(19) DANMARK

(10) **DK/EP 2529134 T3**

Patent- og Varemærkestyrelsen

(12) # Oversættelse af europæisk patentskrift

(51) Int.Cl.: ***F 16 J 15/00 (2006.01)*** ***F 16 J 15/32 (2006.01)*** ***F 16 J 15/34 (2006.01)*** ***F 16 J 15/44 (2006.01)*** ***F 16 L 27/093 (2006.01)***

(45) Oversættelsen bekendtgjort den: **2016-02-15**

(80) Dato for Den Europæiske Patentmyndigheds bekendtgørelse om meddelelse af patentet: **2015-12-16**

(86) Europæisk ansøgning nr.: **11701240.1**

(86) Europæisk indleveringsdag: **2011-01-20**

(87) Den europæiske ansøgnings publiceringsdag: **2012-12-05**

(86) International ansøgning nr.: **EP2011050769**

(87) Internationalt publikationsnr.: **WO2011092111**

(30) Prioritet: **2010-01-28 DE 102010001345**

(84) Designerede stater: **AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR**

(73) Patenthaver: **Trelleborg Sealing Solutions Germany GmbH, Handwerkstrasse 5-7, 70565 Stuttgart, Tyskland**

(72) Opfinder: **JORDAN, Holger, Novizenweg 140, 73765 Neuhausen auf den Fildern, Tyskland**

(74) Fuldmægtig i Danmark: **Awapatent A/S, Rigensgade 11, 1316 København K, Danmark**

(54) Benævnelse: **Rotationstætningsindretning.**

(56) Fremdragne publikationer:
EP-A1- 1 731 804
DE-A1- 3 502 799
DE-A1- 3 526 731
DE-A1-102007 062 470
GB-A- 2 140 101
US-A1- 2003 178 790

Rotary feed-through

The invention relates to a rotary feed-through, comprising a rotatably mounted machine part and a machine part that forms a bearing for the rotatably mounted machine part, wherein a first of the machine parts forms a seal-accommodating structure and the second of the machine parts has a surface forming a sealing surface, and at least one rotary seal arranged in the seal-accommodating structure. The rotary seal allows to seal off a high-pressure area from a low-pressure area between the machine parts.

The high-pressure area is constituted by a rotary feed-through area between the two machine parts. The rotary seal is also termed a rotary feed-through seal. The rotary feed-through permits fluids, that is, gases or liquids, a sealed transition between a stationary machine part and a rotating machine part. The first machine part having the seal-accommodating structure is usually constituted as the stationary machine part and the second machine part, as a shaft mounted rotatably within it. Such rotary feed-throughs are used, for example, in hydraulic applications or to input hot gas for heating a roller.

Known rotary feed-through seals are constituted, for example, as a sliding ring (mechanical seal) wherein the sliding ring usually has a sealing ring made of polytetrafluoroethylene (PTFE).

An example of such a rotary feed-through seal is described in DE 10 2007 062 470 A1. A rotary feed-through seal is designed such that as little fluid as possible, which is under positive pressure, enters the low-pressure area from the rotary feed-through area, that is, it is subject to low leakage. However, the lower the leakage, the greater the friction occurring between the sealing surface of the rotatably mounted machine part and the rotary feed-through seal. The wear of the rotary feed-through seal is correspondingly higher and a relatively large amount of driving energy is expended against that friction force. In particular, when shafts rotate at high speeds and with fluids under high pressure, the life of such known rotary feed-through seals is therefore short.

Moreover, entrained rotation of the rotary seal with the shaft must be avoided. This is frequently achieved by pressing the sealing ring into a holding element that is also ring-shaped and is made, for example, of steel. The holding element is mounted torsionally rigidly in the seal-accommodating structure. However, such a rotary feed-through seal is relatively complicated to manufacture. For torsionally rigid mounting, an anti-rotation element must be provided on the seal-accommodating structure and/or the holding element must be firmly pressed into the seal-accommodating structure. Mounting in a simple slot, functioning as the seal-accommodating structure, is not possible because of the rigidity of the holding element. A rotary feed-through having such a holding element is disclosed e.g. in DE 35 02 799 A1.

The object of the invention is to provide a rotary feed-through, also referred to as rotary seal arrangement, wherein simple mounting of the rotary seal between the machine parts is possible and entrained rotation of the sealing ring of the rotary seal is reliably avoided.

This task is solved by a rotary feed-through comprising the features stated in claim 1. The dependent claims represent preferred embodiments of the invention.

An inventive rotary feed-through has a rotatably mounted machine part and a machine part that forms a bearing for the rotatably mounted machine part, wherein a first of the machine parts constitutes a seal-accommodating structure and the second of the machine parts has a surface forming a sealing surface. At least one rotary seal disposed in the seal-accommodating structure is provided to seal a high-pressure area against a low-pressure area between the machine parts. The high-pressure area is at least temporarily under positive pressure relative to the pressure of the low-pressure area. In this case, the high-pressure area is constituted by a rotary feed-through area wherein, through the rotary feed-through area, a fluid that is under a positive pressure relative to the low-pressure area can be introduced from one of the machine parts through the sealing surface into the other of the machine parts. That is, the two machine parts together form a rotary feed-through and the rotary seal is disposed between the machine parts as a rotary feed-through seal. The rotary feed-through area forms the high-pressure area that is at least temporarily under positive pressure relative to the pressure of the low-pressure area.

According to the invention, the rotary seal has an essentially rigid support element that is disposed essentially positionally stably with respect to the first machine part, a rubber-elastically deformable contact body in contact with the support element on the high-pressure area side, and a sealing ring that has a sealing edge and is in loose contact with the contact body.

The sealing ring has a wide side on both sides of the sealing edge and a seal seat edge area facing away from the sealing edge. The wide sides are interconnected via the seal seat edge area and the contact body is disposed at least partially between one of the wide sides of the sealing ring and the support element.

