



(51) International Patent Classification:

B60K 15/04 (2006.01)

(21) International Application Number:

PCT/GB2020/050857

(22) International Filing Date:

31 March 2020 (31.03.2020)

(25) Filing Language:

English

(26) Publication Language:

English

(30) Priority Data:

1904524.4

01 April 2019 (01.04.2019)

GB

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(81) Designated States (unless otherwise indicated, for every

kind of national protection available): AE, AG, AL, AM,
AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ,
CA, CH, CL, CN, CO, CR, CU, CZ, DE, DJ, DK, DM, DO,

DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN,
HR, HU, ID, IL, IN, IR, IS, JO, JP, KE, KG, KH, KN, KP,
KR, KW, KZ, LA, LC, LK, LR, LS, LU, LY, MA, MD, ME,
MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ,
OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA,
SC, SD, SE, SG, SK, SL, ST, SV, SY, TH, TJ, TM, TN, TR,
TT, TZ, UA, UG, US, UZ, VC, VN, WS, ZA, ZM, ZW.

(84) Designated States (unless otherwise indicated, for every

kind of regional protection available): ARIPO (BW, GH,
GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, ST, SZ, TZ,
UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ,
TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK,
EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV,
MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM,
TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW,
KM, ML, MR, NE, SN, TD, TG).

Published:

— without international search report and to be republished
upon receipt of that report (Rule 48.2(g))

(54) Title: ANTI-SIPHON DEVICE AND METHOD OF INHIBITING ACCESS TO STORAGE TANK

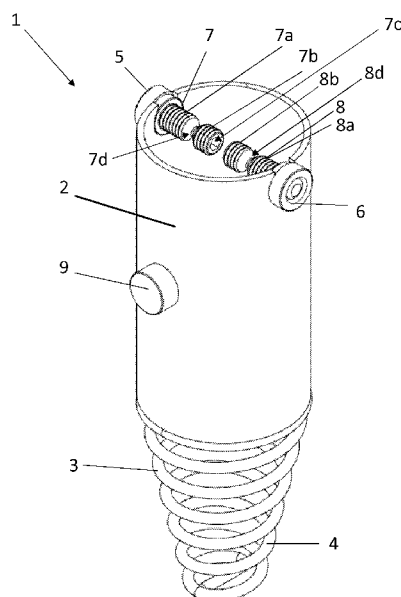


Fig. 1

(57) Abstract: An anti-siphon inlet device (1) is provided. The device (1) comprises a body portion (2) for the receipt of a filling conduit, one or more means (7, 8) for securing the device to a storage tank, and a flexible cage (3, 4) extending from the body portion, the flexible cage being configured to permit passage of liquid into a storage tank but inhibit passage of a siphon tube therethrough, the flexible cage being flexible in a direction non-parallel to the longitudinal axis of the body portion.



Anti-siphon device and method of inhibiting access to storage tank

BACKGROUND OF THE INVENTION

[0001] The present disclosure relates to an anti-siphon device.

[0002] The present application relates to an anti-siphon device and to a method of inhibiting access to a storage tank.

[0003] The siphoning-off of liquids from storage tanks, such as vehicle fuel tanks, is well-known. A siphon tube is introduced into a storage tank and some of the content of the storage tank removed. Siphoning-off can be deterred by fitting an anti-siphon device to a storage tank. Such devices permit filling of the tank, while inhibiting the passage of a siphon tube into the tank.

[0004] The fitting of anti-siphon devices to certain storage tanks can be difficult. For example, some storage tanks (such as those of certain vans) have curving filler necks. Such filler necks may not accommodate some of the known longer anti-siphon devices, such as that described in GB2406333. Shorter devices may be fittable, but they may not accommodate a filler nozzle, or if they do, then the nozzle may not be securely received within the device, presenting a risk of fuel spillage by virtue of the nozzle falling out of the fuel tank during the fuelling process. Furthermore, during the fuelling process fuel has a tendency to “pool” and not flow through the device into the storage tank to which it has been fitted, a phenomenon often known as “backflow”. Such backflow may become a problem if it becomes so pronounced that fuel is ejected or flows out of the vehicle. The dangers associated with such backflow are often more pronounced for shorter devices because they tend to have a smaller volume than longer devices.

