body for electrical socket or plug according to an embodiment;

**[0025]** Fig. 17 is a sectional view according to the line XVII-XVII in Fig. 16;

**[0026]** Fig. 18 is a rear view of the locking member in Fig. 16;

**[0027]** Fig. 19 is a bottom view of the locking member in Fig. 16;

**[0028]** Fig. 20 is a perspective view of the locking member in Fig. 16.

**[0029]** With reference to the Figures, the body of an electric plug or socket is generally indicated with the reference numeral 1. The body 1 comprises a gripping member 2, a modular device-holding member 3 adapted to receive a connecting modular device 4, rotative coupling means, particularly of the bayonet type, for example, three radial tongues 7 (hidden and schematically indicated with a hatched line in Fig. 6) formed at a collar 8 of the gripping member 2, and three radial tongues 5 formed at a neck 6 of the modular device-holding member 3 and so configured as to carry out a coupling thereof in an axial direction L-L of the body 1.

**[0030]** The body 1 further comprises a locking device 9 adapted to lock the bayonet coupling in a closing position.

**[0031]** Such locking device 9 generally comprises an engaging portion 10 connected to one 3 of the gripping 2 and modular device-holding 3 members, as well as a locking member 11 connected to the other 2 of the gripping 2 and modular device-holding 3 members.

**[0032]** The locking member 11 is such as it can be moved between a locking position, in which it engages the engaging portion 10 such as to prevent a relative rotation of the gripping 2 and modular device-holding 3 members in an opening direction of the bayonet coupling, and a release position, in which it does not prevent such opening relative rotation.

**[0033]** In accordance with an aspect of the present invention, detent means are provided which, upon a bayonet coupling in the closing position, prevent a return of the locking member 11 from the release position to the locking position. Such detent means can be implemented, for example, through frictional, interference, or shape-coupling means. An advantageous, non-limiting embodiment of such detent means will be described herein below.

**[0034]** According to an embodiment, the locking member 11 is rotatably supported between the locking position and the release position around a transversal axis R-R, preferably perpendicular to the longitudinal axis L-L of the body 1, and comprises a seat or slit 12 for the application of a tool, for example a screwdriver tip, in order to rotate the locking member 11 to the release position.

**[0035]** The engaging portion preferably comprises a locking detent 10 movably supported in an axial direction (essentially parallel to the longitudinal axis L-L of the body 1) and urged, by first elastic means 13 towards the other member 2 in an engaging position with a seat 14 formed

in the locking member 11.

**[0036]** In accordance with an embodiment, the locking detent 10 comprises a first side surface 15 radially inwardly relative to the body 1 and inclined so that the locking member 11 movement from the locking position to the release position moves the locking detent 10 against the elastic force of the first elastic means 13 out of the locking seat 14.

**[0037]** According to a further aspect of the invention, the locking detent 10 comprises a front surface 16 facing the closure rotation direction of the body 1 and shaped as a ramp so that, during a relative rotation movement towards the body 1 closing position, the locking member 12 slides on the ramped front surface 16 and moves the locking detent 10 against the elastic force of the first elastic means 13 axially from the other member 2 in order to allow a positioning of the locking member 11 above the locking detent 10 and the snap-back of the detent 10 to the engaging position thereof in the seat 14.

**[0038]** In this context, it is advantageous to configure the locking member 11 so that the elastic stresses of the locking detent 10 in the axial direction do not involve any rotations of the same locking member 11.

**[0039]** According to a further embodiment, the locking detent 10 comprises a rear surface 17 opposite the front surface 16, and facing the opening rotation direction of the body 1. Such rear surface 17 is shaped with undercut or pawl, so that, in the locking position, a relative opening rotation of the body 1 and the consequent circumferential movement of the locking member 11 to the opening direction involve a further axial movement of the locking detent 10 towards the locking position thereof (or, in other terms: upwardly) and a mutual coupling with the locking seat 14, so as to ensure a locking.

**[0040]** According to an embodiment, the locking detent 10 comprises a second side surface 18, opposite the first side surface 15 and so configured as to form an abutment which, after the snap-back of the locking detent 10 to the engaging position, holds the locking member 11 in the release position. In this manner, the locking detent 10 implements the above-mentioned locking member detent means.

**[0041]** Furthermore, a clearance 19 is advantageously formed on the rear side of the locking detent 10, which allows a return of the locking member 11 to the locking position (preferably automatic reset of the locking device 9), when a relative rotation of the gripping 2 and modular device-holding 3 members to the opening direction is performed.

**[0042]** According to an embodiment, the first elastic means 13 can comprise a plastic supporting structure, preferably axially compliant and manufactured as one piece both with locking detent 10 and member 3.

**[0043]** Figs. 12, 13, and 14 illustrate possible embodiments, according to which the first elastic means comprise a projecting tongue extending in the circumferential direction of the member 3 (Fig. 12), an arc having two side abutting points, both of which being sufficiently thin

to form elastic hinges (Fig. 14), or an arc having a first essentially rigid side abutment, and a second side abutment arranged on the side facing the opening direction, and being sufficiently thin to form an elastic hinge (Fig. 13).

