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The present invention relates to a brake disc-hub connection according to the preamble of claim 1.

For improving the thermal crack resistance of brake discs it has proved advantageous if the friction ring of the brake disc is able to expand radially and is designed symmetrically. To this end there are various proposals in the prior art. Thus a generic brake disc-hub connection is disclosed in DE 109 18 069 A1, in which the connection of the brake disc to the hub takes place by means of tooth-like elements on the hub and on the brake disc, which engage in each another and which ensure a transmission of the braking torque from the brake disc to the hub.

In this case, the teeth have a significant wedge shape. If the brake disc is subjected to high temperatures this may lead to internal component stresses that allow the brake disc to shrink slightly in diameter. In this case, the wedge shape of the teeth may lead to a clamping of the brake disc in the connection thereof, which impedes, on the one hand, the thermal expansion and, on the other hand, the servicing relating to the dismantling of the components.

In particular for easier dismantling, solutions are disclosed in DE 10 2009 019 420 A1 or the aforementioned DE 109 18 069 A1, in which intermediate elements are provided between the tooth-like elements engaging in each another on the hub and the brake disc, the dismantling being thereby simplified.

For reducing a heat input caused by a braking procedure, it is disclosed for example in DE 10 2008 014 857 A1 to insert intermediate elements between the teeth of the brake disc and/or the hub, a direct heat transfer thereby being prevented.

It is the object of the present invention to provide a brake disc-hub connection with an improved capacity for servicing and a further reduced heat input.

This object is achieved by a brake disc-hub connection having the features of claim 1.

Advantageous refinements of the invention can be derived from the sub-claims.

In the brake disc-hub connection according to the invention, in which a hub has drivers extending from a wheel flange of the hub in the axial direction relative to a rotational axis common to a brake disc and the hub, and which engage in a tooth-like manner between supporting elements arranged between an inner circumference of a brake disc and extending in the direction of the rotational axis, lateral flanks of the drivers are orientated radially relative to the rotational axis or parallel to a radial line, and lateral flanks of the supporting elements are orientated parallel to the lateral flanks of the drivers, wherein the lateral flanks of each of the drivers are orientated at an angle of 15º to 30º to each other. Preferably, the lateral flanks of each of the drivers viewed from the rotational axis (A) are orientated at an angle of 15º to 30º to one another.

Through the radial or at least approximately radial orientation of the lateral flanks of the drivers to the rotational axis, a brake disc-hub connection is created, in which the braking forces occur in the interface between the hub and the brake disc almost exclusively as purely normal forces.

Through the orientation of the lateral flanks of the drivers of the hub such that the tangents thereof meet in the rotational centre of the hub and/or inside an area of a circle, the centrepoint thereof being the rotational centre of the hub, and with a corresponding design of the lateral flanks of the brake supporting elements of the brake disc, the braking torque is transmitted into this toothing virtually as a purely normal force. The tangents of the lateral flanks of the supporting elements of the brake disc therefore either meet likewise in the rotational axis or - with a use of intermediate elements, which form the subject matter of some of the sub-

claims - on or in a circle with double the diameter of the corresponding double thickness of the intermediate elements.

The tooth shape that has thus been altered of the drivers and the supporting elements also reduces the wedge effect of the brake disc toothing and, as a result, the clamping of the brake disc.

The orientation of the lateral flanks of each of the drivers at an angle of 15º to 30º ensures the transmission of high braking torques. The width of the drivers in the circumferential direction is therefore defined by the size of the angle between the lateral flanks of the driver. The larger this angle, the more rigid the toothed connection.

However, with an increasing size of the angle, the intermediate space available between two such drivers for ventilating the brake disc is smaller. It has proved advantageous that an angle of between 15º to 30º determining the width of the drivers is optimal with regard to the rigidity required for the transmission of the braking torque and with regard to a sufficiently large intermediate space for ventilating the brake disc.

Particularly preferably, the lateral flanks of each of the drivers, viewed from the rotational axis, in this case are orientated at an angle of 23º to 25º, in particular of 24º, relative to each other.

According to one variant, the drivers are configured as front ends of support webs extending axially away from the wheel flange.

According to a preferred variant of the invention, a push-on stop is integrally formed on at least one of the lateral flanks of each of the drivers, for axially fixing the brake disc. This allows the omission of additional components and mounting effort on the hub and/or the brake disc, for the axial fixing of the brake disc on the hub.

According to claim 1, each of the support webs has slots extending axially from the driver in the direction of the wheel flange to form lateral support webs, wherein the front faces of the free ends of the support webs are configured as a push-on stop for axially fixing the brake disc.

Through the thermal separation thereby formed between the push-on stop, the supporting elements of the brake disc heated during a braking procedure bearing thereagainst during operation, and the respective driver, a reduction of stresses is possible due to the variable temperatures of the brake disc relative to the hub.

