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(54) A cable clamp for an electrical connector

(57) A cable clamp comprises at least two flanging or clamping elements (21, 22) suitable for being pivotally assembled for flanging at least one cable wire (50), each of said flanging elements (21, 22) having at least one notch (23) intended for cooperating with a notch (24) in another of the flanging elements (21, 22), the relative rotation of the two flanging elements (21, 22) allowing said notches (23, 24) to be brought closer together for forming at least one flange by means of which the cable wire (50) is flanged by the cable clamp, and a locking key (30) intended for being driven in translation and comprising at least one projection (31) that is suitable for cooperating by means of a cam effect with at least one of the flanging elements (21, 22) so as to make it rotate, by means of translation of the locking key (30), for bringing the notches (23, 24) closer together as far as a position corresponding to the formation of the flange or flanges, then lock it in this position in which the cable wire or wires (50) are flanged or clamped.

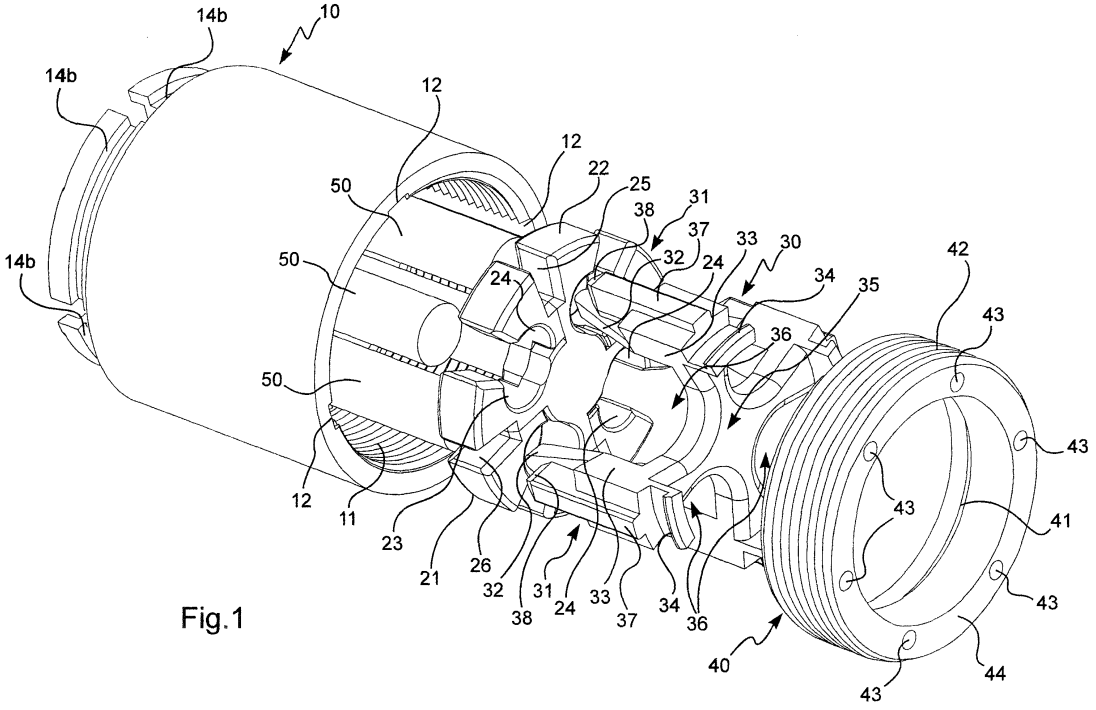


Fig.1

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Description

[0001] The present invention relates to a cable clamp for an electrical connector, in particular it relates to the type provided for a plurality of cable wires.

[0002] Needs in the field of electrical connections have increased in recent years and the design of connectors has progressed from single connectors for signal transmission cables to an increasing number of connectors intended for complex cables, shielded cables, coaxial cables, triaxial cables or even quadraxial cables, and also power cables.

[0003] The increase in the number and size of cable wires per connector has made it necessary to provide devices for reducing stresses in the connectors that are induced by the cables. Conventionally these devices for reducing stresses are in the form of cable clamps positioned at a specific distance from a trailing end of the electrical connector so as to prevent the angle of incidence from becoming too large.

[0004] Moreover, the standardization and design of the connectors are practically fixed, and the only discernible developments relate to additional inserts, which, however, do not ensure sufficient mechanical resistance to the stresses imposed by the cables, in particular due to the large diameters of the wires thereof.

[0005] In most cases, the cable clamps are in the form of a ring which is placed onto the wires of the cable at a specific distance from the trailing end of the connector. The ring is provided with two complementary elements that are provided for tightening the cable wires by means of a mechanical device such as, for example, a screw or a rivet.

[0006] These well-known devices, which are disclosed in the American military standard MIL-C-85049, have the drawback of being in the form of an additional element that must be added to the connector and of needing an additional tightening process that requires specific tools, for example a screwdriver or riveting tongs.

[0007] The object of the present invention is to overcome these drawbacks.

[0008] According to the present invention there is provided a cable clamp for an electrical connector for connection to at least one electrical cable wire, comprising: at least two flanging or clamping elements suitable for being pivotally assembled in planes, which are substantially perpendicular to a longitudinal axis of the cable wire or cable wires to be flanged or clamped, so as to flange or clamp said cable wire or wires, each of said flanging or clamping elements having at least one notch intended to cooperate with a notch in another of the flanging or clamping elements, the relative rotation of the two flanging or clamping elements allowing said notches to be brought closer together for forming at least one flange by means of which a cable wire is flanged or clamped by the cable clamp; and a locking key intended for advancement including at least one projection that is suitable for cooperating by means of a cam effect with at least one of the flanging elements so as to make it rotate by means of translation of the locking key, and for bringing the notches closer together as far as a relative angular position corresponding to the formation of the flange or flanges is concerned, and then lock it in this position in which the cable wire or wires are flanged or clamped by the cable clamp.

[0009] In a preferred embodiment the clamp is configured for connection to a plurality of electrical cable wires.

[0010] The invention has the advantage that it does not require an additional tightening process, this being carried out by means of the locking key when the connector is assembled. Moreover, this solution is very compact because it allows the cable clamp to be arranged in immediate proximity to a trailing end of the connector, advantageously in the cable clamp body connected thereto. Moreover, it allows the cable wires, which are connected to electrical contact pins of the connector, not only to be tightened, but also to be flanged, i.e. to be individually and firmly held in position, thereby advantageously reducing stresses, in particular.

