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DE-C1- 4 038 141
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DESCRIPTION

[0001] The invention relates to an actuator attachment for actuating a valve, in particular a radiator valve, according to the preamble of claim 1. Actuator attachments are usually attached to an attachment geometry of a valve, for example a radiator valve, to control the flow of a fluid, for example through a radiator. Thereby the amount of heat dispensed by the radiator can be controlled.

[0002] However, the attachment geometries of various valve manufacturers and valve types are different which requires the use of a matching connector. Furthermore, it is usually preferable if the actuator attachment can be brought into a certain rotational position such that for example a setting indicator or a display can be properly seen by a user.

[0003] An actuator attachment of the above kind is for example known from DE 10 104 897 A1. Therein the adapter has the shape of a ring comprising a profiled surface and the actuator section comprises a corresponding profiled surface. The actuator section can be freely rotated relative to the adapter in both rotational directions to for example bring the actuator section in a desired rotational position as long as a union nut has not been fully tightened around the actuator section. This solution is however not fully satisfying since the actuator section may be rotated along with the union nut when fixing the actuator attachment to the valve, whereby it becomes difficult to both securely fix the actuator attachment to the valve and keep the actuator section in a desired rotational position.

[0004] DE 10 2009 031 442 A1 shows an alternative solution dispensing with the use of profiled surfaces. The actuator section can be freely rotated on an adapter to change the rotational position of the actuator section. To demount the actuator section and the adapter from the valve or a connection section a tool is however required that needs to be inserted into aligned openings in the actuator section and the adapter. This solution is also not satisfactory, since there can be too much slack between the actuator section and the adapter to keep both parts relatively rotatable. Furthermore, the mounting and demounting is complicated.

[0005] US 4 632 437 discloses an actuator attachment according to the preamble of claim 1 and shows a pipe coupling with an adapter, a coupling sleeve and a gripping ring arranged between the adapter and the coupling sleeve. The coupling sleeve and the adapter may be rotated in unison in one rotational direction. Furthermore, the coupling sleeve and the adapter may be rotated relative to one another in the opposite rotational direction dependent on their relative rotational position to the gripping ring.

[0006] The task of the present invention is therefore to provide an improved actuator attachment that can be rotationally adjusted and allows a simple and firm mounting and demounting.

[0007] According to the present invention the above task is solved in an actuator attachment of

the kind mentioned at the outset in that the actuator attachment comprises a coupling mechanism that is engagable to unrotatably couple the adapter to the actuator section temporarily in the second rotational direction as well.

[0008] Unrotatably coupled here means that the adapter and the actuator section can be rotated in unison in the first rotational direction, e.g. around a central axis of the actuator attachment. In this rotational direction the actuator section and the adapter can for example be screwed into a connection geometry of a valve or of an intermediate connection section. In the opposite, second rotational direction the actuator section can be rotated relative to the adapter and the valve, whereby one can adjust the rotational position of the actuator section relative to the adapter and the valve. Preferably, a rotation in the second rotational direction will then not lead to a dismounting of the actuator section and the adapter from the valve.

[0009] Furthermore, the actuator section comprises a coupling mechanism that is engagable to unrotatably couple the annular adapter to the actuator section temporarily in the second rotational direction as well. By engaging the coupling mechanism, e.g. by pressing and holding a button or the like, and then rotating the actuator section in the second rotational direction one may thus rotate the actuator section and the adapter in unison, for example to dismount the actuator attachment.

[0010] It is preferred if the actuator section comprises a first profiled surface and the adapter comprises a second profiled surface, wherein the first and second profiled surfaces form a slip clutch. When the actuator section is rotated relative to the adapter in the first rotational direction the profiled surfaces engage one another and the actuator section and the adapter are rotatable in unison. However, if the actuator section is rotated in the second rotational direction the first profiled surface slips over the second profiled surface such that the actuator section rotates relative to the adapter. If however in the latter case the coupling mechanism is engaged the first profiled surface can for example be pressed against the second profiled surface whereby the friction is increased up to a point where rotating the actuator section will also rotate the adapter in the second rotational direction.

[0011] It is preferred if at least one of the first and second profiled surfaces has a saw tooth-wave-like cross section in the direction around the rotational axis.

[0012] It is furthermore preferred if the individual saw teeth in the first and second profiled surfaces each comprise one flank that is steeper than the other flank. This way one may ensure that the actuator section is unrotatably coupled to the adapter in the first rotational direction but is rotatably coupled in the second rotational direction. However, if the coupling mechanism is engaged one may create sufficient friction such that the first and second profiled surfaces cannot slip over one another and the actuator section and the adapter are also unrotatably coupled in the second rotational direction.