If the sealing surface is constituted as the lateral surface of a cylinder, that is, as the lateral surface of a rotating shaft, the contact body is disposed in the axial direction, that is, the direction of the axis of rotation, of the machine part mounted rotatably between the support element and the sealing ring. The contact body does not have to be disposed completely between the support element and the sealing ring. It can also extend beyond this area. "In loose contact" means that the sealing ring is not constituted integrally with the contact body. The sealing ring can be pressed against the contact body by the design of the rotary seal so that its relative position with respect to the contact body is fixed by friction forces occurring between the sealing ring and the contact body. The sealing ring does not have to be permanently in contact with the contact body. It can be in contact with the contact body only during a period in which a high pressure above a limit value determined by the design of the rotary seal is present in the high-pressure area, that is, it is pressed onto the contact body by the high pressure. The support element extends, at least in a supporting area, obliquely with respect to the axial direction of the rotatably mounted machine part such that the sealing ring is pressed away from the sealing surface in the supporting area by the contact body. That is, the contact body is constituted such that the sealing ring with the sealing edge is pressed against internal elastic forces of the contact body toward the sealing surface when the contact body is pressed together from its sealing ring side by an applied positive pressure relative to the low-pressure area. This especially effectively reduces the frictional forces acting on the rotary feed-through seal between the sealing surface of the rotatably mounted machine part and the rotary feed-through seal. In this way, it can be achieved that in a state without positive pressure, or a state with a pressure below a threshold value, in the rotary feed-through area, the sealing edge is essentially in contact with the sealing surface without a pressing force or is at a distance from the sealing surface. In a state with positive pressure, or a state with a pressure above the threshold value, in the rotary feed-through area, on the other hand, the sealing edge is in contact with the sealing surface in such a way as to provide a seal because the fluid under pressure then exerts a force component on the sealing ring acting against pressing away by the contact body. Therefore, an increased sealing effect is only achieved by the contacting sealing lip if a relatively high pressure is applied in the rotary feed-through area, that is, if the fluid in the rotary feed-through area is under a relatively high pressure. Because in very many applications of rotary feed-throughs, the fluid is only temporarily under high pressure, or an especially high pressure is only temporarily applied to it, low friction of the rotary seal with low leakage is achieved in this way. For example, if the fluid is a hot gas used to heat a roller, the sealing edge can then only be pressed forcefully onto the sealing surface if the hot gas is pressed into the roller with high pressure, for example, to heat the roller temporarily. Only in such a heating area is rotation of the roller significantly slowed by the sealing edge pressed against the sealing surface. If no hot gas is currently being pressed in, for example, because the operating temperature of the roller has been reached, the pressure of the fluid in the rotary feed-through area will drop and the sealing edge will, for example, be lifted from the sealing surface because the sealing ring is pressed away from the sealing surface by the contact body which is, in particular, elastically pretensioned and/or press-fitted.

Due to the at least temporary pressing of the sealing ring against the rubber-elastic contact body, the relative position of the sealing ring with respect to the contact body is fixed by the friction forces occurring between the sealing ring and the contact body. The contact body is equally pressed against the support element and/or can be constituted integrally with the support element. This reliably avoids entrained rotation of the sealing ring with the rotatably mounted machine part.

Simple mounting of the rotary seal is possible, in particular, if the support element is constituted integrally with the first machine part as part of the seal-accommodating structure. The seal-accommodating structure can be constituted as a ring-shaped slot. Because no additional rigid support element has to be provided, the sealing ring and, if not integrally constituted with the support element, the contact body can simply be inserted or clamped in the seal-accommodating structure as elastically deformable parts.

The rotary feed-through is therefore part of a pressure supply of a pressure accumulator whose pressure can be regulated and/or set as required.

The contact body preferably has an area that is in contact with the sealing ring in the axial direction of the rotatably mounted machine part on the high-pressure area side. In this way, the edge of the sealing ring facing radially away from the sealing surface, that is, the seal seat edge area is disposed in a recess of the contact body. This edge then forms a type of pivot around which the sealing ring can tilt to a greater or lesser degree with alternating relative pressure differences between the high-pressure area and the low-pressure area so that the force with which the sealing edge is pressed onto the sealing surface can be dynamically adapted.

If the sealing ring has a cross-section that is angled concavely with respect to the rotary feed-through area, a force pressing the sealing edge onto the sealing surface against the internal elastic forces of the contact body can be generated especially well by the positive pressure of the fluid prevailing at least temporarily in the rotary feed-through area. The rotary feed-through area is delimited by the sealing ring and the sealing surface in such a way that there is an obtuse angle between the rotary feed-through area side surface of the sealing ring and the sealing surface.

The support element can be made of a rigid plastic or a metal, preferably of steel. In accordance with the invention, the sealing ring is made of PTFE, that is, polytetrafluoroethylene. Low-wear, rubber-elastic materials such as FKM (fluorinated elastomer), or HNBR (rubber-elastic materials) can also be used as materials for the sealing ring. The contact body is preferably made of elastomer. It is important that it exhibits a rubber-elastic spring behavior.

If two rotary seals are preferably disposed mirror-symmetrically around the, or a, rotary feed-through area, the rotary feed-through area is reliably sealed off on both sides.

The invention is explained in more detail below based on examples with reference to the drawings. The drawings each show a cross-section oriented axially with respect to the rotatably mounted machine part, wherein only an upper half of the seal arrangement is shown in each case.

The Figures 1a and 1b show a preferred embodiment of an inventive rotary feed-through.

Figure 2 shows a further embodiment of an inventive rotary feed-through.

Figure 3 shows an embodiment of an inventive rotary feed-through in an end face of a rotatably mounted machine part.

Figures 4a to 4f show embodiments of rotary seals of an inventive rotary feed-through.

Figure 5 shows an embodiment of a contact body of an inventive rotary feed-through.

The representations in the drawings show the inventive object in a very schematic way and are not to scale. The individual parts of the inventive object are shown in such a way that their structure can be clearly illustrated.