[0005] The present invention seeks to mitigate the above-mentioned problems. Alternatively or additionally, the present invention seeks to provide an improved anti-siphon device.

SUMMARY OF THE INVENTION

[0006] In accordance with a first aspect of the present invention there is provided an anti-siphon inlet device comprising a body portion for the receipt of a filling conduit, one or more means for securing the device to a storage tank, and a flexible cage extending from the body portion, the flexible cage being configured to permit passage of liquid into a storage tank but inhibit passage of a siphon tube therethrough, the flexible cage being flexible in a direction non-parallel to the longitudinal axis of the body portion.

[0007] The flexibility of the cage in a direction non-parallel to the longitudinal axis of the body portion permits the anti-siphon device to be used with storage tanks which have curved filler necks. Such fuel tanks are sometimes seen in vans and other light goods vehicles. Such an anti-siphon device may permit a fuelling nozzle to be inserted deeper into a storage tank, thereby reducing the likelihood of backflow problems.

[0008] The cage may also be flexible in a direction parallel to the longitudinal axis of the body portion. The cage may be flexible in two orthogonal directions, each of which is non-parallel to the longitudinal axis of the body portion.

[0009] The body portion may be substantially devoid of apertures in the walls thereof. In this case, fuel therefore leaves the device and enters the fuel tank via the cage only. The cage may optionally be secured to the body portion only. In this case, an end of the cage is optionally secured to one end of the body portion.

[0010] The anti-siphon device may optionally be adapted for receipt by, and attachment to, a filler neck of a fuel tank, such as a fuel tank of a van or other light service vehicle.

[0011] The body portion is optionally elongate. The body portion is optionally cylindrical (i.e. has substantially the same shape and cross-sectional size along its length). The body portion is optionally circular cylindrical. The body portion optionally comprises metal.

[0012] The anti-siphon device optionally comprises one or more spacer projections to facilitate spacing of the device relative to a wall of a fuel tank (for example, the wall of a filler neck). One or more and typically each of the spacer projections optionally projects from the body portion. The anti-siphon device optionally comprises a set of two or more spacer projections located proximate, or at, the end of the anti-siphon device remote from

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the flexible cage. Said spacer projections may be mutually spaced about the outer surface of the body portion. Said spacer projections may be mutually spaced around the circumference of the body portion, if the body portion is circular cylindrical. If there are two (and only two) spacer projections in said set, then said spacer projections may be diametrically opposed. At least one (optionally more than one and optionally each) of said set of spacer projections is configured to receive a means for securing the inlet device to a storage tank. For example, at least one (optionally more than one and optionally each) of said set of spacer projections may comprise a female portion for receiving a male means for securing the inlet device to a storage tank. The at least one (optionally more than one and optionally each) of said set of spacer projections may comprise a thread, for example, to interact with a thread provided on a male means for securing the inlet device to a storage tank.

[0013] The anti-siphon device optionally comprises a protrusion for location in a recess provided in the fuel tank (e.g. a recess in a wall of a filler neck). The protrusion optionally projects from the body portion. The anti-siphon device optionally comprises a spacer projection associated with the protrusion. The protrusion optionally projects further than said spacer projection. Said spacer projection and protrusion may be mutually spaced about the outer surface of the body portion. Said spacer projection and protrusion may be mutually spaced around the circumference of the body portion, if the body portion is circular cylindrical. Said spacer projection and the protrusion may be diametrically opposed.