[0011] Advantageously, the notches are provided in the flanging elements so as to allow the or each of the cable wires to be positioned in an axis of the electrical contact pin of the connector to which the cable wire is intended to be connected. In other words, the cable clamp is adapted to the connector with which it is intended to cooperate.

[0012] Preferably, the cable clamp is accommodated in a cable clamp body intended for being connected to a trailing end of the connector;
the notches in the flanging element have a circular profile;
in the position in which the cable wires are flanged by the cable clamp, each flange completely or partially clamps the associated cable wire;
the flange formed by bringing the notches in the flanging elements closer together has a circular or substantially circular profile, the diameter of which is smaller than the diameter of the cable wire to be flanged;
the flanging elements have a star-shaped profile comprising a predetermined number of arms, each one of which comprises at least one notch intended for cooperating with another notch in an arm of another flanging element;
the cable clamp comprises means for driving the locking key in translation;
said means for driving in translation comprise a threaded stop provided for cooperating with the locking key, its rotation in an inner thread provided in the cable clamp body causing translation of the locking key;
the locking key comprises means allowing the locking key to be locked in rotation relative to the cable clamp body;
the locking means comprise protrusions provided for cooperating with grooves formed in the body;
the locking key comprises means for connecting to the stop, which allow the locking key to be driven while leaving freedom to rotate relative to the stop;

the means for connecting the stop to the locking key comprise, on the one hand, a recess formed in the stop and, on the other hand, engagement lugs provided for engaging with the recess;
the free end of the projection or projections of the locking key exhibits at least one chamfer forming a cam profile;
the free end of the projection or projections of the locking key is in the form of a bevel forming two cam profiles;
the flanging elements each comprise at least one shoulder having a rectangular profile intended for cooperating by means of a cam effect with a free end of the projection of the locking key, for producing the relative rotation between the two flanging elements;
the threaded stop comprises means which allow it to be driven in rotation;
the cable clamp body is an electrical conductor, as are preferably the flanging elements;
sealing means are connected to the end of the cable clamp body that is remote from that which is connected to the connector;
the sealing means are in the form of an attached sleeve;
means providing electromagnetic shielding continuity are in contact with the cable clamp body;
the means providing electromagnetic shielding continuity comprise a shielding braid surrounding the end of the cable clamp body that is remote from that which is connected to the connector;
the shielding braid is accommodated in the sealing sleeve.

[0013] The present invention also relates to a connector comprising the cable clamp according to the invention.

[0014] The description below provides a non-limiting example of the cable clamp according to the invention, which is illustrated by the accompanying drawings (which are not all to the same scale), in which:

Fig. 1 is an exploded perspective view showing the elements forming the cable clamp according to the invention;
Fig. 2 shows a flanging element according to the invention;
Fig. 3 is a perspective view of a locking key for locking the two flanging elements;
Fig. 4 is a perspective view of the two flanging elements and the locking key before it is inserted;
Fig. 5 is a perspective view of the two flanging elements and of the locking key once inserted;
Fig. 6 is a cut-away view of the cable clamp according to the invention and a view of the connector and cable wires in a non-flanged position;
Fig. 7 is a cut-away view of the cable clamp according to the invention showing the connector and the cable wires in an intermediate position;
Fig. 8 is a cross-section of the cable clamp according to the invention showing the connector and the cable wires in a flanged position; and
Fig. 9 is a partial cross-section of the cable clamp according to the invention connected to the connector, and to sealing means and means providing an electromagnetic shielding continuity.

[0015] The cable clamp for an electrical connector according to the invention comprises, generally, a cylindrical cable clamp body 10 intended to be joined (in this case screwed) to a connector body, two flanging elements 21 and 22, a locking key 30 for locking the flanging elements 21 and 22 and a stop 40.

[0016] The flanging elements 21 and 22 are each generally cross-shaped and mutually complementary, thus allowing them to fit together while leaving them a specific degree of freedom for rotating relative to each other.

[0017] In this preferred embodiment, the flanging elements 21 and 22 respectively comprise on each of their arms notches 23 and 24, which can be seen, in particular, in Fig. 2, having a circular arc profile, the radius of which is substantially identical to that of an electrical cable wire 50 that is to be flanged, and also a shoulder 25 and 26 having a rectangular cross-section provided for receiving a projection 31 on the locking key 30.

[0018] In this preferred embodiment, the locking key 30, which can be seen in Fig. 3, comprises a cross-shaped base 35 which comprises at an end of each of its arms the projection 31 extending perpendicularly to said cross-shaped base 35.

[0019] Each of the projections 31 is bevelled at a free end and thus comprises on either side an inclined surface 32 extending from the free end to approximately half its height, a flat surface 33 then extending as far as the cross-shaped base 35 and perpendicularly to the arm thereof.

[0020] It is, however, conceivable in a further variation that each of the projections 31 only exhibit a semi-bevel, and thus only have one of the inclined surfaces 32 and one of the flat surfaces 33.

[0021] The shoulders 25, 26 of the flanging elements 21, 22 exhibit chamfers 27 and 28 suitable for cooperating with the inclined surfaces 32 of the projections 31.

[0022] The cross-shaped base 35 also has spaces 36 between its arms. The spaces 36 are profiled for the passage of the cable wires 50 that are to be flanged.

[0023] The locking key 30 comprises, in the extension of the projections 31, behind a zone thereof (of the arm), which is integral with the cross-shaped base 35, remote from the bevelled end, lugs 34 for engaging with a chamfer. The lugs 34 are suitable for cooperating by hooking to a recess 41 in the stop 40.

[0024] The locking key 30 also comprises a protrusion 37 along the projections 31, on an outer surface thereof

[0025] The protrusions 37, which are generally of a parallel-piped shape, are configured for penetrating grooves 12 formed in the body 10 and advantageously exhibit chamfers 38 on their three ridges which are closest to the free ends of the projections 31.

[0026] The stop 40, which is generally cylindrical in shape, comprises an outer thread 42, which complements an inner thread 11 of the body 10. A set of aper-

tures 43 are formed over a circumference of an end 44 of the stop 40 and are formed to receive one or more tools for screwing the stop 40 into the inner thread 11 of the body 10.

[0027] The special feature of the cable clamp according to the invention, as can be seen in Figs. 1, 6, 7, 8 and 9, is that the rotation of the stop 40 in the inner thread 11 of the body 10 advances the stop 40, which in turn causes the translation of the locking key 30 by means of the recess 41 and the engagement lugs 34. Since the protrusions 37 cooperate with the grooves 12 in the body 10, the locking key 30 can only be driven in translation by the stop 40. The rotation of the locking key 30 becomes impossible as soon as the protrusions 37 are engaged with the grooves 12 in the body 10.

