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(54) GEAR PUMP

GETRIEBEPUMPE

POMPE À ENGRENAGES

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Description

TECHNICAL FIELD OF THE INVENTION

[0001] The current invention relates to gear pumps, in particular to spur-toothed external gear pumps that are easy to maintain and easy to clean after a pumping process.

DESCRIPTION OF THE RELATED ART

[0002] Known embodiments of such gear pumps have a pump housing, in which a drive gear and an idler gear are rotatably mounted. The housing is laterally closed off on one side with a flange and on the opposite side thereof is closed off with a cover. The flange comprising a drive shaft and a coupling piece, by means of which the drive shaft is operatively connected to the drive gear. For example, such a gear pump is disclosed in CN 105298834. Further known gear pumps are disclosed in US 5 391 068, in US 2 346 761 and in DE 1 528 959. These known gear pumps have the disadvantage of comprising a rather high number of spare parts resulting in high maintenance costs.

SUMMARY OF THE INVENTION

[0003] In the present invention, a problem to be solved is the provision of a gear pump that is easy to maintain.
[0004] This problem is solved by a gear pump with the features of claim 1. Further embodiments of the gear pump are defined by the features of further claims.
[0005] A gear pump according to the present invention comprises a housing with a spur-toothed drive gear and a spur-toothed idle gear that are mounted rotatably around two parallel rotation axes within the housing with bushings. A connecting flange is arranged on a first lateral side of the housing, in the direction of the axes. A cover is arranged on a second lateral side of the housing, opposite the connecting flange. A drive shaft is rotatably mounted in the connecting flange by at least one bearing and is sealed against the connecting flange by at least one shaft seal, wherein the drive shaft is operatively connected to the drive gear by a coupling piece coupled to the drive shaft by a complementary profile. The drive gear and the idle gear are identical. In addition, each gear comprises a first bearing pin arranged on a first lateral side of the gear and a second bearing pin arranged on a second lateral side of the gear, opposite to the first lateral side. The axis of rotation of the bearing pins are congruent and the length and the diameter of the bearing pins are identical. Furthermore, the first bearing pin comprises an internal driving profile. Alternatively, the first bearing pin and the second bearing pin comprise an internal driving profile. However, it is also possible to provide an external driving profile at the first and/or second bearing pin. Still furthermore, the coupling piece extends along a longitudinal axis and comprises a driving profile over its entire length that is complementary to the driving profile of the gears or the driving profile of the drive shaft, respectively. Thus, if the driving profile of the gears or the drive shaft is an internal profile, the driving profile of the coupling piece is an external profile and vice versa. Therefore, if the drive gear comprises an internal drive profile and the drive shaft comprises an external drive, the coupling piece comprises an external driving profile on its one side and an internal driving profile on its other side.
[0006] With such a design, the gear pump can be taken apart individually, upon requirement, i.e. the seals can be replaced without removing the gears, or the gears can be replaced without removing the seals. Additionally, fewer spare parts are needed as the drive gear and the idle gear are interchangeable.
[0007] In a further embodiment of the present invention, the driving profile is part of a form-fit shaft-hub connection with a shaft selected from the group comprising polygon shaft, toothed shaft, splined shaft and cycloidal shaft. However, any regular or irregular profile can be used that can act as a driving profile.
[0008] In still further embodiments of the present invention, a lubrification channel extends along the axis of rotation through each gear, from the first bearing pin to the second bearing pin, i.e. through the entire length of each gear. In further embodiments of the present invention, the drive shaft extends along a longitudinal axis from a first end to 25 a second end. The second end of the drive shaft comprises a driving profile.
[0009] In further embodiments of the present invention, the driving profile of the drive shaft is identical to the driving profile of the gears, i.e. they all are either internal driving profiles or external profiles with identical cross-sections.
[0010] In still further embodiments of the present invention, a lubrification channel extends along the longitudinal axis of the drive shaft, at least in the region of the second end. The lubrification channel has a lateral opening spaced apart from the second end of the drive shaft.
[0011] In still further embodiments of the present invention, the first end of the drive shaft comprises a connecting profile for the connection to a drive element. The connecting profile acting as a driving profile is part of a form-fit shaft-hub connection with a shaft selected from the group comprising polygon shaft, toothed shaft, splined shaft and cycloidal shaft. However, any regular or irregular profile can be used that can act as a driving profile.
[0012] In further embodiments of the present invention, a lubrification channel extends along the longitudinal axis over the entire length of the coupling piece.
[0013] In further embodiments of the present invention, a first sealing surface of the housing faces a sealing surface of the connecting flange, and a second sealing surface of the housing faces a sealing surface of the cover. The end faces of the first bearing pin of the drive gear and of the idle gear and the outside end faces of the

corresponding bushes are flush with the first sealing surface. The end faces of the second bearing pin of the drive gear and of the idle gear and the outside end faces of the corresponding bushes are flush with the second sealing surface.

[0014] In further embodiments of the present invention, the sealing surface of the connecting flange comprises a sealing groove surrounding the corresponding bushes and comprises a first sealing ring. The sealing surface of the cover comprises a sealing groove surrounding the corresponding bushes and comprises a second sealing ring.

[0015] In further embodiments of the present invention, the connecting flange comprises a seal cover that is removable from a side opposite the housing. The at least one bearing, the at least one shaft seal and the drive shaft are securely arranged in a recess in the seal cover. This design allows for the exchange of the shaft seal of the drive shaft without the need to disassemble the gear pump otherwise.

