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(54) Container assembly for a volumetric pump

(57) Described herein is a container assembly (10) for a volumetric gear pump of the type comprising a first gear (12), keyed on a first shaft (16), and a second gear (14), keyed on a second shaft (18). The first shaft (16) and the second shaft (18) are on different axes but parallel to each other, in such a manner that the first gear (12) may be engaged with the second gear (14). Also keyed on the first shaft (16) is the internal magnetic core (20) of a magnet forming the system for transmitting torque from an actuation motor (24) to the first gear (12). The magnet also comprises an external magnetic core (22), mounted coaxially around the internal magnetic core (20) and actuated directly by the actuation motor (24). The container assembly (10) comprises a container (26), made of deformable plastic material, capable of at least partly enclosing the internal (20) and external (22) magnetic cores of the magnet.

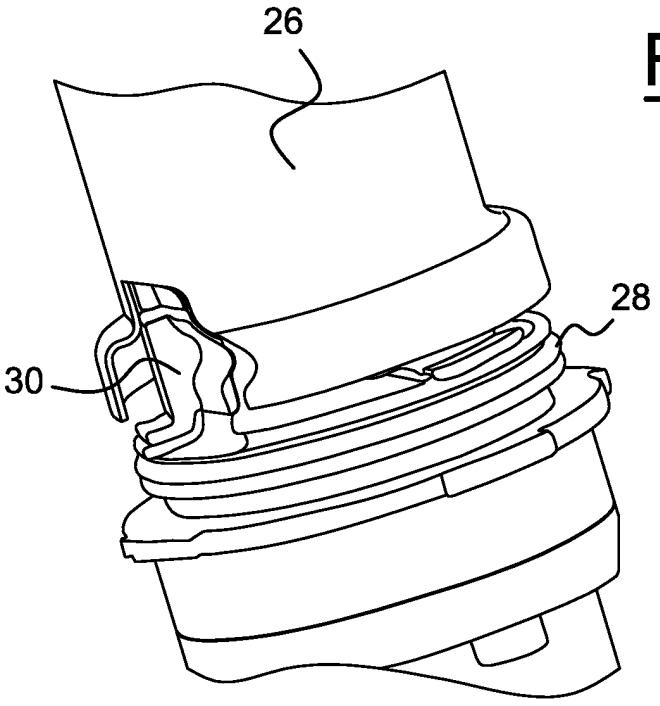

Fig. 3

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Description

[0001] The present finding refers to a container assembly for a volumetric pump, in particular but not exclusively an internal or external gears volumetric pump useable for moving fluids in the automotive industry.

[0002] As known, a volumetric pump is a particular type of pump which exploits volume variation in a chamber to cause suction or pressure on an incompressible fluid. Included among volumetric pumps are rotary pumps of the gear type, wherein the volume variation of the operational chamber is obtained through the rotation of elements, typically two gear wheels which mesh with respect to each other, capable of delimiting variable volume rotating chambers. Gear pumps are widely used in the field of lubrication and generally in all applications wherein the liquid to be transferred is particularly viscous.

[0003] For example, the so-called internal gear pumps are made with the two gears arranged one inside the other but on staggered axis. A partition assembly separates the two gears by means of a crescent-shaped partition plate. The depression caused by the motion of the gears, when the respective teeth mutually move away from each other, allows the entrance of the liquid into the cavity that is created between the gear wheels of the gears themselves. On the contrary, when the gear wheels of the gear are mutually approached to each other, there arises an overpressure which pushes the liquid towards the discharge zone of the pump.

[0004] Transmission of power in gear pumps, usually generated by an electric motor, may occur through the so-called "magnetic drive". This transmission system provides for the presence of two rings or coaxial magnetic cores, one of which is mounted on the drive shaft and the other on the rotor shaft, i.e. one of the gears of the pump. By applying a torque, the magnetic fields of the core mounted on the drive shaft approach those having an identical polarity of the core mounted on the shaft of the rotor and, due to magnetic repulsion, they make it rotate.