[0013] It is preferred if the coupling mechanism comprises an engagement surface of the actuator section that is manually engageable to temporarily unrotatably couple the adapter to

the actuator section in the second rotational direction.

[0014] It is preferred if the coupling mechanism comprises a coupling section that is flexible in a direction parallel to a rotational axis of the actuator section and the adapter. Preferably the coupling section is arranged in the actuator section. It is preferred if the first structured surface is limited to the coupling section in a circumferential direction around the rotational axis. This limits the friction between the actuator section and the adapter when the coupling mechanism is not engaged. In this case the coupling section may elastically deform whereby the actuator section can be rotated relative to the adapter in the second rotational direction.

[0015] It is preferred if the coupling section is blockable from a displacement parallel to the rotational axis by engaging the coupling mechanism. By engaging the coupling mechanism one may then increase the friction between the actuator section and the adapter whereby one may rotate the actuator section and the adapter in unison in the second rotational direction for example to unmount the actuator attachment from the valve.

[0016] It is preferred if the actuator attachment comprises a first connection geometry for connecting the actuator attachment to a valve, wherein the first connection geometry is disconnectable from the valve by engaging the coupling mechanism while rotating the actuator section in the second rotational direction.

[0017] It is preferred if the actuator attachment comprises a connection section that is connectable to a valve, wherein the adapter is arranged between the connection section and the actuator section. In this case the connection section may be mounted to the valve first and afterwards the adapter as well as the actuator section may be mounted to the connection section.

[0018] It is preferred if the actuator attachment comprises a second connection geometry, that is arranged in the connection section whereby the connection section is connectable to a valve, wherein the first connection geometry is arranged in the adapter whereby the adapter and the actuator section are connectable to the connection section. The first connection geometry then connects the adapter to the connection section and the second connection geometry allows to connect the connection section and thereby the whole actuator attachment to the valve.

[0019] The above task is furthermore solved by a method for demounting an actuator attachment according to any of claims 1 to 10 from a valve, comprising the steps:

- Engaging the coupling mechanism,
- Rotating the actuator section and the adapter in the second rotational direction relative to the valve until the actuator section and the adapter can be removed from the valve.

[0020] It is preferred if the actuator section and the adapter are first demounted from the connection section and afterwards the connection section is demounted from the valve. In this

case by engaging the coupling mechanism the adapter and the actuator section can be rotated in the second rotational direction and demounted from the connection section and the valve. Afterwards the connection section is easier to access and can be demounted from the valve.

[0021] A preferred embodiment of the invention is now explained with reference to the figures, wherein:

Fig. 1

shows a cut view of an actuator attachment according to the invention,

Fig. 2

shows the actuator attachment according to fig.1 with an engaged coupling mechanism,

Fig. 3

shows the actuator attachment according to fig. 1 and 2 with a cut through the coupling mechanism,

Fig. 4

shows a bottom view of an actuator section according to the invention,

Fig. 5

shows an adapter of an actuator attachment according to the invention,

Fig. 6

shows an external view of an actuator section of an actuator attachment according to the invention.

[0022] Fig. 1 to 6 show the same embodiment of an actuator attachment 1 comprising an actuator section 2 as well as an adapter 3. The actuator attachment 1 furthermore comprises a connection section 4 through which the actuator attachment 1 may be connected to a valve. Alternatively, the actuator attachment may be connected to a valve directly through the adapter 3. It is also possible for the connection section 4 to be an integral part of the adapter 3.

[0023] In the given embodiment the adapter 3 is arranged between the connection section 4 and the actuator section 2. The actuator section 2 comprises an actuating drive 5 for actuating a pin or a stem of a valve (not shown) onto which the actuator attachment 1 is mounted.

[0024] The actuator section 2 can be rotated in unison with the adapter 3 in a first rotational direction around a central axis of the actuator attachment 1. In this first rotational direction the actuator section 2 and the adapter 3 are therefore unrotatably coupleable in a plurality of discreet relative rotational positions. On the other hand the actuator section 2 is rotatably coupled to the adapter 3 in the opposite, second rotational direction around the central axis. For example the actuator section 2 and the adapter 3 can be unrotatably coupled when the actuator section is rotated in a clockwise direction and the actuator section 2 can be rotatably coupled to the adapter 3 when the actuator section 2 is rotated in a counter-clockwise direction (or vice versa). Rotating the actuator section 2 in the first rotational direction may then be used to connect the actuator section 2 and the adapter 3 to the valve or in case a connection section 4 is used to the connection section 4. Once the actuator attachment 1 is

fully attached to the valve one may then rotate the actuator section 2 in the second rotational direction relative to the valve and the adapter 3 whereby the relative rotational position can be adjusted. This for example allows to choose a rotational position of the actuator section 2 in which a display and/or an interface arranged in the actuator section 2 is optimally visible to a user.