[0016] In further embodiments of the present invention, the sealing surface of the connecting flange comprises a lubrification groove for connecting the lubrification channel of the idle gear with a lubrification port adjacent to the drive shaft and the sealing surface of the cover comprises a lubrification groove for connecting the lubrification channel of the drive gear with the lubrification channel of the idle gear. Thus, the lubrification groove of the connecting flange extends from a region comprising the projection of the lubrification channel of the idle gear in the direction of the axis of rotation and the lubrification groove of the cover extends from a region comprising the projection of the lubrification channel of the drive gear in the direction of the axis of rotation to a region comprising the projection of the lubrification channel of the idle gear in the direction of the axis of rotation.

[0017] In further embodiments of the present invention, the gear pump comprises a lubrification channel insert that extends along a longitudinal axis and comprising a driving profile over its entire length that is complementary to the driving profile of the idle gear and a lubrification channel that extends along the longitudinal axis over the entire length of the lubrification insert. The length of the lubrification channel insert is identical to the length of a recess in the idle gear comprising the driving profile and an adjoining undercut for the driving profile. If the lubrification channel insert is introduced in said recess, the lubrification channel of the lubrification channel insert connects the lubrification channel of the idle gear to the lubrification groove of the connecting flange.

[0018] In further embodiments of the present invention, the housing is clamped between the connecting flange and the cover by means of clamping elements.

BRIEF DESCRIPTION OF THE DRAWINGS

[0019] Embodiments of the present invention are described in more detail in the following with reference to the drawings. These are for illustrative purposes only and are not to be construed as limiting. It shows:

Fig. 1 a perspective exploded view of a gear pump according to the present invention;

Fig. 2 an alternative view of the exploded view according to Fig. 1;

Fig. 3 a sectional view of the gear pump according to Fig. 1 ;

Fig. 4 a partial sectional view of a gear according to the present invention;

Fig. 5 a sectional view of a coupling piece according to the present invention; and

Fig. 6 a partial sectional view of a drive shaft according to the present invention.

DETAILED DESCRIPTION OF THE INVENTION

[0020] Fig. 1 shows a perspective exploded view of a gear pump 15 according to the present invention and Fig. 2 shows an alternative view of the exploded view of Fig. 1.

[0021] The gear pump comprises a housing 1 with a spur-toothed drive gear 4 and a spur-toothed idle gear 5 that are mounted rotatably around two parallel rotation axes within the housing 1 comprising bushings 8. A connecting flange 2 is arranged on a first lateral side of the housing 1 in the direction of the axes. A cover 3 is arranged on a second lateral side of the housing 1, opposite the connecting flange 2. A drive shaft 7 is rotatably mounted in the connecting flange 2. The housing 1 comprises a pressure port 10 and a suction port 11. The housing 1 further comprises a first sealing surface 12 facing the connecting flange 2 and a second sealing surface 13 facing the cover 3. Through holes 14 extend from the first sealing surface 12 to the second sealing surface 13. The connecting flange 2 comprises a sealing surface 20 facing the housing 1. The sealing surface 20 comprises a lubrification groove 22 extending from a region of the rotation axis of the idle gear 5 to a location adjacent to the drive shaft 7. The connecting flange 2 further comprises thread holes 23 that are distributed around the periphery of the sealing surface 20. The connecting flange 2 further comprises a seal cover 24 that is removable from a side opposite the housing 1 and that is secured to the housing by means of screws. The drive shaft 7 is rotatably arranged in the seal cover 24. The cover 3 comprises a sealing surface 30 facing the housing 1. The sealing surface 20 of the connecting flange 2 comprises a lubrification groove 22 extending from a region of the rotation axis of the drive gear 4 to a region of the rotation axis of the idle gear 5. The cover 3 further comprises through holes 33 distributed around the periphery of the sealing surface 30 and extending from the sealing sur-

face 30 through the entire thickness of the cover 3. In the assembled state, screws 34 extend through the through holes 33 of the cover 3 and the through holes 14 of the housing 1 and are screwed-in in the thread holes 23 of the connecting flange 2. Thus, the housing 1 is clamped between the connecting flange 2 and the cover 3 by said screws 34. The sealing surface 20 of the connecting flange 2 comprises a closed sealing groove 21 that surrounds the corresponding region of the end faces of the bushings 8 and a corresponding lubrification groove 22 in the sealing surface 20 of the connecting flange 2. A first sealing ring 90 is arranged in said sealing groove 21 of the connecting flange 2. The sealing surface 30 of the cover 3 comprises a closed sealing groove 31 that surrounds the corresponding region of the end faces of the bushings 8 und the corresponding lubrification groove 32 in the sealing surface 30 of the cover 3. A second sealing ring 91 is arranged in said sealing groove 32.

[0022] Fig. 3 shows a sectional view of the gear pump of Fig. 1. The section being in a plane defined by the axis of rotation of the gears 4 and 5 and the drive shaft 7. Both, the drive gear 4 and the idle gear 5, are rotatably arranged with bushings 8 within a recess in the housing 1. The bushings 8 are arranged on both sides of each gear 4 and 5, respectively. The recess extends along the axis of rotation of the gears 4 and 5 through the entire housing 1 from the first sealing surface 12 to the second sealing surface 13. This design allows the introduction or the removal of the gears 4 and 5 and the bushings 8 from either side of the recess. There are bearing pins on both sides of the gears 4 and 5 which rest within the corresponding bushings 8. The end faces of the bearing pins and the outside end faces of the corresponding bushes 8 are flush with the first sealing surface 12, and the end faces of the bearing pins and the outside end faces of the corresponding bushes 8 are flush with the second sealing surface 13. A coupling piece 6 is partially introduced in a complementary recess in the drive gear 4. The rest of the coupling piece 6 extends over the first sealing surface 12 and into a complementary recess in the drive shaft 7. The drive shaft 7 is rotatably mounted in the seal cover 24 of the connecting flange 2 with two bearings 80. The drive shaft 7 is sealed against the seal cover 24 with one shaft seal 9. The drive shaft 7, the bearings 80 and the shaft seal 9 are secured in a recess in the seal cover 24 by means of a retaining element, i. e. a retaining ring. The seal cover 24 has a cylindrical husk body that is introduced into a corresponding recess of the flange body of the connecting flange 2. The seal cover 24 comprises a brim that extends laterally over the diameter of the husk body. Through holes are evenly distributed around the circumference of the brim. The seal cover 24 is fixed to the flange body by means of screws (see Fig. 1).