[0014] The device may be configured such that means for securing the device to a storage tank secures the body portion to the storage tank. At least one, optionally more than one and optionally each of the means for securing the device to a storage tank may comprise a male member for securing the device to a storage tank, such as a bolt or screw. At least one, optionally more than one and optionally each of the means for securing the device to a storage tank may be configured to be anti-tamper. “Anti-tamper” indicates that the means for securing the device to a storage tank is difficult to remove, once in a securing position. For example, the means for securing the device to a storage tank may comprise an anti-tamper tool-engaging configuration which permits the means

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for securing the device to be driven into an engaging position in which the device is secured to the storage tank, but which inhibits removal of the means for securing the device (e.g. Schmersal tamperproof screws which permit a screwdriver to be used to fasten the screw, but do not readily permit removal of the screw). Such anti-tamper tool-engaging configurations typically facilitate rotation of a screw or bolt in one direction, but are configured so that rotation in the opposite direction is not easily done, at least using the same tool that is used to rotate the screw or bolt in the first direction.

[0015] At least one, optionally more than one and optionally each of the means for securing the anti-siphon device to the storage tank may comprise a first portion for securing the device and optionally the body portion to the storage tank, a second portion comprising a configuration for mating with a tool, and a break region between the first and second portions at which the anti-tamper means is configured to break, thereby separating the first portion and the second portion from one another. The first portion (and optionally the second portion) may be threaded. The configuration for mating with a tool may, for example, comprise a female configuration for receipt of a tool, such as a linear slot for the receipt of a head of a flat-head screwdriver, a cross-shaped slot for the receipt of a head of a Posidrive or Phillips screwdriver or a hexagonal-sectioned recess for the receipt of the head of an Allen key. The break region may be configured to break on the application of a suitable turning force. The force required is typically sufficiently high so that the first portion can be deployed to secure the device to the storage tank, but low enough so that turning of the second portion once the first portion is so deployed causes breakage at the break region.

[0016] The cage may comprise a spring, such as a coil spring. A spring is a convenient way of providing a flexible cage which inhibits passage of a siphon tube into a storage tank, while permitting passage of liquid out of or through the cage.

[0017] The cage may have a cross-section proximate to the main body which is greater than a cross-section remote from the main body. The cage may optionally taper. The cage may, for example, taper with increasing distance from the main body. Such a shape is effective in inhibiting passage of a siphon tube therethrough. The cage may optionally be conical or frusto-conical. This provides a convenient shape which permits egress of fuel

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into a storage tank, but inhibits passage of a siphon tube into a storage tank. The cage may comprise a conical or frusto-conical spring.

[0018] As mentioned above, the body portion may be elongate. The length of the body portion is optionally greater than the length of the cage.

[0019] According to a second aspect of the invention there is also provided a method of inhibiting access to the contents of a storage tank, the method comprising:

providing an anti-siphon device in accordance with the first aspect of the present invention; and

securing the anti-siphon device to the storage tank.

[0020] The one or more means for securing the anti-siphon device to the storage tank may comprise anti-tamper means. The means for securing the anti-siphon device to the storage tank may comprise a first portion for securing the body portion to the storage tank, a second portion comprising a configuration for mating with a hand tool, and a break region between the first and second portions at which the anti-tamper means is configured to break, thereby separating the first portion and the second portion from one another.

[0021] The method may comprise securing the anti-siphon device to the neck or inlet of a storage tank, such as a fuel tank.

[0022] It will of course be appreciated that features described in relation to one aspect of the present invention may be incorporated into other aspects of the present invention. For example, the method of the second aspects of the present invention may incorporate any of the features described with reference to the anti-siphon device of the first aspect of the present invention and *vice versa*.

DESCRIPTION OF THE DRAWINGS

[0023] Embodiments of the present invention will now be described by way of example only with reference to the accompanying schematic drawings of which:

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[0024] Figure 1 shows a perspective view of an example of an anti-siphon inlet device according to a first embodiment of the invention;

[0025] Figure 2 shows a first side-on view of the inlet device of Fig. 1;

[0026] Figure 3 shows a second side-on view of the inlet device of Fig. 1;

[0027] Figure 4 shows a plan view of the inlet device of Fig. 1; and

[0028] Figure 5 shows a cut-away view of the inlet device of Fig. 1 when installed in a fuel tank.

