

CONTACT ELEMENT FOR ROTARY PISTON PUMP

The present invention relates to contact elements for the rotary pistons and the pump housing of rotary piston pumps.

The rotary piston pump according to the invention comprises at least two counter-rotating rotary pistons which are disposed in an oval pump housing. Each rotary piston comprises at least two rotary piston vanes and each rotary piston is provided with at least one contact element.

German patent application DE 37 07 722 A1 discloses a rotary pump, in particular for conveying solid-containing fluids. The patent application discloses a rotary pump, wherein plastic or rubber strips are detachably connected to the outer ends of the displacer vanes of the rotary pistons. The described elastic strips are fitted into a groove and are connected detachably in the radial direction to the outer end of the displacer vane with one or more screws.

In German patent specification DE 1 553 031 A1, a rotary piston pump is described, wherein the housing interior wall is provided with an enamel layer. This enamel layer serves on the one hand to protect the housing against corrosive media and on the other hand is intended to reduce media slippage between the rotary pistons and the housing interior wall.

German patent DE 1 807 392 A1 describes a rotary piston pump, wherein at least the head flanks of the rotary pistons, interacting with the housing interior wall, are provided with a corrosion- and abrasion-resistant plastic. Furthermore, the interior wall of the housing is provided with an enamel layer. In addition to the corrosion- and/or abrasion-resistant protection, the end faces of the rotary pistons and/or the housing can be lined with enamelled

plates or plates made of plastic. A flexible soft material is preferably used for the lining.

Another way of providing wearing parts on the displacer vanes of a rotary piston pump is described in German patent specification DE 20 56 661 C3. Unlike in the previously described publications, a jacket of corrosion- and abrasion-resistant plastic is pulled over the metal working flanks of the displacer vanes in DE 20 56 661 C3. A seal, which prevents the penetration of the medium to be conveyed, is fitted at the lower edge of the plastic jacket.

A rotary piston pump emerges from British patent application GB 2 429 751 A, wherein the housing interior is lined with four wearing plates. Two wearing plates are provided for the rear wall with bores for the shafts receiving the rotary pistons. Two further, semicircular wearing plates are provided for the lining of the upper shell and the lower shell of the housing. Furthermore, a method for removing the semicircular wearing plates is disclosed.

A rotary piston pump for conveying liquid media with a high solid fraction is disclosed in German patent application DE 42 18 855 A1. The patent application discloses a rotary piston pump, wherein the rotary pistons are provided all around the periphery with a jacket. The jacket is characterised in that it comprises, on the outer surfaces of the piston circumferences, a profiling in the form of differently constituted grooves.

The problem underlying the invention is to provide an economical and wear-resistant rotary piston pump which has a high delivery capacity.

The problem is solved by the features of claim 1. Further embodiments according to the invention can be derived from the features of the sub-claims.

The rotary piston pump according to the invention comprises at least two counter-rotating rotary pistons which are disposed in an oval pump housing. In a preferred embodiment, each rotary piston comprises at least two rotary piston vanes, wherein each of these rotary pistons is provided with at least one contact element. The at least two rotary pistons of the rotary piston pump are provided at the contact points of their flanks with, in each case, at least one contact element. At least two rotary pistons in each case form a friction pair. The oval pump housing is also provided at its interior with at least one exchangeable contact element.

The contact elements, which are disposed at the flanks of the two rotary pistons of the rotary piston pump, are also exchangeable.

The active interrelation between the contact elements and the at least two rotary pistons is ensured in each rotational angle position of the rotary pistons by the arrangement and embodiment of the contact elements at the flanks of the rotary pistons.

The exchangeable contact element of the pump housing is constituted by at least two contact elements, this also being able to be one contact element which is constituted by a plurality of parts. In the preferred embodiment, such a contact element is a structure which in one part covers the rear side of the pump housing and the radial surfaces, as well as the extension pieces of the inlets and outlets. Provided in the rear side are cutouts through which the shafts can be passed to receive the rotary pistons. Furthermore, the contact element of the pump housing

comprises, on the radial surfaces, extension pieces which are inserted into the inflow opening and into the outflow opening of the pump housing. Another part of the contact element is located in the cover on the end face of the pump housing. After assembly of the cover, this part is in an active interrelation with the contact element of the pump housing in the region of the sealing surface.