[0023] Fig. 4 shows a partial sectional view of a gear according to the present invention, i.e. the drive gear 4 or the idle gear 5. The gear 4 comprises a gearing 40 located in its middle and extending in the direction of the axis of rotation A. On one side of the gearing 40, a first bearing pin 41 extends along the axis of rotation A having an outside diameter that is smaller than the outside diameter of the gearing 40 and having a length that is shorter than the width of the gearing 40. A second bearing pin 42 is arranged on the opposite side of the gearing 40, having an outside diameter and a length that are identical to the ones of the first bearing pin. A recess is provided centrically in the first bearing pin 41 extending from the end face. The recess comprising a toothing 43 complementary to the one of the coupling piece 6 and an undercut adjoining the toothing 43. A lubrification channel 44 extends along the axis of rotation A from the undercut towards the end face of the second bearing pin 42.

[0024] Fig. 5 shows a sectional view of a coupling piece 6 according to the present invention. The coupling piece 6 has a cylindrical body that extends along a longitudinal axis L that comprises an external toothing 60 along its entire length that is complementary to the one of the drive gear 4 and the drive shaft 7. A lubrification channel 61 extends along the longitudinal axis L over the entire length of the coupling piece 6.

[0025] Fig. 6 shows a partial sectional view of a drive shaft 7 according to the present invention. The drive shaft 7 has a cylindrical body 70 that extends along a longitudinal axis L from a first end 71 to an opposite second end 72. The first end 71 having an outside diameter that is smaller than the one of an adjoining middle section, and the outside diameter of the middle section is smaller than the one of the adjoining second end 71. The outside diameter of the second end 71 is identical to the outside diameter of the bearing pins 41, 42 of the drive gear 4. A recess is provided centrically in the second end 72 extending from the end face towards the middle section. The recess comprising a gearing 73 complementary to the one of the coupling piece 6 and an undercut adjoining the gearing 73. A lubrification channel 74 extends along the longitudinal axis L from the undercut into the middle section. From there, the lubrification channel 74 extends essentially perpendicular to the longitudinal axis L towards a lateral opening 740. The diameter of the lubrification channel 74 of the drive shaft 7 is Identical to the one of the coupling piece 6 and the gears 4, 5. A connecting groove 75 in the form of a keyseat is provided at the first end 71.

LIST OF REFERENCE SIGNS

[0026]

1	housing
10	pressure port
11	suction port
12	first sealing surface
13	second sealing surface
14	through hole
2	connecting flange
20	sealing surface of the connecting flange 2

21 sealing groove of the connecting flange 2
22 lubrification groove of the connecting flange 2
23 thread hole
24 seal cover
3 cover
30 sealing surface of the cover 3
31 sealing groove of the cover 3
32 lubrication groove of the cover 3
33 through hole
34 screw
4 drive gear
40 gearing
41 first bearing pin
42 second bearing pin
43 gearing
44 lubrification channel
5 idle gear
6 coupling piece
60 gearing
61 lubrification channel
7 drive shaft
70 body
71 first end
72 second end
73 gearing
74 lubrification channel
740 lateral lubrification opening
75 connecting groove
8 bushing
80 bearing
9 shaft seal
90 first sealing ring
91 second sealing ring

A axis of rotation
L longitudinal axis

Claims

1. A gear pump comprising a housing (1) with a spur-toothed drive gear (4) and a spur-toothed idle gear (5) that are mounted rotatably around two parallel rotation axes within the housing (1) comprising bushings (8), a connecting flange (2) that is arranged on a first lateral side of the housing (1) in the direction of the axes, a cover (3) that is arranged on a second lateral side of the housing (1) opposite the connecting flange (2), a drive shaft (7) being rotatably mounted in the connecting flange (2) by at least one bearing (80) and being sealed against the connecting flange (2) by at least one shaft seal (9), wherein the drive gear (4) and the idle gear (5) are identical, **characterized in that** the drive shaft (7) being operatively connected to the drive gear (4) by a coupling piece (6) coupled to the drive shaft (7) by a complementary profile, wherein each gear (4; 5) comprising a first bearing pin (41) arranged on a first lateral side of the gear (4; 5) and a second bearing pin (42) arranged on a second lateral side of the gear (4; 5), opposite to the first lateral side, wherein the axis of rotation (A) of the bearing pins (41; 42) are congruent and the length and the diameter of the bearing pins (41; 42) are identical, wherein the first bearing pin (41) comprising an internal driving profile (43) or wherein the first bearing pin (41) and the second bearing pin (42) comprising an internal driving profile (43) and wherein the coupling piece (6) extending along a longitudinal axis (L) and comprising a driving profile (60) over its entire length that is complementary to the driving profile (43) of the gears (4; 5) or the driving profile (73) of the drive shaft (7), respectively.

2. The gear pump according to claim 1, wherein the driving profile (43) is part of a form-fit shaft-hub connection with a shaft selected from the group comprising polygon shaft, toothed shaft, splined shaft and cycloidal shaft.

3. The gear pump according to one of claims 1 or 2, wherein 10 a lubrification channel (44) extending along the axis of rotation (A) through each gear (4; 5) from the first bearing pin (41) to the second bearing pin (42).

4. The gear pump according to one of the preceding claims, wherein the drive shaft (7) extending along a longitudinal axis (L) from a first end (71) to a second end (72) wherein the second end (72) comprising a driving profile (73).