Figures 1a and 1b show cross-sections of a preferred embodiment of an inventive rotary seal arrangement 1. Rotary seals 5 are mounted between a rotatably mounted machine part 2 (shaft) and a machine part 3 that forms a bearing for the rotatably mounted machine part 2. The rotary seals therefore have a ring shape that is symmetrical about the center of the ring. The rotatability of the shaft is symbolically shown in the figure by a curved double arrow. The second machine part 2 is constituted as a radial shaft mounted in the first machine part 3, wherein the rotary seals 5 are constituted in a ring shape and are disposed around the radial shaft. The axis of rotational symmetry 6 of the rotary seals 5 coincides with the axis of rotation of the radial shaft.

Alternatively, the machine part 3 can rotate around the machine part 2.

The rotary seals 5 are inserted in a seal-accommodating structure constituted by the first of the machine parts 3. The seal-accommodating structure does not have to be constituted by special shaping of the internal surface of the first, that is, the stationary machine part 3, as shown in the figure. The seal-accommodating structure may only be an area of surface that is not further specified, on which a rotary seal is positioned. The second of the machine parts 2, that is, the radial shaft in the case shown, has a surface forming a sealing surface 7 that is formed as the lateral surface of a cylinder. The seat of the rotary seals 5 is secured by a disk 8, which is in turn fixed by means of a spring washer 9 engaging in a slot.

By means of the rotary seals 5, a high-pressure area 10 constituted as a rotary feed-through area is sealed off from a low-pressure area 11 between the machine parts 2, 3. Through the rotary feed-through area 10, a fluid that is under positive pressure relative to the low-pressure area 11 with the low pressure P_N can be introduced from the stationary machine part 3 through the sealing surface 7 into the rotatable machine part 3. The low pressure P_N can, for example, be standard atmospheric pressure. For this purpose, a hole 14 is provided in the stationary machine part 3 that opens into the rotary feed-through area 10. The rotatable machine part 2 also has holes 14 that exit into the rotary feed-through area 10 and connect the rotary feed-through area 10 to one shaft end of the rotatable machine part 2 for leading through the fluid. The fluid can therefore be introduced through the holes 14 from the stationary machine part 3 into the rotatable machine part 2, which is symbolically shown by arrows 16 in the figure. The fluid can also flow against the direction of the arrows 16 if required.

Two rotary seals 5 are disposed mirror-symmetrically around the high-pressure area 10, or the rotary feed-through area. Each of the rotary seals 5 has an essentially rigid support element 20 that is disposed essentially positionally stably with respect to the first machine part 3, a rubber-elastically deformable contact body 21 in contact with the support element 20 on the rotary feed-through area side, and a sealing ring 23 that has a sealing edge 22 and a sealing ring 23 in loose contact with contact body 21.

Each of the sealing rings 23 has a wide side 24 on both sides of its sealing edge 22 and a seal seat edge area 26 facing away from the sealing edge. The wide sides 24 of each sealing ring 23 are interconnected via the corresponding seal seat edge area 26 and each contact body 21 is disposed between one of the wide sides 24 of each sealing ring 23 and the associated support element 20. The wide sides 24 form surface areas that constitute, at least on one of the sides of the sealing edge 22, a sufficient engagement surface for the fluid that is under pressure in the high-pressure area to press the sealing ring 23 onto the sealing surface 7 with the sealing edge 22 so as to provide a seal. The sealing ring 23 can, in particular, have the shape of a flat circular ring, preferably deformed concavely within itself, wherein the edge pointing radially inward constitutes the sealing edge 7.

The sealing rings 23 are therefore not permanently connected to the associated contact body 21 but are only in contact with it. There may also be interstices. The support element 20 is a component that is separate from the machine parts 2,3. The sealing edge 22 of the sealing rings 23 is disposed in each case on a load area of each sealing ring 23 protruding toward the sealing surface 7 beyond the support element 20 and the interposed contact body 21. In particular, this load area is variable in its position in the high-pressure area 10 when pressure is applied. When pressure is applied, the load area is therefore deformed in such a way that the sealing edge 22 is pressed onto the sealing surface 7.

The sealing rings 23 are each pressed away from the sealing surface 7 by the associated contact body 21. This is shown symbolically by arrows 25 in the figure. Pressing away is effected by the rubber-elastic properties of the contact body 21. The sealing rings 23 each have a cross-section that is angled concavely with respect to the rotary feed-through area 10. The rotary feed-through area 10 is delimited by the sealing rings 23 and the sealing surface 7 in such a way that there is an obtuse angle between the rotary feed-through area side surfaces of the sealing rings 23 and the sealing surface 7. The contact bodies 21 rest against each associated support element 20.

If a fluid under high pressure P_H is introduced into the rotary feed-through area 10, as shown by the curved arrows in the figure, a force is exerted on the rotary feed-through area side surfaces of the sealing rings 23. This force presses the contact bodies 21 together against their internal rubber-elastic return forces which press the sealing ring 23 away from the sealing surface 7. This presses the sealing edges 22 onto the sealing surface 7 in such a way that the rotary feed-through area 10 is sealed essentially without leakage against the low-pressure area 11.

In the seal arrangement shown in Figure 1a, the two rotary seals 5 have an identical radial diameter. Accordingly, the seal-accommodating structure, into which the rotary seals 5 are mounted, also have the same inside diameter on both sides of the hole 14 in the stationary machine part 3.

In Figure 1b, the two rotary seals 5 each have a different radial diameter. Accordingly, the seal-accommodating structure into which the rotary seals 5 are mounted also has a different inside diameter on both sides of the hole 14 in the stationary machine part 3, forming a step 29 of the inside diameter.

