(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) Publication number: **0 450 690 A1**

(12) EUROPEAN PATENT APPLICATION

(21) Application number: **91200609.5**

(51) Int. Cl.5: **F04C 15/00**, F16D 1/10

(22) Date of filing: **19.03.91**

(30) Priority: **03.04.90 NL 9000785**

(43) Date of publication of application:
09.10.91 Bulletin 91/41

(84) Designated Contracting States:
AT BE CH DE DK ES FR GB GR IT LI LU NL SE

(71) Applicant: **DE BOER STALINRICHTINGEN B.V.**
No. 17, Jupiterweg
NL-8938 AD Leeuwarden(NL)

(72) Inventor: **Wildschut, Gerben**
No. 20, F. Shurerwei
NL-8915 DM Leeuwarden(NL)

(74) Representative: **'t Jong, Bastiaan Jacobus et al**
OCTROOIBUREAU ARNOLD & SIEDSMA
Sweelinckplein 1
NL-2517 GK 's-Gravenhage(NL)

(54) Displacer pump.

(57) The invention relates to a displacer pump (1) comprising a pump housing with a middle part (2) in which a pump chamber is defined and to which an inlet (3) and an outlet (6) are connected and with two bearing (14,15) boxes which are arranged on the sides against the middle part and in which bearings are mounted defining two parallel axes, wherein mounted in the bearings are bushes (16,17) with internal shaft engaging means (23) which slidably receive shafts (10,11) provided with external shaft engaging means (24) which shafts carry mutually co-acting displacer bodies (8,9) in the pump chamber (2).

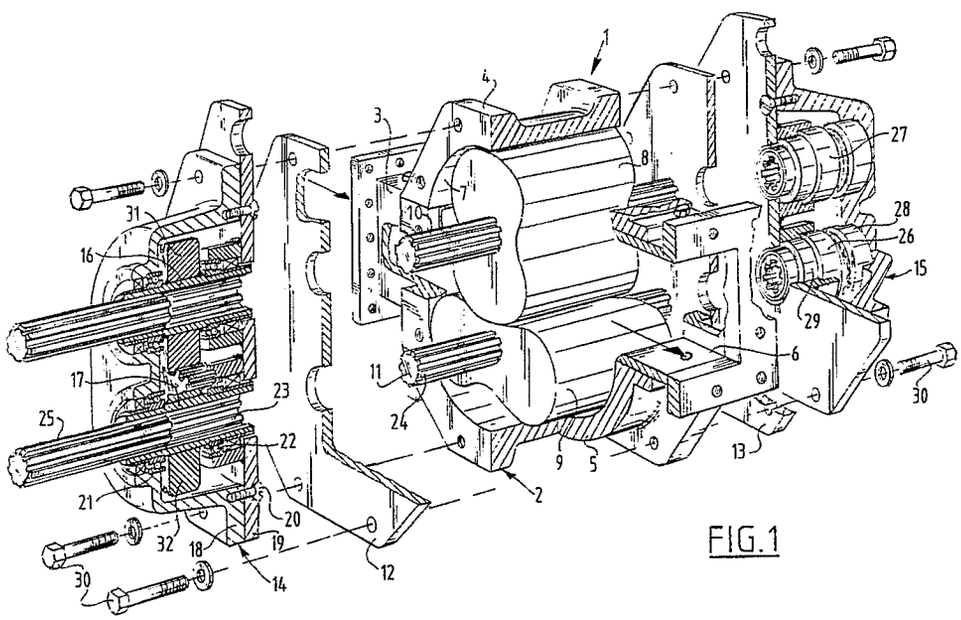

FIG.1

EP 0 450 690 A1

The invention relates to a displacer pump of the type with displacer bodies rotating in opposing directions in one pump chamber. Pumps of this type have been commercially available from applicant for years for pumping liquid manure, sewage sludge and the like.

The displacer bodies are exposed to heavy loads during operation and have to be regularly replaced due to wear.

The invention now has for its object to provide a displacer pump of the stated type which is easy to maintain.