5. The gear pump according to claim 4, wherein the driving profile (73) of the drive shaft (7) is identical to the driving profile (43) of the gears (4; 5).

6. The gear pump according to claim 4 or 5, wherein a lubrification channel (74) extending along the longitudinal axis (L) of the drive shaft (7), at least in the region of the second end (72) and having a lateral lubrification opening (740), spaced apart from the second end (72).

7. The gear pump according to claim 5 or 6, wherein the first end (71) of the drive shaft (7) comprising a connecting profile (75) for the connection to a drive element.

8. The gear pump according to claim 1, wherein a lubrification channel (61) is provided extending along the longitudinal axis (L) over the entire length of the coupling piece (6).

9. The gear pump according to one of the preceding claims, wherein a first sealing surface (12) of the housing (1) facing a sealing surface (20) of the connecting flange (2) and wherein a second sealing sur-

face (13) of the housing (1) facing a sealing surface (30) of the cover (3) and wherein the end faces of the first bearing pins (41) and the outside end faces of the corresponding bushes (8) are flush with the first sealing surface (12) and wherein the end faces of the second bearing pins (42) and the outside end faces of the corresponding bushes (8) are flush with the second sealing surface (13).

10. The gear pump according to claim 9, wherein the sealing surface (20) of the connecting flange (2) comprising a sealing groove (21) surrounding the corresponding bushes (8) and comprising a first sealing ring (90), and wherein the sealing surface (30) of the cover (3) comprising a sealing groove (31) surrounding the corresponding bushes (8) and comprising a second sealing ring (91).

11. The gear pump according to one of the preceding claims, wherein the connecting flange (2) comprising a seal cover (24) that is removable from a side opposite the housing (1) and wherein the at least one bearing (80), the at least one shaft seal (9) and the drive shaft (7) are securely arranged in a recess in the seal cover (24).

12. The gear pump according to one of claims 9 to 11, wherein the sealing surface (20) of the connecting flange (2) comprising a lubrification groove (22) for connecting the lubrification channel of the idle gear (5) with a lubrification port adjacent to the drive shaft (7), and wherein the sealing surface (30) of the cover (3) comprising a lubrification groove (32) for connecting the lubrification channel of the drive gear (4) with the lubrification channel of the idle gear (5).

13. The gear pump according to one of claims 8 to 12, comprising a lubrification channel insert extending along a longitudinal axis and comprising a driving profile over its entire length that is complementary to the driving profile of the idle gear (5) and comprising a lubrification channel extending along the longitudinal axis over the entire length of the lubrification channel insert and wherein the length of the lubrification channel insert is identical to the length of a recess in the idler gear (5) comprising the driving profile and an adjoining undercut for the driving profile.

14. The gear pump according to one of the preceding claims, wherein the housing (1) is clamped between the connecting flange (2) and the cover (3) by means of clamping elements (34) .

Patentansprüche

1. Zahnradpumpe mit einem Gehäuse (1) mit einem geradverzahnten Antriebszahnrad (4) und einem geradverzahnten Leerlaufzahnrad (5), die um zwei parallele Drehachsen innerhalb des Gehäuses (1) mit Buchsen (8) drehbar gelagert sind, einem Anschlussflansch (2), der auf einer ersten, in Richtung der Achsen verlaufenden Lateralseite des Gehäuses (1) angeordnet ist, einem Deckel (3), der auf einer zweiten, dem Anschlussflansch (2) gegenüberliegenden Lateralseite des Gehäuses (1) angeordnet ist, eine Antriebswelle (7), die über mindestens ein Lager (80) im Anschlussflansch (2) drehbar gelagert ist und über mindestens einen Wellendichtring (9) gegen den Anschlussflansch (2) abgedichtet ist, wobei das Antriebszahnrad (4) und das Leerlaufzahnrad (5) identisch sind, **dadurch gekennzeichnet, dass** die Antriebswelle (7) mit dem Antriebszahnrad (4) über ein Kupplungsstück (6) wirkverbunden ist, das über ein komplementäres Profil mit der Antriebswelle (7) gekoppelt ist, wobei jedes Zahnrad (4; 5) einen ersten Lagerzapfen (41) aufweist, der an einer ersten Lateralseite des Zahnrades (4; 5) angeordnet ist, und einen zweiten Lagerzapfen (42), der an einer zweiten, der ersten Lateralseite gegenüberliegenden Lateralseite des Zahnrades (4; 5) angeordnet ist, wobei die Drehachsen (A) der Lagerzapfen (41; 42) deckungsgleich sind und die Länge und der Durchmesser der Lagerzapfen (41; 42) identisch sind, wobei der erste Lagerzapfen (41) ein innenliegendes Mitnahmeprofil (43) aufweist oder wobei der erste Lagerzapfen (41) und der zweite Lagerzapfen (42) ein innenliegendes Mitnahmeprofil (43) aufweisen und wobei sich das Kupplungsstück (6) entlang einer Längsachse (L) erstreckt und über seine gesamte Länge ein Mitnahmeprofil (60) aufweist, das komplementär zum Mitnahmeprofil (43) der Zahnräder (4; 5) bzw. zum Mitnahmeprofil (73) der Antriebswelle (7) ist.

2. Zahnradpumpe nach Anspruch 1, **dadurch gekennzeichnet, dass** das Antriebsprofil (43) Teil einer formschlüssigen Welle-Nabe-Verbindung mit einer Welle aus der Gruppe Polygonwelle, Zahnwelle, Keilwelle und Zykloidenwelle ist.

3. Zahnradpumpe nach einem der Ansprüche 1 oder 2, **dadurch gekennzeichnet, dass** sich ein Schmierkanal (44) entlang der Drehachse (A) durch jedes Zahnrad (4; 5) vom ersten Lagerbolzen (41) zum zweiten Lagerbolzen (42) erstreckt.