Figure 2 shows a further embodiment of an inventive rotary seal arrangement on a rotary feed-through. The rotary seal arrangement is essentially the same as the embodiment shown in Figure 1a, which is why the relevant features are referred to with the same reference symbols. Unlike the embodiment in Figure 1a, the contact bodies 21 of the rotary seals 5 shown in Figure 2 each have a bulge 30 in their area adjacent to the hole 14 in the stationary machine part 3. The bulges of the contact bodies 21 touch in such a way that they function as a non-return valve. If a fluid under high pressure is introduced through the hole 14 in the stationary machine part 3 in the direction of the arrow 16, the bulges are pressed apart so that the fluid is introduced into the high-pressure area 10. If the pressure of the fluid is reduced, the bulges 30 reclose the hole 14 in the stationary machine part 3 due to the elastic return forces of the rubber-elastic material of the contact bodies 21.

Figure 3 shows an embodiment of an inventive rotary seal arrangement with two rotary seals 5 for sealing off a rotary feed-through in an end face of a rotatably mounted machine part 2. End face refers to a side of the rotatable machine part 2 to the surface of which the axis of rotation of the rotatable machine part 2, i.e. its axial direction, is perpendicular. Characteristics that are the same as the rotary seal arrangement of Figure 1a are referred to by the same reference symbols. The end face of the rotating machine part 2 forms the sealing surface 7 and is constituted as a circular ring area. The contact bodies 21 are disposed in the radial direction of the rotatably mounted machine part 2 between the corresponding support element 20 and the respective sealing ring 23. The stationary machine part 3 has, on both sides of a hole 14 for a fluid supply, a ring-shaped slot as a seal-accommodating structure into which the rotary seals 5 are inserted. On each of the slot edges of the slots facing away from the hole, a notch 32 is provided into which, in each case, a projection 33 provided on the support elements 20 engages, whereby the rotary seals 5 are fixed in their position axially with respect to the rotary machine part 2.

Figures 4a to 4f show axial cross-sections of different embodiments of rotary seals of an inventive rotary seal arrangement. The embodiments are essentially the same as the rotary seal according to Figure 1. For this reason, only special details will be described here. In the figures, the rotary seal arrangement parts corresponding to those in Figure 1 are referred to by the same reference symbols. The contact bodies 21 of the rotary seals shown each have a foot-like widened section on the seal-accommodating structure side. The contact body extends in the radial direction of the rotary seal 5 between the sealing ring 23 and the seal-accommodating structure, and the contact body 21 has an area in contact with the sealing ring 23 in the axial direction of the rotatably mounted machine part 2 on the high-pressure area side. The latter area extends different distances toward the sealing edge. The edge of the sealing ring 23 facing radially away from the sealing surface is thus disposed in a recess of the contact body 21.

The contact bodies 21 each have at least one end 60 coming to a point on the sealing accommodating side. These ends 60 are pressed onto the seal-accommodating structure in such a way that the contact body 21 is elastically deformed, providing pretensioning of the sealing ring 23. This is symbolized by the dashed-line representation of the ends 60. In this way, the edge of the sealing ring 23 facing radially away from the sealing surface is also elastically clamped in the recess in the contact body 21 in each case. In Figure 5b, this is effected by an edge 70 bridging a space. The illustrated rotary seals differ further in the shaping of the support elements 20, the sealing rings 23, and the areas of the contact bodies 21 between them.

In Figures 4a to 4e, the support elements 20, the sealing rings 23 and the areas of the contact bodies 21 between them each have a cross-section that is angled concavely with respect to the high-pressure area. In this case, in the embodiments of Figures 5c to 5e, the area of the contact body 21 disposed between the support element 20 and the sealing ring 23 becomes conically wider toward the sealing edge. In Figure 5f, on the other hand, the cross-section of the support element 20, of the sealing ring 23, and of the area of the contact body 21 between them are not angled.

All the embodiments shown have the common feature that, in each case, the sealing ring 23 is pretensioned in the radial direction toward the second machine part 2, which is not shown, due to an elastic return force of the contact body 21. Because the support element 20 extends obliquely with respect to the axial direction of the rotatably mounted machine part (not shown) at least in a respective supporting area, the contact body 21 is pressed together in this area between the support element 20 and the sealing ring due to this pretensioning. This in turn presses the sealing ring 23 in the supporting area away from the sealing surface due to the contact body 21. The contact body 21 is disposed in each respective supporting area radially between the respective support element 20 and the associated sealing ring 23.

Figure 5 shows an embodiment of a contact body 21 of an inventive rotary seal arrangement in an axially oriented plan view. It therefore shows the surface of the contact body 21 on the sealing ring side. The contact body can also have flat surfaces on the sealing ring side; in this embodiment, however, the surface has projections 80 toward the sealing ring so that a distance between the contact body 21 and the sealing ring is also retained when the contact body 21 is compressed.

P A T E N T K R A V

1. Drejegennemføring med

- en drejeligt lejret maskindel (2) og en maskindel (3), som udformer et leje til den drejeligt lejrede maskindel (2), hvor en første af maskindelene (3) udformer en tætningsoptagelsesstruktur, og
  den anden af maskindelene (2) omfatter en overflade, som udformer en tætningsflade (7), og
- mindst én i tætningsoptagelsesstrukturen anbragt rotationstætning (5) til tætning af et som drejegennemføringsområde udformet højtryksområde (10) i forhold til et lavtryksområde (11) mellem maskindelene (2, 3), hvor der gennem drejegennemføringsområdet kan indledes en fluid, som i forhold til lavtryksområdet (11) står under et overtryk, fra en af maskindelene (2, 3) gennem tætningsfladen (7) ind i den anden af maskindelene (2, 3), hvor rotationstætningen (5) omfatter
- et i det væsentlige stift og i forhold til den første maskindel (3) i det væsentlige positionsstabilt anbragt støtteelement (20),
- et gummielastisk deformerbart anlægslegeme (21), som slutter sig til støtteelementet (20) på højtryksområdesiden, og
- en tætningsring (23), som omfatter en tætningskant (22), som ligger fortrinsvis løst an mod anlægslegemet (21), og som er udformet af PTFE, hvor tætningsringen (23) på begge sider af tætningskanten (22) omfatter en respektive bredside (24), og omfatter et væk fra tætningskanten vendende tætningssædekantområde (26), og bredsiderne (24) er forbundet med hinanden over tætningssædekantområdet (26), hvor
  anlægslegemet (21) er anbragt mindst delvist mellem mindst én af bredsiderne (24) af tætningsringen (23) og støtteelementet (20), og hvor støtteelementet (20) i det mindste i et støtteområde forløber skråt på den aksiale retning af den drejeligt lejrede maskindel (2), og hvor anlægslegemet er således udformet, at tætningsringen (23) i støtteområdet trykkes væk fra tætningsfladen (7) af anlægslegemet (21), således at tætningskanten (22) af tætningsringen (23) ved et under en tærskelværdi liggende tryk i drejegennemføringsområdet ligger an mod anlægsfladen (7) uden trykkekraft, eller er anbragt i en afstand fra tætningsfladen (7), og at tætningsringen (23) ved et tryk over tærskelværdien med tætningskanten (22) trykkes mod indre elastiske kræfter af anlægslegemet (21) i retning af tætningsfladen (7) og ligger tætnende an mod denne.

