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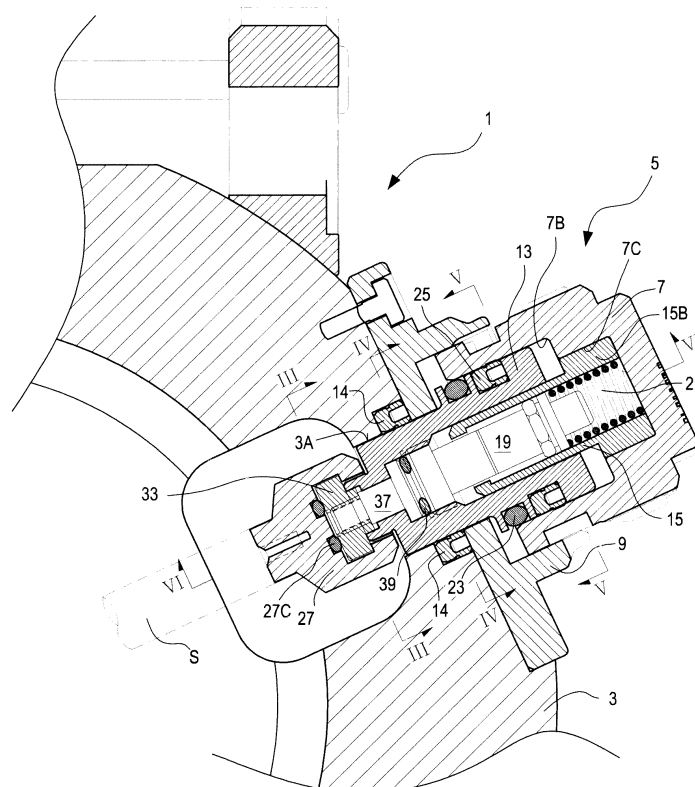
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(54) **Removable crown for timepiece**

(57) The watch comprises a case (3) for housing a clockwork, a control stem (S) and a crown (5) to actuate the stem (S) from the outside of the case, wherein the crown (5) is connected to the stem (S) through a securing

member (27) by means of an axial constraint (35, 37) and of a torsional constraint (13T, 29M) that can be released independently of each other.

Fig.2



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Description

FIELD OF THE INVENTION

[0001] The present invention relates to improvements for timepieces, for instance, but not limited to watches. Specifically, the invention relates to watches with a case for housing a clockwork and a crown that projects from the case and can be actuated to control a stem provided inside the case to set or adjust one or more functions of the watch, such as time and/or date, or to wind the clockwork.

BACKGROUND TO THE INVENTION

[0002] In mechanical and electronic watches a crown on the outer of the case is used to axially and torsionally act on a stem, i.e. to make it rotate around the axis, to act on the various mechanisms inside the watch. The stem controlled by means of the crown may be used for instance to wind up the watch when the clockwork is fully mechanical. The stem may be also used to set time and date or to act onto other functions of the watch.

[0003] To remove the clockwork (i.e. all the members moving the hands and/or other components such as the date or the like) it is necessary to remove the stem from the crown. To this end, the case back is usually removed from the case, making thus possible to access the member which connects the crown and the stem to one another, so as that the crown can be removed from the stem. US7651259 discloses an example of watch with a case having a removable case back of this type.

[0004] A gasket is provided around the case back to avoid water from entering the case. Gaskets are subject to wear and therefore require periodical maintenance and replacement, when necessary. Moreover, gaskets are elements that can be damaged or fail, above all under high pressure.

[0005] High-performance dive watches, guaranteeing water-resistance up to a depth of hundreds meters and therefore to tens atmospheres, are provided with a monobloc case, whose case back cannot be removed as it is produced in a single piece with the annular wall of the case. In this case, to remove the control stem from the crown it is necessary to leave an opening in the case back for inserting a tool, through which the stem is released from the crown, so as then to remove the watch clockwork from the top through the opening obtained by removing the transparent bezel covering the dial. US7401975 discloses a watch with a monobloc case and a hole for accessing the mechanism for releasing the crown from the control stem. The access hole is protected by means of a screw closing element with a gasket, having a diameter which is significantly smaller than that of the gasket generally used between case and case back in the watches where the case back can be removed, and is therefore less subject to failure. Anyway, also in this case it may be necessary to replace the gasket,

above all when the device is opened, as the gasket may be damaged when the closing element is removed from the case back.

5 SUMMARY OF THE INVENTION

[0006] A watch is disclosed that fully or at least partially overcomes one or more drawbacks of the prior art watches. Specifically, according to some embodiments, a watch is provided wherein the crown can be removed from the control stem inside the watch without the need for a removable case back and without the need for a hole to access the inside of the case to release the crown from the stem.

[0007] In substance, according to the invention a watch is provided, wherein the crown is connected to the control stem through a securing member by means of an axial constraint and a torsional constraint, which can be released independently of each other. In this way it is possible to act from the outside of the case, firstly releasing the axial constraint between crown and stem and then the torsional constraint, separating all the crown components that are outside or in the side wall of the case and leaving the securing member and the stem inside the case, so that they can be removed together with the watch mechanism by removing the bezel.

[0008] In advantageous embodiments, a crown is provided comprising a body movable parallel to the axis of the stem and comprising a torsional coupling profile co-acting with the securing member. Through the torsional coupling the rotation of the crown is transmitted to the stem. The crown furthermore comprises an axial constraint arrangement, connecting the crown body and the securing member of the stem to one another. In some embodiments, the axial constraint arrangement comprises a screw which extends coaxially with the torsional coupling profile and through which the crown body is axially fixed to the securing member.

[0009] With such a mechanism it is possible to remove part of the crown, and typically the crown cap, that can be torsionally constraint to the crown body, thus accessing said crown body. Once the crown body has been accessed, it can be held fixed, for instance by means of a tool, so that it does not rotate, to allow the removal of the axial constraint between body and securing member, for instance by unscrewing the screw connecting the crown body and the stem securing member. Once the screw has been removed, it is possible to remove the crown body, leaving the securing member and the stem completely inside the watch case, from which they can be removed together with the clockwork.

[0010] Features and embodiments are disclosed here below and are further set forth in the appended claims, which form an integral part of the present description. The above brief description sets forth features of the various embodiments of the present invention in order that the detailed description that follows may be better understood and in order that the present contributions to the

art may be better appreciated. There are, of course, other features of the invention that will be described hereinafter and which will be set forth in the appended claims. In this respect, before explaining several embodiments of the invention in details, it is understood that the various embodiments of the invention are not limited in their application to the details of the construction and to the arrangements of the components set forth in the following description or illustrated in the drawings. The invention is capable of other embodiments and of being practiced and carried out in various ways. Also, it is to be understood that the phraseology and terminology employed herein are for the purpose of description and should not be regarded as limiting.