The contact elements of the at least two rotary pistons and/or of the pump housing are formed from a sealing and/or slidable material. These materials can be, amongst others, rubber, PTFE, metals or material mixtures. The contact elements of the rotary pistons and of the pump housing can be made from different materials and/or material mixtures. The material pairing between the rotary pistons and the contact element must be selected such that the rotary pistons form a friction pairing and that the motion of the rotary pistons in the pump housing is not blocked. It is clear to the person skilled in the art that rotary piston pumps can be lined with the most diverse materials depending on the area of application. The same applies to the contact elements of the rotary pistons. The aforementioned material selection does not therefore represent a conclusive limitation of the scope of protection.

In a further embodiment, the contact elements for the pump housing and the rotary pistons can be produced from different materials. A first layer of the contact element, which is inserted into the interior of the pump housing, can for example be reinforced here with fibres and/or other materials. The second layer of the contact element is constituted in a rubberised form, as a result of which it is ensured that the rotary pistons form a friction pair with one another. The inner layer is therefore harder and more stable than the other. The same applies to the contact elements of the rotary pistons. The person skilled in the

art is aware that the choice of the material combinations is dependent on the area of application of the rotary piston pump. The nature of the material arrangement may possibly have to be selected according to the nature of the application.

Furthermore, it is possible to constitute the contact elements of the at least two rotary pistons and of the pump housing as wear protection. With this usage, it is not only ensured that the active interrelation of the rotary pistons with one another and with the pump housing is ensured, but also that the rotary pistons and/or the pump housing are additionally protected against wear.

In the preferred embodiments, the contact elements of the rotary pistons are constituted rectangular or trapezoidal. In special embodiments, for example in the case of helical rotary pistons, it is in addition also necessary to provide the contact elements with a spatial curvature.

The flanks of the rotary pistons, which are provided with contact elements, are constituted in their dimensions such that, in each rotational angle position of the rotary pistons, only materials form an active pairing with one another that give rise to as low a friction value as possible. This applies both to the friction partners between the rotary pistons, as well as to the friction partners at the end faces of the rotary pistons and the friction pairing comprising the rotary pistons and the piston housing. The disruption-free operation of the rotary piston pump is ensured by this friction pairing. This also occurs when the contact elements are constituted not only to ensure the friction pairing, but also as wear and/or corrosion protection.

In a preferred embodiment, the contact elements of the rotary pistons are made from an elastomer and the rotary

pistons themselves from a metallic material, because the friction surface of the rotary pistons is smaller than the friction surface of the contact elements. This thus ensures that excess wear does not occur on the pump components.

The contact elements of the rotary pistons have a thickness from 0.5 mm to 20 mm or alternatively a thickness in a ratio of 1:3 to 1:300 to the spacing of the two piston flanks from one another. In the preferred embodiment, the contact elements are used with a thickness from 3 mm to 7 mm. In order to ensure a secure active interrelation between the rotary pistons, it is important that the contact elements are securely connected to the rotary pistons. This friction-locked and/or form-fit and/or firmly bonded interconnection is produced by the fact that the contact elements are connected by vulcanisation and/or gluing to the rotary pistons. It is also conceivable for the contact elements to be able to be connected to the rotary pistons by a screwed connection or by clamping connections.

Further important features of the embodiment of the contact elements of the rotary pistons and/or of the contact element for the pump housing are, apart from their material thickness and their material shape, their hardness. The material in the embodiments can have a hardness between 10 Shore A and 100 Shore A and between 10 Shore D and 100 Shore D. In a preferred embodiment, the contact elements are constituted with a hardness between 50 Shore A and 100 Shore A. Possible metallic materials, which can also be used to produce the contact elements, can also be constituted in different degrees of hardness. The end face of the rotary pistons and the contact elements on the end plate of the pump housing form an active pairing after the assembly of the end plate. This active pairing is characterised by a particularly small contact or gap dimension. The very small gap dimension ensures that as

little as possible of the material to be pumped flows past the rotary pistons and that the rotary piston pump exhibits a very good suction capacity. The same applies to the end face which is turned towards the bearing of the shafts and to the region between the rotary piston caps and the pump housing.