2. Drejegennemføring ifølge krav 1,
k e n d e t e g n e t ved, at
tætningsfladen (7) er udformet som en cylinderflade, og at anlægslegemet (21), i

det mindste delvist i aksial retning af den drejeligt lejrede maskindel (2), er anbragt mellem støtteelementet (20) og tætningsringen (23).

3. Drejegennemføring ifølge krav 1,

k e n d e t e g n e t ved, at

tætningsfladen (7) er udformet som en cirkelflade eller en cirkelringflade, og at anlægslegemet (21), i det mindste delvist i radial retning af den drejeligt lejrede maskindel (2), er anbragt mellem støtteelementet (20) og tætningsringen (23).

4. Drejegennemføring ifølge ét af kravene 1 til 3,

k e n d e t e g n e t ved, at

den anden maskindel (2) er udformet som en radial aksel lejret i den første maskindel (3), hvor rotationstætningen (5) er udformet ringformet og er anbragt om den radiale aksel.

5. Drejegennemføring ifølge ét af kravene 1 til 4,

k e n d e t e g n e t ved, at

støtteelementet (20) er udformet i ét stykke med den første maskindel (3) som del af tætningsoptagelsesstrukturen.

6. Drejegennemføring ifølge ét af kravene 1 til 5,

k e n d e t e g n e t ved, at

anlægslegemet (21) udstrækker sig i den radiale retning af rotationstætningen (5) mellem tætningsringen (23) og tætningsoptagelsesstrukturen, hvor en i en radial retning af den anden maskindel (2) rettet forspænding af tætningsringen (23) foreligger ved hjælp af en elastisk tilbagestillingskraft af anlægslegemet (21).

7. Drejegennemføring ifølge ét af kravene 1 til 6,

k e n d e t e g n e t ved, at

anlægslegemet (21) omfatter et område, som slutter sig til tætningsringen (23) på højtryksområdesiden i aksial retning af den drejeligt lejrede maskindel (2), på en sådan måde, at den radialt væk fra tætningsfladen vendende rand af tætningsringen (23) er anbragt i et udtag af anlægslegemet (21).

8. Drejegennemføring ifølge krav 1,

k e n d e t e g n e t ved, at

tætningsringen (23) omfatter et konkavt på drejegennemføringsområdet (10) vinklet tværsnit.

9. Drejegennemføring ifølge ét af kravene 1 til 8,

k e n d e t e g n e t ved, at

støtteelementet (20) er udformet af stål, og/eller at anlægslegemet (21) er udformet af en elastomer.

10. Drejegennemføring ifølge ét af kravene 1 til 9,

k e n d e t e g n e t ved, at

to rotationstætninger (5) er anbragt fortrinsvis spejlsymmetrisk rundt om højtryksområdet (10).

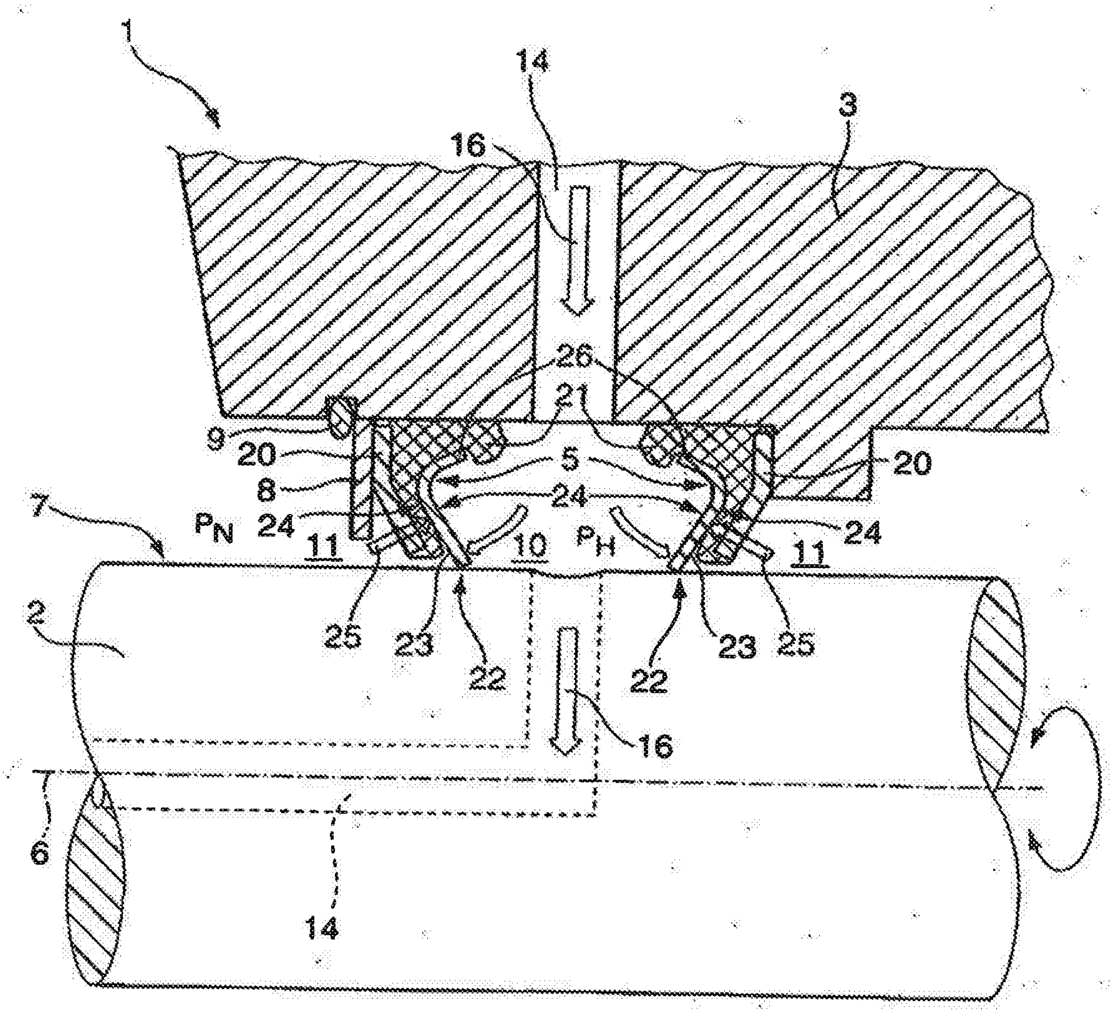
1
14
3
16
26
21
9
20
5
20
8
24
7
24
P_N
24
11
10
P_H
24
11
2
25
23
22
22
23
25
16
6
14