[0028] The translation of said locking key 30, as can be seen, in particular, in Figs. 4 and 5, causes the projections 31 of the locking key 30 to penetrate the gaps formed by the shoulders 25 and 26 between the flanging elements 21 and 22. Since the projections 31 have bevel forming inclined surfaces 32 at their ends, as a result of the advancement of said projections 31, by penetrating the gaps formed by the shoulders 25 and 26 and by shape-mating with the chamfers 27 and 28 of the shoulders 25 and 26, the projections 31 cause the arms of the flanging elements 21 and 22 to be set apart and thus to rotate relative to one another.

[0029] This relative rotation of the flanging elements 21 and 22 causes the notches 24 and 23 to be brought closer together, thus forming a flange for the cable wire 50. By continuing the translation of the locking key 30, the straight portions 33 of the projections 31 are brought into contact with the shoulders 25 and 26 of the flanging elements 21 and 22, thus locking them in the flanging position of the cable wires 50 corresponding to a locking of said cable wires 50, as a result of which they are firmly held in an axis of electrical contact pins of the connector.

[0030] It should also be noted that in another embodiment it is conceivable to invert the means, allowing relative rotation of the flanging elements 21 and 22 by sufficiently increasing the size of the chamfers 27 and 28 and by reducing, or even eliminating, the bevel of the projections 31 and the size of the inclined surfaces 32, which will not change the desired effect in any way, i.e. the relative rotation of the flanging elements 21 and 22.

[0031] By inverting the direction of rotation of the stop 40, its direction of advancement in the inner thread 11 of the cable clamp body 10 is also inverted, which advancement is transmitted via the recess 41 and the engagement lugs 34 to the locking key 30, thus withdrawing the projections 31 from the gaps formed by the shoulders 25 and 26 in the flanging elements 21 and 22, thus allowing relative rotation thereof and releasing the cable wires 50 from their flanging.

[0032] The assembly, which consists of the connector for the cable clamp and the cable wires 50, can be seen in Figs. 6, 7 and 8, in the non-flanging position of the cables, in the intermediate position and in the flanging position of the cable wires 50, respectively.

[0033] It should be noted in this respect that after the cable clamp body 10 and the stop 40 have been attached to the cable wires 50, said cable wires 50 are each fixed to the electrical contact pins 15 of the connector.

[0034] The flanging elements 21 and 22 and the locking key 30 are then fitted between the cable wires 50 before the stop 40, and hence the locking key 30, are advanced as described above.

[0035] The connector/cable clamp assembly in the flanging position of the cable wires 50 can be seen in more detail in Fig. 9.

[0036] Fig. 9 shows the connector with the electrical contact pins 15, to which are fixed the cable wires 50 and the cable clamp body 10, which is screwed to the trailing end of the connector by means of a threaded connector 112, which is integral with the cable clamp body 10 via a connecting ring 13 accommodated in a peripheral recess 14a in a body of the threaded connector 112 and in a recess 14b in the cable clamp body 10.

[0037] The flanging elements 21 and 22 are in the flanging position of the cable wires 50, a position in which they are prevented form further advancement as a result of abutting an annular shoulder 111 of the cable clamp body 10.

[0038] The cable clamp according to the invention is also equipped with a means for providing tightness between the cable wires 50 and the connector, and a means for providing electromagnetic shielding continuity of the cable wires 50 in the cable clamp.

[0039] More precisely, the sealing means comprise a sleeve 70 engaged, at one of its end, to an outer sheath of the cable wires 50 and, at its other end, to an end of the cable clamp body 10 that is remote from that which is connected to the connector. In both cases, the joining at this location is provided by means of an adhesive.

[0040] The electromagnetic shielding continuity is achieved by placing shielding on the cable clamp body 10, which is in this case metallic, by means of a shielding braid 60 accommodated in the sleeve 70 for sealing and clamping the cable wires 50 by one of its ends and the cable clamp body 10 by its opposing end. A ferrule clamped by the sealing sleeve 70 holds the shielding braid 60 firmly against the cable clamp body 10.

[0041] Similarly, if each of the cable wires 50 is provided with a separate shielding braid 60, the flanging elements 21 and 22 are, preferably, an electrical conductor (metallic or metal-coated part), with the aid of which each of the individual shielding braids 60 is grounded via the flanging elements 21 and 22, the cable clamp body 10 with which they are in contact and the shielding braid 60.

[0042] Moreover, in other embodiments, the profile of the notches 23 and 24 may be semi-elliptical, semi-hexagonal, etc.

[0043] Furthermore, the locking key 30 and the stop 40 may be connected by means other than those described above, and the shoulders 25 and 26 may have a profile other than a rectangular one.

[0044] This description is given solely by way of example and in no way limits the possible variations of the invention.

Claims

1. A cable clamp for an electrical connector for connection to at least one electrical cable wire (50), comprising: at least two flanging or clamping elements (21, 22) suitable for being pivotally assembled in planes, which are substantially perpendicular to a longitudinal axis of the cable wire or cable wires (50) to be flanged or clamped, so as to flange or clamp said cable wire or wires (50), each of said flanging or clamping elements (21, 22) having at least one notch (23) intended to cooperate with a notch (24) in another of the flanging or clamping elements (21, 22), the relative rotation of the two flanging or clamping elements (21, 22) allowing said notches (23, 24) to be brought closer together for forming at least one flange by means of which the cable wire (50) is flanged or clamped by the cable clamp; and a locking key (30) intended for advancement including at least one projection (31) that is suitable for cooperating by means of a cam effect with at least one of the flanging elements (21, 22) so as to make it rotate, by means of translation of the locking key (30), and for bringing the notches (23, 24) closer together as far as a relative angular position corresponding to the formation of the flange or flanges is concerned, and then lock it in this position in which the cable wire or wires (50) are flanged or clamped by the cable clamp.

2. A cable clamp for an electrical connector according to claim 1, wherein the cable clamp is accommodated in a cable clamp body (10) intended to be connected to a trailing end of the connector.

3. A cable clamp for an electrical connector according to any one of the preceding claims, wherein the notches (23, 24) are provided in the flanging elements (21, 22) in such a way so as to allow the or each of the cable wires (50) to be positioned along an axis of an electrical contact pin (15) of the connector to which the cable wires (50) is intended to be connected.

4. A cable clamp for an electrical connector according to any one of the preceding claims, wherein the notches (23, 24) in the flanging elements (21, 22) have a circular profile.

5. A cable clamp according to any one of the preceding claims, wherein in the position in which the cable wires (50) are flanged by the cable clamp, each flange completely or partially clamps the associated cable wire (50).