According to a further variant of the brake disc-hub connection according to the invention, first intermediate elements are arranged in the intermediate spaces between the lateral flanks of the drivers and the supporting elements, said first intermediate elements encompassing the drivers in a radial and U-shaped manner in the circumferential direction and bearing at least against the opposing flanks of the drivers in a planar manner. The U-shaped design of these intermediate elements in this case permits a particularly simple mounting.

According to a further preferred variant, second intermediate elements are arranged between the lateral flanks of the supporting elements and the arms of the first intermediate elements bearing against the lateral flanks of the drivers, said second intermediate elements being able to be mounted separately between the first intermediate elements.

These second intermediate elements are particularly preferably configured as angled elements with two arms oriented at an angle, in particular at right-angles to one another, wherein in the mounted state a first arm is clamped between the lateral flank of one of the supporting elements and the lateral flank of one of the first intermediate elements, and a second arm bears against the front face of the supporting element applied to the wheel flange of the hub.

A further improved thermal insulation between the brake disc and the hub is facilitated by the introduction of two separate intermediate elements between the flanks of the drivers and the supporting elements. Moreover, two such separately mountable intermediate elements also contribute to improving the ease of servicing (in particular when replacing the brake disc).

In order to avoid adhesion of the two intermediate elements bearing against one another by the action of moisture, the first and second intermediate elements preferably consist of a non-rusting material or are provided with a non-rusting coating, so that the first and second intermediate elements can be easily mounted and/or dismantled when installed and also when dismantled.

Additionally, such non-rusting materials and/or non-rusting coatings have a low coefficient of friction, which facilitates, in the case of servicing, a simple axial connection of the brake disc.

According to a further preferred variant, in the region of the brake disc-hub connection the first intermediate elements form a separating layer between the brake disc and the hub. To this end, particularly preferably the free ends of the arms of the first intermediate elements extending approximately radially to the rotational axis are configured as separating webs bent back outwardly and extending axially to the rotational axis, in each case a lower face of the supporting elements extending axially to the rotational axis or a lower edge of the first arm of the second intermediate element being able to be supported on said separating webs.

Additionally, preferably separating surfaces are integrally formed on the lateral arms of the first intermediate elements on a side facing towards the wheel flange of the hub, said separating surfaces being orientated parallel to the plane of the brake disc and covering a push-on stop integrally formed on the hub and axial to the rotational axis, for the axial fixing of the brake disc relative to the brake disc.

By means of the first intermediate elements configured with such projections, an improved thermal insulation of the brake disc from the hub is ensured, since the brake disc is insulated relative to the hub on all contact surfaces, by the first intermediate element being positioned on the driver of the hub.

According to a further preferred variant, the transitions between the separating webs and the arms of the first intermediate elements extending approximately radially to the rotational axis are configured as depressions, in each of which lower edges of the first arm of the second intermediate elements can be supported through insertion in said depressions.

As a result, the lower edges of the first arm of the second intermediate elements are additionally secured against slippage in the circumferential direction relative to the rotational axis of the brake disc.

Preferably, the first and the second intermediate elements are positively connected together. Particularly preferably, openings are formed on a region of the separating surfaces in the vicinity of the lateral arms of the first intermediate elements. In each case, a nose of one of the second intermediate elements extends through said openings, in the mounted state, wherein the nose extends from the end of the first arm spaced apart from the second arm.

As a result, the second intermediate elements are effectively prevented from migrating radially to the rotational axis of the brake disc after mounting on the first intermediate elements.

According to a further preferred variant, a spring element can be fastened on a side of the drivers remote from the wheel flange of the hub, in order to axially fix the intermediate elements.

In order to achieve sufficient ventilation of the brake disc, the hub preferably has a total of three, four or five drivers and the brake disc correspondingly has six, eight or ten supporting elements.

As a result, it is possible, in particular, to provide larger recesses between the supporting elements of the brake disc (in comparison with those brake discs known from the prior art with a considerably greater number of supporting elements), whereby the cool air cross-section is considerably enlarged.

According to a further preferred variant the hub has a wheel flange extending radially outwardly to the rotational axis, the drivers extending axially therefrom to the rotational axis.

In a preferred variant, the hub has a pot-like, hollow-cylindrical portion which merges into the wheel flange extending radially outwardly to the rotational axis, wherein the drivers are supported by webs rising radially outwardly from the pot-like portion and extending axially towards the wheel flange.

The axial extension of the drivers away from the wheel flange of the hub in this case also contributes to improved thermal insulation of the brake disc relative to the hub.