4. Zahnradpumpe nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** sich die Antriebswelle (7) entlang einer Längsachse (L) von einem ersten Ende (71) zu einem zweiten Ende (72) erstreckt, wobei das zweite Ende (72) ein Antriebsprofil (73) aufweist.

5. Zahnradpumpe nach Anspruch 4, **dadurch gekenn-**

zeichnet, dass das Antriebsprofil (73) der Antriebswelle (7) identisch mit dem Antriebsprofil (43) der Zahnräder (4; 5) ist.

6. Zahnradpumpe nach Anspruch 4 oder 5, **dadurch gekennzeichnet, dass** ein in Längsrichtung der Längsachse (L) der Antriebswelle (7) erstreckender Schmierkanal (74) sich zumindest im Bereich des zweiten Endes (72) erstreckt und eine seitliche Schmieröffnung (740) aufweist, die vom zweiten Ende beabstandet ist.

7. Zahnradpumpe nach Anspruch 5 oder 6, **dadurch gekennzeichnet, dass** das erste Ende (71) der Antriebswelle (7) ein Anschlussprofil (75) für die Verbindung mit einem Antriebselement aufweist.

8. Zahnradpumpe nach Anspruch 1, **dadurch gekennzeichnet, dass** ein Schmierkanal (61) vorgesehen ist, der sich entlang der Längsachse (L) über die gesamte Länge des Kupplungsstücks (6) erstreckt.

9. Zahnradpumpe nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** eine erste Dichtfläche (12) des Gehäuses (1) einer Dichtfläche (20) des Anschlussflansches (2) zugewandt ist, dass eine zweite Dichtfläche (13) des Gehäuses (1) einer Dichtfläche (30) des Deckels (3) zugewandt ist, dass die Stirnflächen der ersten Lagerzapfen (41) und die äusseren Stirnflächen der zugehörigen Buchsen (8) mit der ersten Dichtfläche (12) fluchten, dass die Stirnflächen der zweiten Lagerzapfen (42) und die äusseren Stirnflächen der zugehörigen Buchsen (8) mit der ersten Dichtfläche (12) fluchten (41) und dass die äusseren Endflächen der entsprechenden Buchsen (8) mit der zweiten Dichtfläche (12) bündig sind.

10. Zahnradpumpe nach Anspruch 9, **dadurch gekennzeichnet, dass** die Dichtfläche (20) des Anschlussflansches (2) eine Dichtungsnut (21) aufweist, die die entsprechenden Buchsen (8) umgibt und einen ersten Dichtungsring (90) umfasst, und dass die Dichtfläche (30) des Deckels (3) eine Dichtungsnut (31) aufweist, die die entsprechenden Buchsen (8) umgibt und einen zweiten Dichtungsring (91) umfasst.

11. Zahnradpumpe nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** der Anschlussflansch (2) einen Dichtungsdeckel (24) aufweist, der von einer dem Gehäuse (1) gegenüberliegenden Seite abnehmbar ist, und dass das mindestens eine Lager (80), die mindestens eine Wellendichtung (9) und die Antriebswelle (7) fest in einer Ausnehmung des Dichtungsdeckels (24) angeordnet sind.

12. Zahnradpumpe nach einem der Ansprüche 9 bis 11, **dadurch gekennzeichnet, dass** die Dichtfläche (20) des Anschlussflansches (2) eine Schmiernut (22) aufweist, um den Schmierkanal des Leerlaufzahnrads (5) mit einer an die Antriebswelle (7) angrenzenden Schmieröffnung zu verbinden, und dass die Dichtfläche (30) des Deckels (3) eine Schmiernut (32) aufweist, um den Schmierkanal des Antriebszahnrads (4) mit dem Schmierkanal des Leerlaufzahnrads (5) zu verbinden.

13. Zahnradpumpe nach einem der Ansprüche 8 bis 12, **dadurch gekennzeichnet, dass** ein sich entlang einer Längsachse erstreckenden Schmierkanaleinsatz, der über seine gesamte Länge ein zum Antriebsprofil des Leerlaufzahnrades (5) komplementäres Antriebsprofil aufweist, und der einen sich entlang der Längsachse über die gesamte Länge des Schmierkanaleinsatzes erstreckenden Schmierkanal aufweist, wobei die Länge des Schmierkanaleinsatzes identisch ist mit der Länge einer Ausnehmung im Leerlaufzahnrad (5), die das Antriebsprofil und eine daran anschliessende Hinterschneidung für das Antriebsprofil aufweist.

14. Zahnradpumpe nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** das Gehäuse (1) zwischen dem Anschlussflansch (2) und dem Deckel (3) mittels Spannelementen (34) eingespannt ist.

Revendications

1. Pompe à engrenages comprenant un boîtier (1) avec un pignon d'entraînement (4) à denture droite et un pignon fou (5) à denture droite qui sont montés rotatifs autour de deux axes de rotation parallèles à l'intérieur du boîtier (1) comprenant des douilles (8), une bride de raccordement (2) qui est disposée sur un premier côté latéral du boîtier (1) dans la direction des axes, un couvercle (3) qui est disposé sur un deuxième côté latéral du boîtier (1) opposé à la bride de raccordement (2), un arbre d'entraînement (7) qui est monté rotatif dans la bride de raccordement (2) par au moins un palier (80) et qui est rendu étanche par rapport à la bride de raccordement (2) par au moins un joint d'arbre (9), le pignon d'entraînement (4) et le pignon fou (5) étant identiques, **caractérisé en ce que** l'arbre d'entraînement (7) est relié fonctionnellement au pignon d'entraînement (4) par une pièce d'accouplement (6) couplée à l'arbre d'entraînement (7) par un profil complémentaire, chaque pignon (4 ; 5) comprenant un premier tourillon (41) disposé sur un premier côté latéral de l'engrenage (4 ; 5) et un deuxième tourillon (42) disposé sur un deuxième côté latéral de l'engrenage (4 ; 5), opposé au premier côté latéral, dans lequel les axes de ro-

