(19) DANMARK

(10) **DK/EP 4136048 T3**

(12) Oversættelse af europæisk patentskrift

Patent- og Varemærkestyrelsen

(51) Int.Cl.: ***F 16 G 15/08 (2006.01)***

(45) Oversættelsen bekendtgjort den: **2024-07-08**

(80) Dato for Den Europæiske Patentmyndigheds bekendtgørelse om meddelelse af patentet: **2024-06-05**

(86) Europæisk ansøgning nr.: **21726620.4**

(86) Europæisk indleveringsdag: **2021-05-12**

(87) Den europæiske ansøgnings publiceringsdag: **2023-02-22**

(86) International ansøgning nr.: **EP2021062669**

(87) Internationalt publikationsnr.: **WO2021239470**

(30) Prioritet: **2020-05-27 DE 202020103028 U**

(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: **J.D. Theile GmbH & Co. KG, Letmather Stasse 26, D-58239 Schwerte, Tyskland**

(72) Opfinder: **MÜER, Bernd, , 58239 Schwerte, Tyskland**

(74) Fuldmægtig i Danmark: **Zacco Denmark A/S, Arne Jacobsens Allé 15, 2300 København S, Danmark**

(54) Benævnelse: **FASTGØRELSESPUNKT**

(56) Fremdragne publikationer:
**DE-U1-202005 019 357**
**DE-U1-202015 104 747**
**DE-U1-202016 006 871**

# Attachment point

## Description

[0001] The invention relates to an attachment point for securing to an object to be secured or handled, comprising a lower part having a connection means for connecting the attachment point to an object to be secured and/or handled using a bearing bush and comprising an upper part which is rotatable relative to the lower part and which engages with a bearing section in the bearing bush of the lower part.

[0002] Such attachment points are typically used for lifting objects. The attachment points are connected to the object to be lifted or secured using their connection means, typically designed as a screw bolt. In many cases, such an attachment point is designed so that when a lifting device is hung in the connection eye, the connection eye aligns itself according to the direction of traction acting thereon. In such a connection point, the base body carrying the eye arch is designed as an upper part which is rotatable relative to a lower part carrying the connection means(s). The same properties are also desired for an attachment point when it is used to lash an object, in principle even if the attachment point is not designed as an attachment swivel having an upper part rotatable relative to the lower part.

[0003] Such attachment points are sometimes also used to apply a traction force that is directed transversely to the longitudinal extension of the attachment point. In order to be able to estimate or determine the angular position of the connection eye, markings are provided on the outside of the eye element of the upper part at the connection point previously known from DE 10 2006 052 986 B4. The divider elements protruding from the inside of the connection eye represent the complementary pointers thereto. A maximum transverse force is introduced into the upper part of the attachment point when it is applied in the transverse direction to the longitudinal extension of the attachment point, i.e. in the so-called 90° position relative to the longitudinal axis of the attachment point. This previously known attachment point is already able to withstand high transverse forces. However, it would be desirable if the shear force load capacity of such an

attachment point could be improved, in particular by simple means.

[0004] An attachment point designed as a swivel attachment is known from DE 20 2005 019 357 U1. In this case, the movement gap between the upper part and the lower part is covered to prevent dirt from penetrating. This is achieved by a gap cover that covers the axial gap between the upper part and lower parts. Its height corresponds to the height of the maximum permissible gap width between the upper and lower parts due to wear. If a gap is visible between the two parts despite the gap cover, the attachment swivel is ready to be discarded. In one of the possible designs, the gap cover is designed as a labyrinth.

[0005] Even in the case of the connection point known from DE 20 2016 906 871 U1, a labyrinth seal is provided between the upper part and the lower part in order to prevent the introduction of dirt to the rolling elements acting in the radial direction. The flanks of this and the other previously known labyrinth seal projections and accordingly also the walls of the labyrinth seal grooves are straight.

[0006] In the attachment swivel known from DE 20 2005 019 357 U1, the bearing section of the upper part engaging in the bearing bush of the lower part is supported on the base of the bearing bush by a centrally arranged sphere. In the radial direction, the upper part is mounted by a sphere bearing relative to the inner wall of the lower part. These spheres are also used to lock the upper part relative to the lower part in the axial direction. For this purpose, the lower part has a sphere feed channel into which the spheres required for this radial roller bearing can be introduced as rolling elements into the complementary half-grooves of the inner wall of the bearing bush of the lower part and the lateral surface of the bearing section of the upper part. This document discloses the preamble of claim 1.