[0025] The actuator attachment 1 may be directly connectable to a valve via the adapter 3 or the actuator attachment 1 may be connectable via the connection section 4 if present as a separate part from the adapter 3.

[0026] In case the actuator attachment 1 needs to be demounted, for example to replace a battery, it may be necessary to unrotatably couple the actuator section 2 to the adapter 3 in the second rotational direction also. To this end the actuator attachment 1 comprises a coupling mechanism 6. The coupling mechanism 6 can be engaged to unrotatably couple the adapter 3 to the actuator section 2 temporarily while the actuator section 2 is rotated in the second rotational direction to unmount the actuator attachment 1. The coupling mechanism 6 comprises an engagement surface 7 located on an outer surface of the actuator section 2. By engaging the engagement surface 7 a section of the actuator section is elastically deformed inwards to block a coupling section 8 of the actuator section 2. The coupling section 8 is located in the direct vicinity of the adapter 3. The coupling section 8 is flexible in a direction parallel to the rotational axis of the actuator section 2 and the adapter 3, in this case the vertical direction as shown in the orientation of fig. 1 and 2.

[0027] Fig. 3 shows a cut view through the coupling mechanism 6 such that the coupling section 8 becomes visible. The actuator section 2 comprises a first profiled surface 9 and the adapter 3 comprises a second profiled surface 10. The coupling section 8 furthermore comprises a blocking protrusion 11 at which the coupling section 8 is engaged when the engagement surface 7 is pressed inwardly as shown in fig. 2.

When the coupling mechanism 6 is however not engaged the coupling section 8 can elastically deform upwards such that the first profiled surface 9 can slip over the second profiled surface 10 when the actuator section 2 is rotated in the second rotational direction, in the given embodiment in the counter clockwise direction. The first profiled surface 9 and the second profiled surface 10 thus form a slip clutch between the actuator section 2 and the adapter 3.

[0028] Fig. 4 shows a bottom view of the actuator section 2 without the adapter 3 and the connection section 4. As one can see the first profiled surface 9 only comprises a limited number of teeth. All teeth of the first profiled surface 9 are in this embodiment arranged in the coupling section 8.

[0029] Fig. 5 shows the adapter 3 in more detail. As one can see the second profiled surface 10 is arranged circumferentially on the top surface of the adapter 3. The adapter 3 here has the shape of a ring with a gap 12 to improve the flexibility of the adapter 3. To ensure that the coupling mechanism 6 also works if the coupling section 8 is located above the gap 12 the adapter 3 comprises two extensions 13 onto which the second profiled surface 10 also

extends.

[0030] The first profiled surface 9 as well as the second profiled surface 10 have a saw tooth-wave-like cross section in the direction around the rotational axis. Individual teeth of the first and second profiled surfaces 9, 10 each have one flank that is steeper than the other flank whereby the first profiled surface 9 may slide over the second profiled surface 10 when the coupling mechanism 6 is not engaged and the actuator section 2 is rotated in the second rotational direction. If the actuator section 2 is however rotated in the first rotational direction the adapter 3 and the actuator section 2 will be rotated in unison because the steeper flanks of the teeth engage one another.

[0031] In the given embodiment the actuator attachment 1 comprises a first connection geometry 14 for connecting the actuator attachment 1 to a valve.

[0032] The first connection geometry 14 is disconnectable from the valve by engaging the coupling mechanism 6 while rotating the actuator section 2 in the second rotational direction. In the given embodiment the first connection geometry 14 allows to disconnect the actuator section 2 and the adapter 3 from the connection section 4. Alternatively, in case no separate connection section 4 is used the first connection geometry 14 may also be used to directly connect the actuator section 2 and the adapter 3 to the valve without an intermediate connection section 4 being involved.

[0033] In the given embodiment a second connection geometry 15 is arranged in the connection section 4. The connection section 4 is thereby connectable to a valve, wherein the first connection geometry 14 is arranged in the adapter 3 whereby the adapter 3 and the actuator section 2 are connectable to the connection section 4.

[0034] To unmount the actuator attachment 1 one may engage the coupling mechanism 6 while rotating the actuator section 2 and the adapter 3 in the second rotational direction relative to the valve until the actuator section 2 and the adapter 3 can be removed from the valve. In case no separate connection section 4 is used the complete actuator attachment 1 is thereby unmounted from the valve. In case a connection section 4 separate from the adapter 3 is part of the actuator attachment 1 the connection section 4 needs to be unmounted from the valve after the actuator section 2 and the adapter 3 have been removed from the valve by the above described method.