DETAILED DESCRIPTION

[0029] Figure 1 shows an example of an anti-siphon inlet device in accordance with an embodiment of the present invention. The anti-siphon inlet device is denoted generally by reference numeral 1, and comprises a metal, circular cylindrical body portion 2 for the receipt of a filling conduit, such as a fuel filling nozzle. The anti-siphon inlet device 1 comprises one or more means 7, 8 for securing the device to a storage tank, which in the present case are snap-off screws, and a flexible cage 3 extending from the body portion, configured to permit passage of liquid into a storage tank but inhibit passage of a siphon tube therethrough, the flexible cage being flexible in a direction non-parallel to the longitudinal axis of the body portion 2. The flexible cage 3 is a frusto-conical helical spring 4. It should be noted that the spring 4 is also flexible in a direction parallel to the longitudinal axis of the body portion 2. For the avoidance of doubt, the longitudinal axis of the body portion is the axis of cylindrical body portion 2 and is shown as feature A in Figures 2 and 3.

[0030] The flexibility of the cage in a direction non-parallel to the longitudinal axis of the body portion permits the anti-siphon device to be used with storage tanks which may have curved filler necks. Such fuel tanks are sometimes seen in vans and other light goods vehicles. The device 1 and its fitment to a fuel tank will now be described.

[0031] The device 1 as shown in Figure 1 is inserted into the filler neck N of a fuel tank of a van, see Figure 5. Those skilled in the art will recognise that the filler cap C is removed to facilitate this. The device 1 comprises a protrusion 9 which is located about

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half-way along the length of the main body 2 and which projects from the main body 2. The device is oriented so that protrusion 9 is located in a recess (not labelled) of the filler neck N. The device 1 comprises a spacer projection 10 which is located diametrically opposite protrusion 9, and which helps space the wall of main body 2 from the wall of the filler neck N. Device 1 comprises a set of spacer projections 5, 6 which extend outwards from the top part of the main body 2. The spacer projections 5, 6 allow the device to be positioned in a filler neck, and provide support to the rest of the device. Each spacer projection 5, 6 comprises an internal threaded portion for the receipt of a respective grub screw 7, 8, each of which is used to attach the device 1 to the filler neck as will now be described. Each grub screw 7, 8 is provided with an Allen-key receiving portion, one of which 7c is shown. An Allen key is used to screw the grub screws through the spacer projections 5, 6 and into engagement with the wall of the cap receiving portion (CRP) of the filler neck N. Once a grub screw is in engagement with the wall, the resistance to further turning of the grub screw increases dramatically. Each grub screw is provided with a break portion 7d, 8d at which the grub screw breaks, thereby separating the portion 7a, 8a of the grub screw which attaches the anti-siphon device 1 to the filler neck N from the portion 7b, 8b of the grub screw which comprises the Allen-key receiving portion 7c, once a certain torque is applied. Once the grub screw 7, 8 is in engagement with the wall, further turning of the Allen key will cause breakage of the grub screw, leaving part 7a, 8a of the grub screw securing the device 1 to the wall of the neck N, but with no easily usable tool-receiving configuration to facilitate removal of the grub screw 7, 8.

[0032] When the device 1 is in place, the cap C may be replaced.

[0033] With the device 1 in place, a fuelling nozzle may be inserted into the device 1, the nozzle extending into the main body 2 and into flexible cage 3. As can be seen in Figure 5, flexible cage 3 may follow the shape of filler neck. The fuelling nozzle may be received deep within the filler neck, reducing the risk of the nozzle falling out of the fuel tank during the fuelling process and decreasing the risk of backflow.

[0034] The spacing of adjacent turns of the coil of spring 4 is sufficiently small to inhibit passage therebetween of a typical siphon tube which would have an external diameter of 8-10mm. Furthermore, the end of the spring 4 remote from body portion 2 is provided

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with a laterally-extending end portion (not labelled but best seen in Figs. 1 and 4) which inhibits passage of a siphon tube through the end of the spring 4.