**[0044]** In accordance with a further embodiment (Figs. 21 and 22), the first elastic means comprise a L-shaped projecting tongue 29 connected to the member 3, for example, to a circumferential flange 30 (different from optional radially projecting tongues of the bayonet) of such member, and having a first portion 31 essentially extending in the longitudinal direction L of the body 1 and connecting tongue 29 to the member 3, and a second portion 32 manufactured as one piece with such first portion 31, and extending in the circumferential direction relative to the longitudinal axis L. The second portion 32 ends with a projecting free end, and forms the locking detent 10.

**[0045]** According to a still further embodiment of the invention (Fig. 23), the first elastic means comprise a projecting tongue 33 connected to the member 3, for example, to a circumferential flange 30 (different from optional radially projecting tongues of the bayonet) of such member. The projecting tongue 33 is, on the whole, under a L shape, with a first portion 34 essentially extending in the longitudinal direction L of the body 1 and connecting tongue 33 to the member 3, and a second portion 35 manufactured as one piece with such first portion 31, and extending in an approximately circumferential direction relative to the longitudinal axis L. The second portion 32 ends with a projecting free end, and forms the locking detent 10. Such overall L-shape is created by means of a shaft extending from a first connecting point with the member 3 to the free end, along a first L-shaped path 36, and from the free end, where the shaft is U-bent, to a second connecting point with the member 3 (near the first connecting point), along a second L-shaped path 37. Advantageously, the shaft gradually tapers along the entire length thereof, and the first and second L-shaped paths preferably lie in the same generally L-shaped plane of the tongue 33.

**[0046]** With reference again to the locking member 11 (Figs. 2, 3, 17-20), it generally comprises an outer surface 20 radially facing the body 1 outer part and defining the above-mentioned tool seat 12 to receive a screwdriver tip, an inner surface 21 radially facing the body 1 inner part, a lower surface 22 defining the locking seat 14, and two side surfaces 23 on which hinging side seats 24 of locking member 11 to member 2 are formed (in relief, or in bas-relief).

**[0047]** According to an alternative embodiment, the locking member 11 is manufactured as one piece with the member 2 and is connected to the latter by a portion having a thickness sufficiently thin to perform a hinging between locking member 11 and member 2.

**[0048]** The above-mentioned tool seat 12 can be configured as a slit which is open on a single side (preferably radially outer) or, alternatively, as a bevelling or notch which is open on two sides, in order to allow the insertion

of a tool (screwdriver tip) into the space which has been thus obtained between locking member and member 2.

**[0049]** According to an advantageous aspect of the invention, the locking member 11 is configured so that, at least in the locking position, the direction of the elastic force applied by the locking detent 10 on the locking member 11 lower surface 22 is oriented relative to the locking member 11 rotational axis defined by the hinging seats 24, so as not to create any release moments, and preferably so as to create a moment which urges the locking member 11 to the locking position.

**[0050]** In accordance with an embodiment, in the locking position of the locking member 11, the direction of the elastic force applied by the locking detent 10 on the locking member 11 lower surface 22 and the locking member 11 rotational axis lie in a same plane, which is essentially parallel to the body 1 longitudinal axis L-L.

**[0051]** The lower surface 22 forms, on the side facing the closure rotation direction, a ramp 25 (Fig. 19) adapted to cooperate with the locking detent 10 front surface 16 in order to promote the locking detent 10 movement and the locking member 11 positioning above the locking detent 10 during the closure of the bayonet-type connection.

**[0052]** Similarly to what has been previously described with reference to the locking detent, the locking seat 14 comprises a side surface 26 which is radially inner and inclined so as to cooperate with the corresponding locking detent 10 surface 15, so that the locking member 11 movement from the locking position to the release position moves the locking detent 10 against the elastic force of the first elastic means 13 out of engagement with the seat 14.

**[0053]** According to an aspect of the present invention, it is generally highly advantageous (even not being indispensable) that the inclined surfaces 16, 25, which move the locking detent during the relative closure rotation of the gripping and modular device-holding members, and the inclined surfaces 15, 26, which move the locking detent during the locking member rotation from the locking position to the release position, are mutually distinct and spaced apart, so as to make the two functions independent.

**[0054]** In order to achieve an automatic reset of the locking device once the locking member has been disengaged and stopped in the release position, it is advantageous to provide second elastic means 27 acting between locking member 11 and member 2 so as to elastically urge the locking member 11 to the locking position thereof. Such second elastic means can be implemented, for example, by one or more elastic tongues which are manufactured as one piece with the locking member 11 and extending from the inner side 21 thereof so that a free end thereof elastically abuts against the member 2 (Fig. 20).

**[0055]** In accordance with a further embodiment, one or more stop cams or little teeth 28 can be provided, which are adapted to signal when the closing position is reached by means of a perceptible and/or audible clicking

sound. Advantageously, such little teeth 28 can be formed on the bayonet-type device radial tongues (Fig. 11).