The displacer pump according to the invention comprises a pump housing with a middle part in which a pump chamber is defined and to which an inlet and an outlet are connected and with two bearing boxes which are arranged on the sides against the middle part and in which bearings are mounted which define two parallel axes, wherein mounted in the bearings are bushes with internal shaft engaging means which slidably receive shafts provided with external shaft engaging means, which shafts carry mutually co-acting displacer bodies in the pump chamber. The displacer bodies can hereby be exchanged in simple manner. Only one of the bearing boxes need be removed in order to be able to reach the displacer bodies and to be able to remove them with their shafts. The inlet and outlet connection pipes can remain fitted. To replace the displacer bodies in the known displacer pumps the complete pump has to be dismantled. This leads to undesired operational stoppages and relatively high labour costs.

A favourable embodiment of the shaft engaging means for the shafts is characterized in claim 2.

According to a further development the step from claim 3 is applied. The complete bearing box with the bearings and bushes mounted therein can be replaced as part of an overhaul. Displacer pumps of the present sort are frequently supplied in a series, wherein the pump capacity increases with the width of the displacer bodies. The side boxes can therein be the same for each type in the series.

The step from claim 4 is preferably applied. Although in some embodiments of displacer pumps of the present type the displacer bodies drive each other the type wherein the shafts of the displacer bodies are mutually coupled by gear wheels has the advantage that a forced correct relative angular position of the displacer bodies is ensured. The side box with bushes mutually coupled by means of gears can also be embodied as an independent construction part and be simply exchangeable.

The step from claim 5 achieves that the pump can be directly coupled to a drive source, for example a power take-off of an agricultural tractor. When both bushes of a bearing box carry a fixed shaft stump, the pump can operate in two directions, in accordance with which of the two shaft stumps is used as drive shaft.

A good construction wherein the bushes are mounted in reliable manner can be seen in claim 6. Because the shafts are slidably received in the bush they can have just sufficient tolerance to absorb small coaxial variations of the bushes of the bearing boxes lying in one line on either side of the pump.

The invention is elucidated in the following description with reference to the embodiment shown in the figures.

Fig. 1 shows a partially broken away perspective view with dismantled parts of a preferred embodiment of the displacer pump according to the invention.

Fig. 2 shows a partially broken away side view of a displacer pump according to another embodiment.

The displacer pump 1 shown in fig. 1 comprises a pump housing consisting of a middle part 2 and two bearing boxes 14, 15 arranged on the sides against the middle part 2. The middle part 2 is assembled from a top shell 4, a bottom shell 5 and an inlet piece 3 and an outlet piece 6. In the embodiment the inlet piece 3 and outlet piece 6 have the shape of a rectangular tube with a width equal to the width of the top and bottom shell 4, 5.

Between the top and bottom shell 4, 5 and the inlet and outlet is defined a pump chamber in which two displacer bodies 8, 9 rotate in mutually opposing directions during operation.

The displacer bodies 8, 9 are mounted on or form an entity with the respective shafts 10 and 11 which are provided with a spline shaft 24. The middle part 2 of the pump housing is closed on either side by wear plates 12, 13. The displacer bodies 8, 9 lie laterally sealing against these plates 12, 13.

Two bushes 16, 17 are mounted in the bearing box 14. The bearing box is assembled from two box parts 18, 19. In each box part a ball-bearing is mounted in the manner shown for each bush 16, 17. The ball-bearings for the bush 17 are designated by 21 and 22. The bush 16 is mounted in the same way. The box parts 18, 19 are joined to one another by means of bolts 20.

Fixedly connected to the bushes 16, 17 are the respective gear wheels 31 and 32. These gears have an equal number of teeth and are in permanent mutual engagement so that the bushes 16, 17 can rotate only forcibly in opposing direction.

The bushes 16, 17 are likewise provided internally with splines 23 which co-act with the splines 24 on the shafts 10, 11. It will be apparent from fig. 1 that the bearing box 14 can be mounted simply against the middle part wherein the ends of the

shafts 10, 11 are received in the bushes 16, 17 and engage therein non-rotatably.

The bearing box 15 is constructed substantially in the same manner as the bearing box 14. The bushes 26, 27 are each mounted in two ball-bearings which for the bearing bush 26 are designated by 28 and 29. In this embodiment the bushes 26 and 27 are not mutually coupled by gear wheels.

The middle part 2 and the two bearing boxes 14, 15 are fitted to a whole using bolts 30. Welded fixedly into the bushes 16 and 17 are shaft stumps 25 which can for example be coupled to the power take-off of a tractor. For normal pump operation one of the two shaft stumps 25 will be driven. For reverse suction out of the outlet the other shaft stump 25 can be driven.