6. A cable clamp according to claim 5, wherein the flange formed by bringing the notches (23, 24) in the flanging elements (21, 22) closer together has a circular or substantially circular profile, the diameter of which is smaller than a diameter of the cable wire (50) to be flanged.

7. A cable clamp according to any one of claims 1 to 5, wherein the flanging elements (21, 22) have a star-shaped profile comprising a predetermined number of arms, each one of which comprises at least one notch (23) intended for cooperating with another notch (24) in an arm of another flanging element (21, 22).

8. A cable clamp according to any one of claims 1 to 7, further comprising means for driving the locking key (30) in translation.

9. A cable clamp according to claim 8, wherein said means for driving in translation comprises a threaded stop (40) provided for cooperating with the locking key (30), and wherein translation of the locking key (31) is caused by rotation of said threaded stop (40) in an inner thread (11) provided in the cable clamp body (10).

10. A cable clamp according to any one of claims 1 to 9, wherein the locking key (30) comprises means for allowing the locking key (30) to be locked in rotation relative to the cable clamp body (10).

11. A cable clamp for an electrical connector according to claim 10, wherein the locking key (30) comprises protrusions (37) provided for cooperating with grooves (12) formed in the cable clamp body (10).

12. A cable clamp for an electrical connector according to any one of the preceding claims, wherein the locking key (30) comprises means for connecting to the stop (40), which allows the locking key (30) to be driven in translation while leaving freedom to rotate relative to the stop (40).

13. A cable clamp according to claim 12, wherein the means for connecting the stop (40) to the locking key (30) comprise, on the one hand, a recess (41) formed in the stop (40) and, on the other hand, engagement lugs (34) provided for engaging with the recess (41).

14. A cable clamp for an electrical connector according to any one of the preceding claims, wherein the free end of the arm or arms (31) of the locking key (30) exhibits at least one chamfer forming a cam profile (32).

15. A cable clamp for an electrical connector according to any one of the preceding claims, wherein the free

end of the arm or arms (31) of the locking key (30) is in the form of a bevel have two inclined surfaces (32).

16. A cable clamp for an electrical connector according to any one of the preceding claims, wherein the flanging elements (21, 22) each comprise at least one shoulder (25, 26) having a rectangular profile intended for cooperating by means of a cam effect with the free end of the arm (31) of the locking key (30), for producing the relative rotation between the two flanging elements (21, 22).

17. A cable clamp for an electrical connector according to any one of claims 9 to 16, wherein the threaded stop (40) comprises means which allow it to be driven in rotation.

18. A cable clamp for an electrical connector according to any one of the preceding claims, wherein the cable clamp body (10) and the flanging elements (21, 22) are electrical conductors.

19. A cable clamp for an electrical connector according to any one of the preceding claims, wherein sealing means is connected to an end of the cable clamp body (10) that is remote from that which is connected to the connector.

20. A cable clamp for an electrical connector according to claim 17, wherein the sealing means is in the form of an attached sleeve (70).

21. A cable clamp for an electrical connector according to any one of the preceding claims, wherein means providing electromagnetic shielding continuity is in contact with the cable clamp body (10).

22. A cable clamp for an electrical connector according to claim 21, wherein the means providing electromagnetic shielding continuity comprises a shielding braid (60) surrounding the end of the cable clamp body (10) that is remote from that which is connected to the connector.

23. A cable clamp for an electrical connector according to either claim 21 or claim 22, wherein the shielding braid (60) is accommodated in the sealing sleeve (70).