[0035] Whilst the present invention has been described and illustrated with reference to particular embodiments, it will be appreciated by those of ordinary skill in the art that the invention lends itself to many different variations not specifically illustrated herein. By way of example only, certain possible variations will now be described.

[0036] Those skilled in the art will realise that the anti-siphon device of the present invention need not only be used with fuel tanks. Those skilled in the art will realise that the anti-siphon device may be used in association with other liquid-receiving and containing tanks. In fact, the anti-siphon device may be used with flowable materials other than liquids, such as powders.

[0037] Those skilled in the art will realise that the flexible cage need not be conical or frusto-conical. Those skilled in the art will also realise that flexible cages other than springs may be used.

[0038] Those skilled in the art will realise that means for securing the anti-siphon inlet device to a storage tank other than the bolts described herein may be used.

[0039] Where in the foregoing description, integers or elements are mentioned which have known, obvious or foreseeable equivalents, then such equivalents are herein incorporated as if individually set forth. Reference should be made to the claims for determining the true scope of the present invention, which should be construed so as to encompass any such equivalents. It will also be appreciated by the reader that integers or features of the invention that are described as preferable, advantageous, convenient or the like are optional and do not limit the scope of the independent claims. Moreover, it is to be understood that such optional integers or features, whilst of possible benefit in some embodiments of the invention, may not be desirable, and may therefore be absent, in other embodiments.

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CLAIMS

1. An anti-siphon inlet device comprising:

a body portion for the receipt of a filling conduit;

one or more means for securing the device to a storage tank; and

a flexible cage extending from the body portion;

the flexible cage being configured to permit passage of liquid into a storage tank but inhibit passage of a siphon tube therethrough,

the flexible cage being flexible in a direction non-parallel to the longitudinal axis of the body portion.
2. The anti-siphon device according to claim 1 comprising one or more spacer projections to facilitate spacing of the device relative to a wall of a fuel tank, one or more of the spacer projections optionally projecting from the body portion.
3. The anti-siphon device according to claim 2 comprising a set of two or more spacer projections located proximate, or at, the end of the anti-siphon device remote from the flexible cage.
4. The anti-siphon device according to claim 3 wherein said spacer projections are mutually spaced about the outer surface of the body portion, wherein if there are two (and only two) spacer projections in said set, then said spacer projections are optionally diametrically opposed.
5. The anti-siphon device according to claim 3 or claim 4 wherein at least one of said set of spacer projections is configured to receive a means for securing the inlet device to a storage tank.
6. The anti-siphon device according to claim 5 wherein at least one of said set of spacer projections comprises a female portion for receiving a male means for securing the inlet device to a storage tank.

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7. The anti-siphon device according to any preceding claim comprising a protrusion for location in a recess provided in the fuel tank, the protrusion optionally projecting from the body portion.
8. The anti-siphon device according to claim 7 comprising a spacer projection associated with the protrusion.
9. The anti-siphon device according to claim 8 wherein the protrusion projects further than said spacer projection.
10. The anti-siphon device according to claim 8 or claim 9 wherein said spacer projection and protrusion are mutually spaced about the outer surface of the body portion, said spacer projection and the protrusion optionally being diametrically opposed.
11. The anti-siphon device according to any preceding claim configured such that means for securing the device to a storage tank secures the body portion to the storage tank.
12. The anti-siphon device according to any preceding claim wherein one or more means for securing the device to a storage tank comprises a male member for securing the device to a storage tank.
13. The anti-siphon device according to any preceding claim wherein one or more means for securing the device to a storage tank is configured to be anti-tamper.
14. The anti-siphon device according to claim 13 wherein the anti-tamper means for securing the device to a storage tank comprises an anti-tamper tool-engaging configuration which permits the means for securing the device to be driven into an engaging position in which the device is secured to the storage tank, but which inhibits removal of the means for securing the device.
15. The anti-siphon device according to any preceding claim wherein at least one of the means for securing the anti-siphon device to the storage tank comprise a first portion for securing the device to the storage tank, a second portion comprising a configuration for mating with a tool, and a break region between the first and second portions at which the anti-tamper means is configured to break, thereby separating the first portion and the second portion from one another.