[0007] In order to ensure the desired rotatability of the upper part relative to the lower part, a certain amount of play is required in the areas - the bearing partners - relevant for the bearing of the upper part on the lower part. Such an attachment point is also to be able to withstand high transverse forces, i.e., forces that are applied to the upper part in total or in part transverse to the

axis of rotation of the upper part relative to the lower part. In addition, it is desired that the upper part aligns itself in the direction of the applied traction force even in the event of an unfavourable transverse force engagement. The previously known connection points have shown that in the case of such a transverse force engagement, the rotation of the upper part relative to the lower part can be reduced and, if the force engagement is sufficiently high, can even be blocked. This is attributed to a jamming of the labyrinth seal partners as a result of such a tilting of the upper part relative to the lower part caused by transverse forces. This could be counteracted by making the sealing gap larger. However, such a measure has the disadvantage that it runs counter to the sealing functionality provided by the labyrinth seal.

[0008] Against the background outlined above, the invention is therefore based on the object of developing an attachment point of the type mentioned at the outset in such a way that it is improved with regard to its transverse force load capacity.

[0009] This object is achieved according to the invention on the one hand by a generic attachment point mentioned at the outset, in which the upper part projects with its radially outer edge region over the upper side of the lower part and between the edge region of the upper part that overlaps the lower part and the lower part a labyrinth seal is formed by a labyrinth protrusion formed on the upper part and engaging in a labyrinth groove on the lower part, wherein at least the outer wall of the labyrinth groove and the outer flank of the labyrinth protrusion are curved complementarily to one another in those sections of their engaged position in which the two parts - upper part and lower part - can come into contact with one another in the event of a transverse load strain on the attachment point as a result of a tilt of the upper part relative to the lower part.

[0010] In the case of the attachment point according to the first proposed solution, the sections of the labyrinth seal partners which come into contact in the event of a tilt of the upper part relative to the lower part are curved in a complementary manner to one another. This measure results in the labyrinth seal partners being in a more flat position in the event of a tilting of the upper part relative to the lower part in the section in which they are brought into contact when the

attachment point is subjected to a transverse force load. In such a case, the force is introduced from the upper part into the lower part via this contact surface section, which effectively counteracts a notch effect within the labyrinth groove of the lower part. This can therefore absorb correspondingly higher transverse forces without tearing out. At the same time, the rotatability of the upper part relative to the lower part is sufficiently maintained, since this ability is not greatly reduced or even blocked by punctiform or line-shaped force peaks, as is the case with the prior art. At this attachment point, the gap size of the labyrinth seal can be designed to be sufficiently small due to the special design of the interacting contours of the labyrinth seal partners in order to effectively prevent the penetration of contaminants into the bearing partners between the upper part and the lower part or to reduce it to a tolerable level.

[0011] In contrast to previously known attachment points, with this attachment point a certain tilting of the upper part relative to the lower part in the event of a transverse force load is accepted and used in order to provide additional support of the upper part relative to the lower part via the contact surface area between the two labyrinth seal partners in the event of a corresponding transverse force load, without, however, impairing the swiveling property of the attachment point.

[0012] Preferably, the cross-sectional area of the labyrinth groove is curved overall and not only in the area of the possible contact surface with the labyrinth protrusion of the upper part. This further counteracts a notch effect within the labyrinth groove.

[0013] Typically, the labyrinth protrusion of the upper part is convex and the labyrinth groove of the lower part is concave. According to one embodiment, the camber radius is constant in each case. According to one embodiment, the camber radius of the labyrinth groove is only slightly larger than the camber radius of the labyrinth protrusion in order to provide the desired movement play when the attachment point is subjected to an axial load. In another embodiment, it is provided that the camber radius of the convex labyrinth seal partner in the possible contact area is a few degrees larger than the camber radius of the complementary convex section of the other labyrinth seal partner. In case of contact between the upper part and the lower part in the event of

a transverse force load, the transverse force is introduced from the upper part into the lower part in two contact areas, so that the transverse force load capacity of the connection point is also significantly increased by such a measure.

[0014] In a further development, the bearing section of the upper part engaging in the bearing bush is supported on a bearing at a radial distance from the axis of rotation of the upper part relative to the lower part on the base of the bearing bush. In the event of a transverse force load on the upper part, it is therefore supported on the bearing body in the area of the foot of its cylindrical bearing section. This measure also limits the amount of tilting by which the upper part can be tilted relative to the lower part when subjected to a transverse load. It is understood that the support of the bearing section of the upper part engaging in the bearing bush of the lower part interacts with the radial bearing of the two parts against one another, typically a roller bearing, for example designed as a sphere bearing. At the same time, the swivel functionality of the attachment point is retained even in such a case.

[0015] Such a bearing can be designed as a roller bearing. Cylindrical bodies are suitable as rolling elements for such a roller bearing, so that this roller bearing is designed as a needle bearing.