Examples of embodiment are intended to explain the invention and its advantages in greater detail below with the aid of the appended figures. The size ratios of the individual elements with respect to one another in the figures do not always correspond to the actual size ratios, since some forms are represented simplified and other forms enlarged in relation to the other elements for the sake of better clarity.

Figure 1 shows diagrammatically the structure of a rotary piston pump.

Figure 2 shows diagrammatically the arrangement of the rotary pistons and the contact elements in the pump housing.

Figure 3 shows an exploded drawing of a piston and of the pump housing with contact elements.

Figure 4 shows a diagrammatic front view of the structure of the contact element for the pump housing.

Figure 5 shows a diagrammatic front view of the open pump housing with the rotary pistons.

Identical reference numbers are used for identical or identically acting elements of the invention. Furthermore, for the sake of clarity, only reference numbers that are required for the description of the given figure are represented in the individual figures.

Figure 1 shows the diagrammatic structure of a rotary piston pump 20. Rotary piston pump 20 essentially comprises a motor 44 and a pump housing 28 in which rotary pistons 22 are disposed. Furthermore, an inflow opening 41 and an outflow opening 42 are represented.

Figure 2 shows how rotary pistons 22 are disposed in pump housing 28. Furthermore, inflow opening 41 and outflow opening 42 are represented, in which a contact element 34b of pump housing 28 can be seen. Contact elements 34a of rotary pistons 22 are fitted to flanks 24 of rotary pistons 22. A friction pairing arises when cap 26 of rotary piston 22 enters into an active interrelation with a contact element 34a of second rotary piston 22.

Figure 3 shows the structure of a pump housing 28 with one of two rotary pistons 22 and contact elements 34a and 34b in an exploded drawing. Pump housing 28 can be seen, into interior 32 of which contact element 34b is inserted. Rotary pistons 22 are then inserted into contact element 34b. Rotary piston 22 has two flanks 24 and two caps 26. Cutouts 35 are introduced into flanks 24 to receive contact elements 34a. Contact elements 34a are dimensioned such that it is ensured that cap 26 of the one rotary piston 22 is always in an active interrelation with a contact element 34a of second rotary piston 22. Furthermore, an end plate 30 is represented, with which pump housing 28 is closed. End plate 30 of pump housing 28 is also provided with a contact element 34b. After assembly with an end face 27 of rotating piston 22, this contact element 34b forms a unit which has only a minimal gap. Furthermore, pump housing 28 is tightly sealed by the interaction of contact element 34b of end plate 30 with a sealing surface 37, which is located on contact element 34b of pump housing 28.

Figure 4 represents the structure of contact element 34b for pump housing 28 in a front view. Contact element 34b has an oval basic shape. Introduced into rear side 39 of contact element 34b, which is located closest to the drive, are two cutouts 36, through which the shafts (not represented here) are passed, to which rotary pistons 22 are fixed. Sealing surface 37 can be seen in the front view, which runs all around the periphery of contact element 34b at its front side. The sealing between contact element 34b of end plate 30 (not represented here) and pump housing 28 is ensured with this sealing surface 37. Furthermore, extension pieces 38 for inflow opening 41 and outflow opening 42 are represented at flanks 40 of contact element 34b.

Figure 5 shows a front view of pump housing 28, in which contact element 34b for pump housing 28 and two rotary pistons 22 are located. Inflow opening 41 and outflow opening 42 can be seen at the two flanks 40 of pump housing 28. Sealing surface 37 can be seen running around pump housing 28. Rotary pistons 22 are disposed in interior 32 of pump housing 28. Contact elements 34a can be seen at flanks 24 of rotary pistons 22. Caps 26 of rotary pistons 22 are in an active connection either with contact element 34b of pump housing 28 or with contact element 34a of other rotary piston 22.

