

STATOR CASING FOR ECCENTRIC WORM PUMPS

The invention relates to a stator for an eccentric worm pump which consists of a stator casing and an elastic lining disposed movably in the stator casing.

A stator whose stator casing and lining are configured in a spiral shape is deduced in this regard from DE 198 21 065 A1. Both parts are screwed together, whereby any twisting during operation of the pump should be avoided. It is also deduced from this document that stator combinations in which the stator casing has projecting strips on its inner side which engage in grooves on the surface of the lining, prevent any twisting of both components.

Figure 4 of DE 1553127 A1 discloses a polygonal lining which is surrounded by a likewise polygonal-shaped stator casing. In this example, the lining is not vulcanised-in but a withdrawal device is required to remove it from the pump casing.

A configuration to improve the adhesive effect of the lining with the stator casing can be deduced from DE 29 07 392 A1. For this purpose, the basically round inner surface of the stator casing has a plurality of groove-shaped indentations in which the elastic material of the lining is vulcanised. No axial mobility of the lining is thereby provided.

However, these exemplary embodiments neglect the fact that the pressure produced in the pump during pumping presses the lining very firmly against the stator casing which can then only be moved, removed or exchanged subsequently and during operation of the pump with a very expenditure of force and in most cases not without mechanical aids.

It is therefore the object of the invention to configure the stator casing such that adhesion of the lining is counteracted.

5 This object is achieved with the features of claim 1. Further embodiments of the invention are deduced from the features of the dependent claims.

10 Depending on the pressure ratios, products and materials with which an eccentric worm pump is operated, loads are produced on the lining. These loads can naturally result in exchange or correction of the position of the lining earlier or later. In addition, the axial mobility of the stator lining in the stator casing can be necessary for optimum adjustment of the stator dimensions. With the structure of the conventional stator combinations, exchanging the lining or positional compensation is only possible with great difficulty since the stator lining abuts very tightly
15 against the inner surface of the stator casing. Even when the lining abuts against the stator casing free from binders, the forces of attraction or suction produced or caused require high opposing forces to remove the lining from the stator casing or to keep it movable in relation to said casing. According to the invention, the required opposing forces are almost eliminated by reducing the adhesive forces, for which grooves are inserted in the surface of the inner side of the stator casing. Thus, the stator lining also
20 retains its axial mobility during pumping operation.
25
30

In a preferred embodiment, the grooves run on the inner surface of the stator casing parallel to its longitudinal axis. The adhesive effect is uniformly
35 cancelled out thereby or with the spiral arrangement of the grooves.

According to a further embodiment, the cross-section of the grooves is adapted to different elastic materials for the stator lining. Thus, when using highly elastic material and V-shaped grooves, the release process can
5 take place more efficiently than with angular-shaped or swallowtail-shaped grooves. This groove shape is in turn better suited for low-elasticity material since the depth of penetration can be kept small here.

10 It has been shown that depth and width ratios in the range of 1:1 to 2:1 are very well suited to safeguard the stator insert from twisting during operation of the pump and on the other hand, to positively support the separation process. Should the lining not become
15 detached from the stator casing, the stator alone could be inserted between an end plate and a pressure medium storage device. The subsequent introduction of the pressure means (gas, liquid) into the grooves would initiate and accelerate the release process.

20 A further exemplary embodiment of the invention relates to the polygonal cross-sectional shape of the stator casing and the lining. Depending on which conveying cross-section is required by the eccentric worm pump and what friction is produced by the rotor in the
25 stator, compensation must take place between the force produced in the area of the grooves and the area of the edges between the polygonal casing surfaces, in order to avoid undesirable wear of the lining. The polygonal configuration of the stator casing serves here as
30 optimal fixing of the stator lining. A uniform distribution of the loading takes place above an edge number of 8 edges upwards.

35 Special numbers of grooves and groove shapes are possible depending on the pump capacity and delivery pressure. With all groove shapes, care should be taken

to ensure that all the radii of the grooves do not fall below a radius of 0.2 mm so that deformation and reformation of the lining material is not impeded.