[0016] According to another embodiment, a bearing disc is provided as a bearing body, on which the bearing section of the upper part is supported relative to the base of the bearing bush of the lower part.

[0017] In addition, the foot of the bearing section of the upper part can be supported on the base of the bearing bush of the lower part by a centrally arranged support sphere.

[0018] The invention is described in the following using an exemplary embodiment with reference to the attached figures. In the figures:

Figure 1:

shows a side view of an attachment point according to the invention,

Figure 2:

shows a cross-section through the attachment point of Figure 1 along line A-B,

Figure 3

shows a top view of the lower part of the attachment point of Figure 1 with the upper part removed,

Figure 4:

shows a partial longitudinal section through the upper end of the lower part and the lower section of the upper part in the normal position of the upper part and lower part in relation to one another, and

Figure 5:

shows a partial longitudinal sectional view of the attachment point of Figure 1 with the upper part engaging with its bearing section into the bearing bush of the lower part under a transverse force load.

[0019] An attachment point 1 is used to connect to an object so that it can be handled, that is to say: depending on the application, lifted, lashed down, or the like. The attachment point 1 has a lower part 2 and an upper part 3. The upper part 3 is rotatably mounted relative to the lower part 2. A screw bolt 4 is connected to the lower part, the threaded section 5 of which is used to connect the attachment point 1 to an object to be handled by screwing it into a correspondingly prepared internally threaded hole in the object. The upper part 3 carries an eye link 6, which together with a part of the base body 7 of the upper part 3 forms an eye. A connection eye 8 is hooked into the eye link 6. The connection eye 8 is used for the purpose of connecting a lifting or lashing device, such as a crane hook, a cable, a belt, or the like. The connection eye 8 is asymmetrical with respect to its longitudinal extension and has a first arc 9 with a larger radius and a second arc 10 with a smaller radius. The connecting eye 8 is hooked using its arc 10 having a smaller radius into the eye bend 6 of the upper part 3 and can hinge thereon. In the embodiment shown, the legs 11, 11.1 connecting the two arcs 9, 10 are straight and inclined towards one another, due to which the interior enclosed by the connection eye 8 tapers towards the arc 10.

[0020] The upper end of the lower part 2 carries a circumferential ring flange 12 which projects in the radial direction and thus protrudes. This has a circular outer contour geometry. In the exemplary embodiment shown, the diameter of the ring flange 12 corresponds to the diameter of the lower contact flange 13 of the lower part 2, which is clamped with its lower side 14 against the surface of an object to be handled. The material thickness of the ring flange 12 in the exemplary embodiment shown is somewhat less than that of the contact flange, and is approximately 80% of the material thickness of the contact flange 13. In order to connect the lower part 2 to an object to be handled, its radial outer surface has wrench surfaces 15. In the embodiment shown, these are arranged in the manner of a hexagon nut. The ring flange 12 projects beyond the wrench surfaces 15 in the radial direction, so that this measure not only provides an effective tear-out protection for the upper part 3, but also an effective slip protection for a tool, typically an open-end wrench, using which the lower part 2 of the attachment point 1 is clamped to an object to be handled. In the embodiment shown, the ring flange 12 also projects in the radial direction beyond the rounded edge sections 16, using which two adjacent wrench surfaces 15 arranged at an angle to one another are connected. In the embodiment shown, the diameter of the ring flange 12 and that of the contact flange 13 are the same.

[0021] The lower part 2 of the attachment point 1 is produced as a forged part, wherein the forging process results in the lower part 2 having an unstructured surface in its longitudinal direction. The wrench surface contour was introduced into the lower part by milling.

[0022] Due to the ring flange 12, the lower part 2 has an equal material thickness all the way around in the radial direction at its end facing toward the upper part 3. As a result of this measure, the lower part 2 is not weakened by the wrench surfaces 15 arranged on the outside. The ring flange 12 therefore also has, in addition to the function of the slip protection described above, a reinforcing function.

[0023] In the cross section of the attachment point 1 shown in Figure 2, the connection eye 8 is not shown. It is clearly visible from this cross-sectional view how the ring flange 12 projects

over the wrench surfaces 15 and, in this embodiment, also over the edge sections 16 connecting the adjacent wrench surfaces 15. Also visible in the sectional view of Figure 2 is the bearing bush 17 of the lower part 2 and the bearing section 18 of the upper part 3 engaging therein. The upper part 3 is connected to the lower part 2 via a sphere bearing and is also supported in this way. For the sake of simplicity, this figure only shows one of the spheres 19 arranged circulating in the complementary sphere bearing grooves.

[0024] This sectional view shows that a tool applied to the attachment point 1 cannot slip off the wrench surfaces 15 in the axial direction.