In the operational state fixed pipes can be connected to the inlet and the outlet of the pump 1. A drive motor can therein also be in permanent engagement with one of the shaft stumps 25.

The displacer bodies 9 can nevertheless be very simply and quickly exchanged, for example when they are worn or damaged. Only the bolts 30 with which the bearing box 15 is mounted against the middle part 2 need be released and the bearing box 15 removed in its entirety. The wear plate 13 can thereafter be taken off and the displacer bodies 9 together with their shafts 10, 11 can simply be pulled to the right as seen in fig. 1 out of the pump chamber. New displacer bodies can then be pushed into the pump chamber, wherein the shafts 10, 11 are thereafter pushed into the bushes 16, 17 of the left-hand bearing box 14, following which the wear plate 13 is placed in position and the bearing box 15 again mounted using the associated bolts 30.

In the embodiment shown the top shell 4 and the bottom shell 5 can also be simply exchanged in the case of damage. When for example the top shell 4 is damaged because a hard object has found its way into the pump, the bolts 30 gripping into the top shell 4 are wholly released and the other bolts 30 are slightly loosened. The bolts with which the top shell 4 is joined to the inlet 3 and outlet 6 are removed. The top shell 4 can then be simply taken out upwardly. The other parts of the pump remain in place. A new top shell 4 can be mounted again quickly in reverse sequence.

As noted, the bearing boxes 14, 15 form independent construction parts which can also be exchanged in their entirety in simple manner, for example in the case that ball-bearings or seals become worn. The replaced bearing boxes can be overhauled and then re-used.

The displacer pump according to the invention can be constructed in different capacities from a number of standard elements. The greater the pump capacity desired the more shells 4, 5 can be mounted adjacent each other, and correspondingly wider displacer bodies 8, 9 or a number of displacer bodies 8, 9 on a correspondingly longer shaft 10, 11 are employed.

Fig. 2 shows this principle. The pump 35 shown therein comprises a middle part 36 assembled from a number of elements 37, 38. Each element 37, 38 comprises a top shell and a bottom shell corresponding with those shown in fig. 1 and a pair of displacer elements corresponding with the displacer elements 8, 9 of fig. 1. Only the shafts on which the displacer elements are arranged and the inlet and outlet must have a length corresponding with the specific number of elements 37, 38. The bearing boxes can again be the same for each pump of a series. As shown in fig. 2, particularly in the case of pumps with a large capacity, that is, with a number of elements 37, 38, the rear bearing box 1 can be of the type wherein the bushes are in mutual engagement by means of gear wheels 43. The torsion in the shafts can hereby be limited. The bearing box 40 can be of the same type as the bearing box 14 of fig. 1, that is, provided with gear wheels 42 and shaft stumps.

Instead of a spline shaft as shown in the figures, key ways for example with separate keys or non-round, for instance square or hexagonal, shafts and bushes can be applied as shaft engaging means.

Claims

1. Displacer pump comprising a pump housing with a middle part in which a pump chamber is defined and to which an inlet and an outlet are connected and with two bearing boxes which are arranged on the sides against the middle part and in which bearings are mounted defining two parallel axes, wherein mounted in the bearings are bushes with internal shaft engaging means which slidably receive shafts provided with external shaft engaging means, which shafts carry mutually co-acting displacer bodies in the pump chamber.

2. Displacer pump as claimed in claim 1, wherein the shaft engaging means are formed by splines.

3. Displacer pump as claimed in claim 1 or 2, wherein each bearing box with the bearings and bushes mounted therein forms an independent construction part.

4. Displacer pump as claimed in any of the foregoing claims, wherein the bushes in at least one bearing box carry mutually engaging gear wheels.

5. Displacer pump as claimed in any of the foregoing claims, wherein at least one of the bushes of at least one bearing box bears a shaft stump protruding outside the bearing box and connected as one entity to this bush.

6. Displacer pump as claimed in any of the foregoing claims, wherein each bearing box comprises two box parts separable from one another in the direction of the axes and wherein the bearing for each bush comprises a bearing part in each box part, which bearing parts fix the bush in axial direction.