Exemplary embodiments of the invention are described in more detail hereinafter with reference to the accompanying drawings, in which:

Figure 1 shows a perspective view of a hub with a brake disc and with a brake disc-hub connection;

Figure 2 shows a plan view of the brake disc-hub connection of Figure 1 with a view of the geometry of the drivers of the hub and/or the

supporting elements of the brake disc and the forces resulting therefrom;

Figure 3 shows a plan view of a variant of a brake disc shown in Figures 1 and 2;

Figure 4 shows a perspective view of a variant of a hub with drivers arranged thereon;

Figure 5 shows a perspective view of a variant of a first intermediate element;

Figure 6 shows a perspective detailed view of a first intermediate element positioned on one of the drivers of the hub;

Figure 7 shows a sectional view of the brake disc-hub connection with the mounted intermediate elements;

Figure 8 shows a plan view of the brake disc-hub connection with the mounted first and second intermediate elements;

Figure 9 shows a perspective view, from above, of the hub with the first and second intermediate elements mounted on the drivers and spring elements holding said elements;

Figure 10 shows a perspective view of the brake disc and the hub in the mounted state with five drivers;

Figure 11 shows a perspective view of a hub configured with five drivers;

Figure 12 shows a plan view of the brake disc of Figure 10 with ten corresponding supporting elements;

Figure 13 shows a perspective view of a hub with the brake disc mounted thereon with an alternative embodiment of the hub;

Figure 14 shows a perspective view of a partially cut-away brake disc-hub connection according to Figure 13;

Figure 15 shows a perspective view of the hub shown in Figures 13 and 14;

Figure 16 shows a perspective view of a further variant of a hub configured with five drivers with the mounted first and second intermediate elements;

Figure 17 shows a perspective detailed view of the hub shown in Figure 16 without the first and second intermediate elements mounted on the driver;

Figure 18 shows a perspective detailed view of the hub shown in Figure 16 according to figure 17 with the first and second intermediate elements mounted on the driver;

Figures 19 to 21 show perspective views of the first and second intermediate elements shown in Figures 16 and 18;

Figure 22 shows a plan view of the first and second intermediate elements shown in Figures 19 to 21; and

Figures 23 and 24 show perspective views of a further variant of a hub configured with five drivers without intermediate elements.

In the following description of the figures, terms such as above, below, left, right, front, rear, etc. exclusively refer to the exemplary view selected in the respective figures and position of the brake disc, hub, supporting elements, drivers, intermediate elements, and the like. These terms are not to be understood as limiting, i.e. these references may be altered by different operating positions or a mirror-symmetrical design or the like.

A brake disc-hub connection is shown in Figure 1, said brake disc-hub connection serving for connecting an annular, internally ventilated brake disc 1 to a hub 2 and being configured as a brake disc-hub, optionally also in connection with the function of a wheel hub, the brake disc 1 being able to be axially positioned and/or having been positioned thereon. In this case, such as for example as shown in Figure 2, the brake disc 1 and the hub 2 have a common rotational axis A.

The brake disc 1 in this case is preferably configured as an internally ventilated brake disc, with two friction rings 11 which are connected together via webs and on the internal circumference via a circumferential annular portion.

For transmitting the torque, in particular in braking procedures, radially inwardly extending teeth - called supporting elements 12 - arranged spaced apart from one another and uniformly distributed over the circumference, are integrally formed on the internal circumference of the brake disc 1.

The hub 2 may be configured in different ways. Thus, for example, a hub 2 is shown in Figures 1, 4, 10, 11, with a pot-like, hollow cylindrical portion 27

and a wheel flange 21 extending radially outwardly to the rotational axis A, drivers 22 extending axially therefrom to the rotational axis A. For supporting the drivers 22, webs 26 extending axially to the wheel flange 21 are integrally formed on the outer circumference of the hollow cylindrical portion 27.

The drivers 22 in this case are preferably configured as front ends of support webs 25, wherein the support webs 25 extend axially away from the wheel flange 21. The circumferential width of the support webs 25 in this case is preferably greater than the circumferential width of the drivers 22.

In the brake disc-hub connection according to Figures 13 to 15, the drivers 22 also extend from the wheel flange 21 axially to the front, but are not supported on their lower face via corresponding webs 26 on a hollow cylindrical portion 27 of the hub, instead protruding freely in the axial direction.

The drivers 22 of the hub 2 in this case correspond, in the sense of interlocking, with the supporting elements 12 on the internal circumference of the brake disc 1. The drivers 22 in this case respectively engage in the circumferential direction in the free space (recesses 13) between two adjacent supporting elements 12.

As can be seen clearly in Figure 2, the drivers 22 are configured such that they widen radially, from inwardly to outwardly. The lateral flanks 23 of the drivers 22 extending radially and axially to the rotational axis A, in this case viewed from the rotational axis A, are orientated relative to each another at an angle α of 15º to 30º, preferably of 20º to 30º. This angle α and the radial spacing of the drivers 22 from the rotational axis A in this case determine the width of the drivers 22 in the circumferential direction. It is also conceivable that the lateral flanks 23 of the drivers 22 extend offset in parallel, preferably by a few millimeters, relative to a radial line from the rotational axis A.

The lateral flanks 15 of the supporting elements 12 in this case are orientated parallel to the lateral flanks 23 of the drivers 22. Thus, in a simple manner a brake disc-hub connection is provided, in which, in contrast with the prior art, in the interface on the flanks 15, 23 of the supporting elements 12 and/or the drivers 22, the braking forces f_B occur only as purely normal forces or at least approximately as purely normal forces.