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16. The anti-siphon device according to any preceding claim wherein the cage comprises a spring, optionally a coil spring.
17. The anti-siphon device according to any preceding claim wherein the cage has a cross-section proximate to the main body which is greater than a cross-section remote from the main body.
18. The anti-siphon device according to claim 17 wherein the cage tapers, optionally with increasing distance from the main body.
19. The anti-siphon device according to any preceding claim wherein the cage is conical or frusto-conical.
20. The anti-siphon device according to any preceding claim wherein the body portion is elongate and the length of the body portion is greater than the length of the cage.
21. The anti-siphon according to any preceding claim wherein the cage is flexible in a direction parallel to the longitudinal axis of the body portion.
22. A method of inhibiting access to the contents of a storage tank, the method comprising:

providing an anti-siphon device in accordance with any preceding claim; and

securing the anti-siphon device to the storage tank.
23. A method according to claim 22 comprising securing the anti-siphon device to the neck or inlet of a fuel tank.

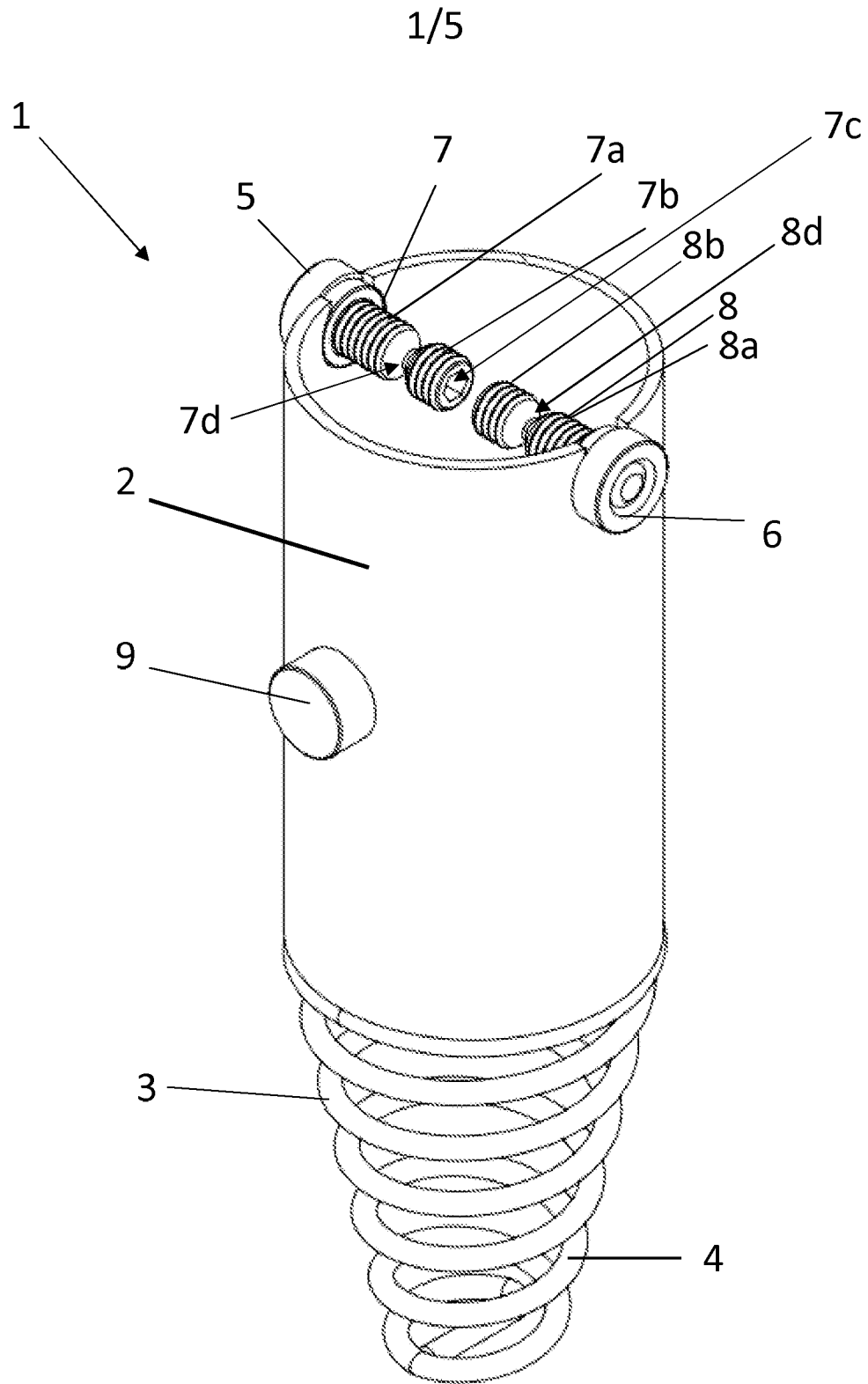


Fig. 1

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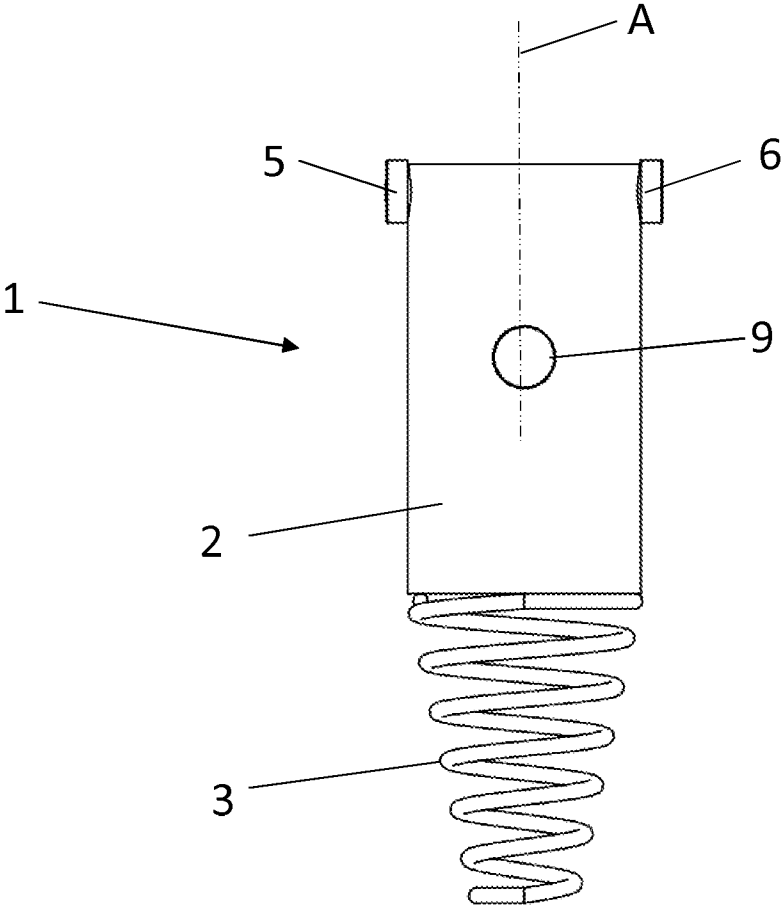