**[0056]** The locking device individual members can be made of the same material, preferably plastic or, alternatively, of different materials, for example, metallic materials, and connected to the members 2 and 3. In particular, locking member, locking portion, and first and/or second elastic means can be manufactured separately from different materials and subsequently connected to the body 1.

**[0057]** The body for electrical socket or plug according to the present invention has a number of advantages. During the opening step, the movement is divided in two different stages, which can be easily performed without experience or particular dexterity. The tool tip acts upon a component (tool seat) which is distinct and spaced apart from locking detent and locking seat, which remain protected, so that damages due to improper or unduly constrained use of the tool do not negatively affect the locking and releasing function of the coupling.

**[0058]** Furthermore, both the locking device locking and reset occur automatically, without any manual intervention, and only the locking member release (which rarely occurs, and only in exceptional cases) involves an additional manual intervention (which, by the way, is required due to safety reasons).

**[0059]** It shall be apparent that to the body for electrical socket or plug according to the present invention, one of ordinary skill in the art, with the aim of meeting contingent, specific, needs, will be able to make further modifications and variations, all of which fall anyhow in the protection scope of the invention, as defined by the following claims.

## Claims

1. A body (1) for electric plug or socket for industrial or service sector use, comprising:

- a gripping member (2);
- a modular device-holding member (3) adapted to receive a connecting modular device (4);
- rotative coupling means (5, 6, 7, 8) formed at said gripping member (2) and at said modular device-holding member (3) in order to carry out the coupling thereof in an axial direction (L) of the body (1);
- a locking device (9) adapted to lock said rotative coupling in a closing position, in which said locking device (9) comprises:

- an engaging portion (10) connected to one of the gripping (2) and modular device-holding (3) elements;
- a locking member (11) connected to the other of the gripping (2) and modular device-holding (3) elements, and which can be

moved between a locking position, in which it can engage the engaging portion (10) such as to prevent a relative rotation of the gripping (2) and modular device-holding (3) elements to an opening direction of the rotative coupling, and a release position, in which it does not prevent said relative opening rotation,

**characterized in that** said locking device (9) comprises detent means (18) which, upon a rotative coupling in the closing position, prevent a return of the locking member (11) from the release position to the locking position.

2. The body (1) for electric plug or socket according to claim 1, wherein said locking member (11) is rotatably supported between locking position and release position around a transversal axis (R-R), preferably perpendicular to the longitudinal axis (L) of the body (1), and comprises a seat (12) or attachment slit for the application of a tool, in order to rotate it to the release position.
3. The body (1) for electric plug or socket according to claim 1 or 2, wherein said engaging portion (10) comprises a locking detent (10) movably supported in an axial direction (L) of the body (1), and wherein first elastic means (13) urge the locking detent (10) towards said other member (2) in an engaging position with a locking member (11) seat (14).
4. The body (1) for electric plug or socket according to claim 3, wherein said locking detent (10) comprises a first side surface (15) inclined so that a locking member (11) movement from the locking position to the release position moves the locking detent (10) against the elastic force of the first elastic means (13) out of engagement with said locking member (11) seat (14).
5. The body (1) for electric plug or socket according to claim 4, wherein said locking detent (10) comprises a front surface (16) facing the closure rotation direction of the body (1) and being ramp-shaped, so that a locking member (11) circumferential movement towards the body (1) closing position moves the locking detent (10) against the first elastic means (13) elastic force in the axial direction from said other member (2) in order to allow a positioning of the locking member (11) above the locking detent (10) and the detent snap-back to the engaging position thereof in said seat (14).
6. The body (1) for electric plug or socket according to claim 5, wherein said locking member (11) is configured so that the locking detent (10) elastic stresses in the axial direction do not involve any rotations of