[0011] As such, those skilled in the art will appreciate that the conception, upon which the disclosure is based, may readily be utilized as a basis for designing other structures, methods, and/or systems for carrying out the several purposes of the present invention. It is important, therefore, that the claims be regarded as including such equivalent constructions insofar as they do not depart from the spirit and scope of the present invention.

BRIEF DESCRIPTION OF THE DRAWINGS

[0012] A non-limiting exemplary embodiment of the invention is shown in the attached drawings, wherein:

figure 1 is a top view of a watch case implementing the invention;
 figure 2 is a cross-section according to II-II of figure 1;
 figures 3, 4, and 5 are cross sections of figure 2 according respectively to III-III, IV-IV, and V-V;
 figures 6, 7, 8, and 9 show, in section according to VI-VI, the mechanism of the crown in four different operating positions;
 figure 10 is an axonometric view of the flange for securing the crown;
 figure 10A is an axonometric view of the cap of the crown;
 figure 11 is a side view of a sleeve of the mechanism of the crown;
 figures 12 and 13 show respectively a longitudinal section according to XIII-XIII and a view according to XIII-XIII of figure 11;
 figure 14 is a side view of the piston inside the mechanism of the crown;
 figure 15 is a cross-sectional view according to XV-XV of figure 14;
 figure 16 is a side view of the crown body;
 figure 17 is a cross-sectional view according to XVII-XVII of figure 16;
 figure 18 is a side view of the screw connecting the crown and the stem of the mechanism inside the watch;
 figure 19 is a side view of a component of the coupling between the crown body and the stem inside the watch;

figure 20 is a cross-sectional view according to XX-XX of figure 19;

figure 21 is a side view of the member securing the crown to the stem inside the watch;

figures 22 and 23 are side views according to XXII-XII and XXIII-XXIII of figure 21;

figure 24 is a cross-sectional according to XXIV-XXIV of figure 22.

DETAILED DESCRIPTION OF EMBODIMENTS OF THE INVENTION

[0013] The following detailed description of the exemplary embodiments refers to the accompanying drawings. The same reference numbers in different drawings identify the same or similar elements. Additionally, the drawings are not necessarily drawn to scale. Also, the following detailed description does not limit the invention. Instead, the scope of the invention is defined by the appended claims.

[0014] Reference throughout the specification to "one embodiment" or "an embodiment" or "some embodiments" means that the particular feature, structure or characteristic described in connection with an embodiment is included in at least one embodiment of the subject matter disclosed. Thus, the appearance of the phrase "in one embodiment" or "in an embodiment" or "in some embodiments" in various places throughout the specification is not necessarily referring to the same embodiment(s). Further, the particular features, structures or characteristics may be combined in any suitable manner in one or more embodiments.

[0015] With initial reference to figure 1, reference number 1 indicates a watch as a whole, reference number 3 indicates the case of the watch and reference number 5 indicates the overall crown device allowing to act on a stem S, inside the watch case, of a mechanism (not shown) to set time and data or for other functions.

[0016] The crown device 5 comprises a cap 7, which can be coupled, for instance by means of a bayonet coupling, a screw coupling or other, to a flange 9 fixed to the case 3 of the watch 1 and shown in particular in the cross-section of figure 2. In the illustrated embodiment, the flange 9 comprises a pin 11 (see figure 10) engaging a groove 7A (figure 10A) of the crown cap 7, thus forming a bayonet-coupling between the flange 9 and the crown cap 7. In some embodiments the crown cap 7 comprises a plurality of equally shaped grooves 7A so as to fix the cap 7 to the flange 9 in different angular positions.

[0017] In other embodiments the cap 7 and the flange 9 can be coupled by means of different mechanisms, for instance by means of a screw system.

[0018] The inner components of the crown device 5 will be described below in greater detail with particular reference to figures 2 and 6 to 9.

[0019] The crown device 5 comprises a crown body 13, mounted coaxially with the cap 7 of the crown 5. The shape of the crown body 13 is shown in particular in fig-

ures 16 and 17 separately from the remaining elements of the crown device 5. The crown body 13 is slidably housed in a seat 7B of the crown cap 7, and in a through hole 3A of the case 3 (see in particular figure 2). A gasket 14 may be provided around the crown body 13, in correspondence of the hole 3A. Inside the crown cap 7 and coaxially with the seat 7B a further seat 7C is provided (see also detail of figure 10B), where there is engaged a sleeve 15, illustrated in detail and separately from the remaining components in figures 11 to 13.

[0020] The sleeve 15 may have a substantially cylindrical body 15A and a substantially cylindrical head 15B of greater diameter than the body 15A. The head 15B is inserted in the seat 7C of the crown cap 7 so as to torsionally couple the crown cap 7 and the sleeve 15 so that these two components rotate integrally with each other. The torsional coupling may be provided by means of a reverse-threaded screw, i.e. which is unscrewed by turning it clockwise, or by means of a splined profile, or in other adequate manner.

[0021] Inside the sleeve 15 there is a through hollow 17 that may have a substantially circular cross-section except for an end portion 17A forming a non-circular profile to provide a torsional coupling with a further component of the crown device 5 that will be described later on. In the illustrated embodiment, the end portion 17A has a hexagonal cross-section, as shown in figure 13. In other embodiments the end portion 17A may have a polygonal profile with a number of sides different than six, or a grooved profile, or a profile of any other shape suitable to form a torsional coupling with an element inserted coaxially inside the sleeve 15 and having a conjugated profile.

[0022] Advantageously, the body 15A of the sleeve 15 has an outer circular section and is inserted in an axial hollow 13A of the crown body 13. The axial hollow 13A of the crown body 13 (see in particular figure 17) has a portion of substantially cylindrical cross-section with a diameter substantially corresponding to the outer diameter of the body 15A of the sleeve 15. A second portion of the inner hollow 13A of the crown body 13 has an inner thread 13B and extends forming a portion 13C of smaller diameter forming a shoulder 13D with the threaded portion 13B (see in particular figure 17).

[0023] An element 19, called "piston" hereunder, is housed inside the sleeve 15. The piston 19 is shown separately from the other components of the crown device 5 in the side view of figure 14 and in the sectional view of figure 15. The piston 19 may have a threaded head 19A engaging the threaded portion 13B of the axial hollow 13A of the crown body 13. In an intermediate area, and preferably nearer the end opposite the head 19A, the piston 19 is provided with a first collar 19B having a circular cross-section and a second collar 19C having a hexagonal cross-section or anyway with a cross-section shaped correspondingly to the cross-section of the end portion 17A of the hollow 17 of the sleeve 15. When the collar 19C is in the area 17A of the inner hollow 17 of the

sleeve 15, the components 15 and 19 are coupled torsionally. The cross-section of figure 15 illustrates in greater detail the shapes of the two collars 19B and 19C.