24. A connector comprising a cable clamp according to any one of the preceding claims.

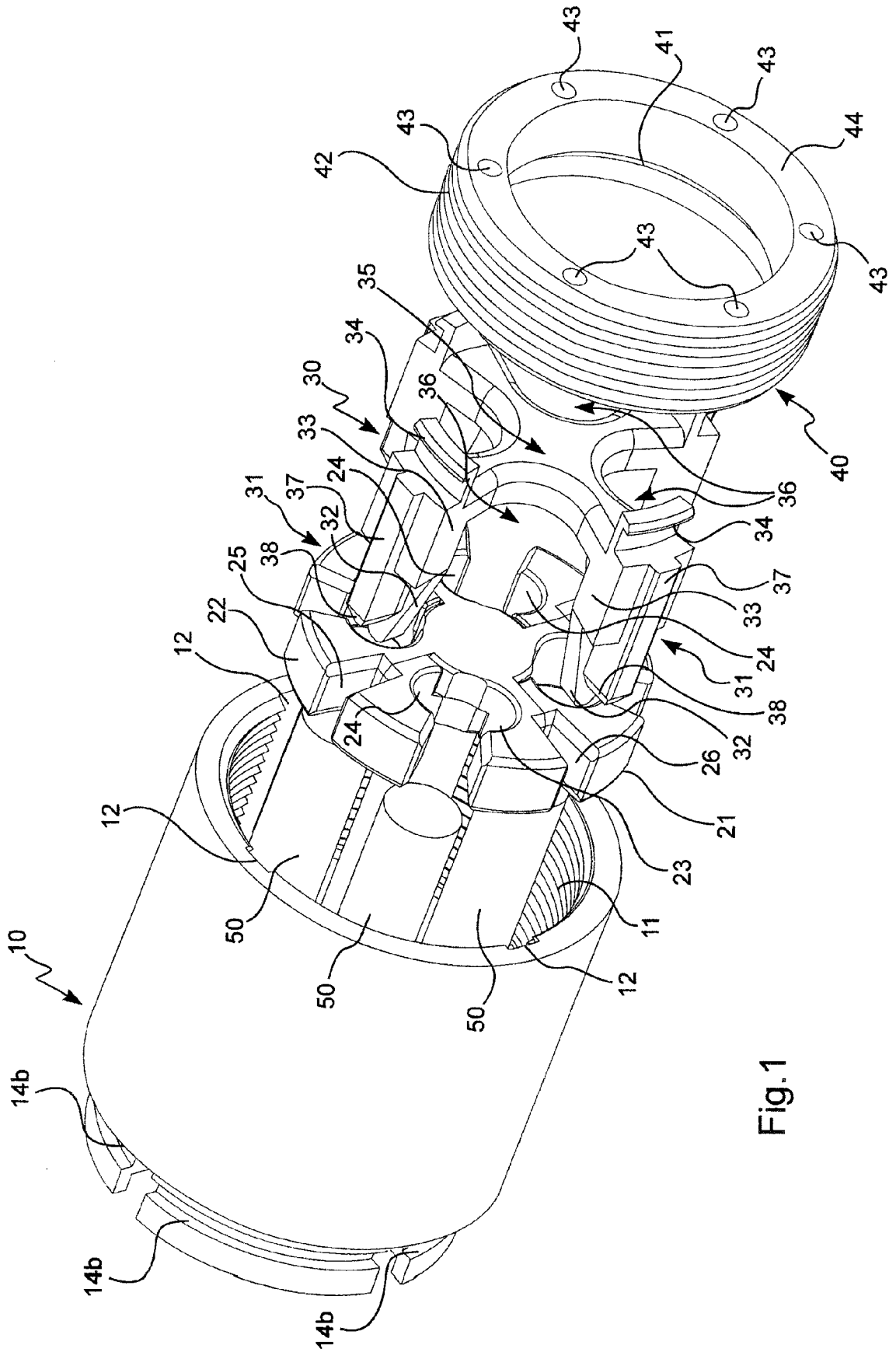

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Fig.1

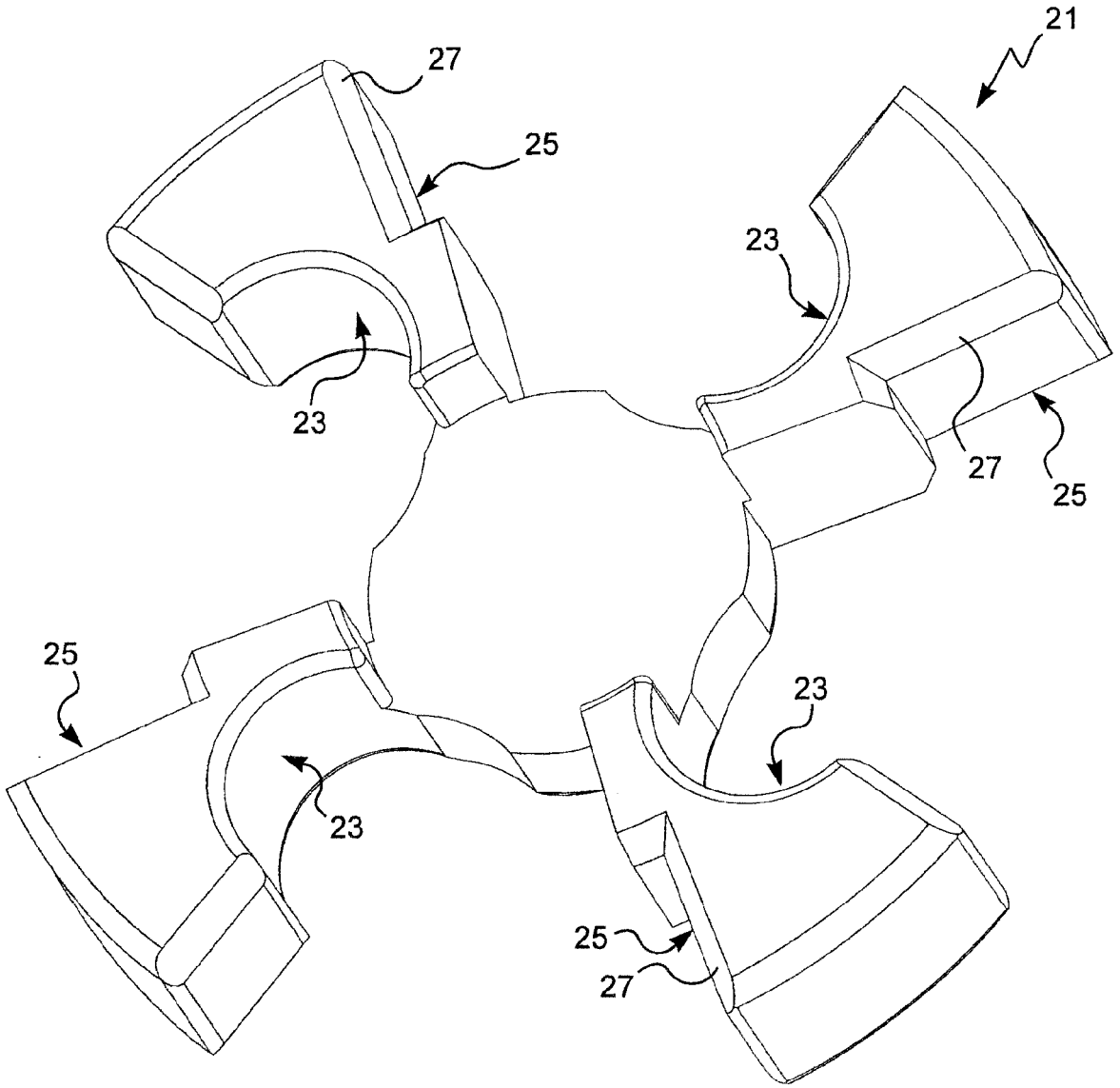


Fig.2

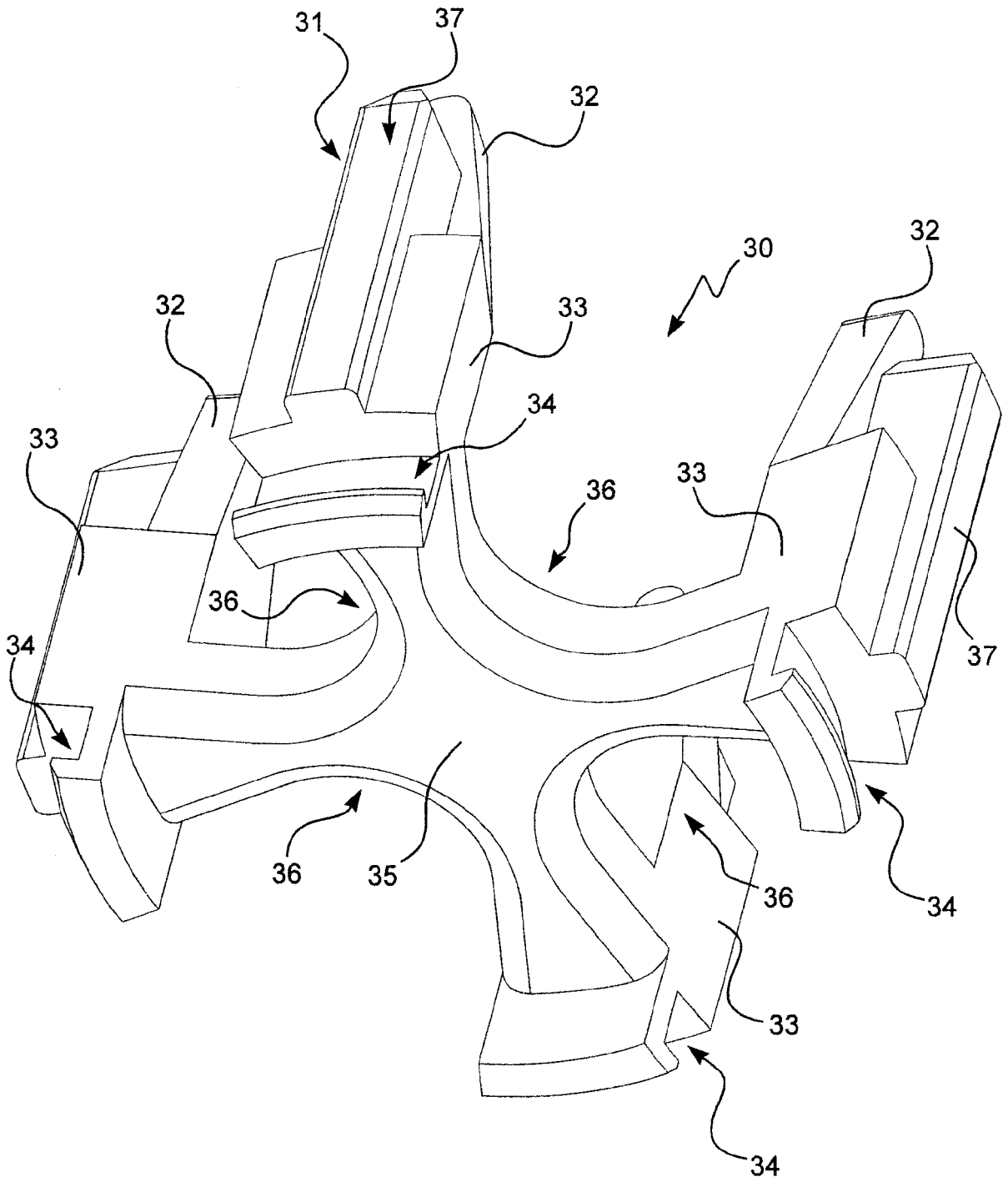


Fig.3

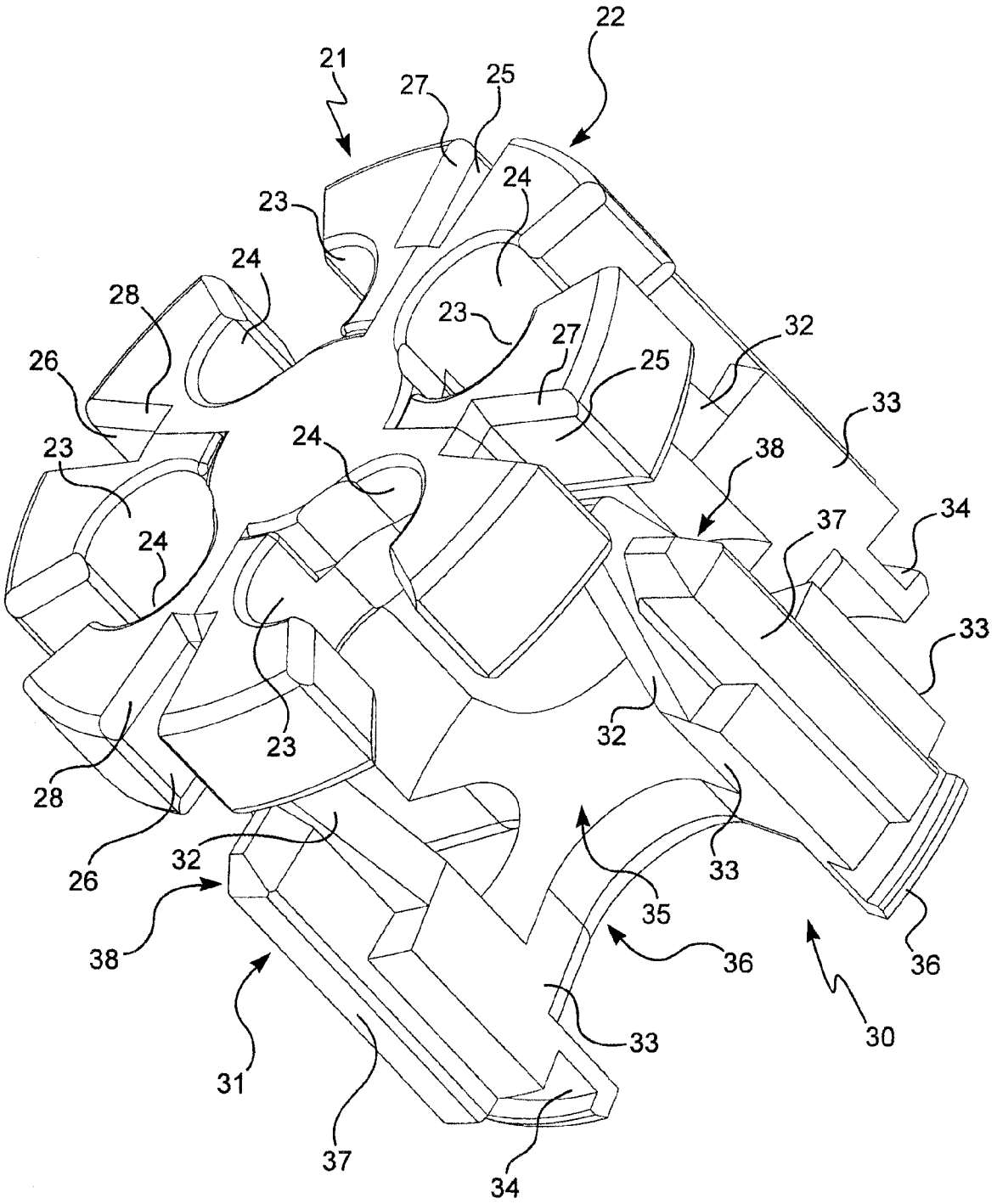

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Fig.4

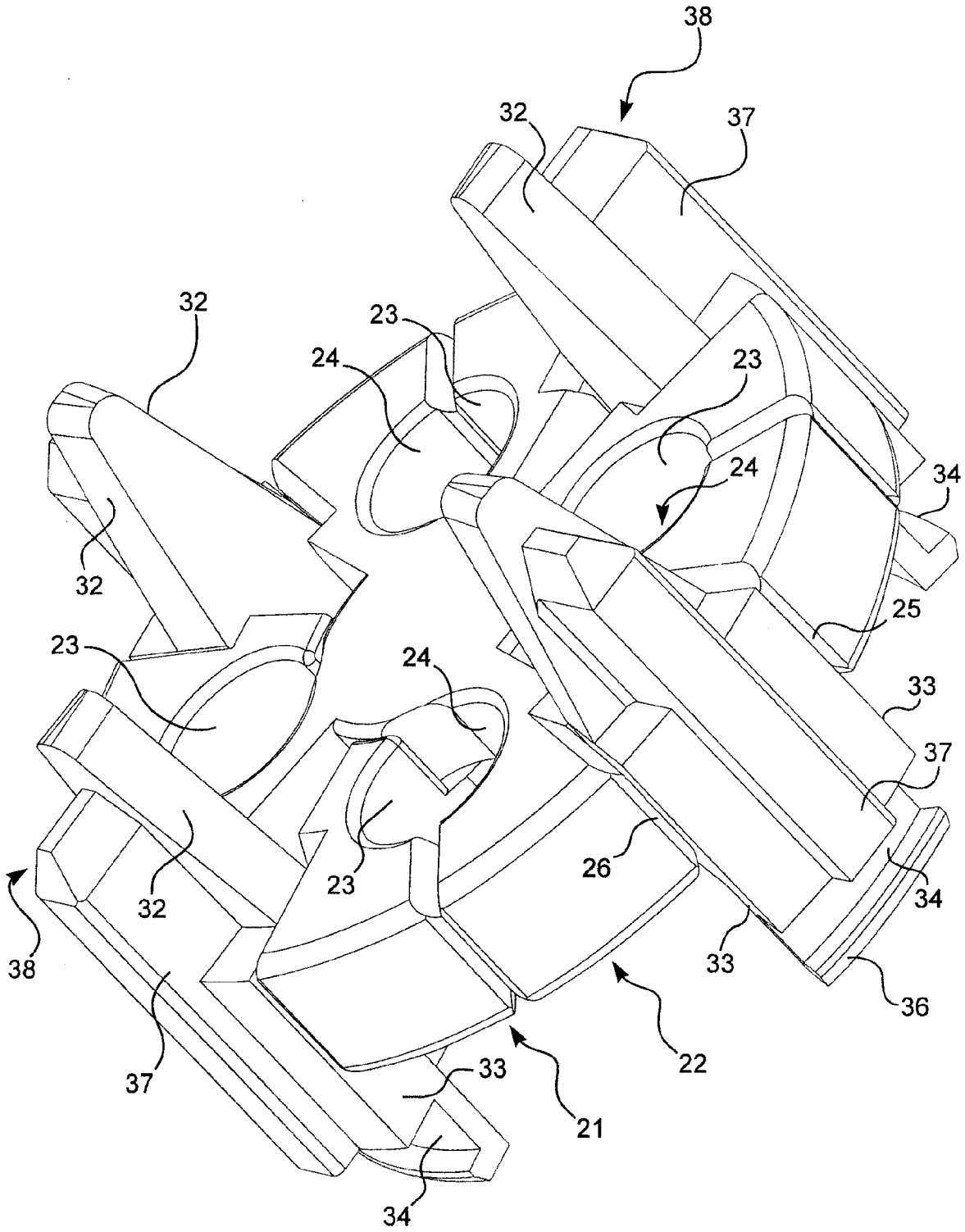

