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(54) **DEVICE FOR REDUCING SPILLAGE UPON REFUELLING AND METHOD THEREFOR**

(57) The present invention relates to fuel pistols. The object of the invention is to solve the problem of fuel spills, primarily from fuel pistols having sensing tubes in the dispenser nozzle.

The invention is based on a device for reducing fuel spills from a fuel pistol with a dispenser nozzle, wherein the device comprises:

- a casing shaped as a pipe, wherein the casing has an inner surface, a first and second end, wherein the first end may enclose the fuel dispenser nozzle;
- a flexible disc having a circumference, wherein the circumference of the disc contacts the other end of the casing, wherein the flexible disc is divided into two or more flexible sections, wherein the space between the adjacent sections may be varied, when the disc is affected by force, e.g. fluid pressure.

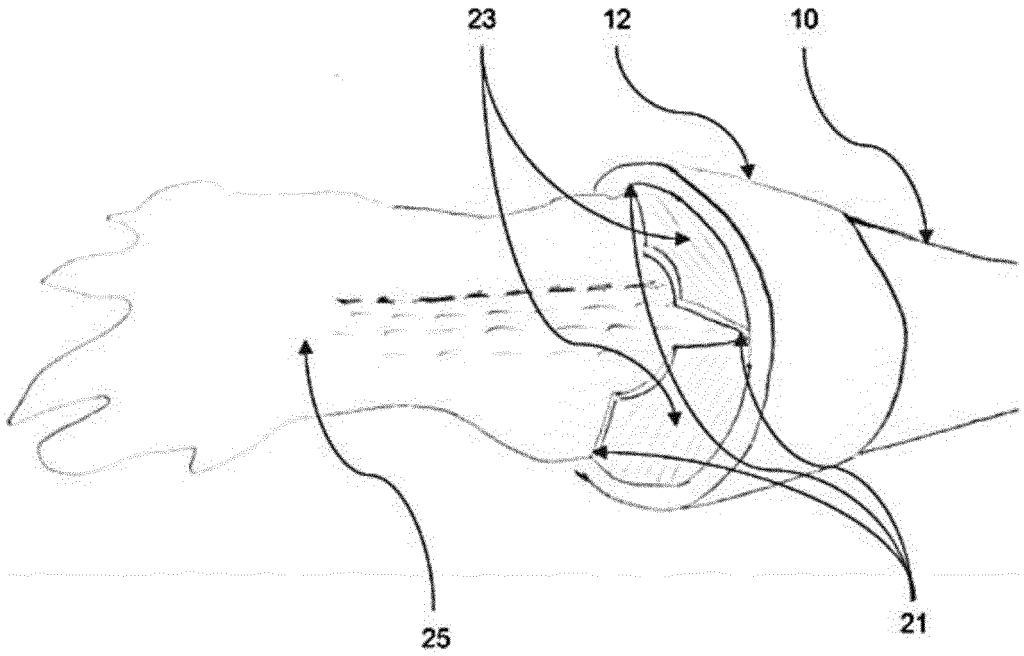

Fig. 4

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Description

Field of the invention

[0001] The present invention relates to fuel pistols.

Background of the invention

[0002] When refuelling vehicles at filling stations, a certain amount of fuel pistol dripping after refuelling is known to occur, when removing it from the vehicle's fuel tank opening and replacing it in the filling station's fuel dispenser (pump).
This is caused by remaining excess fuel between the fuel dispenser nozzle and the internal valve of the fuel pistol, which needs to be discharged after the fuelling from the fuel dispenser (pump) has stopped automatically, which will result in fuel spill and thus potential contamination of the environment, as well as clothing, the vehicle and the filling station area.

[0003] Fuelling being stopped automatically by fuel pistols is based on the venturi principle, whereby the liquid flows back through a narrowed section in the form of a small sensing tube in the fuel pistol extending to the internal valve of the fuel pistol, thus mechanically stopping fuelling.

[0004] This sensing tube is located a bit above the fuel dispenser nozzle in several types of fuel pistols, however, it is also located in the dispenser nozzle of many other types of fuel pistols.

[0005] This type of fuel pistol having a sensing tube in the dispenser nozzle therefore forms the basis of the invention, which addresses the problem of dripping in all types of fuel pistols, in that no closing of the small sensing tube must occur.