[0024] To allow the piston 19 to be mounted in the sleeve 15, the piston 19 is advantageously subdivided into two axially coupled parts, one of which comprising the head 19A and the other one comprising the collars 19B, 19C.

[0025] When mounted, a compression spring 21, for instance a helical spring, is housed inside the hollow 17 of the sleeve 15. Advantageously, the compression spring 21 is held between the piston 19 and the bottom 7F (figure 10B) of the seat 7C of the crown cap 7. In some embodiments the piston 19 may comprise a retention and guide stem 19D around which the end turns of the compression spring 21 are arranged.

[0026] In some embodiments, on the outer surface of the crown body 13, two seats 13X and 13Y are provided for respective gaskets, as shown in particular in figures 16 and 17. In some embodiments a first gasket 23, for instance an O-ring, may be housed in the seat 13X. Advantageously, a second gasket 25 may be housed in the second annular seat 13Y. The second gasket 25 may be a high-pressure seal. Both gaskets 23, 25 seal the inner surface of the seat 7B of the crown cap 7.

[0027] The end part of the crown body 13 is torsionally coupled to a securing member 27 that is locked on the stem S represented only schematically in the drawing (figure 1) and being part of the inner mechanism of the watch, through which date and time are adjusted. The stem S is not represented in greater detail as it is known. One embodiment of the securing member 27 is illustrated in detail in figures 21 to 24 separately from the other components of the crown device.

[0028] In some embodiments, as illustrated in the drawing, the torsional coupling between the crown body 13 and the securing member 27 is provided by means of a grooved or splined profile. The coupling is provided between the end portion 13T of the crown body 13 and an inner flange 29 of the securing member 27 shown in particular in figures 22 and 24. In the illustrated embodiment, the torsional coupling is provided with a splined profile, whose male connector is provided on the end portion 13T of the crown body 13 and the female or inner connector is provided on the inner edge of the inner flange 29 of the securing member 27.

[0029] As shown in particular in figure 22, the inner flange 29 has a non-circular, but rather oval profile 29P, elongated according to an axis A-A. The central part of the profile 29P is defined by two nearly circular opposite portions, on which the splined profile 29M is provided.

[0030] The extension of the splined profile 29M is sufficient to form a torsional coupling with the corresponding splined profile on the terminal portion 13T of the crown body 13. In this way, when the device 5 is mounted (figures 2 and 6-9) the crown body 13 rotates integrally with the securing member 27 and therefore with the stem S.

[0031] Inside the securing member 27 a seat 31 is pro-

vided, which is delimited at one side by a bottom 27F of the securing member 27 and at the other side by the flange 29. Inside the seat 31 an insert 33 is housed, whose shape is better illustrated in figures 19 and 20 showing the insert 33 separately from the other components of the mechanism. The insert 33 has advantageously an elongated shape and a through hole 35, which is internally threaded.

[0032] The shape of the insert 33 in a front view (figure 20) and the dimension thereof are such that the insert 33 can be introduced in the seat 31 of the securing member 27 through the hole free of the profile 29P of the inner flange 29, as it is clearly apparent by comparing figures 20 and 22. To this end the axis B-B (figure 20) of the insert 33 shall be arranged co-axial with the axis A-A illustrated in figure 22. Once the insert 33 has been inserted in the seat 31, it can rotate and take such an angular position to become locked inside the seat 31 as a result of the undercut formed by the inner flange 29.

[0033] The securing member 27 has a hole 27A parallel to its axis, inside which can be inserted a pin 28 (figure 21) extending in the seat 31 to limit the rotation of the insert 33 so that it does not take the angular position allowing it to exit the seat 31.

[0034] In some advantageous embodiments, the bottom 27F of the seat 31 provided in the securing member 27 may have a groove 27B inside which a gasket 27C, for instance an O-ring, is housed.

[0035] Engaged with the threaded hole 35 of the insert 33 there is screw 37, whose stem extends through the portion 13C, of smaller diameter, of the hollow 13A of the crown body 13, so as to be coaxial inside the end or terminal portion 13T of the crown body 13, on which the grooved or splined profile is provided for torsionally coupling the crown body 13 and the securing member 27 to one another.

[0036] In some embodiments a gasket 39, for instance an O-ring, is interposed between the head 37T of the screw 37 shown separately in figure 18 and the piston 19, so that between the elements 37, 19 there is no direct contact but a thrust mediated by the same gasket 39.

[0037] When mounted (figures 2, 6-9) the stem is axially and torsionally fixed to the crown body 13 by means of the securing member 27. The axial coupling is provided by means of the screw 37 that, engaging the insert 33, fixes the crown body 13 to the insert 33. This latter, being locked in the seat 31 of the securing member 27, provides the axial constraint between the crown body 13 and the securing member 27. Vice versa, the torsional constraint between the crown body 13 and the securing member 27 is provided by means of the grooved or splined coupling between the components 13T and 29M described above.

[0038] Figure 6 illustrates the mechanism of the crown in a neutral position. In this arrangement the crown cap 7 is pushed by means of the compression spring 21 in a locked position, as the pin 11 of the flange 9 is inside one of the grooves 7A of the crown cap 7.

[0039] To unlock the crown device and allow it to rotate, for instance to adjust date or time on the watch 1 by means of the stem S, a first compression movement shall be made against the force of the compression spring 21 to bring the crown cap 7 in the position of figure 7. In this way the pin 11 may be freed from the groove 7A rotating the crown cap 7 and moving it towards the outside, i.e. moving it away from the case 3 of the watch 1.

[0040] Figure 8 shows a first partially extracted position of the crown, wherein the crown cap 7 is free from the bayonet mechanism formed by the grooves 7A and by the flange 9 with its pin 11. The movement of the crown cap 7 in axial direction according to the arrow f7 is such that the end portion 17A with hexagonal cross-section of the sleeve 11 arrives in correspondence of the second collar 19C with hexagonal cross-section of the piston 19. In this way a torsional coupling between the sleeve 15 and the piston 19 is provided. As the sleeve 15 is torsionally coupled in the seat 7C to the crown cap 7, the rotation of the crown cap 7 causes a rotation of the sleeve 15 and consequently a rotation of the piston 19. This latter rotates the crown body 13 that, due to the effect of the coupling with the securing member 27, causes the rotation of the stem S. The axial position of the stem may be for instance the position for setting date and time.

[0041] Moving the crown cap 7 furthermore in axial direction (arrow f70 in figure 9), the crown device 5 achieves the position of figure 9. Moving from the arrangement of figure 8 to the arrangement of figure 9, the axial coupling between the crown body 13 and the securing member 27 has caused the axial displacement of the crown cap 7 according to the arrow f70, together with the securing member 27 and the stem S, fixed to this latter.