According to a preferred variant, for the axial fixing of the brake disc 1 a push-on stop 29 is integrally formed on at least one of the lateral flanks 23 of each of the drivers 22 of the hub 2, the brake disc 1 in the mounted state being pressed thereagainst, as is explained below in more detail.

The lateral flanks 15 of the supporting elements 12 in this case can bear either directly against the lateral flanks 23 of the drivers 22 or, according to the variants shown by way of example in Figure 2, in each case can bear against the first intermediate elements 3 or second intermediate elements 4, which are configured in corresponding intermediate spaces between the supporting elements 12 and the drivers 22 in the circumferential direction.

The first intermediate elements 3 in this case encompass the drivers 22 radially outwardly and in the circumferential direction and in this case bear at least against the opposing flanks 23 of the drivers 22 in a planar manner, as shown in Figure 6.

A variant of the first intermediate elements 3 is shown in a perspective view in Figure 5. As can be seen in Figure 5, the first intermediate elements 3 in this case consist of a substantially U-shaped body with respective arms 31, 32 which bear, in the mounted state, against the lateral flanks 23 of the drivers 22 and which are connected together via a bridging element 33 which, as is visible in Figure 2, at least partially bears against the radially outward upper surface 24 of the driver 22.

According to the preferred variant shown in Figure 5, the free ends of the arms 31, 32 extending radially to the rotational axis A of these first intermediate elements 3 are configured as separating webs 35, which are outwardly bent back and extend axially to the rotational axis A, in each case a lower face 16 of the supporting elements 12 extending axially to the rotational axis A, or a lower edge of the first arm 42 of a second intermediate element 4, being able to be supported thereon, which is explained in more detail below.

The two arms 31, 32 of the first intermediate elements extending approximately radially to the rotational axis A are orientated at an angle α of 15º to 30º to each another, according to the orientation of the lateral flanks 23 of the drivers 22. In a particularly preferred variant, the lateral flanks 23 of the drivers 22 and correspondingly also the arms 31, 32 of the first intermediate elements 3, viewed from the rotational axis A, are orientated relative to each another at an angle α of 20º to 30º, particularly preferably of 23º to 25º, in particular of 24º.

This angle of 15º to 30º has proved particularly appropriate, on the one hand, with regard to the width of the drivers 22 associated therewith and the associated load bearing capacity for receiving the applied braking torque and, on the other hand, with regard to the remaining intermediate spaces, which, preferably with the provision of three, four or five drivers 22 distributed equally on the hub 2 in the circumferential direction, are sufficiently large in order to permit a sufficient ventilation of the brake disc 1.

As is also visible in Figure 5, separating surfaces 34 orientated parallel to the plane of the brake disc 1 are integrally formed on the lateral arms 31, 32 of the first intermediate elements 3 on a side facing towards the wheel flange 21 of the hub 2, said separating surfaces covering the push-on stops 29 which are integrally formed on the hub 2, axially to the rotational axis A, for axially fixing the brake disc 1 as shown in Figure 6.

As is clearly visible, for example in Figures 1, 2 and 7 to 9, second intermediate elements 4 are arranged between the lateral flanks 15 of the supporting elements 12 and arms 31, 32 of the first intermediate elements 3 bearing against the lateral flanks 23 of the drivers 22, said second intermediate elements being able to be mounted separately from the first intermediate elements 3 in order to provide additionally thermal insulation of the brake disc 1 from the hub 2.

The provision of two intermediate elements 3, 4, which are able to be mounted separately for the thermal insulation of the brake disc 1 from the hub 2, has the further advantage that said intermediate elements are able to be mounted in a simple manner and, in particular, are also able to be dismantled again in a simple manner, for example when the brake disc is to be replaced.

The first intermediate element 3 and the respective second intermediate element 4 are in this case preferably positively connected together. The second intermediate elements 4 in this case, as is clearly visible in Figures 8 and 9, are preferably configured as angled elements with two arms 41, 42 orientated at an angle, in particular at right angles to one another.

In the mounted state, a first arm 42 is clamped between the lateral flank 15 of one of the supporting elements 12 and the lateral flank 31, 32 of one of the first intermediate elements 3. A second arm 41 bears against the front face of the supporting element 12 remote from the wheel flange 21 of the hub.

The first intermediate elements 3 and preferably also the second intermediate elements 4 are preferably produced from a non-rusting material or alternatively or additionally provided with a non-rusting coating in order to prevent permanently an adhesion of the surfaces bearing against one another of the first intermediate elements 3 and the second intermediate elements 4, so that, when dismantling the brake disc in the case of servicing, a slight axial displacement of the brake disc to the front,

i.e. away from the wheel flange 21 of the hub 2, is possible. Also, an anti-seize coating of the intermediate elements 3, 4 is conceivable.

By the shape, in particular, of the first intermediate elements 3 these elements form in the region of the brake disc-hub connection a separating layer between the brake disc 1 and the hub 2, so that at any point in the region of the brake disc-hub connection the brake disc 1 is not directly in contact with the hub.