- the locking member (11).
7. The body (1) for electric plug or socket according to claim 5, wherein said locking detent (10) comprises a rear surface (17) opposite the front surface (16) and facing the body (1) opening rotation direction and shaped with an undercut or pawl, so that, in the locking position, a locking member (11) circumferential movement to the body (1) opening direction involves a further axial movement of the locking detent (10) towards the locking position thereof, and a mutual engagement with said seat (14), so as to ensure a locking. 5
  8. The body (1) for electric plug or socket according to claim 4, wherein said locking detent (10) comprises a second side surface (18), opposite said first side surface (15) and so configured as to form an abutment which, after the locking detent (10) snap-back to the engaging position, holds the locking member (11) in the release position. 10
  9. The body (1) for electric plug or socket according to claim 8, wherein a clearance (19) is formed on the locking detent (10) rear side, which allows the locking member (11) abutted against the locking detent (10) second side surface (18) coming back to the locking position following a relative rotation of the gripping (2) and modular device-holding (3) elements to the opening direction. 15
  10. The body (1) for electric plug or socket according to claim 3, wherein said first elastic means (13) comprise an axially compliant supporting structure made of plastic and manufactured as one piece with locking detent (10) and said one member (3). 20
  11. The body (1) for electric plug or socket according to claim 10, wherein said first elastic means (13) comprise a L-shaped projecting tongue (29; 33) connected to the member (3) and having a first portion (31) essentially extending in the body (1) longitudinal direction (L) and connecting tongue (29) to member (3), and a second portion (32) extending in the circumferential direction relative to the longitudinal axis (L). 25
  12. The body (1) for electric plug or socket according to claim 10, wherein said first elastic means (13) comprise an arc having two side abutting point, both of which being sufficiently thin to form elastic hinges. 30
  13. The body (1) for electric plug or socket according to claim 10, wherein said first elastic means (13) comprise an arc having a first essentially rigid side abutment, and a second side abutment arranged on the side facing the opening direction, and which is sufficiently thin to form an elastic hinge. 35
  14. The body (1) for electric plug or socket according to any preceding claim, wherein said locking member (11) comprises:
    - an outer surface (20) radially facing the body (1) outer part and defining a tool seat (12) adapted to receive a screwdriver tip;
    - an inner surface (21) radially facing the body (1) inner part;
    - a lower surface (22) defining a seat (14) in order to receive a locking detent (10) of said engaging portion;
    - two side surfaces (23) on which side seats (24) hinging the locking member (11) to said other member (2) are formed. 40
  15. The body (1) for electric plug or socket according to claim 14, wherein, in the locking position of the locking member (11), the direction of the elastic force applied by the locking detent (10) on the locking member (11) lower surface is oriented relative to the locking member (11) rotational axis defined by said hinging seats so as to generate a moment which urges the locking member (11) to the locking position. 45
  16. The body (1) for electric plug or socket according to claim 15, wherein, in the locking position of the locking member (11), the direction of the elastic force applied by the locking detent (10) on the locking member (11) lower surface and the locking member (11) rotational axis (R-R) lie in a plane which is essentially parallel to the body (1) longitudinal axis (L). 50
  17. The body (1) for electric plug or socket according to claim 14, wherein said lower surface (22) forms, on the side facing the closure rotation direction, a ramp (25) adapted to cooperate with the locking detent (10) front surface (16) in order to promote the locking detent (10) movement and the locking member (11) positioning above the locking detent (10) during the closure of the rotative connection. 55
  18. The body (1) for electric plug or socket according to claim 14, wherein said locking seat (14) comprises an inclined side surface (26) cooperating with a correspondent locking detent (10) surface so that the locking member (11) movement from the locking position to the release position moves the locking detent (10) against the elastic force of the first elastic means (13) out of engagement with the locking seat (14).
  19. The body (1) for electric plug or socket according to claim 5, wherein the inclined surfaces which move the locking detent (10) during the closure relative rotation of the gripping (2) and modular device-holding (3) elements and the inclined surfaces which

move the locking detent (10) during the locking member (11) rotation from the locking position to the release position are mutually distinct and spaced apart, so as to make the two functions independent.

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- 20.** The body (1) for electric plug or socket according to any preceding claim, wherein said locking device (9) comprises second elastic means (27) acting between said locking member (11) and said other member (2) so as to elastically urge the locking member (11) to the locking position thereof, such as to perform an automatic reset. 10
- 21.** The body (1) for electric plug or socket according to claim 20, wherein said second elastic means (27) 15 comprise one or more elastic tongues which are manufactured as one piece with said locking member (11) and having a free end abutting against said other member (2). 20
- 22.** The body (1) for electric plug or socket according to any preceding claim, comprising one or more stop 25 projections (28) which are adapted to signal when the closing position is reached by means of a perceptible clicking sound. 25
- 23.** The body (1) for electric plug or socket according to any preceding claim, wherein said locking device (9) is configured so as to allow a reset even or only after 30 a manual compression on the locking member. 30

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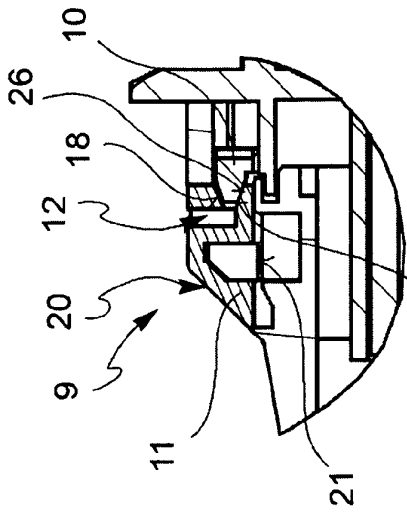