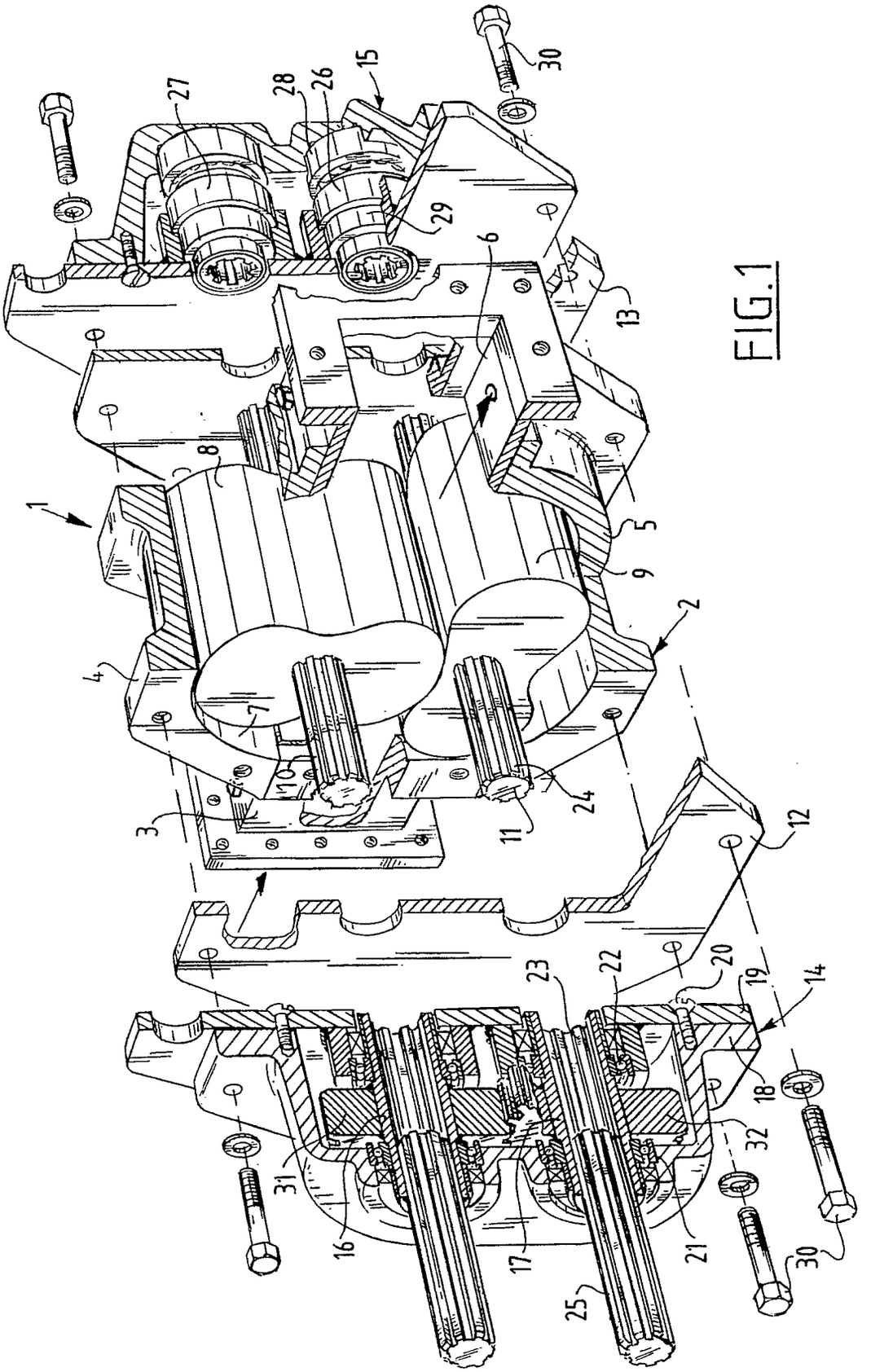
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32