[0025] Figure 3 shows a view of the bearing bush 17 of the lower part 2 with the upper part 3 removed. A support sphere 20 is arranged centrally in the bearing bush 17, on which the cylindrical bearing section 18 of the upper part 3 sits with its foot and thus with its lower side and is thus supported thereon. The sphere 20 engages in a corresponding sphere recess of the bearing section 18 and the base 21 of the bearing bush 17 (see Figure 5). On the base 21 of the bearing bush 17 there is an annular needle bearing 22, the cylindrical rolling elements 23 of which surround the axis of rotation D of the upper part 3 relative to the lower part 2 in a star-like or planet-like manner. The rolling elements 23 are held in a rolling element bearing cage. The needle bearing 22 is arranged in an annular groove introduced into the base 21 and protrudes with its rolling elements 23 from this annular groove only as far as is necessary for the mounting of the bearing section 18.

[0026] A circumferential labyrinth groove 25 is introduced into the upper side 24 of the lower part 2. This can be seen in the cross section in the representation of the attachment point 1 in Figure 4. The cross-sectional profile of the labyrinth groove 25 is cambered with a constant radius, at least its essential section. The upper part 3 projects over the upper side 24 of the lower part 2. In this projecting edge region 26, a labyrinth protrusion 27 is arranged, protruding downwards from the upper part 3. Its contour engaging in the labyrinth groove 25 is also cambered with a constant radius. The camber radius of the labyrinth protrusion 7 is somewhat smaller than that of the labyrinth groove 25 in order to ensure the movement distance between the lower part 2

and the upper part 3 in the axial direction as shown in Figure 4. As can be seen from the sectional view in Figure 4, a labyrinth seal acting in the radial direction is provided in this way in order not to negatively affect an introduction of contamination into the bearing bush 17 and the mounting of the bearing section 18 of the upper part 3 on the inner wall of the bearing bush 17 of the lower part 2 caused by the spheres 19.

[0027] In Figure 4, the attachment point 1 with its upper part 3 and its lower part 2 is shown in its normal position. The upper part 3 is located in this position relative to the lower part 2, for example when a traction force acting axially on the upper part 3 via the connection eye 8 is applied. Figure 5 shows the connection point 1 in a partial longitudinal section, in which the lower side support of the bearing section 18 on the rolling elements 23 on the base 21 of the lower part 2 can also be seen, as well as the support via the support sphere 20. Figure 5 shows the attachment point 1 with a transverse force acting thereon, as indicated in Figure 1 by the block arrow. This force acts at an angle of approximately 90° to the axis of rotation D of the upper part 3. Due to the necessary play of movement between the upper part 3 and the lower part 2, the upper part 3 is tilted relative to the lower part 2 when a corresponding force is applied. This situation is shown in Figure 5. While the labyrinth gap 28 is enlarged on the side facing away from the traction force by tilting, it is reduced on the side facing toward the traction force, so that a contact is formed between the curved surfaces of the labyrinth protrusion 27 and the labyrinth groove 25. This occurs as a result of the tilting direction indicated by the block arrow in Figure 5 on the radial outer wall 29 of the labyrinth groove 25 and the radial outer flank 30 of the labyrinth protrusion 27 of the upper part 3. The protrusion can be seen particularly well in the enlarged detail shown in Figure 5. Due to the previously described contour of the two labyrinth seal partners - the labyrinth protrusion 27 and the labyrinth groove 25 - especially at their radial outer sections, both parts - lower part 2 and upper part 3 - are put in surface contact with one another. This prevents the occurrence of notch effects within the labyrinth groove 25 as well as blocking of the rotational movement of the upper part 3 relative to the lower part 2. Therefore, even under such stresses, the upper part 3 easily aligns itself

in the direction of the applied traction load.

[0028] Studies have shown that the connection point 1 withstands approximately 10% higher transverse forces than identical connection points having a conventional labyrinth seal, in which the sealing partners have straight side surfaces, and without the needle bearing 22 integrated into the base 21 of the bearing bush 17. In addition, it was found that the wear in or on the bearing partners could be significantly reduced, thus such an attachment point 1 could be used for significantly longer before it was ready for disposal.

[0029] The tearing out resistance of the attachment point 1 is additionally supported by the ring flange 12 in the exemplary embodiment shown. By combining the individual measures described, such an attachment point 1 can also withstand transverse forces that are more than 10% higher than those of an equally dimensioned attachment point without the described features.

[0030] The invention has been described in the context of exemplary embodiments. Without departing from the scope of the current claims, there are numerous other possibilities for a person skilled in the art to implement them without this having to be explained in more detail in the context of these remarks.