5 Special products which are pumped at specific temperature influence the stator lining differently in the partial areas. Thus, according to a further embodiment according to the invention, it can be advantageous if at least every other polygonal surface
10 has grooves or if at least one groove is inserted in the polygonal surfaces. The different pressure regions of the stator casing can also be configured differently. Thus, for example, the number of grooves can be increased or their width or depth increased, in
15 areas of higher delivery or counter-pressure values.

To simplify mounting and dismounting of the stator linings, the stator casing can have a continuous slit over the entire length which allows a slight widening.
20 The slit can be covered and reduced by a closure strip during operation of the pump. In the operating state, the stator casing is therefore under a pre-stress which is released on removing the closure strip and thus expands the diameter of the stator casing.

25 According to a further exemplary embodiment, the longitudinal dimension of the lining after manufacture is greater than in the built-in state of the lining in the eccentric worm pump when ready for operation.

30 According to another exemplary embodiment, the closure strip has a conduit system with which a fluid can be pressed between the stator casing and the lining.

35 Examples of the invention can be seen from the following drawings. In the figures:

Fig. 1 shows a stator casing for an eccentric worm pump.

Fig. 2 shows a stator casing for an eccentric worm pump.

Fig. 3 shows a stator casing for an eccentric worm pump.

Fig. 4 shows a lining for a stator casing.

Figure 1 shows a stator casing 10 having a smooth cylindrical surface as is usual in the hitherto known prior art. The inner surface of the stator casing is configured to be polygonal-shaped. Twelve surfaces 12 flat both in their length and in their width are arranged around the inner circumference of the stator casing. Two surfaces are continuously delimited by an interposed edge 14 or are interconnected by an edge 14. In this exemplary embodiment, each surface 12 has three grooves 16. The grooves run parallel to one another along the longitudinal axis of the stator casing 10. The distance of the grooves 16 from one another is same on each and with respect to each surface 12, 12', 12'', 12''' etc. A longitudinal slit 36 whose width is dependent, inter alia, on the diameter and the elasticity of the lining 18, divides the stator casing on one side.

A closure strip 20 makes a positive connection with these two ends 22, 24 and thus ensures that the stator casing does not expand during operation of the pump. In order that the desired anti-adhesion properties remain uniform over the entire inner circumference which is ensured by the inserted grooves 16, the strip can also be provided with a groove. In order that the plane profile of the inner surfaces 12, 12', 12'' is retained,

the ends 22, 24 are outwardly curved, whereby the closure strip forms a tight fit in the outer region and is integrated internally in the surface profile.

5 Figure 2 shows a stator casing having fundamentally the same structure as in Fig. 1. As a result of its naturally smaller diameter compared with Fig. 1, here only 10 polygonally arranged surfaces 12 form the inner surface of the stator casing. In accordance with the
10 smaller capacity required with smaller pumps and counter-pressure depending on the pump head, a double groove arrangement per polygonal surface is provided for this size. As a result of the reduction in the material thickness in the area of the edges, the region
15 is reinforced with ribs 26. The rib width corresponds to the spacing of the grooves 16. Both the ribs 26 and also the platform 28 are provided as a centring aid and as protection from twisting. Figure 2 shows the stator casing without closure strip with opened longitudinal
20 slit 36.

The stator casing 10 according to Fig. 3 is configured as polygonal-shaped on its inner and outer side. The inner surfaces 12 and outer surfaces 30 are arranged to
25 be coincident. All the inner surfaces 12 each have three grooves 16 at the same distances from one another. If the strength of the closure strip is selected to be smaller than that of the stator casing, the closure strip at the same time fulfils the function
30 of a safeguard against excess pressure.

Figure 4 shows a lining 18 of the stator casing 10. A cavity 32 with a multiple thread in which the rotor of the pump revolves, extends through the interior of the lining. The outer surface of the lining is polygonal-shaped and has for this purpose a plurality of outer
35 surfaces 34 arranged parallel to one another. The

length of the lining in the dismantled state is always larger than that of the stator casing. As a result, on insertion into the stator casing or into the eccentric worm pump, the stator lining is axially compressed and
5 acquires the necessary nominal dimensions for the pump cavity. The outside diameter of the stator lining accordingly has an undersize in the dismantled state.