[0035] The present invention therefore provides an actuator attachment 1 which allows to change the rotational position of an actuator attachment already installed on a valve. At the same time the actuator attachment allows a secure and firm connection to a valve while not requiring any tool or other complicated means for demounting the actuator attachment.

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- DE10104897A1 [0003]
- DE102009031442A1 [0004]
- US4632437A [0005]

PATENTKRAV

1. Aktuatoranordning (1) til aktivering af en ventil, især en radiatorventil, omfatter en aktuatorsektion (2) såvel som et mellemstykke (3), hvor mellemstykket (3) er udrejelig tilkobbelbar til en aktuatorsektion (2) i et flertal af diskrete relativt rotationelle positioner, hvor mellemstykket (3) er udrejeligt koblet til aktuatorsektionen (2) når
5 aktuatorsektionen (2) er drejet in en første rotationsretning, og er drejeligt koblet i en modsat, anden rotationsretning, **kendetegnet ved at** aktuatoranordningen (1) omfatter en koblingsmekanisme (6), som er midlertidigt tilkoblelig for også udrejeligt at koble mellemstykket (3) til aktuatorsektionen (2) i den anden rotationsretning.
- 10 2. Aktuatoranordning (1) ifølge krav 1, **kendetegnet ved at** aktuatorsektionen (2) omfatter en første profileret overflade (9) og mellemstykket (3) omfatter en anden profileret overflade (10), hvor den første og anden profilerede overflader (9, 10) danner en glidekobling.
- 15 3. Aktuatoranordning (1) ifølge krav 2, **kendetegnet ved at** mindst en af den første og anden profilerede overflade (9, 10) har en savtandet bølgelignende tværsnit i retningen rundt om rotationsaksen.
- 20 4. Aktuatoranordning (1) ifølge krav 3, **kendetegnet ved at** den individuelle savtand i den profilerede overflade (9, 10) hver omfatter en flange som er stejler end den anden flanke.
- 25 5. Aktuatoranordning (1) ifølge enhver af krav 1-4, **kendetegnet ved at** koblingsmekanismen (6) omfatter en indgrebsflade (7) af aktuatorsektionen (2), der er manuelt tilkoblelig for midlertidig at udrejeligt koble mellemstykket (3) til aktuatorsektionen (2) i den anden rotationsretning.
- 30 6. Aktuatoranordning (1) ifølge enhver af krav 1-5, **kendetegnet ved at** koblingsmekanismen (6) omfatter en koblingssektion (8), der er fleksible i en retning parallel med rotationsaksen af aktuatorsektionen (2) og mellemstykket (3).

7. Aktuatoranordning (1) ifølge krav 6, **kendetegnet ved at** koblingssektionen (8) er blokerbar af en forskydning parallelt til rotationsaksen ved kobling til koblingsmekanismen (6).

5 8. Aktuatoranordning (1) ifølge enhver af krav 1-7, **kendetegnet ved at** aktuatoranordningen (1) omfatter en første forbindelsesgeometri (14) til tilslutning af aktuatoranordningen (1) til en ventil, hvor den første forbindelsesgeometri (14) er frakobelig fra en ventil ved tilkobling til koblingsmekanismen (6) under drejning af aktuatorsektionen (2) i den anden rotationsretning.

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9. Aktuatoranordning (1) ifølge enhver af krav 1-8 omfatter en forbindelsessektion (4) som er forbindelig til en ventil, hvor mellemstykket (3) er placeret mellem forbindelsessektionen (4) og aktuatorsektionen (2).

15 10. Aktuatoranordning ifølge krav 9, **kendetegnet ved at** aktuatoranordningen (1) omfatter en anden forbindelsesgeometri (15), der er placeret i forbindelsessektionen (4), hvorved forbindelsessektionen (4) er forbindelig til en ventil, hvorved den første forbindelsesgeometri (14) er placeret i mellemstykket (3) hvorved mellemstykket (3) og aktuatorsektionen (2) er forbindelige til forbindelsessektionen (4).

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11. Metode til at afmontere en aktuatoranordning (1) ifølge enhver af krav 1-10 fra en ventil omfatter trinene:

- Tilkoble koblingsmekanismen (6),
 - Dreje aktuatorsektionen (2) og mellemstykket (3) i den anden rotationsretning relativt til ventilen indtil aktuatorsektionen (2) og mellemstykket (3) kan fjernes fra ventilen.
- 25

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12. Metode ifølge krav 11, hvor aktuatorsektionen (2) og mellemstykket (3) først afmonteres fra forbindelsessektionen (4) og efterfølgende afmonteres forbindelsessektionen (4) fra ventilen.