[0005] As of date, the most common internal or external gear pumps and the respective systems for transmitting power are enclosed by sealed containers made of metal material, typically stainless steel. As a matter of fact, in numerous applications the pumping units are required to ensure that the pumped liquid and the vapours thereof do not pollute the surrounding environment in any manner whatsoever. In addition, contact between the pumped liquid and the environment must be prevented to avoid triggering chemical and physical reactions such to irreversibly alter the liquid itself within the process.

[0006] Should the pump be operating at particularly low temperatures, for example when mounted on a motor-vehicle, and if subjected to more or less long inoperative periods, the volume of the liquid to be pumped may increase due to the freezing of the liquid itself. Failure, by the sealed pump container, to compensate such volume increases may thus damage the internal mechanisms of the pump itself.

[0007] Thus, an object of the present finding is that of providing a container assembly for a volumetric pump, in particular an internal or external gear pump, that is capable of compensating the volume increase due to the freezing of the liquids in the pump itself during the periods of inactivity. Then another object is that of providing a container assembly for a volumetric pump capable of obtaining a solid and stable coupling with the body of the pump, making disassembly thereof impossible without irreversibly damaging at least one component of the pump itself.

[0008] Lastly, another object of the finding is that of realizing a container assembly for a volumetric pump that does not require using screws or other fixing systems, in such a manner to be mounted on site in a simple and quick manner. These objects according to the present finding are attained by providing a container assembly for a volumetric pump as outlined in claim 1.

[0009] Further characteristics of the finding are highlighted by the dependent claims, which are an integrating part of the present description.

[0010] Characteristics and advantages of a container assembly for a volumetric pump according to the present finding shall be clearer from the following exemplifying and non-limiting description referring to the attached schematic drawings wherein:

figure 1 is a perspective view illustrating a first embodiment of a container assembly for a volumetric pump made according to the present finding;
figure 2 is an enlarged view, in partial section, of the container assembly for a volumetric pump shown in figure 1;
figure 3 is an exploded view, in partial section, of the container assembly for a volumetric pump shown in figure 1; and
figure 4 is a partial sectional view illustrating a second embodiment of a container assembly for a volumetric pump made according to the present finding.

[0011] It is indicated that, in the various attached figures, identical reference numbers indicate identical elements or elements equivalent to each other.

[0012] Referring to the figures, shown is a container assembly for a volumetric pump made according to the present finding, indicated in its entirety with reference number 10. The container assembly 10 is configured to be mounted on a volumetric pump of the gear type, internal or external, schematically illustrated in figure 4. The pump comprises, in a per se known manner, a first gear 12, keyed on a first shaft 16, and a second gear 14, keyed on a second shaft 18. The first shaft 16 and the second shaft 18 are on different axes but parallel to each other in such a manner that the first gear 12 may be engaged with the second gear 14. Therefore, during the rotation of the first gear 12 with respect to the second gear 14, disjoining of the teeth of the two gears 12 and

14 causes the suctioning of the liquid into the pump, while rejoining thereof causes the discharge of the liquid itself.

[0013] Furthermore, keyed on the first shaft 16, alongside the first gear 12, is the internal magnetic core 20 of a magnet which represents the system for transmitting torque from an actuation motor 24, for example an electric motor, to the first gear 12. The magnet also comprises an external magnetic core 22, mounted coaxially around the internal magnetic core 20 and actuated directly by the electric motor 24. According to the present finding, the container assembly 10 comprises a first container 26 made of deformable plastic material, capable of at least partly closing the internal 20 and external 22 magnetic cores of the magnet. The container 26 of the magnet is folded on the rear body of the pump by means of the sheet turning method, or through any other method suitable for deforming plastic, in such a manner to make coupling thereof solid and disassembly impossible without irreversibly damaging at least one component of the pump. Possibly interposed between the container 26 of the magnet and the body of the pump is at least one seal element 28, for example an O-ring, capable of guaranteeing perfect seal between the internal of the pump and the surrounding environment and preventing pollution caused by possible leakage of the pumped liquid and vapours thereof.