[0006] Several efforts and patents have been pursued in order to solve the problem related to dripping, but not involving sensing tubes and all the excess and residual fuel inside the fuel pistol's inner tube. These problems need to be solved in the fuel dispenser nozzle, in that this is where excess fuel in the fuel pistol is discharged. Likewise, the ability to retrofit the device on existing fuel pistols should also be afforded.

[0007] US Pat. No.: 4,214,614 issued to Walter R. Pyle on 4 Dec. 1978 shows a valve in proximity to the dispenser nozzle, which opens when refuelling and subsequently closes. This solution is unworkable, when the sensing tube is located in the fuel dispenser nozzle.

[0008] US Pat. No.: 4,213,488 issued to Walter R. Pyle on 22 July 1980 shows a valve in proximity to the dispenser nozzle, which opens during refuelling and subsequently closes. This solution is unworkable, when the sensing tube is located in the fuel dispenser nozzle.

[0009] US Pat. Pub. No.: US 2004/0060612 A1 issued to Curtis E. Dame on 1 April 2004 shows a drip container collecting excess fuel. However, this solution is impractical and not optimal, in that the drip holder is filled during refuelling and fails to collect all the excess fuel inside the fuel pistol chamber, only in its lower portion.

[0010] US Pat. Pub. No.: WO 2005/039981 A1 published for Lunn, Meredith on 6 May 2005 (subsequently rejected) shows a diaphragm, which closes the fuel dispenser nozzle and opens it, during fuel pressure. In practice, this solution is unfeasible, when the sensing tube is located in the fuel dispenser nozzle, in that the described mobility/operation of the diaphragm is impossible.

[0011] US Pat. Pub. No.: US 2010/096038 A1 issued to Burris Steven Y. on 22 April 2010 shows a check valve located at the dispenser nozzle, which opens when refuelling and subsequently closes. This solution is unworkable, when the sensing tube is located in the fuel dispenser nozzle.

[0012] WO 2018/169845 A1 relates to a device for reducing fuel spill from a fuel pistol, consisting of a flexible casing shaped like a tube. One end of the tube has a first device securing the casing to the fuel pistol. The other end has a second device enclosing the fuel dispenser nozzle. The second device has a flexible disc divided into several flexible sections, which is arranged in front of the fuel dispenser nozzle. When using the fuel pistol for refuelling, the flexible casing is contracted as the casing contacts the fuel tank opening. This allows the dispenser nozzle to be released from the casing, due to the flexible disc in the second device. This is a big and unwieldy device that will not prevent fuel spillage whenever the fuel pistol opening is clear of the device.

[0013] None of the above efforts and patents are based on solving the problem of dripping when the sensing tube is located in the fuel dispenser nozzle.

Object of the invention

[0014] The invention is intended to solve the above problem related to fuel spillage primarily from fuel pistols with sensing tubes in their dispenser nozzle.

Description of the invention

[0015] The invention solves the aforesaid problem by means of a device for reducing fuel spills from a fuel pistol with a fuel dispenser nozzle, wherein the device comprises:

- a casing shaped as a pipe, wherein the casing has an inner surface, a first and second end, wherein the first end may enclose the fuel dispenser nozzle,
- a flexible disc having a circumference, wherein the circumference of the disc contacts the other end of the casing, wherein the flexible disc is divided into two or more flexible sections, wherein the space between the adjacent sections may be varied, when the disc is affected by a force, e.g. fuel pressure.

[0016] A maximum possible amount of the excess fuel in the fuel pistol needs to be discharged into the vehicle fuel tank. The residual fuel, which cannot or will not have

time to be discharged into the vehicle fuel tank, constitutes the primary problem related to fuel spillage after refuelling of a vehicle has completed.

[0017] The invention is therefore adapted to all phases of this type of problem. Liquid spills from the fuel pistol will always occur in the dispenser nozzle, which is the reason for placing the inventive device there.

[0018] The flexible sections or sides are divided by slots, which form the space between the adjacent sections, such that these pliable and flexible sections may be slid out and opened even more for refuelling and retracted when discontinuing refuelling.

[0019] The casing may have an edge recess for securing the disc around the sensing tube. This edge recess may be omitted in certain types of fuel pistols where a sensing tube is not located in the dispenser nozzle.

[0020] This drip-free solution is based on being easily and affordably retrofittable on all types of current and future fuel pistols, while having a high operational reliability. The solution also ensures easy and user-friendly retrofitting on existing fuel pistols.