[0042] In the position of figure 9 it is for instance possible to set the time by rotating the crown cap 7 and consequently the securing member 27 by means of the torsional coupling between these two components described above.

[0043] To demount the crown device 5 by releasing it from the securing member 27 and allow to extract the whole inner mechanism from the watch acting on the upper part of this latter, i.e. simply by removing the bezel from the case 3, the following shall be done.

[0044] Firstly, the crown device 5 is brought in the position of figure 9. The crown cap 7, the sleeve 15 and the piston 19 are removed from the crown body 13 by holding this latter (that has been made accessible by moving the cap 7 away from the flange 9) by means of a suitable tool. As the crown body 13 has been torsionally locked, by rotating the cap 7, the sleeve 15 and the piston 19 it is possible to unscrew this latter from the crown body 13, releasing the threaded head 19A of the piston from the inner thread 13B of the crown body 13.

[0045] At this point, the head 37T of the screw 37 can be accessed through the hollow 13A of the crown body 13 and can be unscrewed. This can be simply done by means of a screwdriver holding the crown body 13 with

a suitable wrench or other tool. In this way the crown body 13 cannot rotate around its own axis. Preventing the rotation of the crown body 13, thanks to the coupling 29M, 13T, it is possible to also prevent the rotation of the securing member 27 and of the insert 33. By rotating the screw 37, this screw is released from the threaded hole 35 of the insert 33.

[0046] Once the screw 37 has been unscrewed from the threaded hole 35, as the axial constraint has been removed, it is possible to remove the crown body 13 from the interior of the flange 9 and therefore from the case 3.

[0047] As it is clearly apparent from figures 1 and 2, the removal of the crown body 13 makes the stem S and the securing member 27 completely free, so that they can be removed by means of a movement orthogonal to the plane of the case, i.e. orthogonal to figures 1 and 2, having previously removed the bezel from the case 3 of the watch 1.

[0048] While the particular embodiments of the invention described above have been shown in the drawing and described integrally above with features and characteristics relating to different example embodiments, those skilled in the art will understand the modifications, changes and omissions are possible without however departing from the innovative learning, the principles and the concepts described above and the advantages of the object described in the attached claims. Therefore, the scope of the invention described shall be determined only based upon the widest interpretation of the attached claims, so as to understand all the modifications, changes and omissions.

Claims

1. A watch comprising a case (3) for housing a clockwork, a control stem (S) and a crown (5) to actuate the stem (S) from the outside of the case, wherein the crown (5) is connected to the stem (S) through a securing member (27) by means of an axial constraint (35, 37) and of a torsional constraint (13T, 29M) that can be released independently of each other.
2. Watch according to claim 1, wherein the crown (5) comprises a body (13) movable parallel to the axis of the stem (S) and comprising a torsional coupling profile (13T) co-acting with the securing member (27); wherein through said torsional coupling the rotation of the crown is transmitted to the stem (S); and wherein an axial constraint arrangement (33, 35, 37) connects the body (13) and the securing member.
3. Watch according to claim 2, wherein the axial constraint arrangement comprises a screw (37), which extends coaxially with the torsional coupling profile (13T) and through which the crown body (13) is axially fixed to the securing member (27).
4. Watch according to claim 3, wherein said axial constraint arrangement furthermore comprises an insert (33) axially constraint to the securing member (27) and having a threaded hole (35), which said screw (37) engages.
5. Watch according to claim 4, wherein the insert (33) is housed inside a seat (31) arranged in the securing member (27).
6. Watch according to claim 5, wherein said seat (31) has an access delimited by a non-circular profile (29P) defining a passage for introducing the insert (33) into the seat (31), the shape of the insert (33) and the shape of the profile (29P) being such as to allow to introduce the insert (33) into the seat (31) by directing the insert (33) in a given angular insertion position with respect to the non-circular profile (29P), and to prevent the insert (33) from exiting the seat when the insert (33) takes an angular position different than the angular insertion position with respect to the non-circular profile (29P).
7. Watch according to claim 6, wherein a pin introduced into the seat (31) prevents the insert (33) from rotating in the seat to take the angular insertion position.
8. Watch according to claim 6 or 7, wherein said non-circular profile (29P) has a shaped portion (29M) to form a torsional coupling with the body (13) of the crown (5).
9. Watch according to claim 8, wherein said shaped portion (29M) forms a splined or grooved profile, co-acting with a corresponding splined or grooved profile provided on the crown body (13).
10. Watch according to one or more of the previous claims, wherein the crown comprises a piston (19) coaxial with the crown body (13) and axially constrained thereto, cooperating with a sleeve (15) that is in turn torsionally constrained to a crown cap (7), and wherein the.
11. Watch according to claim 10, wherein the crown body (13) and the piston (19) are constrained to each other by means of a screw coupling.
12. Watch according to claim 10 or 11, wherein the piston (19) is housed at least partially inside the sleeve (15) and the sleeve is housed at least partially in an axial hollow (13A) of the crown body (13), and wherein preferably the crown cap (7) and the sleeve (9) are axially constrained and are elastically biased away from the piston (19), with a corresponding sliding of the sleeve (15) in the axial hollow (13A) of the crown body (13).

13. Watch according to one or more of claims 10 to 12, wherein the piston (19) and the sleeve (15) are axially movable with respect to each other to take selectively a position wherein they are torsionally released from each other and a position wherein they are torsionally constrained to each other, so that a rotation of the sleeve (15) is transmitted to the crown body (13) and from it to the stem (S), and wherein the piston (19) preferably comprises a projection (19C) with non-circular cross-section selectively co-acting with a non-circular shaped profile (17A) of the sleeve (17). 5 10
14. Watch according to one or more of claims 10 to 13, wherein the sleeve (15) and the crown cap (7) can be removed from the crown body (13) and from the piston (19) so that the piston (19) can be accessed from the outside of the case and can be removed from the crown body (13). 15 20
15. Watch according to one or more of claims 10 to 14, wherein the crown body (13) can be accessed from the outside of the case when the crown cap (7) has been removed, so that it can be torsionally held and to allow the axial constraint (35, 37) between the crown (5) and the securing member (27) to be removed. 25