FIG. 2

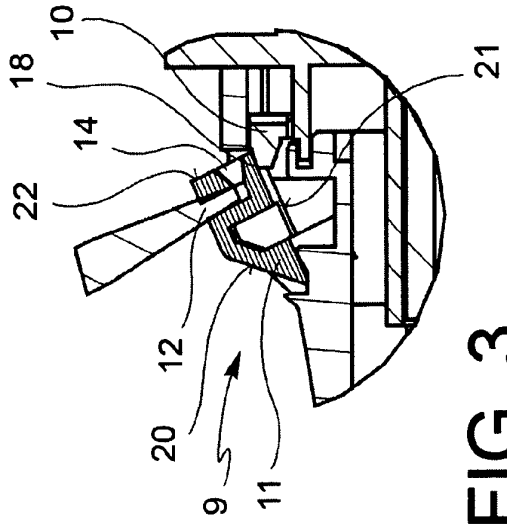


FIG. 3

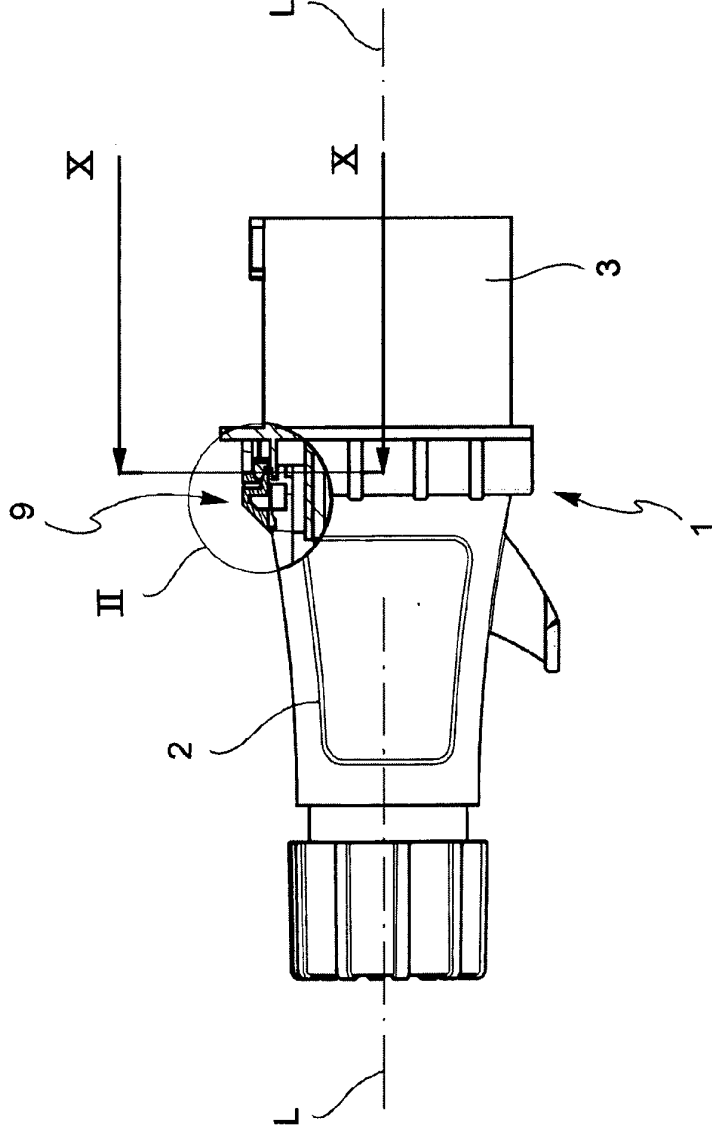


FIG. 1



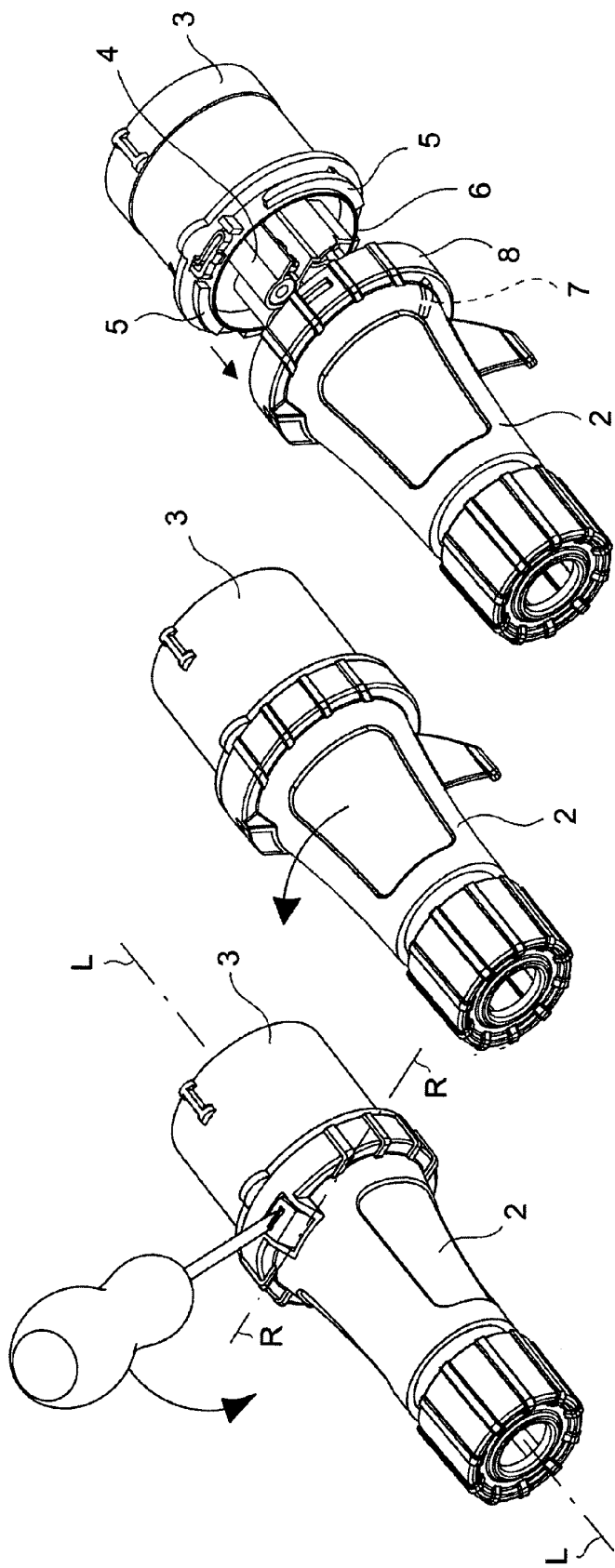


FIG. 6

FIG. 5

FIG. 4

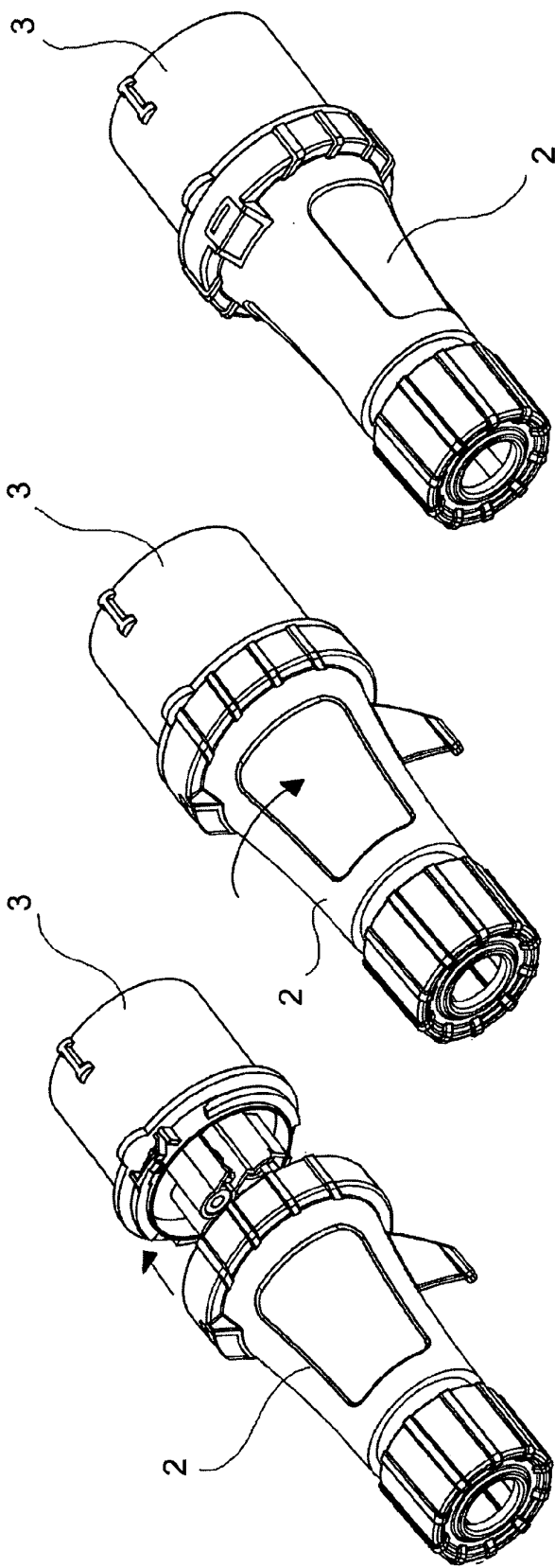


FIG. 9

FIG. 8

FIG. 7