Fig. 2

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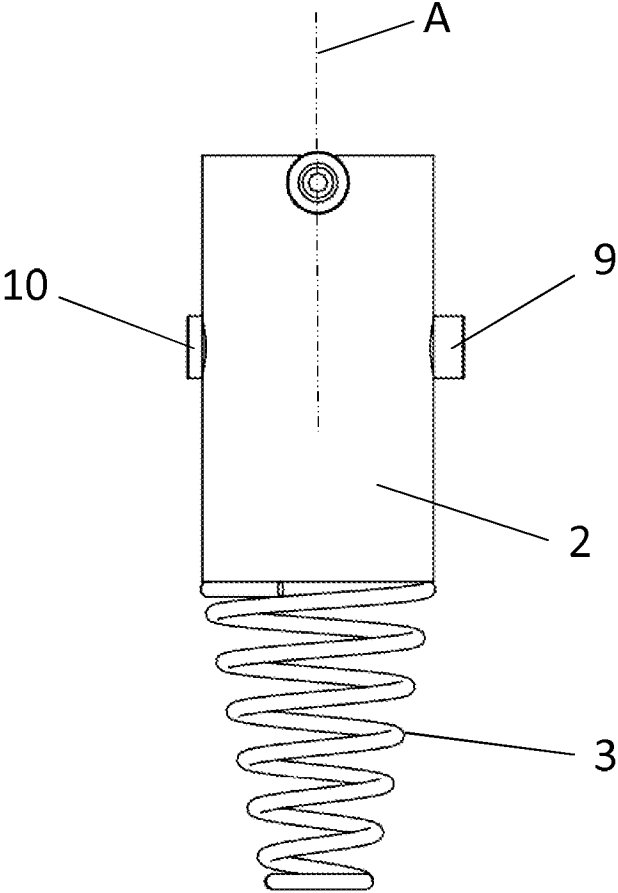


Fig. 3

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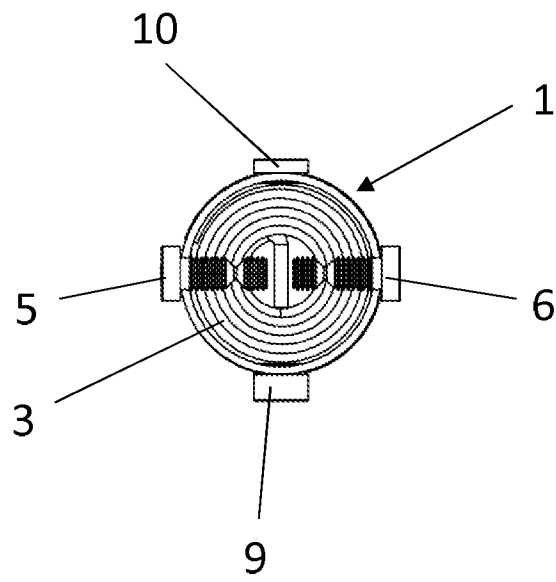


Fig. 4

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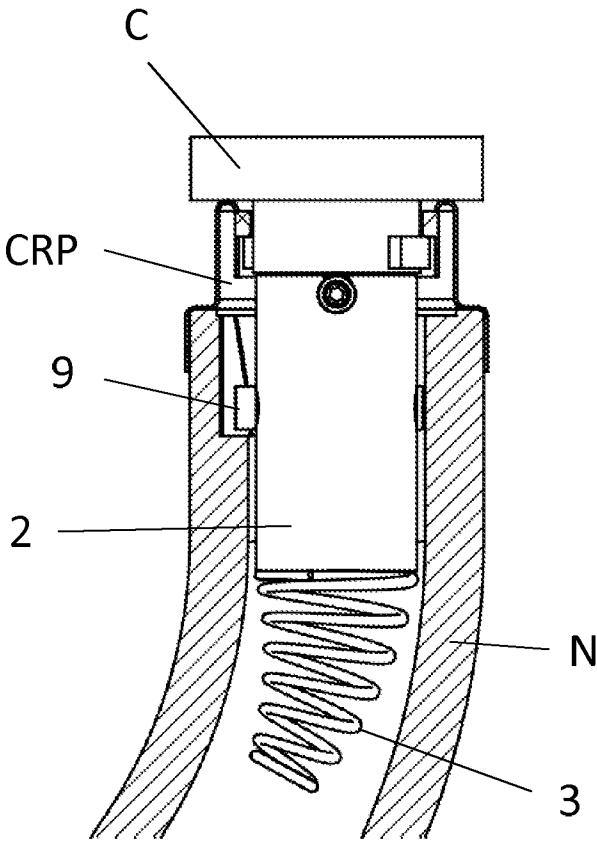


Fig. 5