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Fig.1

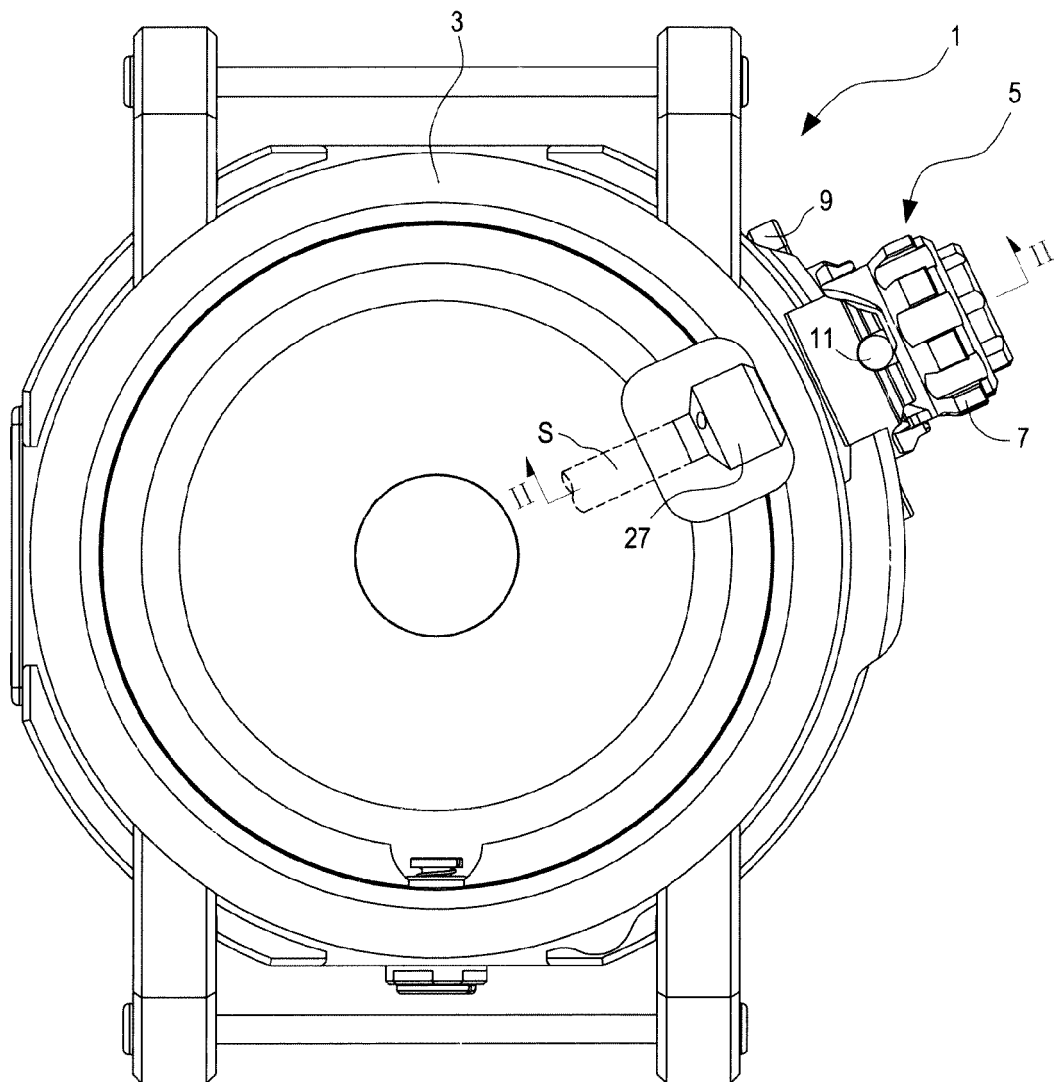
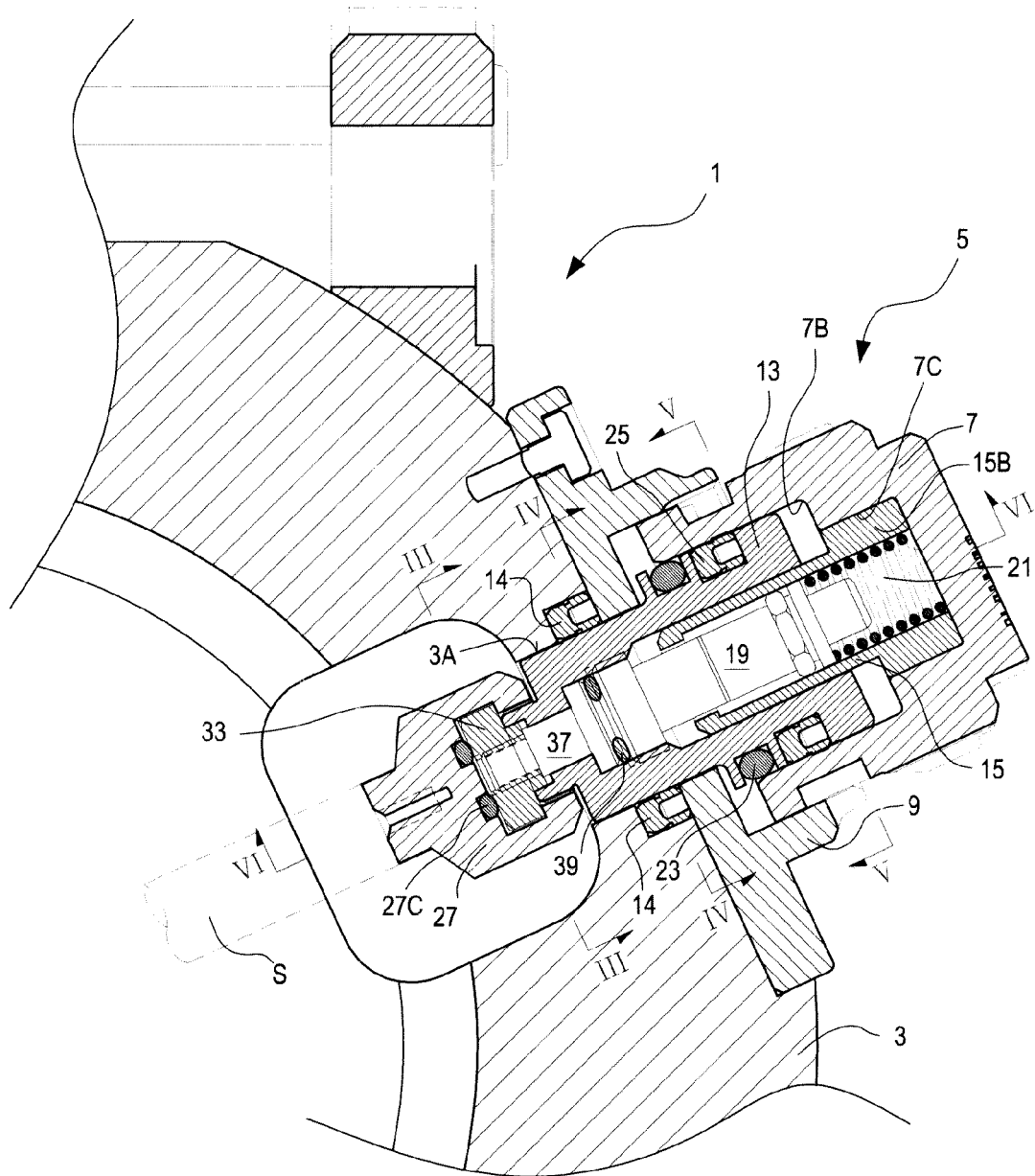