**List of reference numerals**

| | | | |
|---|---|---|---|
| 1 | attachment point | D | axis of rotation |
| 2 | lower part | | |
| 3 | upper part | | |
| 4 | screw bolt | | |
| 5 | threaded section | | |
| 6 | eye link | | |
| 7 | main body | | |
| 8 | connection eye | | |
| 9 | arc | | |

10 arc

11 leg

12 ring flange

13 contact flange

14 lower side

15 wrench surface

16 edge section

17 bearing bush

18 bearing section

19 sphere

20 support sphere

21 base

22 needle bearing

23 rolling elements

24 upper side

25 labyrinth groove

26 edge area

27 labyrinth protrusion

28 labyrinth gap

29 outer wall

30 flank

## Patentkrav

**1.** Kontaktpunkt til fastgørelse til en genstand, der skal fastgøres eller håndteres, hvilket kontaktpunkt omfatter en underdel (2) med et forbindelsesmiddel med henblik på at forbinde fastgørelsespunktet (1) med en genstand, der skal fastgøres eller håndteres, **kendetegnet ved, at** underdelen (2) har en lejebøsning (17), og at fastgørelsespunktet (1) omfatter en overdel (3), der kan roteres i forhold til underdelen (2) og med et lejeafsnit (18) går i indgreb med underdelens (2) lejebøsning (17), hvor overdelen (3), i fastgørelsespunktet (1), strækker sig over underdelens (2) overside med sit radialt ydre kantområde (26), og der mellem overdelens (3) kantområde (26), der går i indgreb over underdelen (2), og underdelen (2) er dannet en labyrinttætning ved hjælp af et labyrintfremspring (27), som er dannet på overdelen (3) og går i indgreb med en labyrintnot (25) i underdelen (2), hvor mindst labyrintnotens (25) væg (29), der peger udad i den radiale retning, og labyrintfremspringets (27) komplementære side (30), der peger indad i den radiale retning, er krumme på en komplementær måde i forhold til hinanden i de afsnit, hvor de er i indgreb, hvor de to dele – overdelen (3) og underdelen (2) – ved en tværgående belastning af fastgørelsespunktet (1) kan bringes i kontakt med hinanden som følge af en vipning af overdelen (3) i forhold til underdelen (2).

**2.** Kontaktpunkt ifølge krav 1, **kendetegnet ved, at** labyrintfremspringet (27), i labyrinttætningspartnernes (25, 27) mulige kontaktområde, er krummet konvekst, og at labyrintnoten (25) er krummet konkavt.

**3.** Kontaktpunkt ifølge krav 1 eller 2, **kendetegnet ved, at** den konvekst konfigurerede labyrinttætningspartners krumningsradius er konfigureret med en lidt større radius i det mulige kontaktområde.

**4.** Kontaktpunkt ifølge krav 2 eller 3, **kendetegnet ved, at** i det væsentlige hele labyrintfremspringet (27) er krummet konvekst, og at i det væsentlige labyrintnoten (25) er konfigureret konkavt, i hvert tilfælde i forhold til deres tværsnitsflade.

**5.** Kontaktpunkt ifølge krav 4, **kendetegnet ved, at** krumningen er konfigureret med en konstant radius over hele udstrækningen.

**6.** Kontaktpunkt ifølge et hvilket som helst af kravene 1 til 5, **kendetegnet ved, at** overdelens (3) lejeafsnit (18), der går i indgreb med underdelens (2) lejebøsning (17), ved lejebøsningens (17) bund er understøttet ved hjælp af et leje (22).

**7.** Kontaktpunkt ifølge krav 6, **kendetegnet ved, at** lejet er et rulleleje (22) med en flerhed af stjerneformede rulleelementer (23), der er anbragt med et radialt afstandsinterval i forhold til overdelens (3) rotationsakse (D).

**8.** Kontaktpunkt ifølge krav 7, **kendetegnet ved, at** rulleelementerne (23) er fastholdt i en rulleelementlejeholder.

**9.** Kontaktpunkt ifølge krav 7 eller 8, **kendetegnet ved, at** rulleelementerne er cylindriske elementer (23), og rullelejet er derfor et nåleleje (22).

**10.** Kontaktpunkt ifølge krav 6, **kendetegnet ved, at** lejet er et glideleje med en lejeskive, der er anbragt mellem lejebøsningens bund og forsiden af overdelens lejeafsnit.

**11.** Kontaktpunkt ifølge et hvilket som helst af kravene 6 til 10, **kendetegnet ved, at** der er anbragt en understøtningskugle (20) centrisk i forhold til lejet (22), på hvilken overdelens (3) lejeafsnit (18) er placeret.