[0021] In another embodiment, one or several first openings are arranged in the flexible disc, wherein an area of said openings changes, when the space between the sections is modified.

[0022] The invention consists of a flexible material, e.g. rubber or plastic, and is shaped as a ring. The centre of the disc constitutes an opening and thus more or less forms a ring, which ensures free passage of a as much excess fuel as possible, which is thus discharged as quickly as possible and as much as possible into the vehicle tank after automatic refuelling stop.

[0023] Further embodiments include:

- The flexible disc comprises a second opening through the disc.
  A sensing tube may be located in the fuel dispenser nozzle. One or more flexible sections has one opening, which may be placed above the sensing tube allowing for free passage of the automatic refuelling stop operation in the internal valve of the fuel pistol. The location and size of this second opening, a universal opening, may vary depending on the type of fuel pistol being considered. If the sensing tube is not located in the fuel dispenser nozzle, the second sensing tube opening may be dispensed with when using these types of fuel pistols.

- The second opening is arranged in a section, offset from the space between the adjacent sections,

- wherein one or more grooves are arranged in whole or in part on the inner surface of the casing;

- wherein one or more grooves are arranged in whole or in part as a thread in the inner surface of the casing.
  In order to mount the disc, a casing of a hard and solid material is placed across the fuel dispenser nozzle, which casing thus is capable of fully securing the disc between the dispenser nozzle and the casing via, e.g., a pressing device or a thread,

- wherein the flexible disc has a groove pattern on at least one surface.
  The back, e.g. the surface facing the fuel pistol tube, may have additional slats or grooves, which may collect excess residual fuel and prevent the fuel dispenser nozzle from dripping.

[0024] A method of mounting a device on a fuel pistol comprising the steps of:

a) providing a device and providing a fuel pistol with a dispenser nozzle;
b) placing the first end of the casing outside the dispenser nozzle, such that the casing has an inner surface arranged laterally to portions of an outer surface of the dispenser nozzle, and wherein the first end of the casing extends beyond the dispenser nozzle, and wherein the flexible disc arranged at the other end of the casing is placed in extension of the dispenser nozzle.

[0025] In a further embodiment, the fuel pistol has a sensing tube arranged in the fuel dispenser nozzle, wherein the flexible disc comprises a second opening through the disc, which opening is arranged in extension of an opening in the sensing tube.

[0026] These and other objects of the present invention will become obvious when reviewing the detailed description of the drawings.

Description of the drawings

[0027] The invention will be described in the following with reference to the accompanying drawings, in which:

FIG. 1a is a 3D overview of a portion of the fuel pistol and its dispenser nozzle, disc and casing.
FIG. 1b is a 3D drawing of the invention end-mounted on the fuel pistol.
FIG. 2 is a 3D drawing showing the location of the sensing tube in the fuel dispenser nozzle.
FIG. 3a is a 3D drawing of the back of the disc facing the fuel dispenser nozzle, and the disc design consisting of flexible sections.
FIG. 3b is a 3D drawing of the front of the disc showing the opening and closing operation of the flexible sections.
FIG. 4 is a drawing of the disc's opening function during refuelling.
FIG. 5a is an external 3D view of the casing.
FIG. 5b is an internal 3D view of the casing.
FIG. 6a is a 3D drawing of the disc and casing in an integrated material.

FIG. 6b is a 3D drawing of the disc and casing in an integrated material seen from the inside.

Detailed description of the invention

[0028] It should be noted, initially, that the attached drawings illustrate the preferred embodiment. When refuelling a vehicle, many people experience a certain amount of dripping from the fuel pistol, either down on the vehicle, clothing or the filling station area.

[0029] Several efforts and patents have been pursued in order to solve the problem of fuel spills from fuel pistols but, thus far, none were able to also address those types of fuel pistols that have sensing tubes in their dispenser nozzle.

[0030] The following invention is described in detail in terms of solving the problem of fuel spills from fuel pistols, in general, as well as fuel pistols with sensing tubes in the dispenser nozzle, in particular.

[0031] FIG. 1a shows a 3D drawing of the end of the fuel pistol with sensing tubes in the dispenser nozzle 10, wherein the disc 11 and the casing 12 are viewed at an angle and from the side, wherein reference is made to the order of assembly.