Fig.2



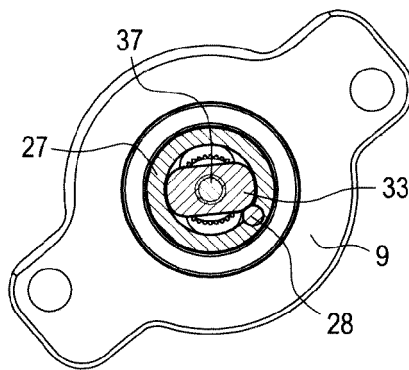


Fig.3

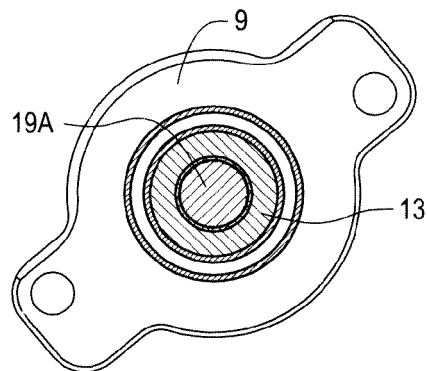


Fig.4

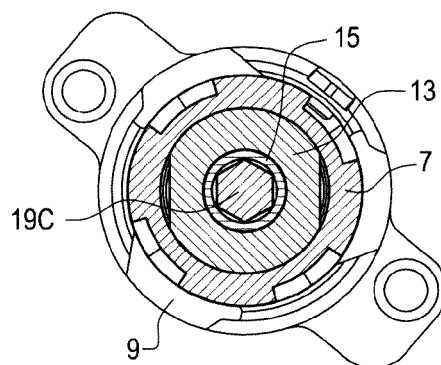


Fig.5

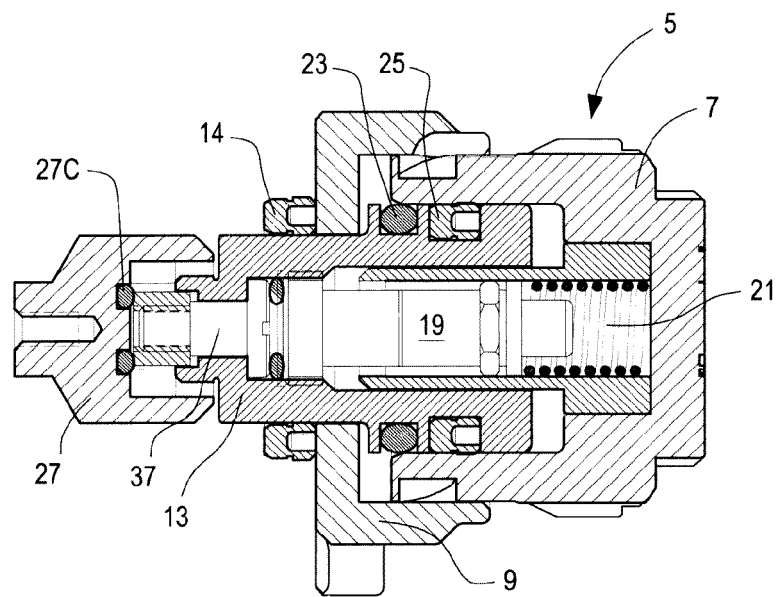


Fig.6

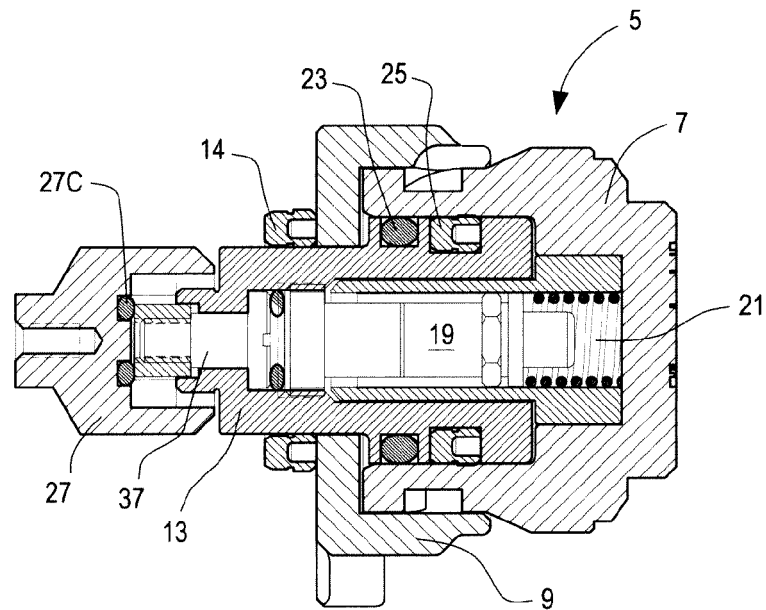


Fig.7

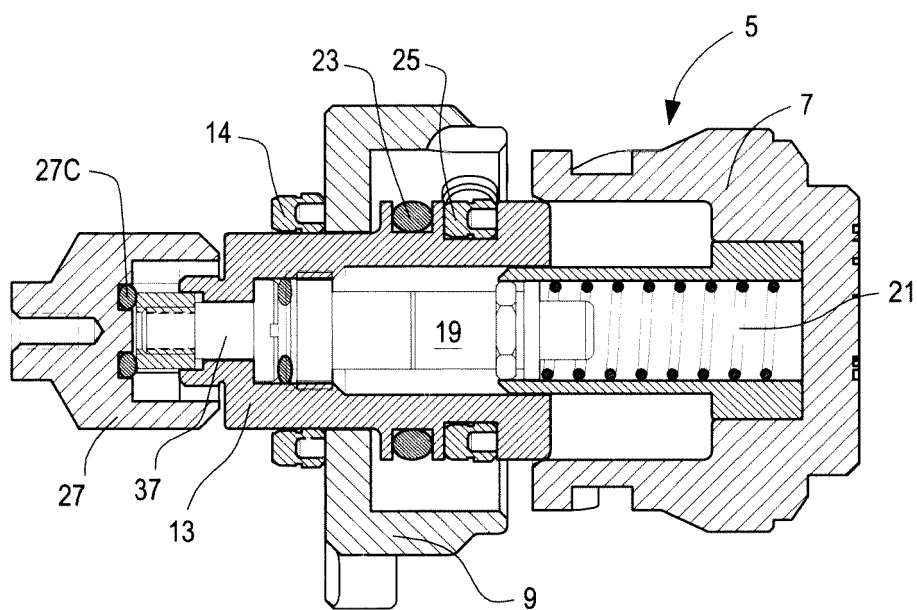


Fig.8

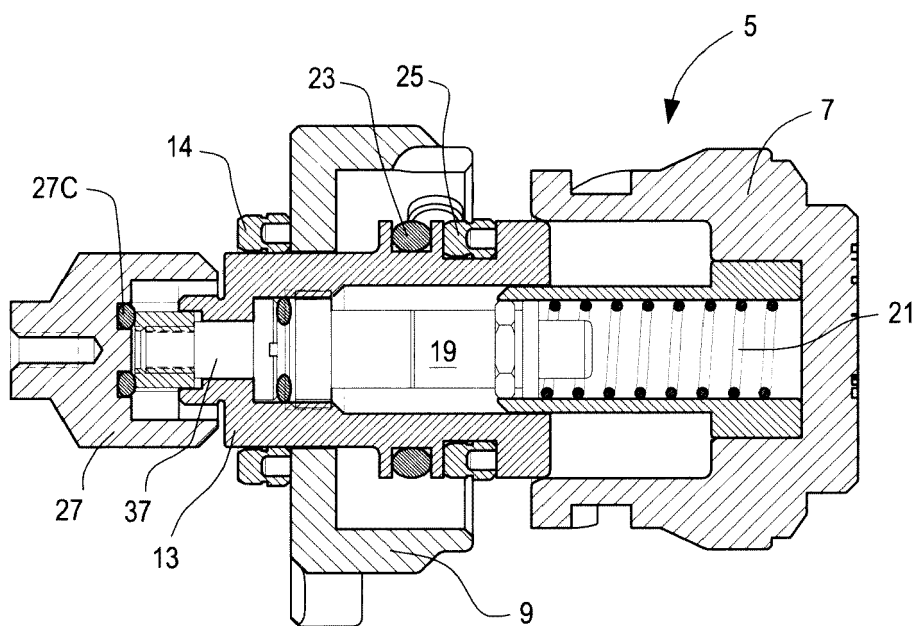


Fig.9

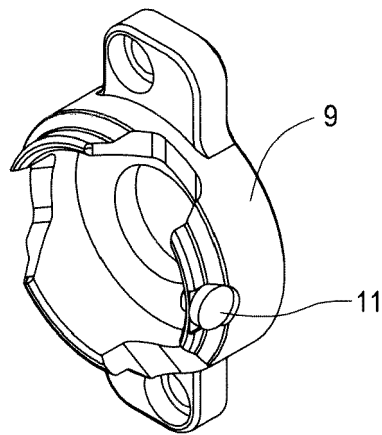


Fig.10

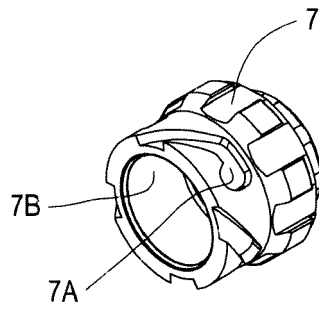


Fig.10A