**12.** Kontaktpunkt ifølge et hvilket som helst af kravene 1 til 11, **kendetegnet ved, at** overdelen (3) er monteret med et rulleleje på kappefladen af lejeafsnittet (18), der går i indgreb med underdelens (2) lejebøsning (17), modsat indervæggen af underdelens (2) lejebøsning (17).

**13.** Kontaktpunkt ifølge krav 11, **kendetegnet ved, at** rullelejets lejeelementer er kugler (19).

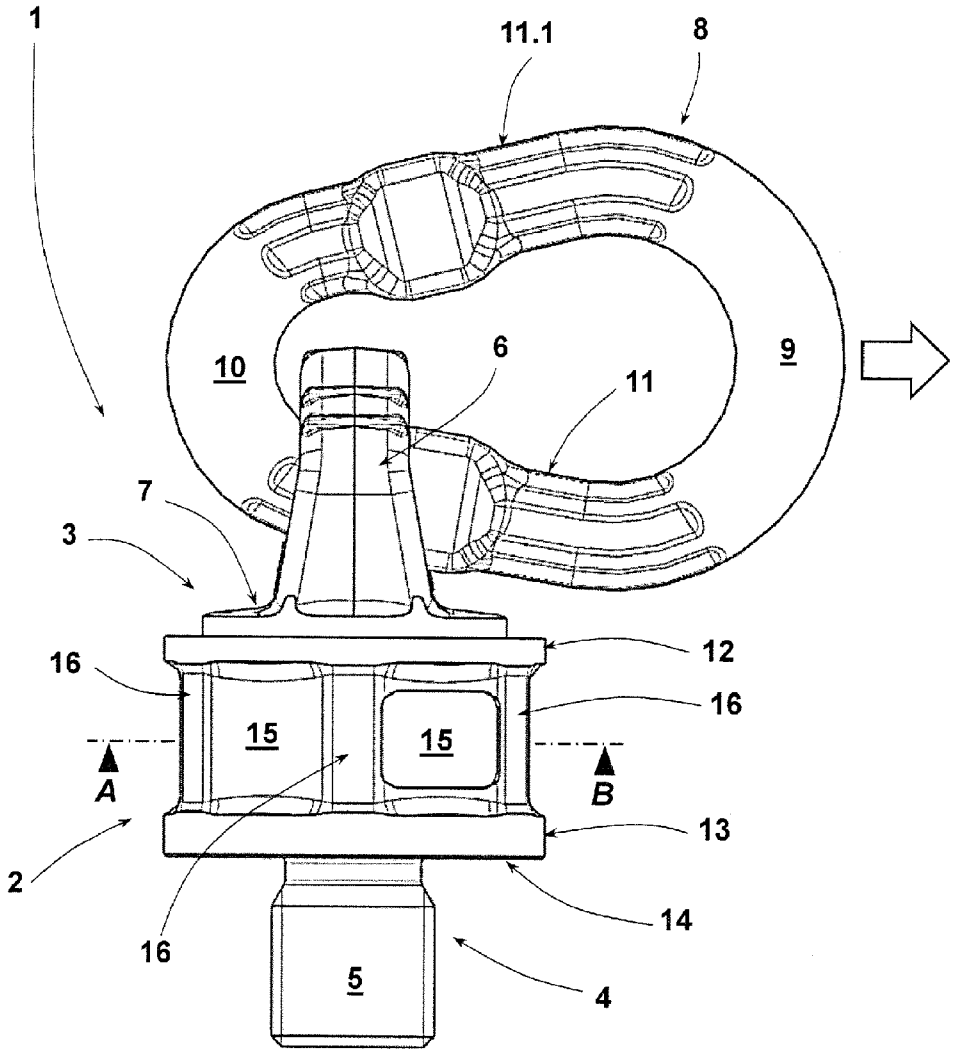