[0014] Possibly provided for between the rear body of the pump and the container 26 of magnet may be at least one membrane 30 (figure 3), made using spongy or soft material, easy to compress, and suitable to compensate the volume increase due to possible freezing of the liquid in the pump during the inoperative period. The membrane 30 is firmly fixed coupled between the rear body of the pump and the container 26 in such a manner that, once the various parts are assembled, movement thereof in the pump itself is prevented. Alternatively, the membrane 30 may also be installed at the closed end part of the container 26.

[0015] The container assembly 10 may also comprise a second container 32 made of deformable plastic material, fixed onto the first container 26 of the magnet and onto the body of the pump by means of any plastic deformation method. The second container 32 is made in form of a pipe or sleeve plastically deformed at one of the ends thereof (figure 4) in such a manner that, due to the particular geometry and the plastic deformation imparted thereto, it is capable of holding all the components of the pump assembled together without requiring using screws or other fixing systems. Due to its elasticity, the second container 32 - made of plastic material - also allows compensating possible volume increases due to the freezing of the liquid contained in the pump during the period of inactivity, recovering the initial configuration upon defreezing without damaging the components of the pump itself in any manner whatsoever. The second container 32 secures the coupling of the various parts of the pump and makes disassembly thereof impossible without irreversibly damaging at least one component.

[0016] It has thus been observed that the container assembly for a volumetric pump according to the present finding attains the objects outlined previously.

[0017] The container assembly for a volumetric pump of the present finding thus conceived is however susceptible to various modifications and variants, all falling within the same innovative concept; Furthermore, all details may be replaced by technically equivalent elements. In practice, the materials used, as well as shape and dimensions, may vary according to technical requirements.

[0018] The scope of protection of the finding is thus defined by the attached claims.

Claims

1. Container assembly (10) for a volumetric gear pump of the type comprising a first gear (12), keyed on a first shaft (16), and a second gear (14), keyed on a second shaft (18), said first shaft (16) and second shaft (18) being on different axes but parallel to each other in such a manner that the first gear (12) may be engaged with the second gear (14), also keyed on the first shaft (16) being the internal magnetic core (20) of a magnet forming the system for transmitting torque from an driving motor (24) to the first gear (12), the magnet also comprising an external magnetic core (22), mounted coaxially around said internal magnetic core (20) and actuated directly by said actuation motor (24), **characterised in that** it comprises a first container (26) made of deformable plastic material, capable of at least partly enclosing said internal (20) and external (22) magnetic cores of the magnet.

2. Container assembly (10) according to claim 1, **characterised in that** said container (26) of the magnet is folded on the rear body of the pump through a plastic deformation method, in such a manner to firmly secure coupling thereof and hinder disassembly without irreversibly damaging at least one component of the pump.

3. Container assembly (10) according to any one of the preceding claims, **characterised in that** interposed between said container (26) of the magnet and the body of the pump is at least one seal element (28), capable of guaranteeing perfect sealing between the internal of the pump and the surrounding environment and preventing pollution caused by possible leakage of the pumped liquid and the vapours thereof.

4. Container assembly (10) according to any one of the preceding claims, **characterised in that** provided for between the rear body of the pump and said container (26) of the magnet is at least one membrane (30), made of spongy or soft material, easily com-

pressible, suitable to compensate the volume increase due to possible freezing of the liquid in the pump during the period of inactivity.

5. Container assembly (10) according to claim 4, **characterised in that** said membrane (30) is firmly fixed by coupling between the rear body of the pump and said container (26) of the magnet, in such a manner that movement of said membrane (30) in the pump is prevented.

6. Container assembly (10) according to any one of the preceding claims, further comprising a second container (32) made of deformable plastic material, fixed onto said first container (26) of the magnet and onto the body of the pump by means of a plastic deformation method.