DRAWINGS

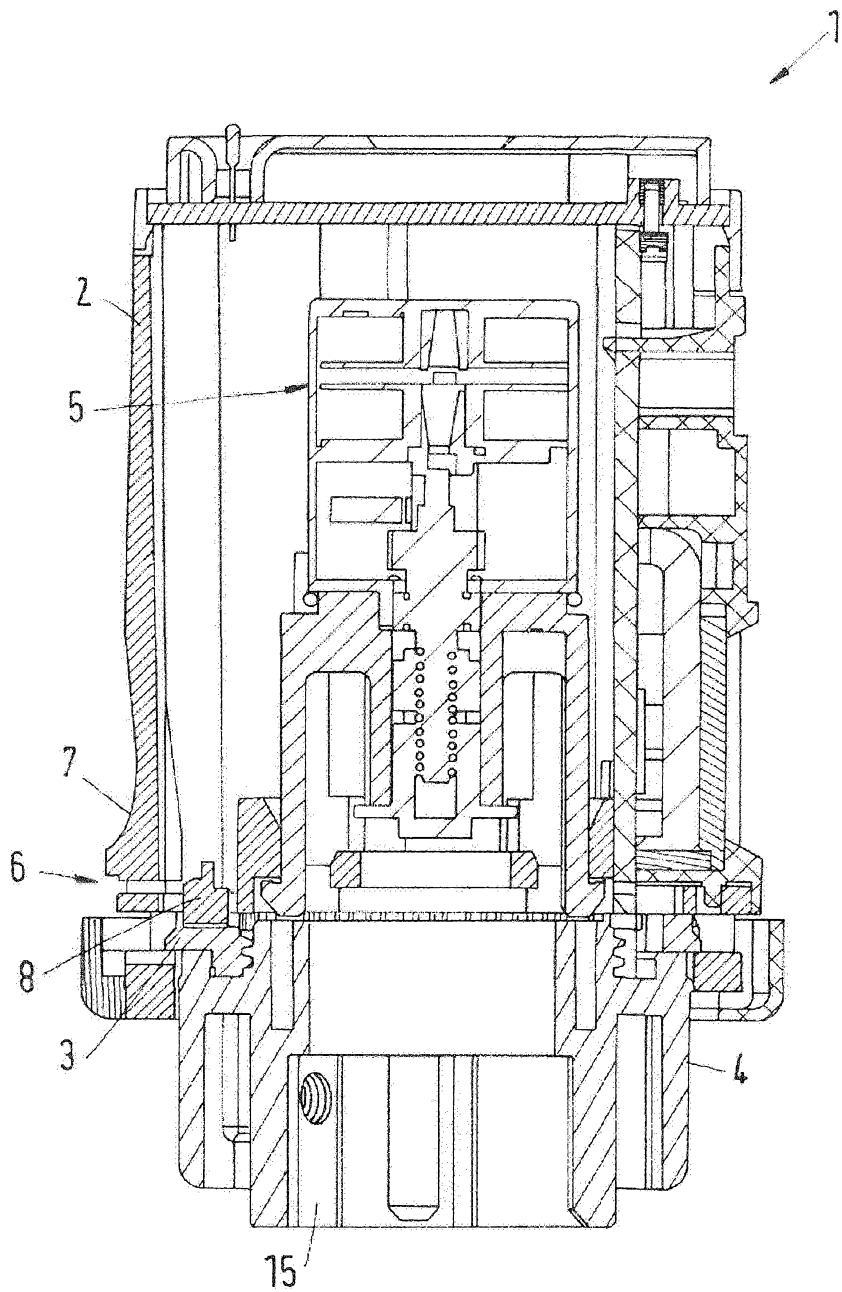


Fig.1