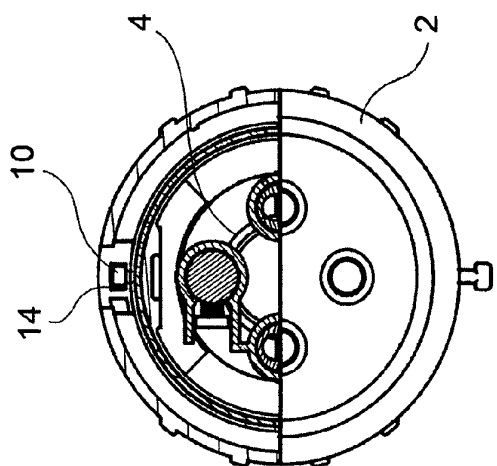


FIG. 10

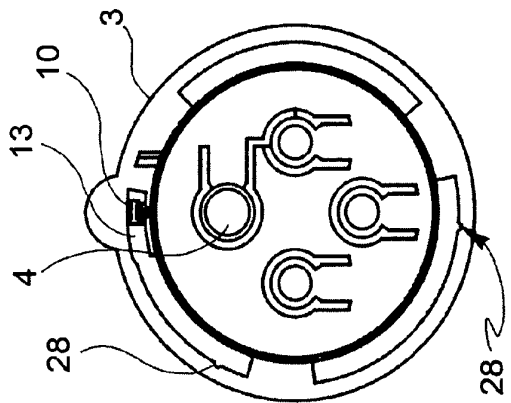


FIG. 11

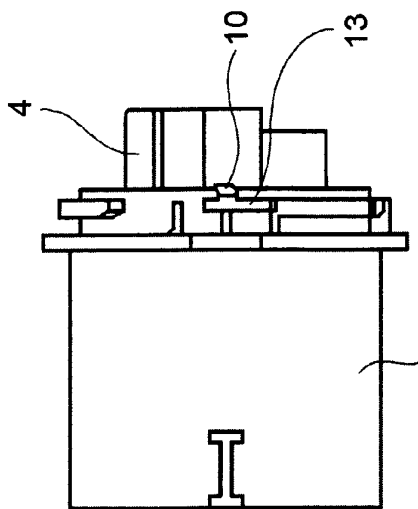


FIG. 12

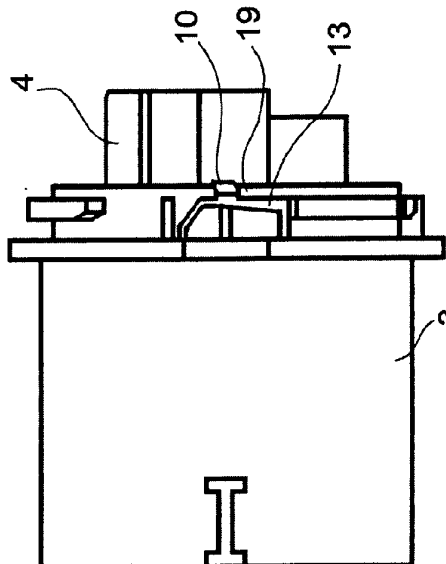


FIG. 13

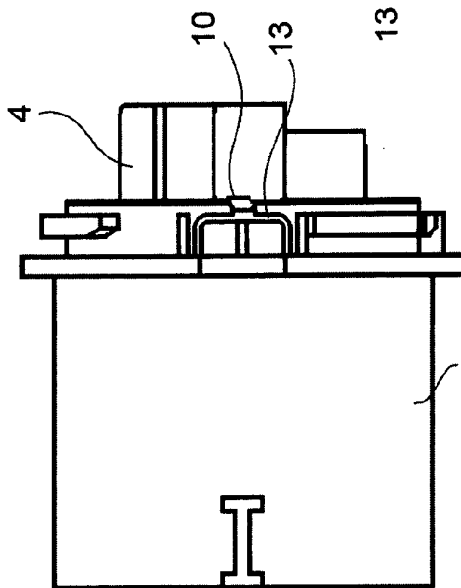


FIG. 14