7. Container assembly (10) according to claim 6, **characterised in that** said second container (32) is made in form of a pipe or sleeve deformed plastically at the ends thereof so that, due to the particular geometry thereof and the plastic deformation imparted thereunto, said second container (32) is capable of holding all the components of the pump assembled without using screws or other fixing systems.

8. Container assembly (10) according to claim 2 or 7, **characterised in that** said plastic deformation method is a sheet turning method.

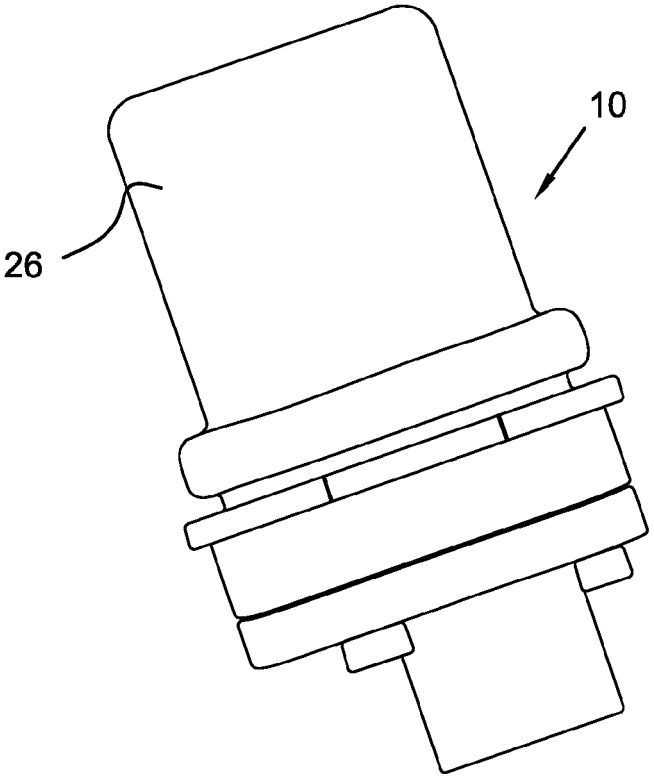

Fig. 1

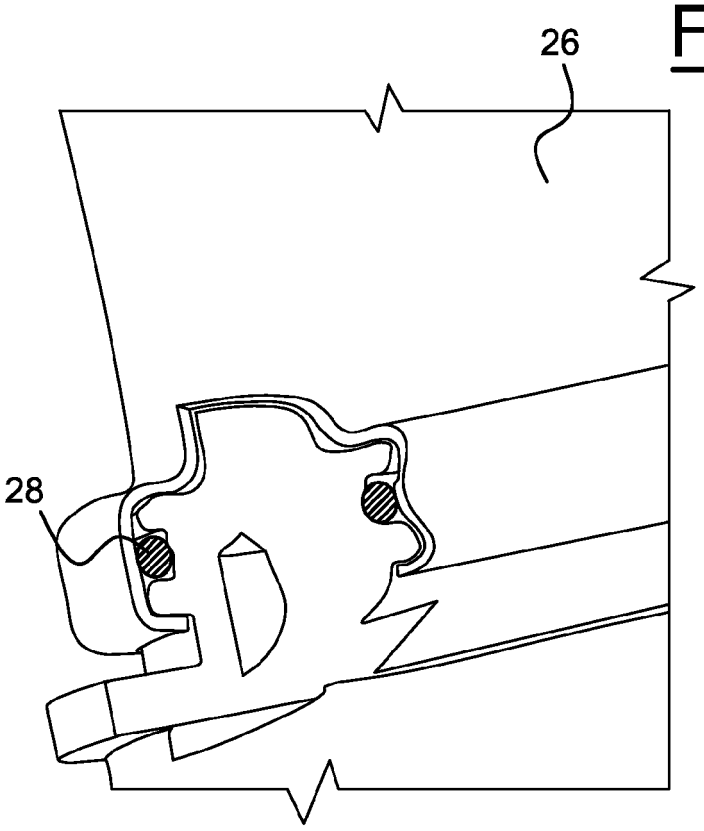

Fig. 2

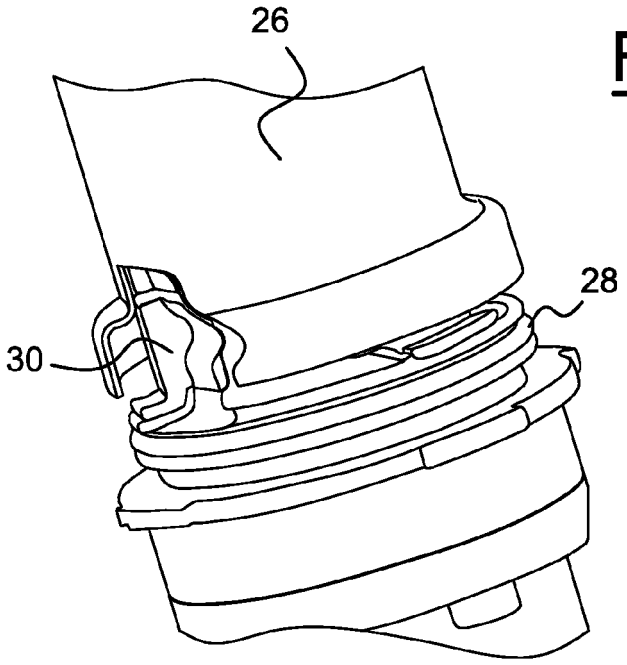

Fig. 3

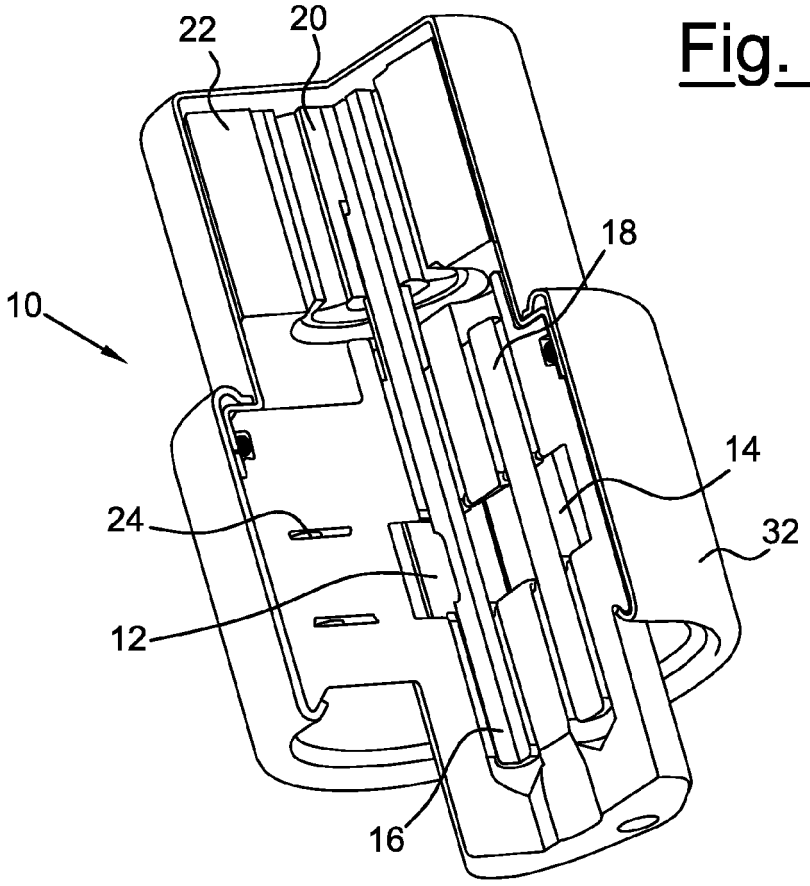

Fig. 4