For the axial fixing of the brake disc 1 on the hub 2 and the first intermediate elements 3 and/or second intermediate elements 4 optionally arranged in the region of the brake disc-hub connection, a spring element 5 can be fastened on a side of the drivers 22 remote from the wheel flange 21 of the hub 2, for example screwed by a screw 6 in a screw bore 28 in the driver 22.

Whilst the hub 2 and/or brake disc 1 shown in Figures 1 to 4 and 9 has a total of three drivers 22 and/or six supporting elements 12, it is also conceivable to configure the brake disc-hub connection such that a hub has a total of four or five drivers 22 and the brake disc 1 accordingly has eight or ten supporting elements 12, as shown in Figures 10 to 15.

With a toothing having such a number of drivers 22 and/or supporting elements 12 engaging in one another, a reliable braking torque transmission is optimally permitted, with at the same time recesses 14 dimensioned to be of sufficiently large size on the inner circumference of the brake disc 1, a sufficient ventilation of the brake disc 1 and the hub 2 thereby being facilitated.

A further variant of the brake disc-hub connection, with alternatively designed support struts 25 and first and second intermediate elements 3, 4, is shown in Figures 16 to 22.

As can be seen in Figure 17, in particular, the support webs 25 comprise slots 251 extending axially from the driver 22 in the direction of the wheel flange 21. These slots 251 preferably extend in this case along the length of the lateral flanks 23 of the drivers 22. The lateral support webs 252 separated by one respective slot 251 from the central region of the support webs 25 are preferably configured at their free ends 253 to be bent back radially relative to the rotational axis of the brake disc 1 in an L-shaped manner, so that the front faces facing towards the brake disc 1 and/or the first intermediate elements 3 have an enlarged surface relative to the cross-section of the support webs 252. The front faces of the support webs in this case serve as axial push-on stops 29 for the axial fixing of the brake disc 1. By means of the separation of the axial push-on stops 29, thus configured, thermally induced stresses in the hub 2 can be avoided, in particular in the transition region between the lateral flanks 23 of the drivers 22 and the push-on stops 29.

The axial length of the slots 251 in this case is preferably more than 10 mm, particularly preferably between 15 mm and 17 mm.

As is shown in Figures 19 to 21, in the variants shown in these figures of the first and second intermediate elements 3, 4, for securing the second intermediate elements 4 against circumferential slippage, the transitions between the separating webs 35 and the arms 31, 32 of the first intermediate elements 3 extending approximately radially to the rotational axis of the brake disc 1 are configured as depressions 37, respective lower edges of the first arm 42 of the second intermediate elements 4 being able to be supported in said depressions by being introduced therein.

In order to effectively prevent the second intermediate elements 4 from migrating radially relative to the rotational axis of the brake disc 1 after the mounting thereof on the first intermediate elements 3, openings 36 of slot-shaped configuration are preferably provided on regions of the separating surfaces in the vicinity of the lateral arms 34 of the first intermediate elements, in each case a nose 43 of one of the second intermediate

elements 4 extending therethrough in the mounted state. The nose 43 extends in this case from the end of the first arm 42 of the second intermediate element 4, spaced apart from the second arm 41 of the second intermediate element 4, preferably in a linear manner.

The width of the nose 43 (radially to the rotational axis of the brake disc 1) in this case is preferably smaller than the width of the first arm 42 of the second intermediate element 4. The edge regions 44 of the first arm 42 protruding over the lateral edges of the nose 43 serve in this case as a stop in order to limit the penetration depth of the nose 43 in the opening 36 of the first intermediate element 3 during mounting.

Figure 18 shows, in a perspective view, the first and second intermediate elements 3, 4 in the state mounted on the hub 2. It is clearly visible that the noses 43 of the second intermediate elements 4 extend through the openings 36 of the first intermediate elements 3 as far as the slots 251 of the support webs 25.

Figure 22 shows in a plan view the nose 43 of one of the second intermediate elements 4, pushed into the opening 36 of the first intermediate element 3.

The features explained by means of variants shown in Figures 16 to 22, relating to the slots 251, depressions 37, openings 36 and noses 43 in this case are also conceivable in the hub 2 shown in Figures 13 to 15.

A further variant of the brake disc-hub connection with alternatively designed support struts 25 and first and second intermediate elements 3, 4 is shown in Figures 23 and 24. This variant is suitable, in particular, for attaching to a rear axle of a utility vehicle.

As can be seen in both Figures 23 and 24, the support struts 25 in this variant extend axially from the push-on stops 29 in the direction of the wheel flange 21. In the vicinity of the push-on stops 29, the support webs

25 widen in the circumferential direction of the hub 2. The flanks 23 of the drivers 22 in this case are separated by the slots 251 from the push-on stops 29. Also, the slots 251 extend in this case along the length of the lateral flanks 23 of the drivers 22.