FIG.1

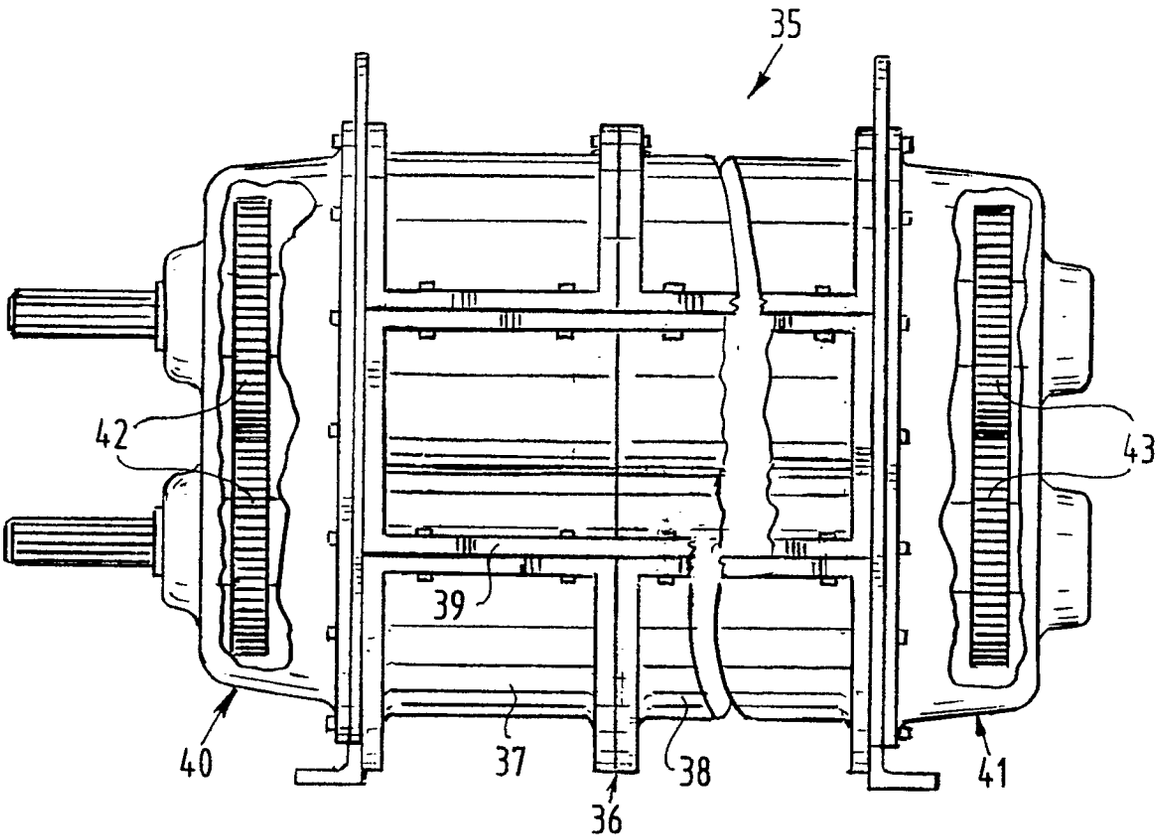

FIG.2

European Patent Office

EUROPEAN SEARCH REPORT

Application Number

EP 91 20 0609

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
Y	FR-A-2 322 280 (SHIMADZU SEISAKUSHO) * page 2, lines 12 - 25 * * page 5, line 36 - page 6, line 23; figure 1 *	1,2,3,4	F 04 C 15/00 F 16 D 1/10
Y	US-A-3 053 585 (HILDEBRAND) * column 1, lines 12 - 37 * * column 1, lines 46 - 59; figures * * column 1, line 71 - column 2, line 23 *	1,2	
Y	GB-A-1 510 962 (W.D.M. LIMITED) * page 1, lines 22 - 67 * * page 1, line 93 - page 2, line 49; figure 1 * * page 2, line 105 - page 3, line 23 *	3	
Y	US-A-2 642 808 (THOMAS) * column 1, lines 18 - 45 * * column 2, line 47 - column 3, line 62; figure 4 @ column 4, line 70 - column 5, line 28 @ column 6, lines 1 - 14 *	4	
A	US-A-3 301 349 (WILLIAMS)		
A	DE-B-1 008 062 (DEMAG-ZUG)		

TECHNICAL FIELDS SEARCHED (Int. Cl.5)

F 04 C
F 01 C
F 16 D

The present search report has been drawn up for all claims

Place of search	Date of completion of search	Examiner
The Hague	10 July 91	KAPOULAS T.

CATEGORY OF CITED DOCUMENTS

X: particularly relevant if taken alone
Y: particularly relevant if combined with another document of the same catagory
A: technological background
O: non-written disclosure
P: intermediate document
T: theory or principle underlying the invention

E: earlier patent document, but published on, or after the filing date
D: document cited in the application
L: document cited for other reasons

&: member of the same patent family, corresponding document