[0032] FIG. 1b shows a 3D drawing of the disc 11 mounted on the end of the fuel pistol having sensing tubes in the dispenser nozzle 10 and attached to the casing 12. The casing 12 is pressed firmly and manually against the end of the fuel pistol having the dispenser nozzle 10, such that the disc 11 is compressed between them for securing including sealing against fuel leakage through the casing 12 along the end of the fuel pistol at dispenser nozzle 10. The casing 12 may be fastened on the fuel pistol with an appropriate tool, or attached by threads, glued, or welded.

[0033] This device for reducing fuel spills from fuel pistols comprises a disc 11 and a casing 12 for rigid mounting on the end of the fuel dispenser nozzle 13, wherein the disc 11 is flexible in response to fuelling, such that the disc 11 may open and close during refuelling.

[0034] FIG. 2 shows a 3D drawing of the design of the fuel pistol end having dispenser nozzle 10, wherein the sensing tube 14 and the sensing tube 15 opening are located in the dispenser nozzle 13 itself, which extends up to the fuel pistol's internal valve, wherein the venturi principle ensures that refuelling automatically stops, when this opening in the sensor tube is closed to the fuel-air flow at full tank.

[0035] FIG. 3a shows a 3D drawing of the design of the back of the disc 11, which should face the fuel dispenser nozzle, wherein the back is designed to collect excess liquid via chambers 19, which are divided by one or more groove patterns consisting of grooves or slats 20. The material of the disc 11 may be of a flexible material, e.g. rubber or plastic, and may vary in size relative to the size of the dispenser nozzle 13 of the fuel pistol, which is often about 1" (inch).

[0036] The sealing frame 16 should be pressed against the edge of the dispenser nozzle and ensure that the fuel does not leak into the casing, where the chamber 17, between the sealing frame 16 and the slats 20, should provide space for the sealing frame 16, when the latter is squeezed together between the casing and the dispenser nozzle. The assembly for collecting excess fuels may be designed differently, e.g. recesses in the form of grooves, or other types of divided chambers.

[0037] The slats 20 form small chambers 19 for collecting the residual fuel, wherein these are divided into at least two identical flexible sections separated by slots 21, four sections being shown in this example. The slots 21 allow the identical flexible sections to move in the same direction as the fuel, thus creating a greater opening 18 for the free passage of fuel, when refuelling.

[0038] The opening 18, as shown in the figure for the original position of the flexible section, may discharge excess fuel from the fuel pistol as quickly as possible at completed refuelling. The opening 18 is about half the size of the disc 11 in diameter.

[0039] There is an opening 22 for the sensor tube 14 in one of the identical flexible sections, which opening is placed exactly above the opening 15 of the sensing tube at the end of the fuel pistol, at dispenser nozzle 13. The opening 22 may vary in size and placement depending on the type of fuel pistol, and may be adapted universally.

[0040] The disc 11 is made of a flexible material, e.g. rubber or plastic approved for several types of fuel, and may vary in size depending on the size of the fuel dispenser nozzle 13.

[0041] FIG. 3b shows a 3D drawing of the front of disc 11 indicating how the flexible sections 23 may move 24 when opened during refuelling. Furthermore, the sections 23 may be adapted to fuel pistols having sensing tubes 15 located in the dispenser nozzle 13 comprising a universal opening 22, which ensures free passage to the fuel pistol sensing tubes 15.

The flexible sections 23 open out and away from the fuel dispenser nozzle 13 in order to create a greater opening 18. Upon completed refuelling, the sections 23 fall back to their original position, as shown in the figure.

[0042] The opening 22 of the sensing tube 14 is placed in one of the identical flexible sections 23 separated by the slots 21. The opening 22 may vary in size and placement depending on the type of fuel pistol.

[0043] The disc 11 is made of a flexible material, e.g. rubber or plastic approved for several types of fuel, and may vary in size depending on the size of the fuel dispenser nozzle 13.

[0044] FIG. 4 shows a drawing of the fuel 25 flow, and indicates the opening operation of the flexible sections 23, which, due to the fuel 25 pressure, tilt out and away from the end of the fuel pistol with dispenser nozzle 10 and casing 12 in the same direction as the fuel 25 pressure.

[0045] FIG. 5a is an external 3D view of the casing 12. The casing may be made of a hard solid material, e.g. aluminium, rubber or plastic, in order to withstand heavy

use. The casing 12 is intended to secure the disc 11 to the fuel dispenser nozzle 13 by means of an edge 26, which is pressed firmly and manually against the disc 11 and the dispenser nozzle 13.