The inner surface of the hub 2 in this case is configured with an internal contour 7. In the variant shown here this internal contour has recesses 71 and raised portions 72, which are integrally formed adjacent to one another, alternating in the circumferential direction. The internal contour 7 in this case serves for meshing with an axle, in particular a rear axle, of the utility vehicle.

List of reference numerals

1	Brake disc
11	Friction ring
12	Supporting elements
13	Recess
14	Recess
15	Flanks
16	Lower face
2	Hub
21	Wheel flange
22	Driver
23	Flanks
24	Upper surface
25	Support strut
251	Slot
252	Arm
253	Free end
26	Webs
27	Pot-shaped portion
28	Screw bore
29	Push-on stop
3	First intermediate element
31	Arm
32	Arm
33	Bridging element
34	Separating surface
35	Separating webs
36	Opening
37	Depression

4	Second intermediate element
41	Second arm
42	First arm
43	Nose
44	Edge region
5	Spring element
51	Central region
52	Spring arm
6	Screw
7	Inner contour
71	Recess
72	Raised portion
A	Rotational axis
f_B	Braking force

Patentkrav

1. Bremseskive-/navforbindelse, hvor et nav (2) omfatter medbringere (22), der strækker sig i aksial retning fra en randflange (21) af navet (2) mod en drejeakse (A) for en hjulflange (21) af navet (2), hvilken drejeakse er fælles for en bremseskive (1) og navet (2), hvilke medbringere griber ind imellem støtteelementer (12), der strækker sig i retning mod drejeaksen og er anbragt ved den indvendige omkreds af en bremseskive (1), på en tandhjulslignende måde, hvor sideflanker (23) af medbringerne (22) er orienteret radialt eller i det mindste tilnærmelsesvis radialt i forhold til drejeaksen (A), og sideflanker (15) af støtteelementerne (12) er orienteret parallelt med sideflankerne (23) af medbringerne (22), hvor sideflankerne (23) af hver af medbringerne (22) er orienteret i en vinkel (α) på 15° til 30° i forhold til hinanden, **kendetegnet ved, at** hver af medbringerne (22) har slidser (251), der strækker sig aksialt i retning mod hjulflangen (21), til udformning af sideværts støtteribber (252), hvor endefladerne af de frie ender (253) af støtteribberne (252) er udformet som skydestopper (29) med henblik på en aksial fiksering af bremseskiven (1).

2. Bremseskive-/navforbindelse ifølge krav 1, **kendetegnet ved, at** der ved den indvendige omkreds af bremseskiven (1), set i omkredsretningen, mellem sideflanker af to støtteelementer (12), der befinder sig i afstand fra en respektiv medbringer (22), er udformet en respektiv udsparing (14), der tjener som ventilation af bremseskiven (1) og navet (2).

3. Bremseskive-/navforbindelse ifølge et af de foregående krav, **kendetegnet ved, at** medbringerne (22) er udformet som forreste ender af støtteribber (25), der strækker sig aksialt væk fra hjulflangen (21).

4. Bremseskive-/navforbindelse ifølge et af de foregående krav, **kendetegnet ved, at** der på mindst en af sideflankerne (23) af hver af medbringere (22) er udformet en skydestopper (29) med henblik på en aksial fiksering af bremseskiven (1).

5. Bremseskive-/navforbindelse ifølge et af de foregående krav, **kendetegnet ved, at** der i mellemrum mellem sideflankerne (15, 23) af medbringerne (22) og støtteelementerne (12) er anbragt første mellemelementer (3), som griber rundt om medbringerne (22) radialt og u-formet i omkredsretningen og i det mindste ligger fladeformet an mod de over for hinanden beliggende flanker (23) af medbringerne (22).

6. Bremseskive-/navforbindelse ifølge krav 5, **kendetegnet ved, at** der mellem sideflankerne (15) af støtteelementerne (12) og ved ben (31, 32) af de første mellemelementer (3), hvilke ben ligger an mod sideflankerne (23) af medbringerne (22), er anbragt andre mellemelementer (4), der kan monteres separat fra de første mellemelementer (3).

7. Bremseskive-/navforbindelse ifølge krav 6, **kendetegnet ved, at** de første mellemelementer (3) og de andre mellemelementer (4) er anbragt forskydelige i forhold til hinanden aksialt i forhold til drejeaksen (A).

8. Bremseskive-/navforbindelse ifølge krav 6 eller 7, **kendetegnet ved, at** de andre mellemelementer (4) er udformet som vinkelelementer med to ben (41, 42), der er orienteret vinklede, især vinkelrette i forhold til hinanden, hvor et første ben (42) i monteret tilstand er klemt ind mellem sideflanken (15) af et af støtteelementerne (12) og sideflanken (31, 32) af et af de første mellemelementer (3), og et andet ben (41) ligger an mod den endeflade af støtteelementet (12), der vender bort fra navets (2) hjulflange (21).

9. Bremseskive-/navforbindelse ifølge et af kravene 6 til 8, **kendetegnet ved, at** de første mellemelementer (3) og de andre mellemelementer (4) består af et ikke rustende materiale eller er forsynet med en ikke rustende coating og/eller har en anti-seize-coating.