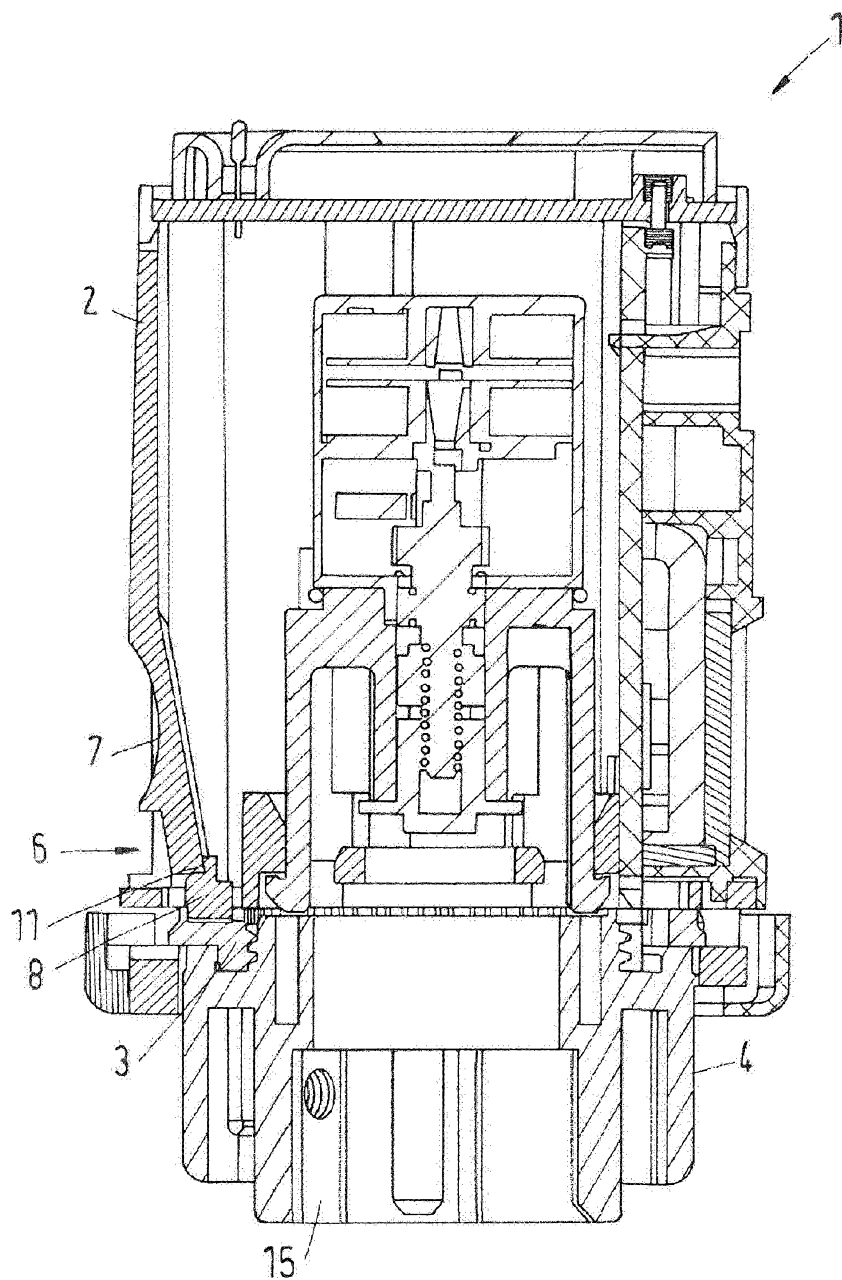


Fig.2

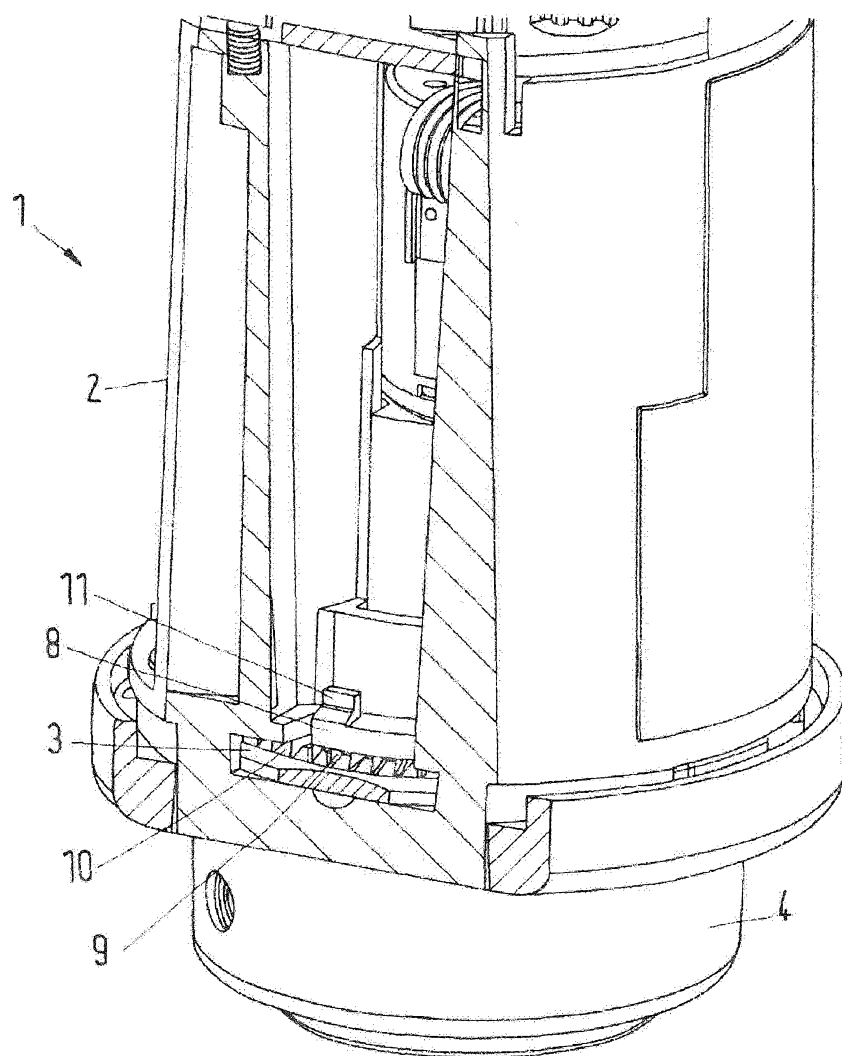