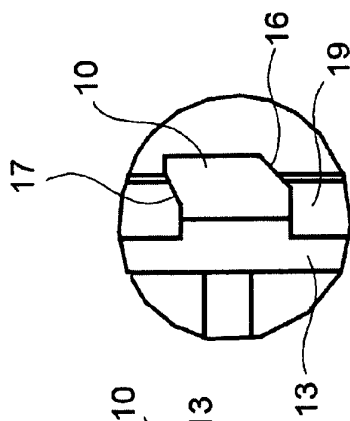


FIG. 15

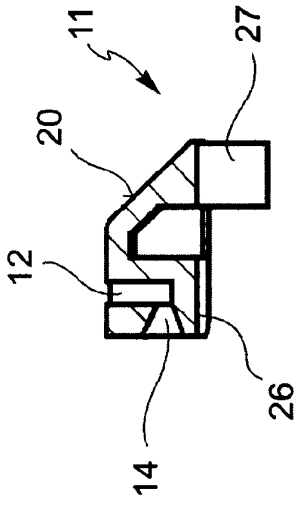


FIG. 17

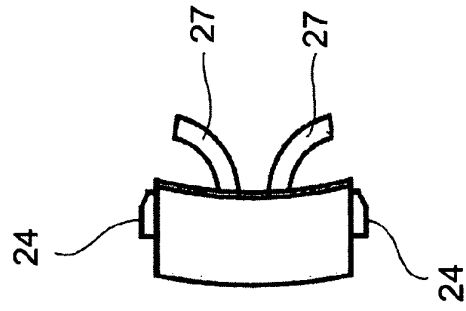


FIG. 18

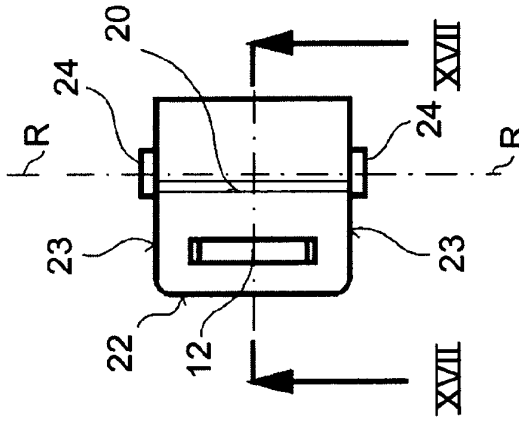


FIG. 19

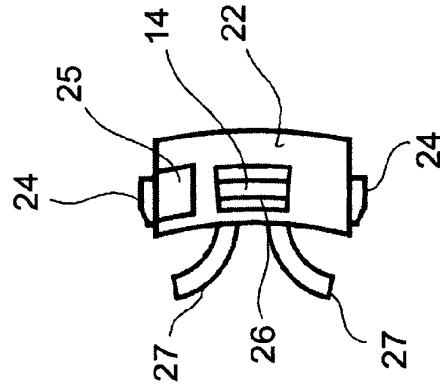


FIG. 20