10. Bremseskive-/navforbindelse ifølge et af kravene 5 til 9, **kendetegnet ved, at** de første mellemelementer (3) i området ved bremseskiverne/navforbindelsen danner et separationslag mellem bremseskiven (1) og navet (2).

11. Bremseskive-/navforbindelse ifølge krav 10, **kendetegnet ved, at** de frie ender af benene (31, 32) af de første mellemelementer (3), hvilke ben strækker sig omtrent radialt hen mod drejeaksen (A), er udformet som udad bøjede separationsribber (35), der strækker sig aksialt i forhold til drejeaksen (A), på hvilke der kan understøttes henholdsvis en underside (16) af støtteelementerne (4), der strækker sig aksialt i forhold til drejeaksen (A), eller en underkant af det første ben (42) af det andet mellemelement (4).

12. Bremseskive-/navforbindelse ifølge krav 11, **kendetegnet ved, at** overgangene mellem separationsribberne (35) og benene (31, 32), der strækker sig omtrent radialt i forhold til drejeaksen (A), er udformet som indbugtninger (37), i hvilken underkanten af det første ben (42) af det andet mellemelement (4) kan støttes.

13. Bremseskive-/navforbindelse ifølge et af kravene 10 til 12, **kendetegnet ved, at** der på sidebenene (31, 32) af de første mellemelementer (3) på en side, der vender mod navets (2) hjulflange (21), orienteret parallelt med planet for bremseskiven (1), er udformet skilleflader (34), som hver især dækker en af skydestopperne (29) med henblik på en aksial fiksering af bremseskiven (1).

14. Bremseskive-/navforbindelse ifølge krav 12 eller 13, **kendetegnet ved, at** det første mellemelement (3) og det respektive andet mellemelement (4) er forbundet med hinanden i en formsluttende forbindelse.

15. Bremseskive-/navforbindelse ifølge krav 13 eller 14, **kendetegnet ved, at** der ved et område af skillefladerne (34), der ligger tæt på sidebenene (31, 32) af de første mellemelementer (3), er udformet åbninger (36), gennem hvilke der i monteret tilstand strækker sig en næse (43) af et af de to mellemelementer (4), hvor næsen (43) strækker sig fra den ende af det første ben (42), der befinder sig i afstand fra det andet ben (41).

16. Bremseskive-/navforbindelse ifølge et af de foregående krav, **kendetegnet ved, at** der på en side af medbringerne (22), der vender bort fra navets (2) hjulflange (21), kan fastgøres et fjederelement (5) med henblik på en ak-

sial fiksering af de første mellemelementer (3) og/eller de andre mellemelementer (4).

17. Bremseskive-/navforbindelse ifølge et af de foregående krav, **kendetegnet ved, at** navet (2) har en hjulflange (21), der strækker sig udad radialt i forhold til drejeaksen (A), ud fra hvilken medbringerne (22) strækker sig aksialt i forhold til drejeaksen (A).

18. Bremseskive-/navforbindelse ifølge krav 17, **kendetegnet ved, at** navet (2) har en pottelignende, hulcylindrisk sektion (27), som går over i hjulflangen (21), der strækker sig udad radialt i forhold til drejeaksen (A), hvor medbringerne (22) er støttet af ribber (26), der hæver sig radialt udad fra den pottelignende sektion (27) og strækker sig aksialt hen mod hjulflangen (21).