tation (A) des tourillons (41 ; 42) sont congruents et la longueur et le diamètre des tourillons (41 ; 42) sont identiques, le premier tourillon (41) présentant un profil d'entraînement interne (43) ou le premier tourillon (41) et le deuxième tourillon (42) présentant un profil d'entraînement interne (43) et la pièce d'accouplement (6) s'étendant le long d'un axe longitudinal (L) et présentant sur toute sa longueur un profil d'entraînement (60) complémentaire du profil d'entraînement (43) des roues dentées (4 ; 5) ou du profil d'entraînement (73) de l'arbre d'entraînement (7).

2. Pompe à engrenages selon la revendication 1, dans laquelle le profil d'entraînement (43) fait partie d'une connexion arbre-moyeu à ajustement de forme avec un arbre choisi dans le groupe comprenant un arbre polygonal, un arbre denté, un arbre cannelé et un arbre cycloïdal.

3. Pompe à engrenages selon l'une des revendications 1 ou 2, dans laquelle un canal de lubrification (44) s'étendant le long de l'axe de rotation (A) à travers chaque engrenage (4 ; 5) depuis le premier tourillon (41) jusqu'au second tourillon (42).

4. Pompe à engrenages selon l'une des revendications précédentes, dans laquelle l'arbre d'entraînement (7) s'étendant le long d'un axe longitudinal (L) d'une première extrémité (71) à une seconde extrémité (72), la seconde extrémité (72) comprenant un profil d'entraînement (73).

5. Pompe à engrenages selon la revendication 4, dans laquelle le profil d'entraînement (73) de l'arbre d'entraînement (7) est identique au profil d'entraînement (43) des engrenages (4 ; 5).

6. Pompe à engrenages selon la revendication 4 ou 5, dans laquelle un canal de lubrification (74) s'étendant le long de l'axe longitudinal (L) de l'arbre d'entraînement (7), au moins dans la région de la deuxième extrémité (72) et présentant une ouverture de lubrification latérale (740), à distance de la deuxième extrémité (72).

7. Pompe à engrenages selon la revendication 5 ou 6, dans laquelle la première extrémité (71) de l'arbre d'entraînement (7) comprend un profil de raccordement (75) pour le raccordement à un élément d'entraînement.

8. Pompe à engrenages selon la revendication 1, dans laquelle il est prévu un canal de lubrification (61) s'étendant le long de l'axe longitudinal (L) sur toute la longueur de la pièce d'accouplement (6).

9. Pompe à engrenages selon l'une des revendications précédentes, dans laquelle une première surface d'étanchéité (12) du carter (1) fait face à une surface d'étanchéité (20) de la bride de raccordement (2) et dans laquelle une deuxième surface d'étanchéité (13) du carter (1) fait face à une surface d'étanchéité (30) du couvercle (3) et dans laquelle les faces d'extrémité des premiers tourillons (41) et les faces d'extrémité extérieures des douilles correspondantes (8) sont en affleurement avec la première surface d'étanchéité (12) et dans lequel les faces d'extrémité des seconds tourillons (42) et les faces d'extrémité extérieures des douilles correspondantes (8) sont en affleurement avec la seconde surface d'étanchéité (13) .

10. Pompe à engrenages selon la revendication 9, dans laquelle la surface d'étanchéité (20) de la bride de connexion (2) comprenant une rainure d'étanchéité (21) entourant les douilles correspondantes (8) et comprenant une première bague d'étanchéité (90), et dans laquelle la surface d'étanchéité (30) du couvercle (3) comprenant une rainure d'étanchéité (31) entourant les douilles correspondantes (8) et comprenant une seconde bague d'étanchéité (91).

11. Pompe à engrenages selon l'une des revendications précédentes, dans laquelle la bride de raccordement (2) comprend un couvercle d'étanchéité (24) amovible depuis un côté opposé au boîtier (1) et dans laquelle le au moins un palier (80), le au moins un joint d'arbre (9) et l'arbre d'entraînement (7) sont disposés de manière fixe dans un évidement du couvercle d'étanchéité (24).

12. Pompe à engrenages selon l'une des revendications 9 à 11, dans laquelle la surface d'étanchéité (20) de la bride de raccordement (2) comprend une rainure de lubrification (22) pour relier le canal de lubrification du pignon fou (5) à un orifice de lubrification adjacent à l'arbre d'entraînement (7), et dans laquelle la surface d'étanchéité (30) du couvercle (3) comprend une rainure de lubrification (32) pour relier le canal de lubrification du pignon d'entraînement (4) au canal de lubrification de l'arbre d'entraînement (7).

13. Pompe à engrenages selon l'une des revendications 8 à 12, comprenant un insert de canal de lubrification s'étendant le long d'un axe longitudinal et comprenant un profil d'entraînement sur toute sa longueur qui est complémentaire au profil d'entraînement du pignon fou (5) et comprenant un canal de lubrification s'étendant le long de l'axe longitudinal sur toute la longueur de l'insert de canal de lubrification et dans lequel la longueur de l'insert de canal de lubrification est identique à la longueur d'un évidement dans le pignon fou (5) comprenant le profil d'entraînement et une contre-dépouille adjacente pour le profil d'entraînement.

14. Pompe à engrenages selon l'une des revendications précédentes, dans laquelle le boîtier (1) est serré entre la bride de raccordement (2) et le couvercle (3) au moyen d'éléments de serrage (34).