REFERENCE LIST

10

10 Stator casing

12 Inner surface

14 Edge

16 Grooves

15

18 Lining

20 Closure strip

22 Ends

24 Ends

26 Ribs

20

28 Platform

30 Outer surface

32 Cavity

34 Outer surface

36 Slit

25

CLAIMS

1. A stator casing (10) for eccentric worm pumps, on the inner surface whereof, which is configured to be polygonal, an elastic lining (18) abuts in an axially movable manner, wherein at least one groove (16) is inserted in the individual polygonal faces, which reduces the adhesive effect between the lining and the stator casing.
2. The stator casing according to claim 1,

characterised in

that the grooves (16) are disposed parallel to the longitudinal axis.
3. The stator casing according to claim 1,

characterised in

that the grooves (16) are disposed in a spiral shape.
4. The stator casing according to claim 1,

characterised in

that the grooves (16) are formed to be rectangular, V-shaped, round or angular in cross-section.
5. The stator casing according to claim 1 or 2

characterised in

that the ratio of groove depth to groove width
1:1.

6. The stator casing according to one of claims 1 or
2,

characterised in

that the ratio of groove depth to groove width is
> 1.

7. The stator casing according to claim 6,

characterised in

that the ratio of groove depth to groove width is
1.5:1.

8. The stator casing according to claim 1,

characterised in

that at least every other polygonal surface has
grooves (16).

9. The stator casing according to claim 1,

characterised in

that zones of the stator casing having a higher
operating pressure have a larger number of grooves
(16) than zones having lower operating pressure.

10. The stator casing according to claim 9,

characterised in

that zones having a higher operating pressure have a greater groove depth than zones having lower operating pressure.

11. The stator casing according to claim 1,

characterised in

that the stator casing (10) has a continuous slit (36).

12. The stator casing according to claim 11,

characterised in

that the slit (36) is covered with a closure strip (20).

13. The stator casing according to claim 12,

characterised in

that the closure strip (20) and the stator casing (10) form longitudinal grooves (16).

14. The stator casing according to claim 1,

characterised in

that the stator casing (10) has a closure strip (20) extending along its longitudinal axis.

15. The stator casing according to claim 1,

characterised in

that the inner surface of the stator casing has an anti-adhesive coating (e.g. PTFE varnish).

16. The stator casing according to claim 1,

characterised in

that the outer surface of the stator casing is polygonal.

17. The stator casing according to claim 12,

characterised in

that the closure strip (20) consists of the same or different materials (plastic, aluminium, chromium nickel steel) as the stator casing.

18. The stator casing according to claim 1,

characterised in

that the inner surface is roughened, for example, by means of sand blasting.

19. The stator casing according to claim 1,

characterised in

that the inner surface has a perforation.

20. The stator casing according to claim 1,

characterised in

that the outer surface of the lining has an anti-adhesive coating (e.g. PTFE varnish).

21. The stator casing according to claim 1,

characterised in

that the outer surface of the stator casing is provided with ribs (26) along the longitudinal axis.
22. The stator casing according to claim 21,

characterised in

that the ribs (26) are disposed in the edge region between two polygonal surfaces.
23. The stator casing according to one of claims 21 or 22,

characterised in

that the ribs (26) have a width corresponding to the distance between two grooves (16).
24. The stator casing according to claim 1,

characterised in

that the stator casing (10) has a platform (28).
25. The stator casing according to claim 12,

characterised in

that the closure strip (20) consists of a softer material than the stator casing (10).
26. The stator casing according to claim 25,

characterised in

that the closure strip (20) has a conduit system via which a fluid is conveyed between the stator casing (10) and the lining (18).

27. A stator lining for a stator according to claim 1,

characterised in

that the length and the internal cross-section of the stator lining in the production state is greater than in the operating state.