Fig.1a

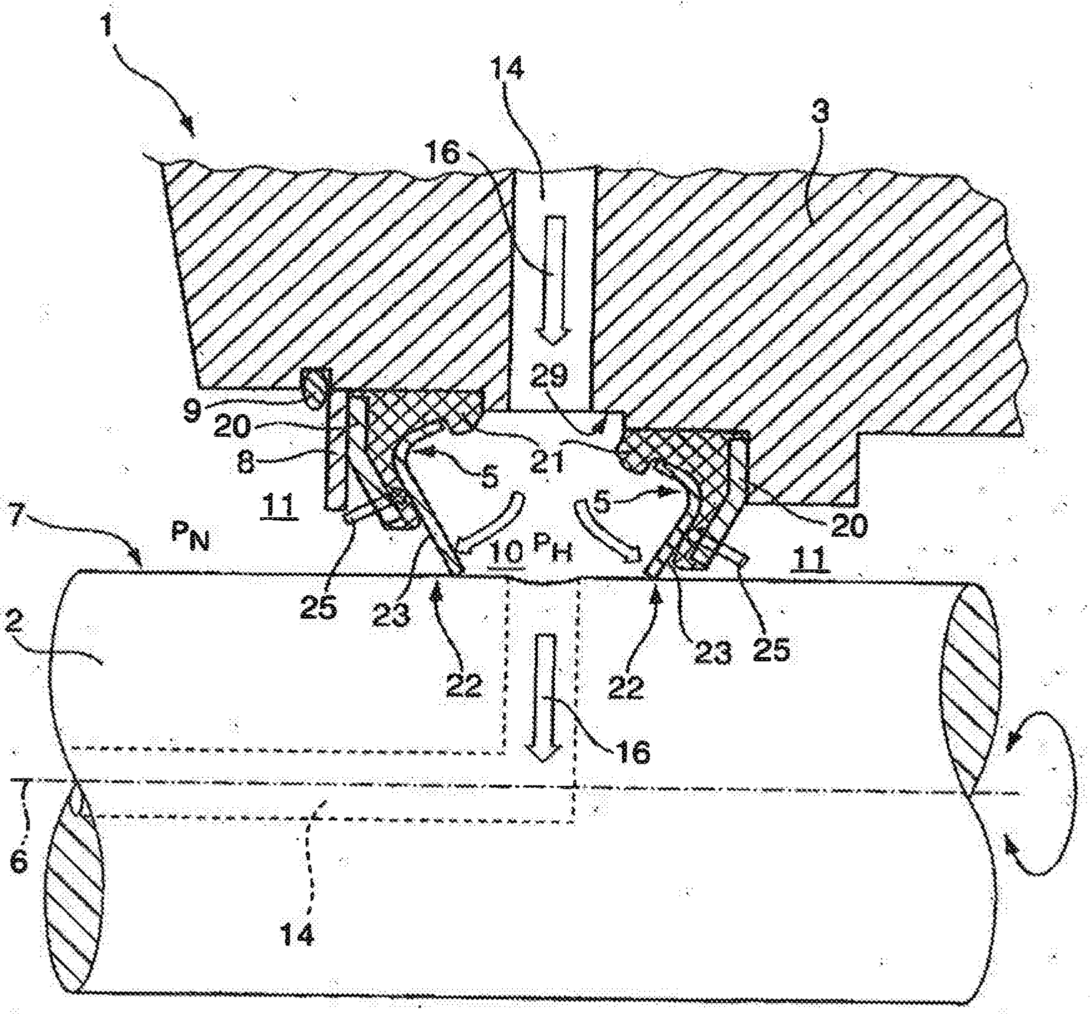

Fig.1b

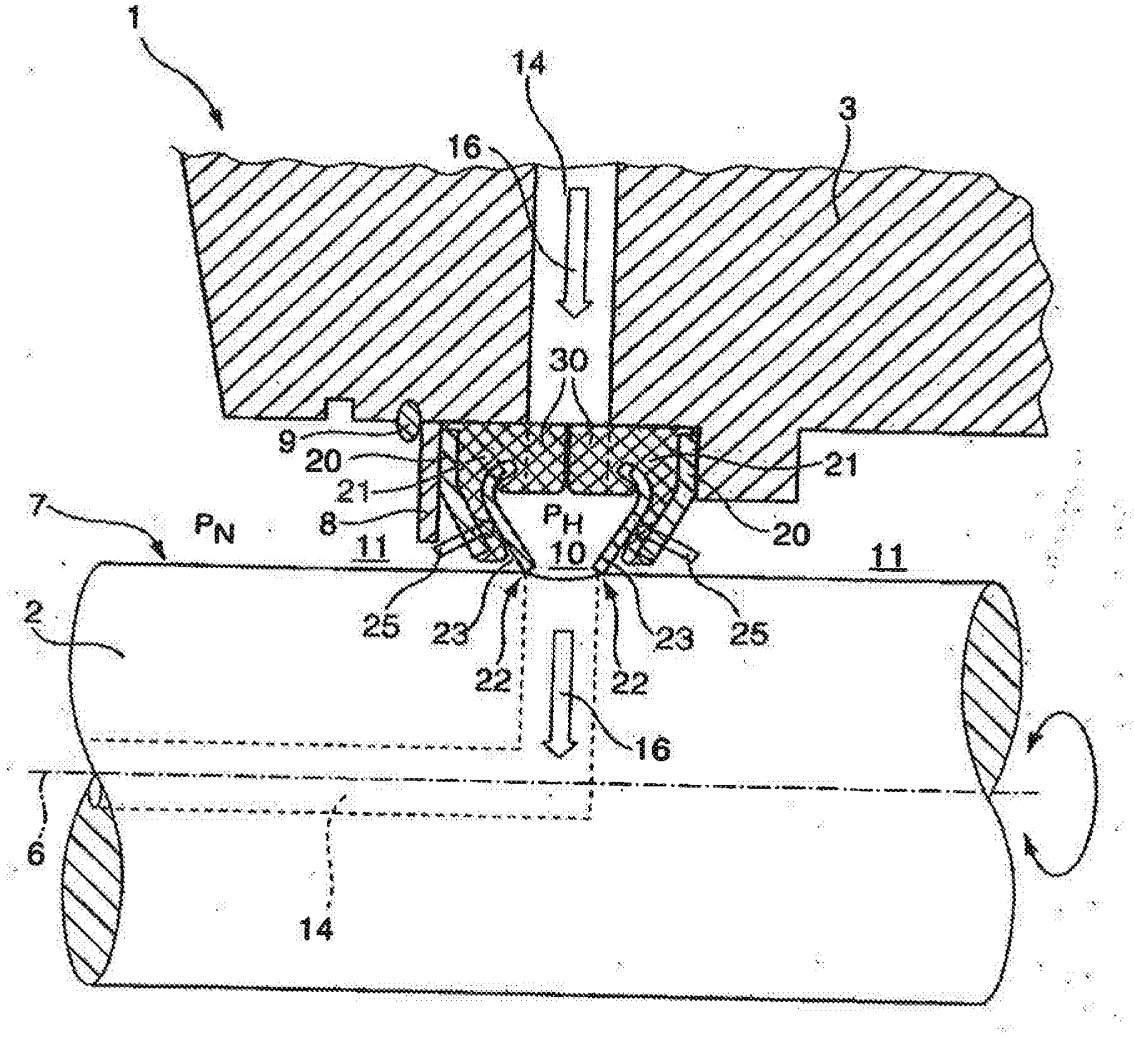

Fig. 2

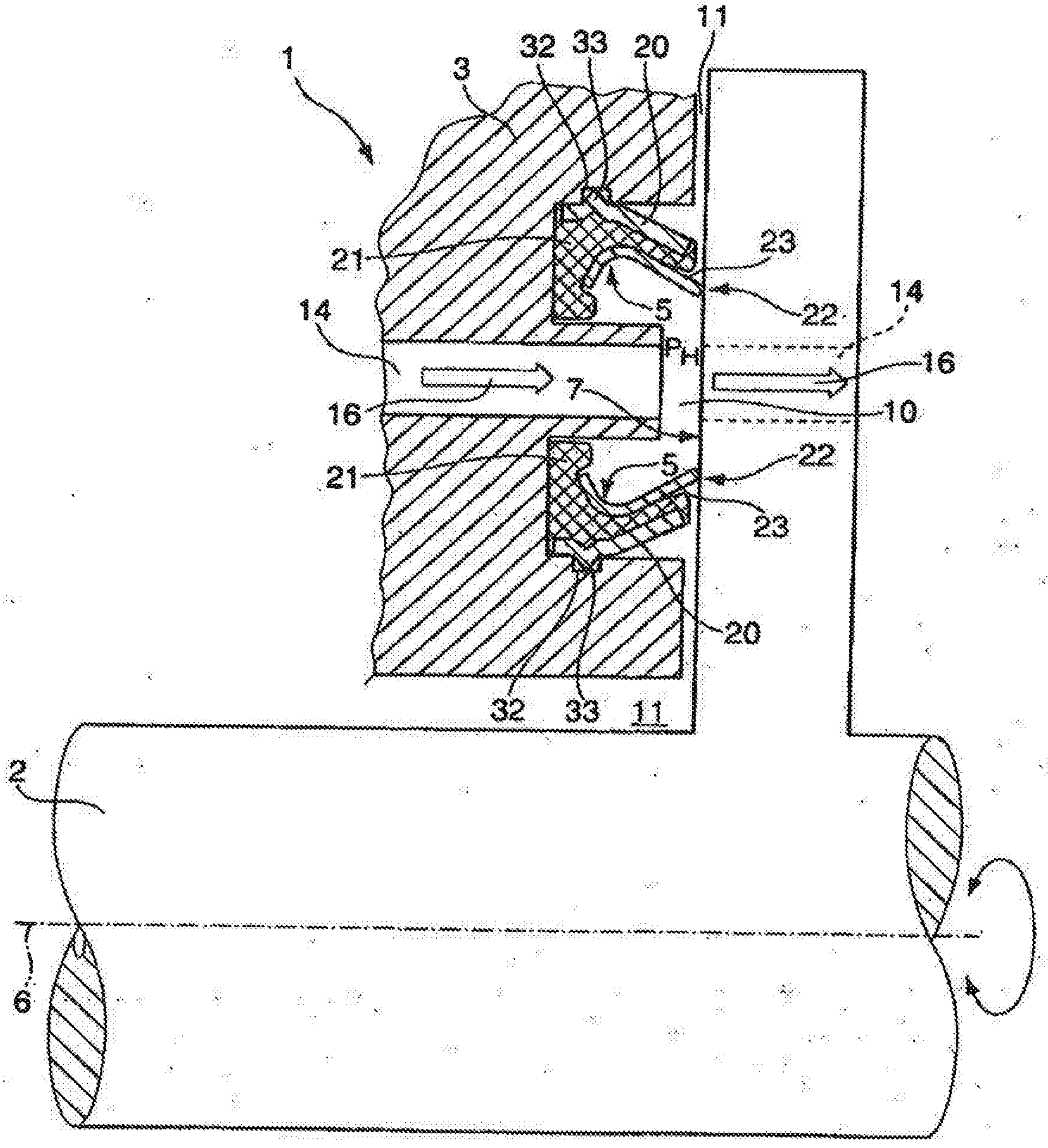

Fig. 3