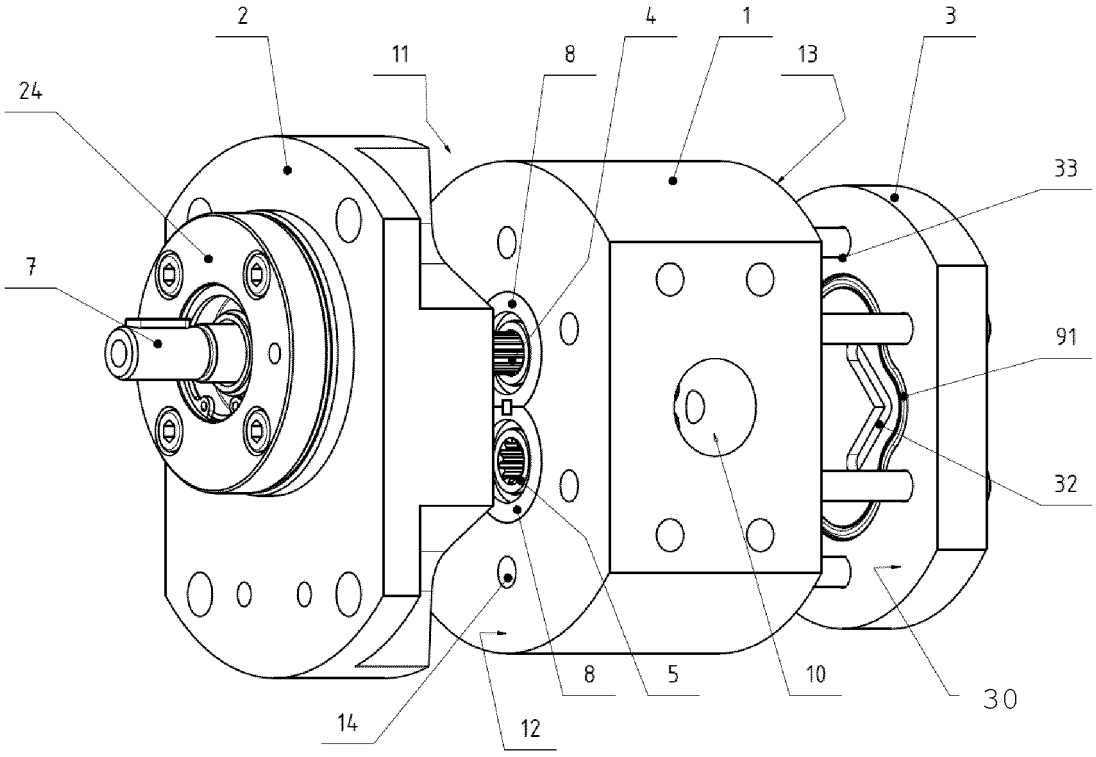


Fig. 1

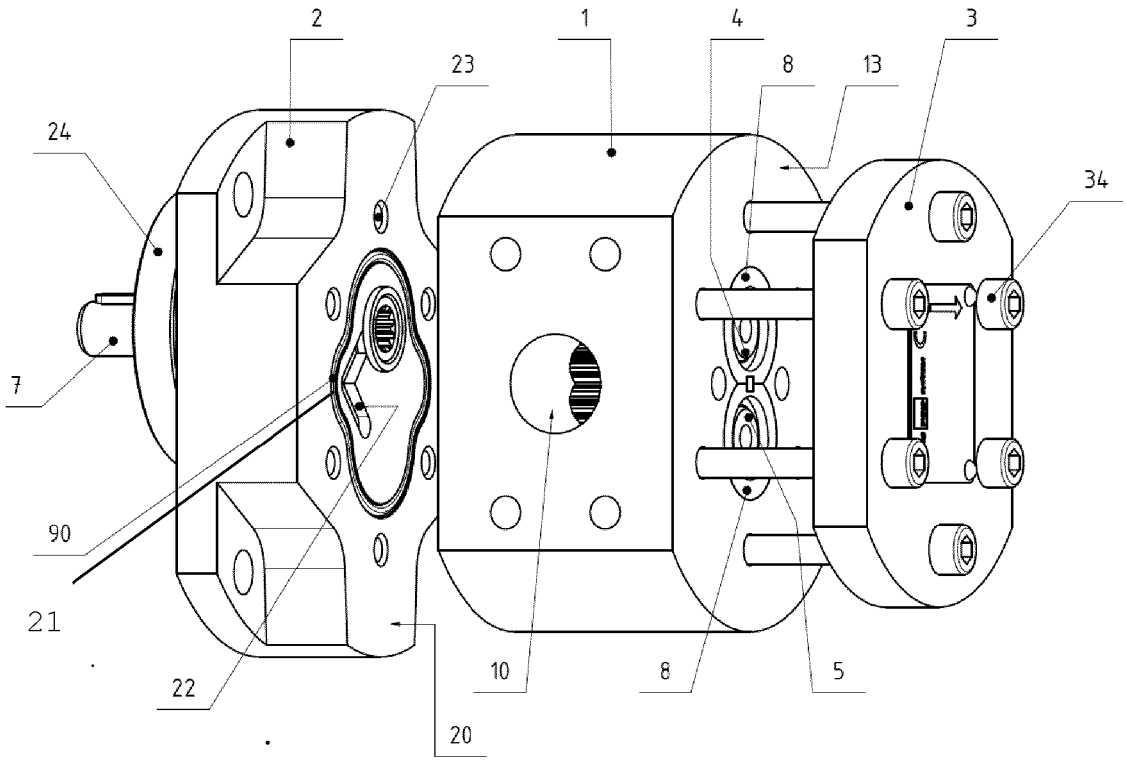
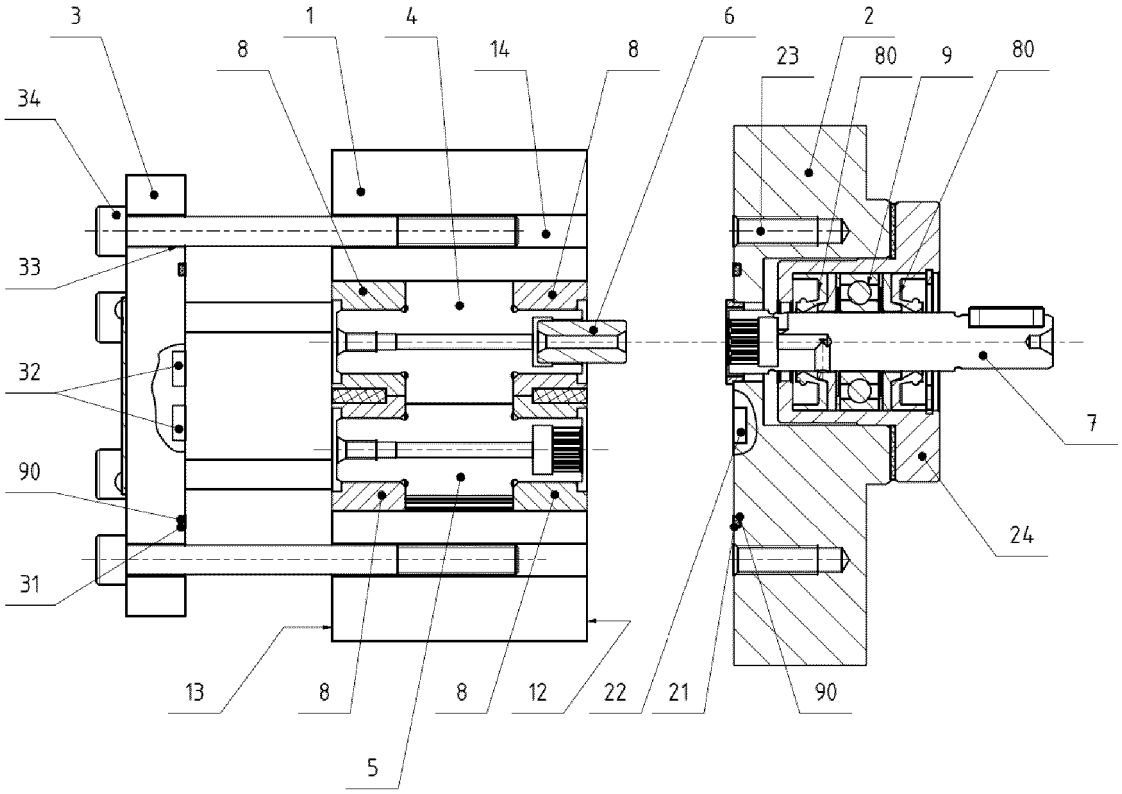