The invention has been described by reference to a preferred embodiment. A person skilled in the art can however imagine that modifications or changes to the invention can be made without thereby departing from the scope of protection of the following claims.

Reference numbers

20	rotary piston pump
22	rotary piston
24	flank
26	caps
27	end face of rotary pistons
28	pump housing
30	end plate of pump housing
32	interior of pump housing
34a	contact element of rotary pistons
34b	contact element of pump housing
35	cutout for contact elements
36	cutout for shaft
37	sealing surface
38	extension pieces for inflow and outflow opening
39	rear side of contact element of pump housing
40	flanks of pump housing
41	inflow opening
42	outflow opening
44	motor

CLAIMS

1. A rotary piston pump (20) comprising at least two counter-rotating rotary pistons (22) and a pump housing (28), wherein each rotary piston (22) comprises rotary pistons vanes and wherein each rotary piston (22) is provided at least with one contact element (34), **characterised in that** the rotary pistons (22) are provided at their flanks (24) that at least one contact element (34a), with which the rotary pistons (22) form a friction pair, wherein the pump housing (28) is provided at its interior (32) with at least one contact element (34b) and wherein the contact elements (34a) are disposed at the flanks (24) of the rotary pistons (22) in such a way that an active interrelation is ensured between the contact elements (34a) of the rotary pistons (22) and caps (26) of the rotary pistons (22).
2. The rotary piston pump (20) according to claim 1, **characterised in that** the contact elements (34a) of the rotary pistons (22) and/or the contact element (34b) of the pump housing (28) are exchangeable.
3. The rotary piston pump (20) according to claim 1, **characterised in that** the contact element (34b) of the pump housing (28) comprises at least two parts.
4. The rotary piston pump (20) according to any one of claims 1 to 3, **characterised in that** the contact elements (34a) of the rotary pistons (22) and/or the contact element (34b) of the pump housing (28) are connected by a form-fit, friction-locked and/or firmly bonded connection to the rotary piston (22) and/or the pump housing (28).

5. The rotary piston pump (20) according to any one of claims 1 to 4, **characterised in that** the contact elements (34a) of the rotary pistons (22) and/or the contact element (34b) of the pump housing (28) are formed from a sealing and/or slidable material.
6. The rotary piston pump (20) according to any one of claims 1 to 5, **characterised in that** the contact elements (34a) of the rotary pistons (22) and the contact element (34b) of the pump housing (28) are made from different materials and/or material combinations.
7. The rotary piston pump (20) according to any one of claims 1 to 6, **characterised in that** the contact elements (34a) of the rotary pistons (22) and the contact element (34b) of the pump housing (28) can be used as wear protection and/or as corrosion protection.
8. The rotary piston pump (20) according to any one of claims 1 to 7, **characterised in that** the contact elements (34a) of the rotary pistons (22) are constituted rectangular or trapezoidal.
9. The rotary piston pump (20) according to any one of claims 1 to 8, **characterised in that** the contact elements (34a) of the rotary pistons (22) and/or the contact element (34b) of the pump housing (28) have a thickness from 0.5 mm to 20 mm, preferably a thickness from 3 mm to 7 mm.
10. The rotary piston pump (20) according to anyone of claims 1 to 9, **characterised in that** the contact elements (34a) of the rotary pistons (22) and/or the contact element (34b) of the pump housing (28) can be

produced from materials having the most diverse degrees hardness.

11. The rotary piston pump (20) according to any one of claims 1 to 10, **characterised in that** the contact elements (34a) of the rotary pistons (22) and/or the contact element (34b) of the pump housing (28) can be produced from plastically deformable materials.
12. The rotary piston pump (20) according to any one of claims 1 to 11, **characterised in that** the active interrelation between the contact element (34b) of the pump housing (28) and the end faces (27) of the rotary pistons (22) is ensured.