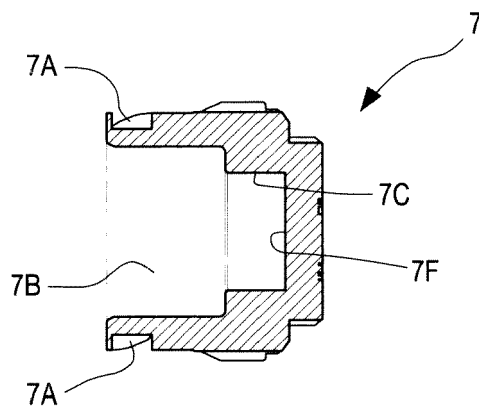


Fig.10B

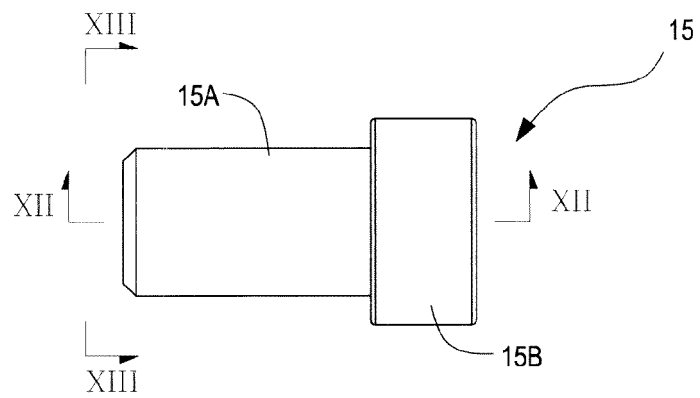


Fig.11

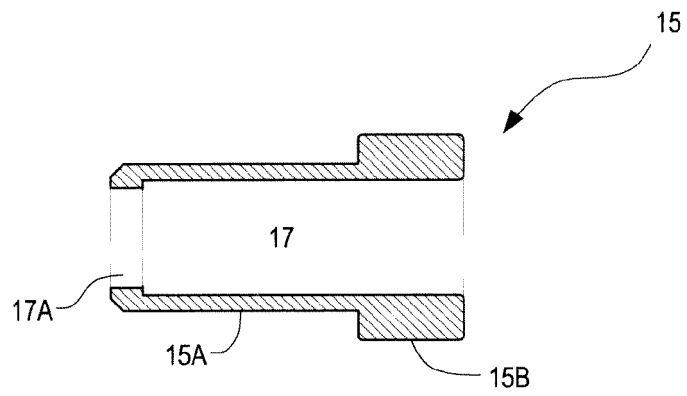


Fig.12

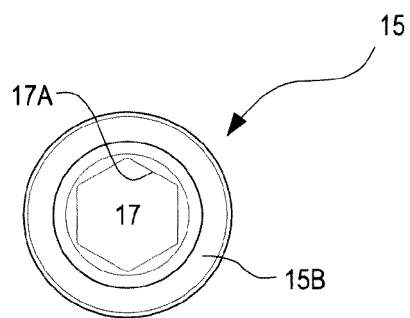


Fig.13

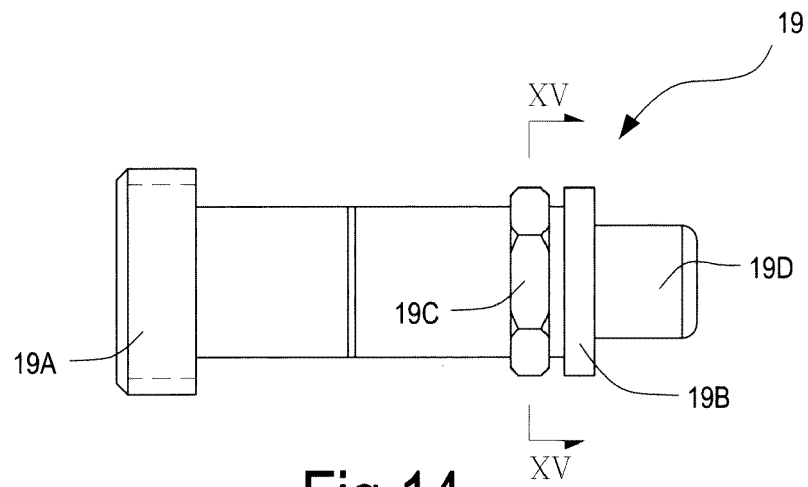


Fig.14

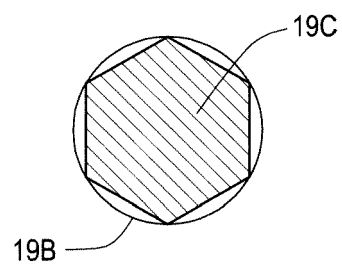


Fig.15

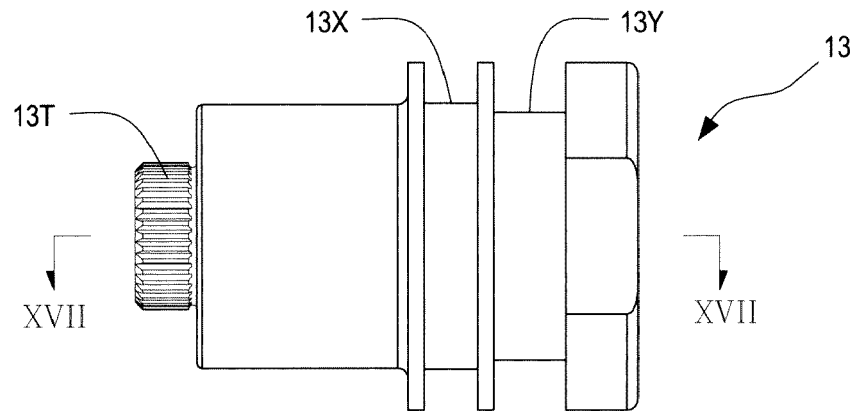


Fig.16

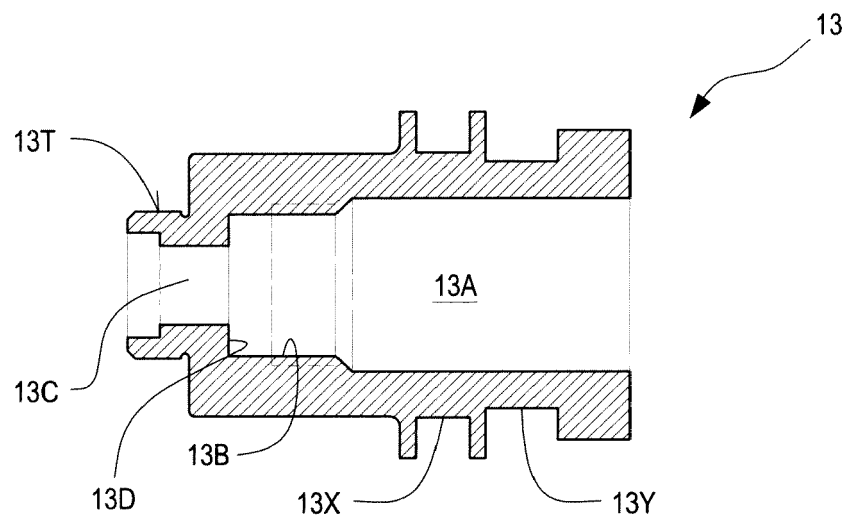


Fig.17

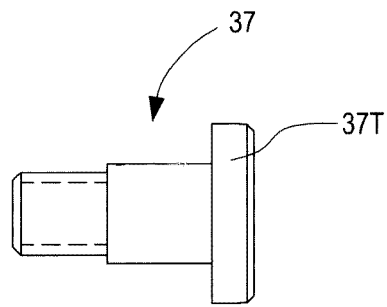


Fig.18

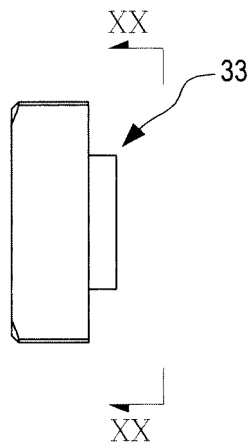