Fig.3

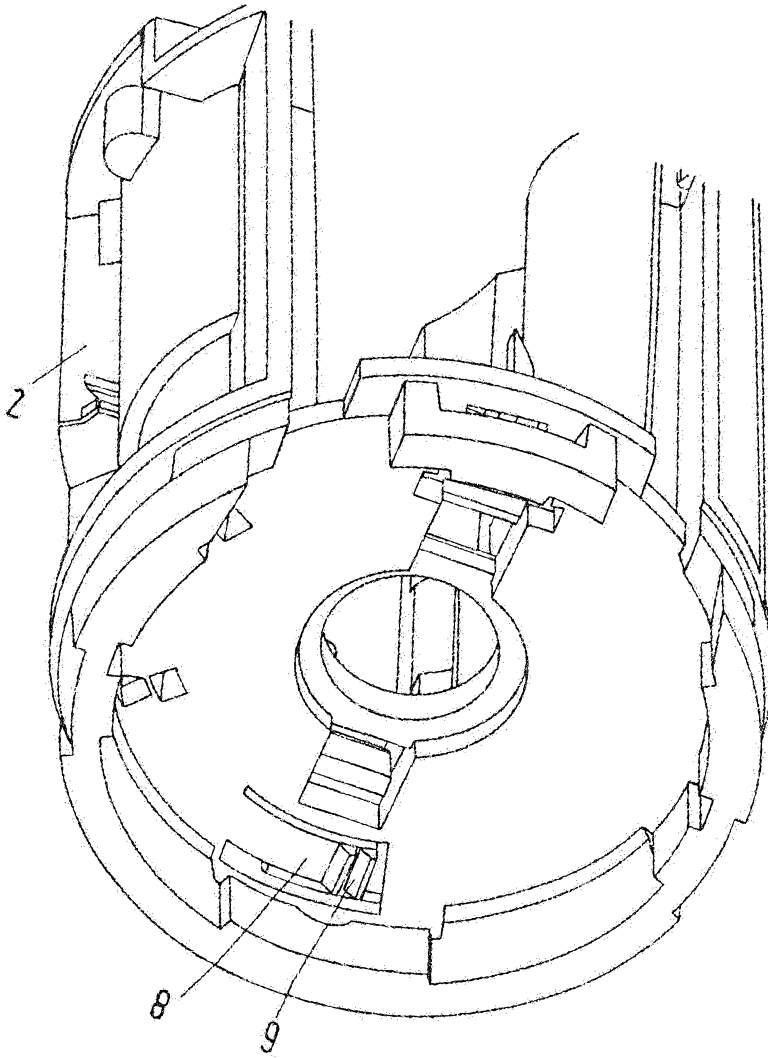


Fig.4

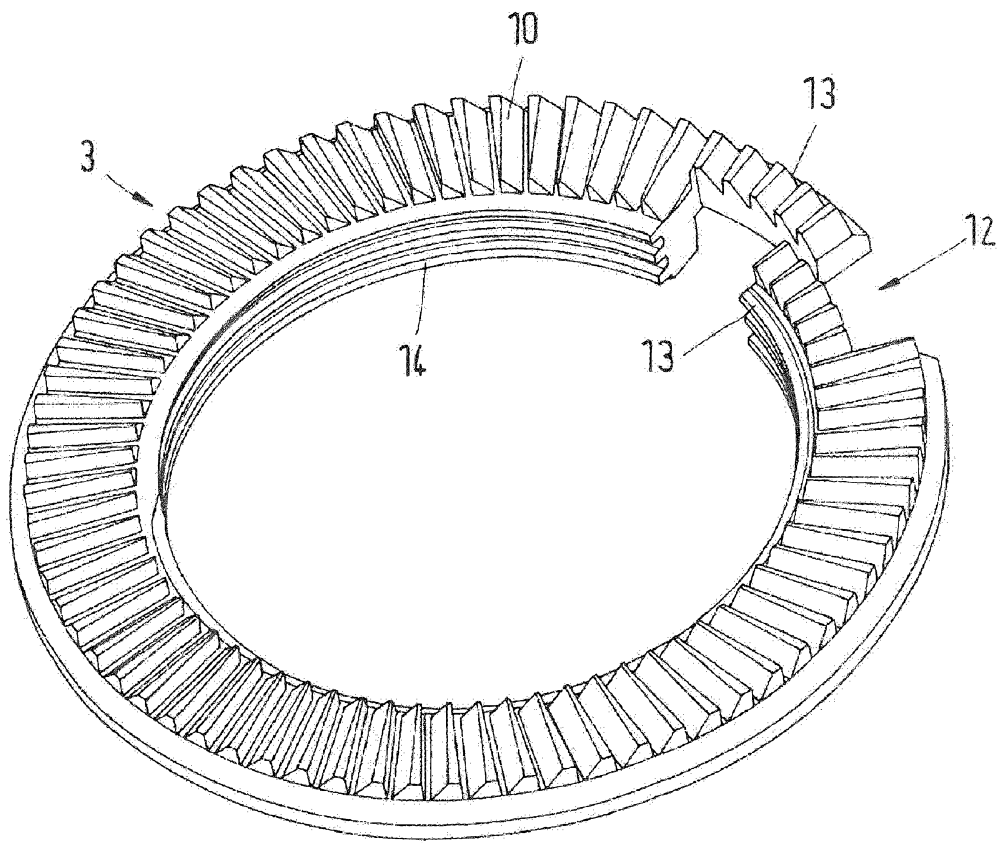