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Fig.5

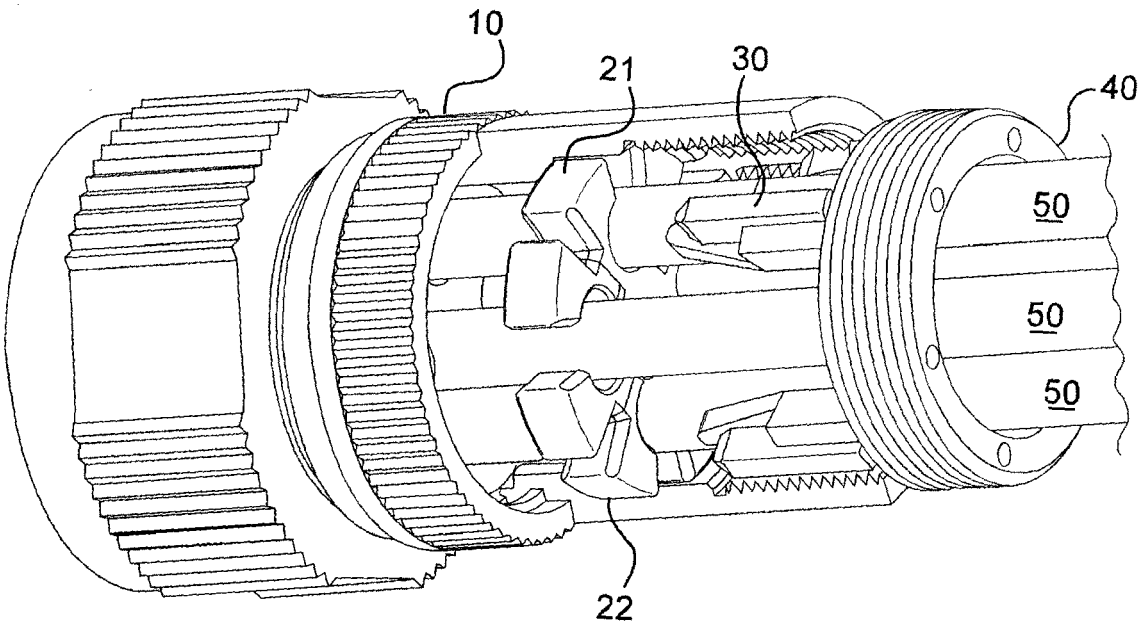


Fig.6

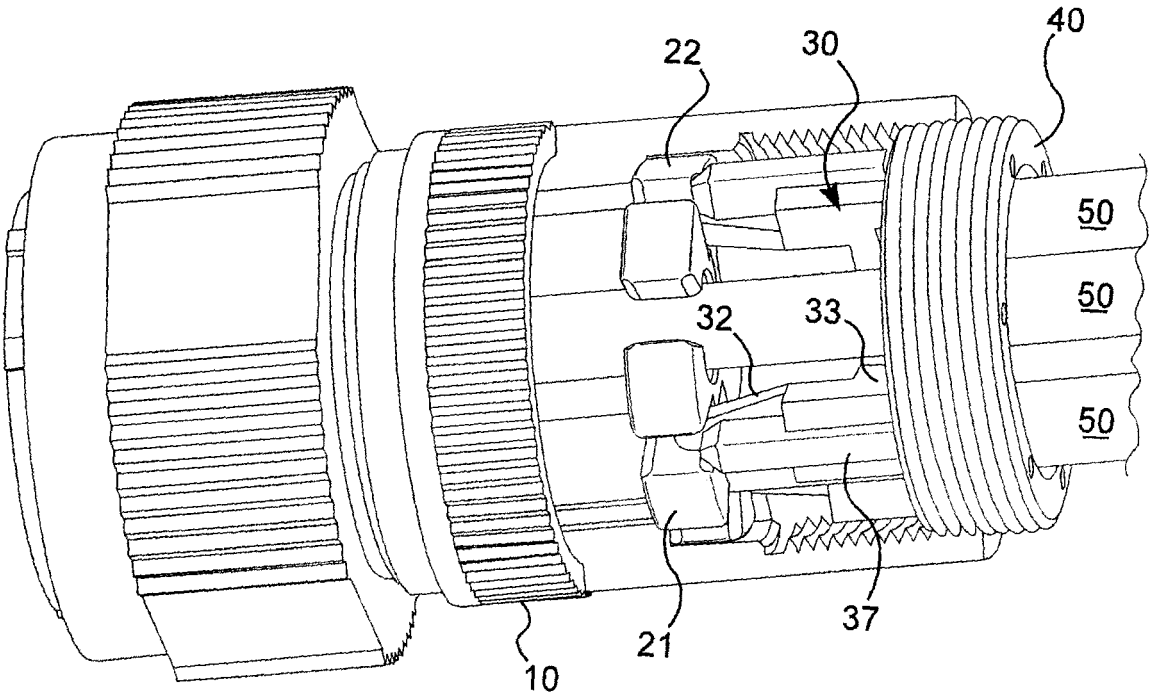


Fig.7

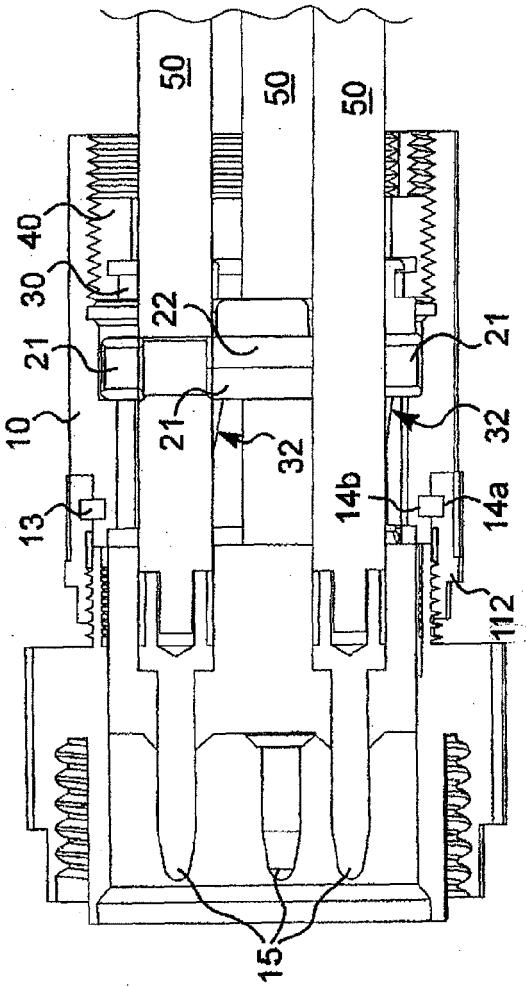

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Fig.8

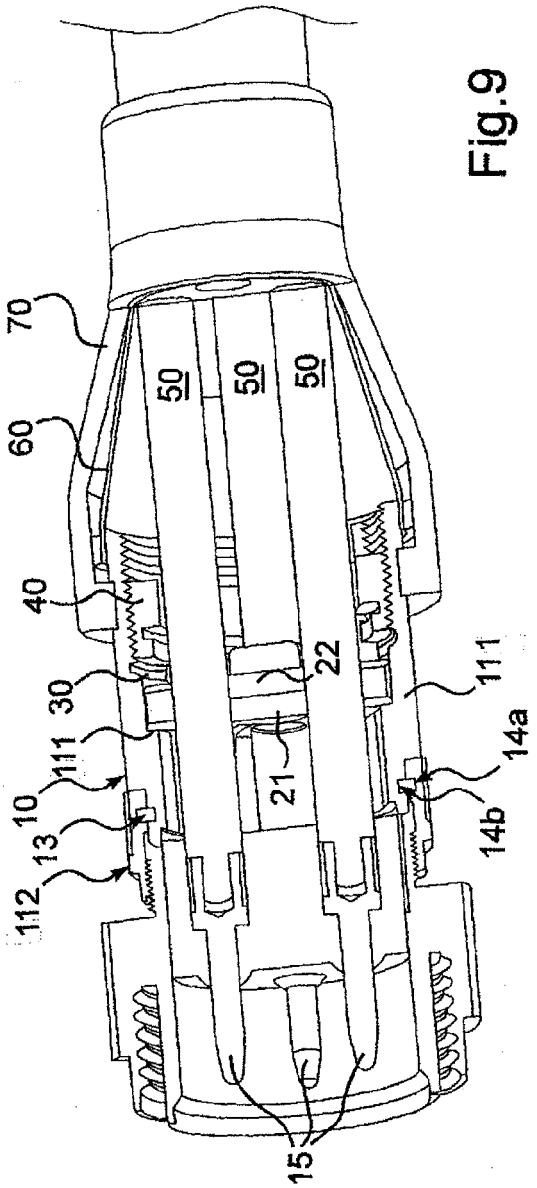

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Fig.9

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 05 11 0385

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	FR 2 579 837 A (BONHOMME FRANCOIS) 3 October 1986 (1986-10-03) * abstract; figures * * page 4, line 8 - page 8, line 15 *	1,2,8, 20,24	H01R13/59
A	US 5 211 576 A (TONKISS ET AL) 18 May 1993 (1993-05-18) * abstract; figures 4-8 * * column 3, line 42 - column 7, line 48 *	1,2,8,20	
A	EP 0 156 956 A (NIXDORF COMPUTER AKTIENGESELLSCHAFT) 9 October 1985 (1985-10-09) * abstract; figures 1-5 * * page 6, line 8 - page 14, line 9 *	1	
A	US 5 599 202 A (KEY ET AL) 4 February 1997 (1997-02-04) * abstract; figures 1-5 * * column 3, line 53 - column 5, line 39 *	1	

TECHNICAL FIELDS SEARCHED (IPC)

H01R

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	30 November 2005	Serrano Funcia, J

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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