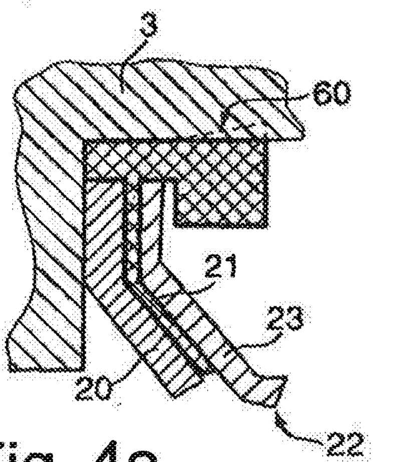

Fig. 4a

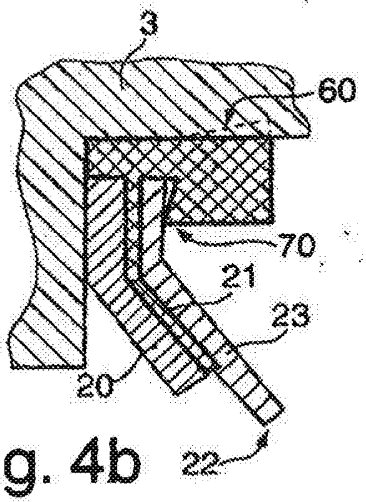

Fig. 4b

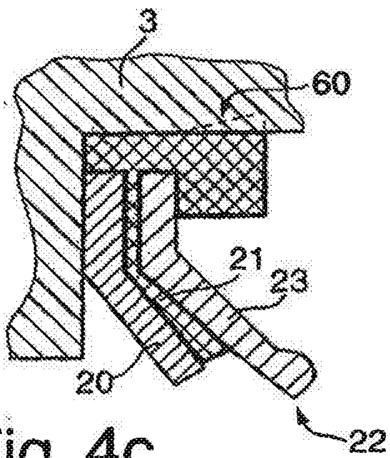

Fig. 4c

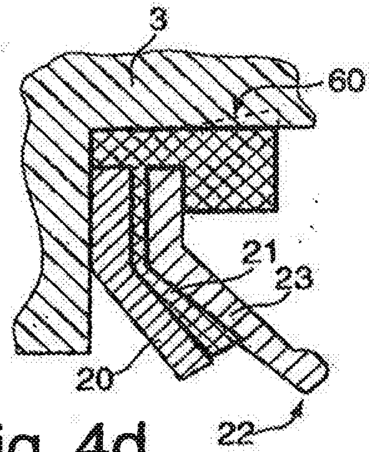