[0046] The edge 26 is provided with an edge recess for the sensing tube 27, with a recess for the sensor tube 28 opening. The edge recess for the sensing tube 27 ensures that the disc 11 is also secured to the sensing tube 14.

[0047] The thickness of the casing 12 material should be at least about 1-3 mm., due to the entry opening for the tank of the vehicles being adapted to the current width of the fuel pistol 13, i.e. from about 1" (inch).

[0048] The casing 12 is, e.g., made of a hard and solid material, e.g. aluminium or other similar material, or a material blend, which is approved for several types of fuel and which may vary in size depending on the size of the fuel dispenser nozzle in order to be adapted to fuel pistols having sensing tubes 15 located in the dispenser nozzle 13 comprising a universal opening 28 ensuring free passage to the fuel pistol sensing tube 15.

[0049] The casing 12 is mounted by pressing it manually upwards along the fuel dispenser nozzle and fastening it with an appropriate tool to the fuel pistol, or mounting it rigidly by means of threads, gluing, and welding.

[0050] FIG. 5b shows an internal 3D view of the casing 12 described the same way as in FIG. 5a.

[0051] FIG. 6a shows an external 3D drawing of the disc 11 and the casing 12 as a single integrated unit of one material - referred to as disc casing 29. The end of the inside walls of the disc casing 29, which end is intended to slide over the end of the fuel pistol, has one or more grooves, such as mounting slats 30, which are intended to provide rigid mounting by means of a sealing material, such as glue, applied over and in between the slats, and thus attaching to the fuel pistol.

[0052] The disc 29 may be of a flexible material or a compound material, fully or partially including, e.g., rubber or plastic approved for several types of fuel, and may vary in size depending on the size of the fuel dispenser nozzle 13.

[0053] FIG. 6b shows an internal 3D view of the disc casing 29 described the same way as in FIG. 6a.

[0054] Due to the modest size of the invention and its ease of assembly, the invention solves the problem of fuel drippage, especially from the types of fuel pistols having sensing tubes located in the dispenser nozzle 10, and at the same time ensures that most of the excess fuel inside the fuel pistol is discharged as much as possible via the opening 18 of the vehicle fuel tank before removing the fuel pistol and replacing it in the filling station's fuel dispenser (pump), and any residual fuel, which cannot or does not have enough time to discharge into the tank of the vehicle, is collected on the back of disc 11 in chambers 19 formed via slats 20 that prevent fuel spillage. The disc 11 and casing 12 do not interfere with the normal desired fuel flow.

Claims

1. A device for reducing fuel spills from a fuel pistol with a dispenser nozzle, wherein the device comprises:

   - a casing shaped as a pipe, wherein the casing has an inner surface, a first end and a second end, wherein the first end may enclose the fuel dispenser nozzle,
   - a flexible disc having a circumference, wherein the circumference of the disc is in contact with the opposite end of the casing, wherein the flexible disc is divided into two or more flexible sections, wherein the space between the adjacent sections may be varied, when the disc is affected by a force, e.g. fluid pressure, wherein one or more first openings are arranged in the flexible disc, wherein an area of said openings changes as the space between the sections is varied, and wherein the flexible disc comprises a second opening through the disc.

2. The device according to claim 1, wherein the second opening is arranged in a section offset from the space between the adjacent sections.

3. The device according to any of the preceding claims, wherein one or more grooves are arranged in whole or in part on the inner surface of the casing.

4. The device according to claim 3, wherein one or more grooves are arranged in whole or in part as a thread in the inner surface of the casing.

5. The device according to any of the preceding claims, wherein the flexible plate has a groove pattern on at least one surface.

6. A method for mounting a device on a fuel pistol comprising the steps of:

   a) providing a device according to claim 1 and providing a fuel pistol with a fuel dispenser nozzle, wherein the fuel pistol has a sensing tube arranged in the fuel dispenser nozzle;
   b) placing the first end of the casing on the outside of the dispenser nozzle, such that the casing has an inner surface arranged laterally to portions of an outer surface of the dispenser nozzle, and wherein the first end of the casing extends beyond the dispenser nozzle, wherein the flexible disc arranged at the other end of the casing is placed in extension of the dispenser nozzle, wherein the flexible disc comprises an opening through the disc, which opening is arranged in extension of an opening in the sensing tube.