*Fig. 1*

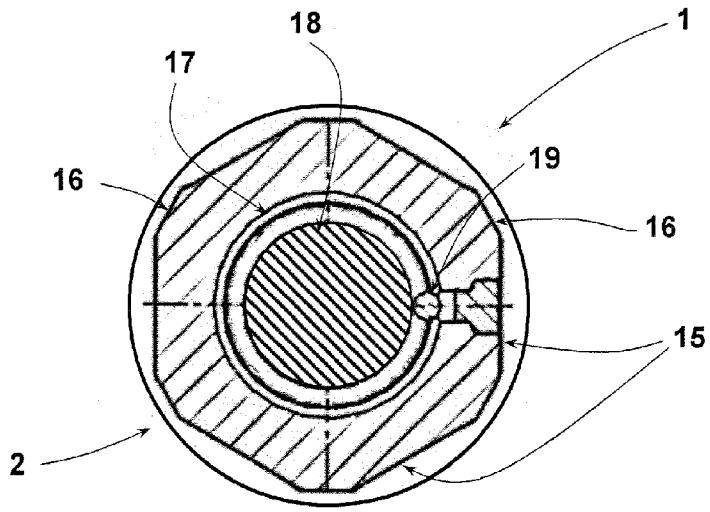


*Fig. 2*

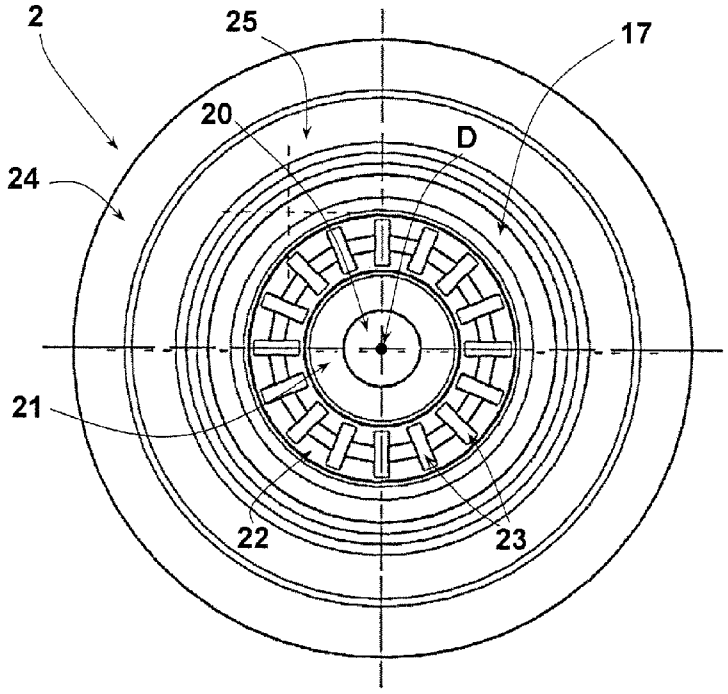


*Fig. 3*

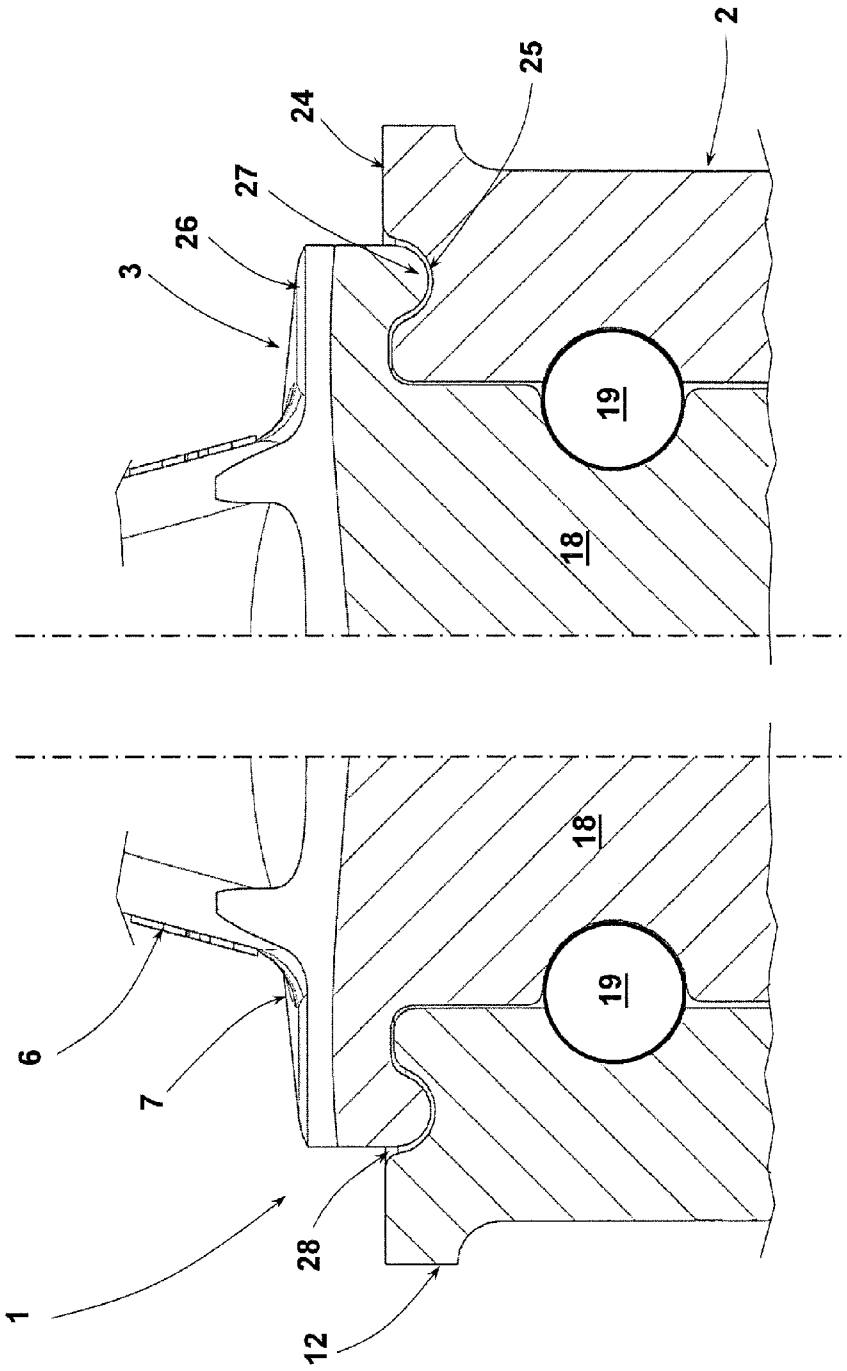


Fig. 4

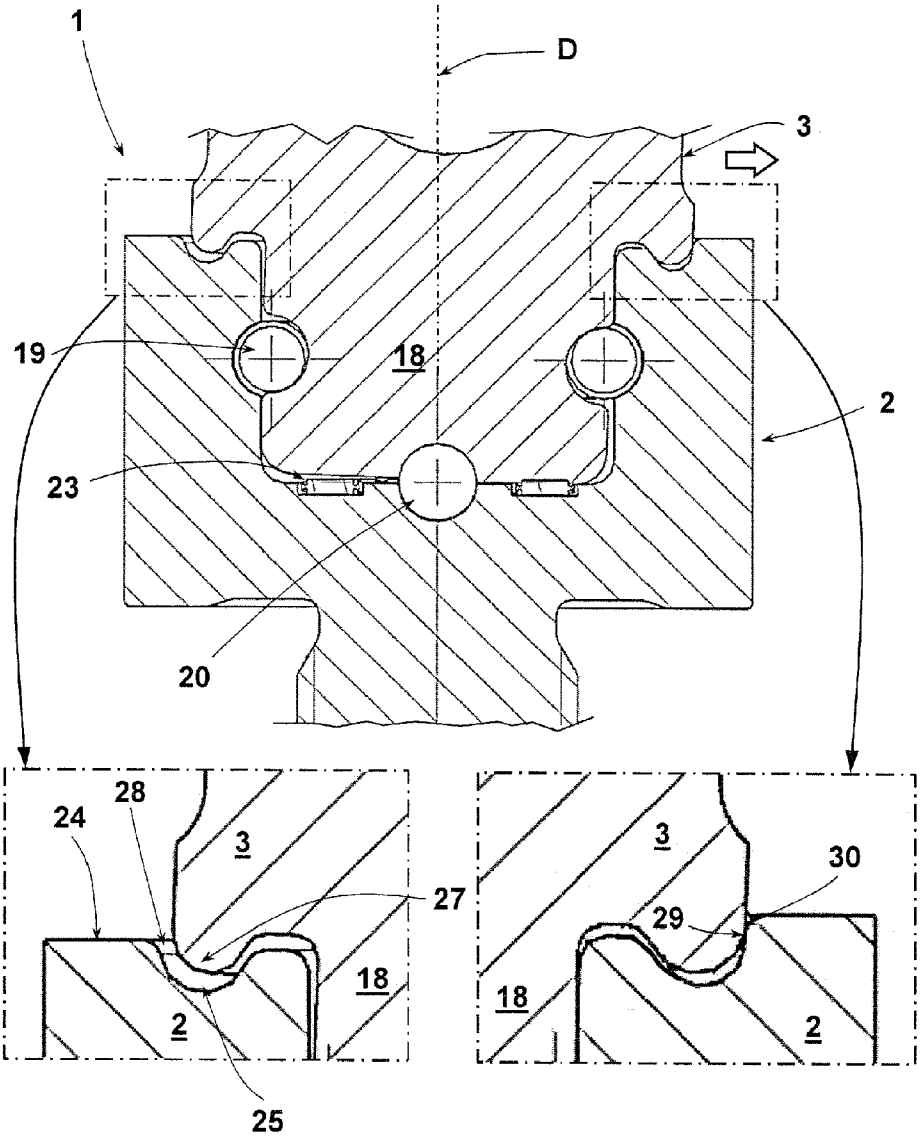


*Fig. 5*