Fig. 2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1
4
6
2
8
14
8
23
80
9
80
34
33
32
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31
7
24
13
8
8
12
22
21
90
5

Fig. 3

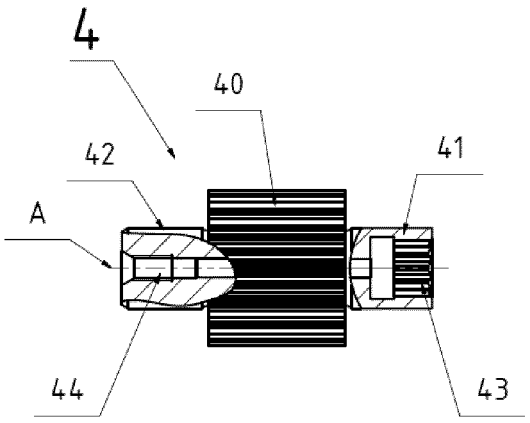
4
40
42
41
A
44
43

Fig. 4

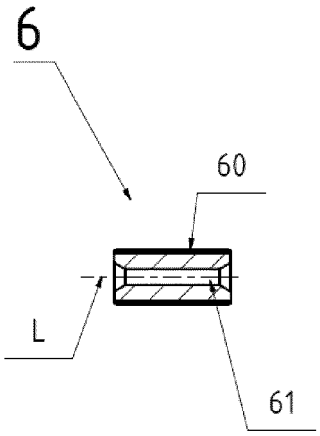

Fig. 5

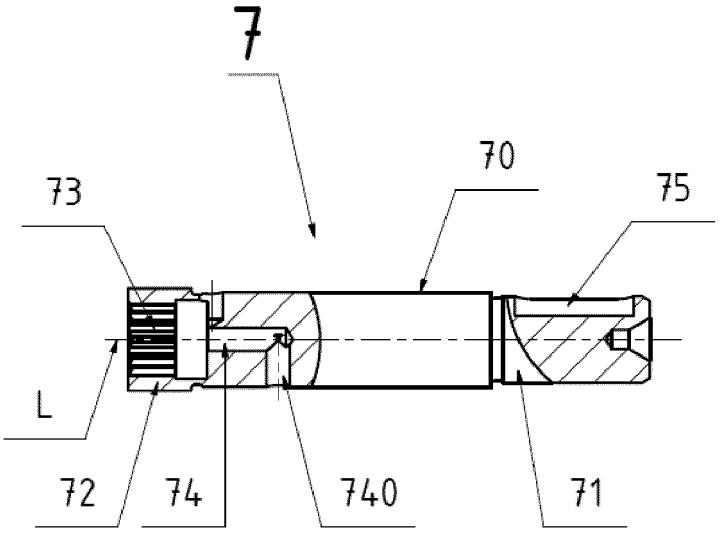

Fig. 6

REFERENCES CITED IN THE DESCRIPTION

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