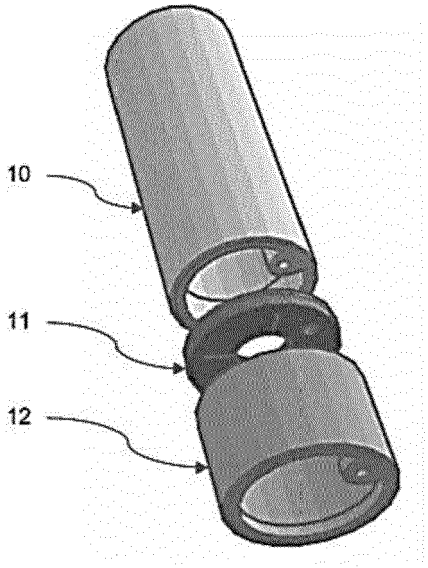

Fig. 1a

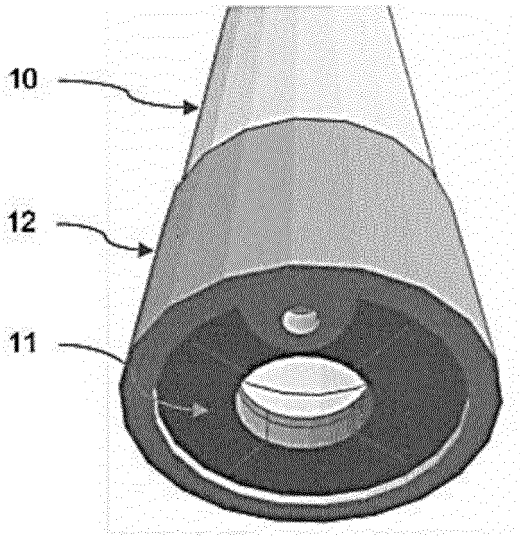

Fig. 1b

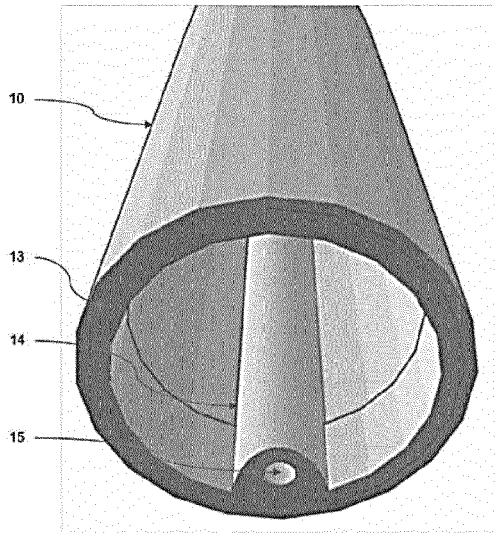

Fig. 2

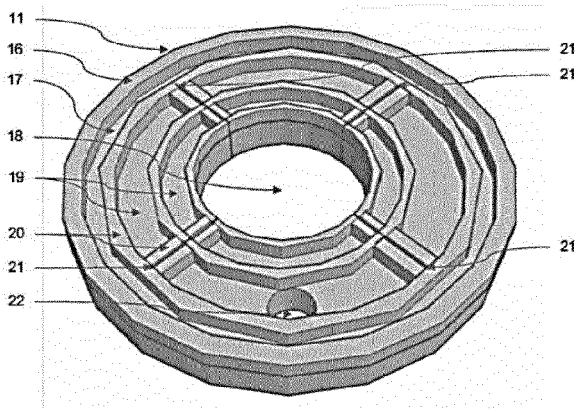

Fig. 3a

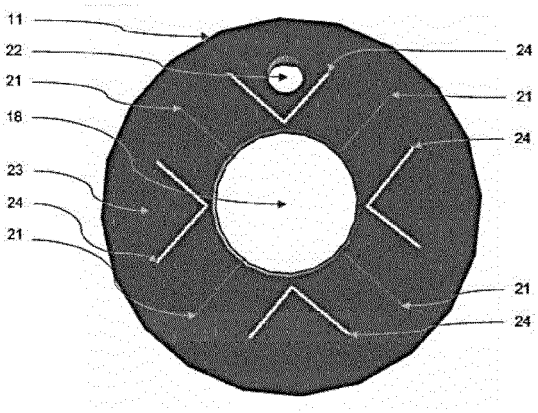

Fig. 3b

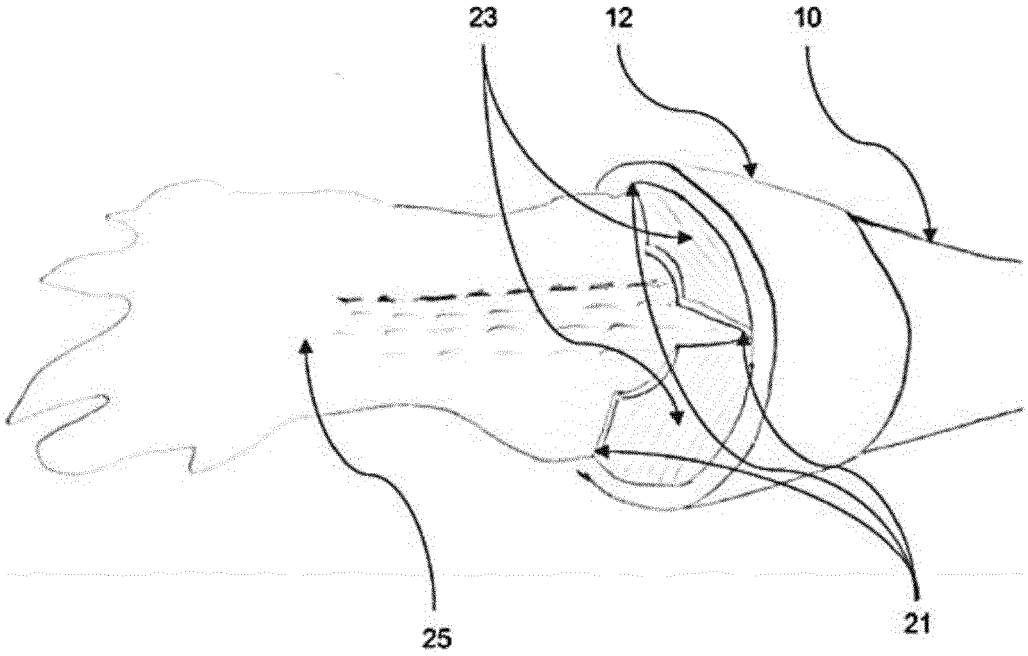

Fig. 4

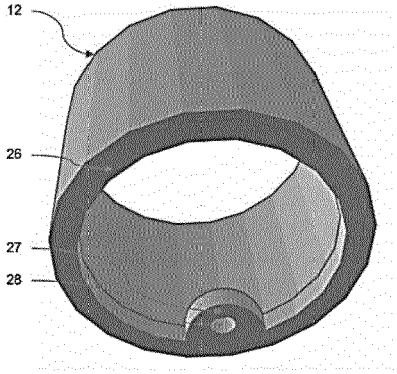

Fig. 5 a

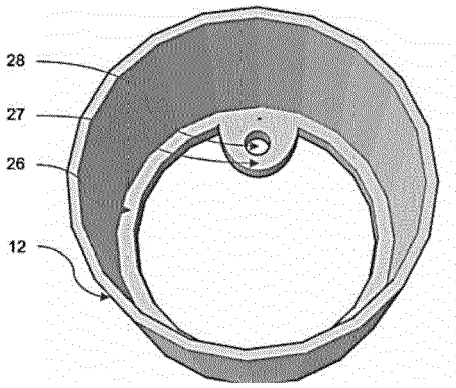

Fig. 5 b

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EUROPEAN SEARCH REPORT

Application Number
EP 20 15 5123

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	WO 2011/148363 A1 (KAIL TAL [IL]; COHEN EYAL [IL]) 1 December 2011 (2011-12-01) * page 8, line 1 - page 10, line 28; figures 2-7 *	1-6	INV. B67D7/42
X,D	WO 2018/169845 A1 (SHELL OIL CO [US]; SHELL INT RESEARCH [NL]) 20 September 2018 (2018-09-20) * page 4, lines 17-32 * * page 5, line 35 - page 6, line 33; figures 2a-4b *	1-6	
A	US 6 810 920 B1 (ROLLING JAMES A [US]) 2 November 2004 (2004-11-02) * column 4, line 38 - column 5, line 13; figures *	1,6	

TECHNICAL FIELDS SEARCHED (IPC)

B67D

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	15 May 2020	Müller, Claus

CATEGORY OF CITED DOCUMENTS

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15-05-2020

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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

REFERENCES CITED IN THE DESCRIPTION

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- WO 2018169845 A1 **[0012]**