Fig.19

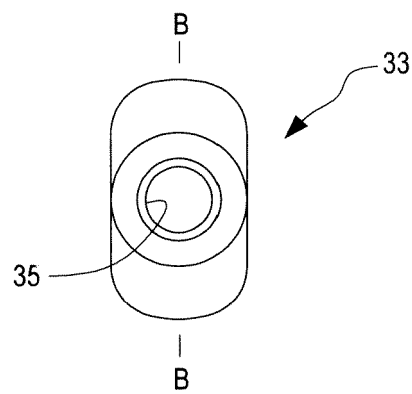


Fig.20

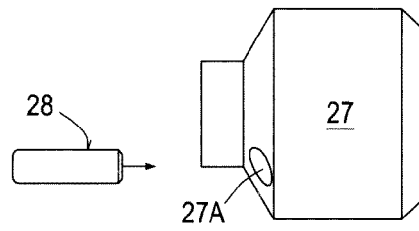


Fig.21

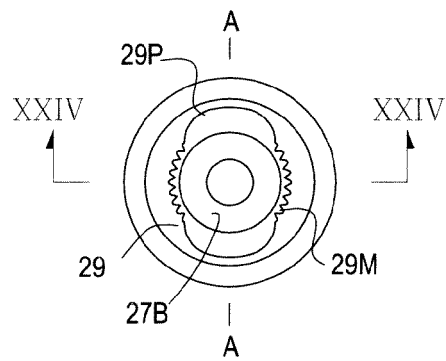


Fig.22

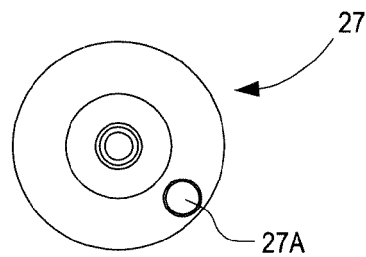


Fig.23

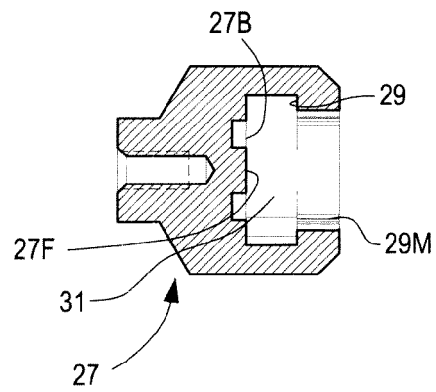


Fig.24



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Place of search The Hague		Date of completion of the search 17 November 2014	Examiner Pirozzi, Giuseppe
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