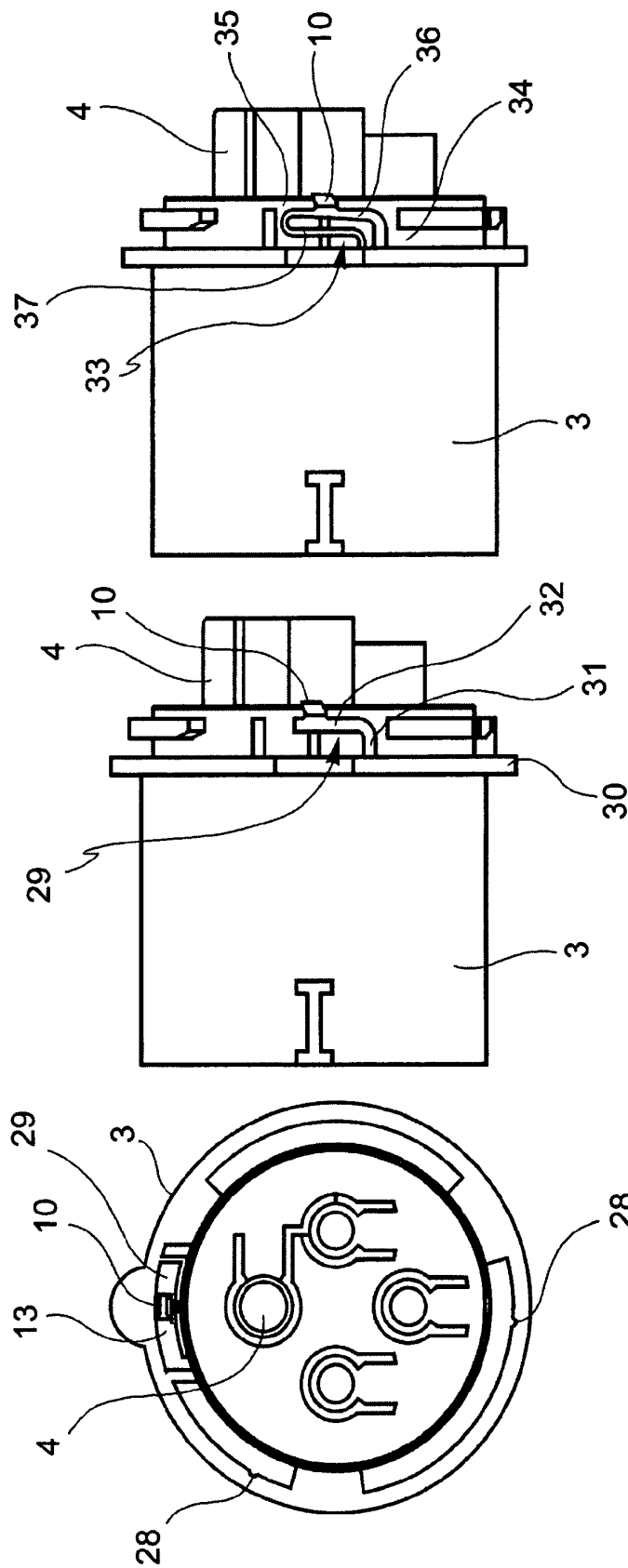


FIG. 23

FIG. 22

FIG. 21



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Place of search Munich		Date of completion of the search 13 August 2008	Examiner Chelbosu, Liviu
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