Fig. 4d

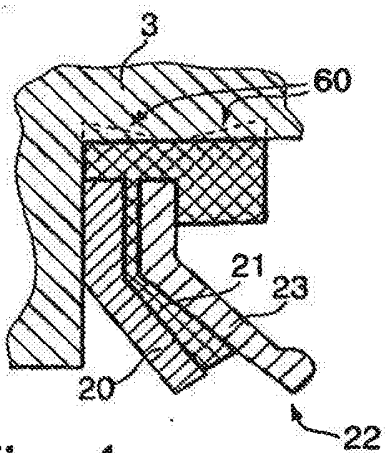

Fig. 4e

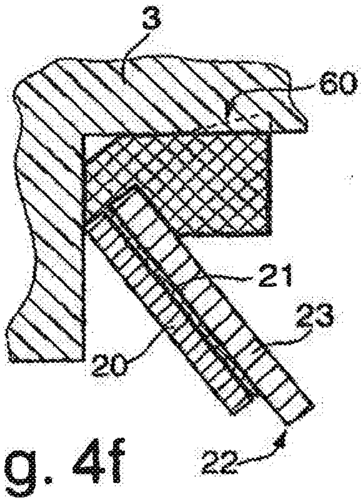

Fig. 4f

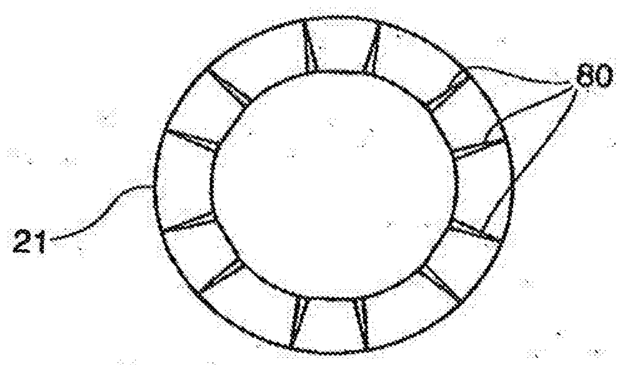

Fig. 5