Fig.5

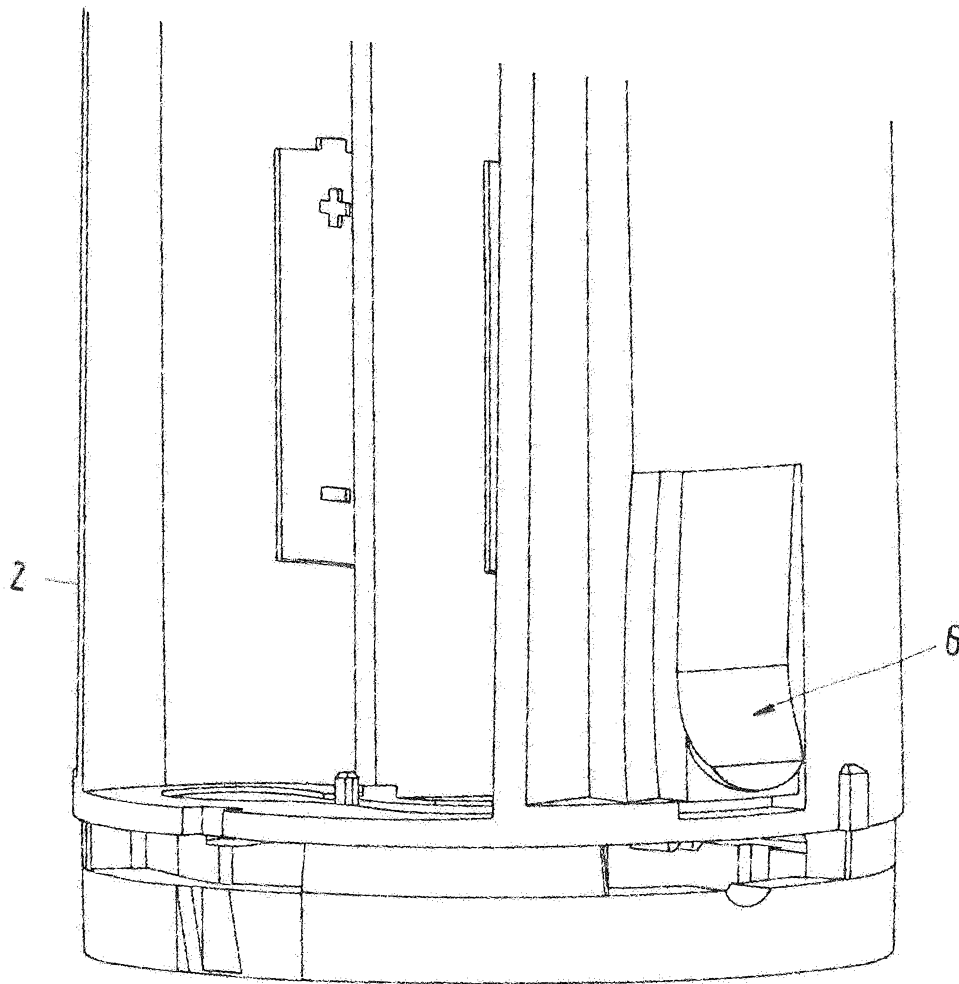


Fig.6