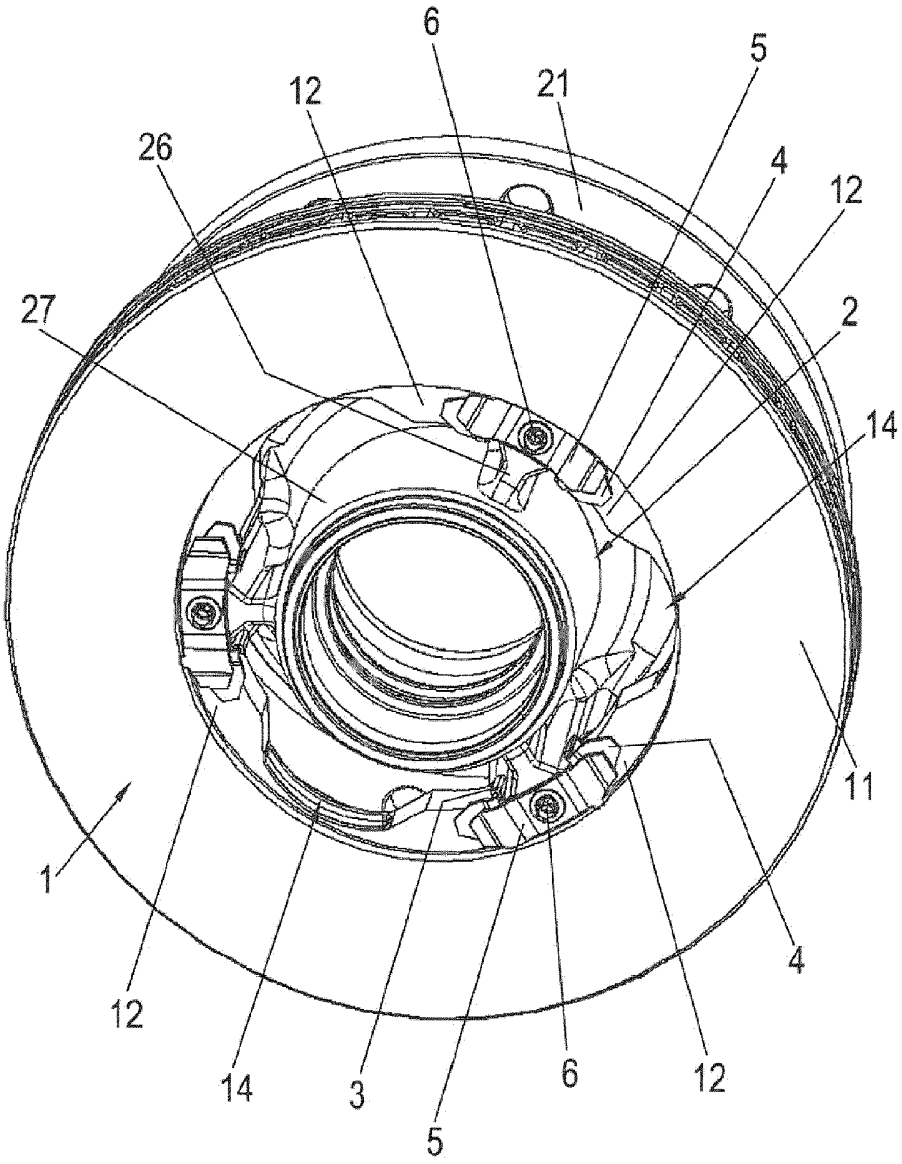


Fig. 1

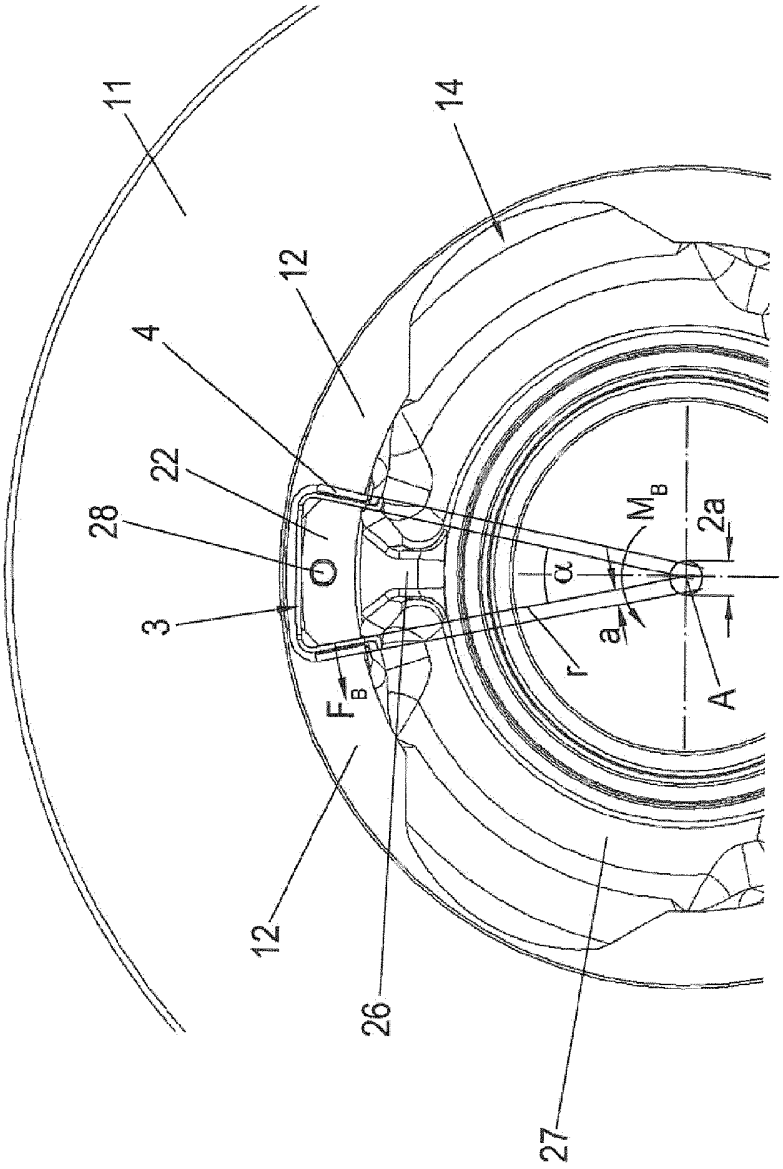


Fig. 2

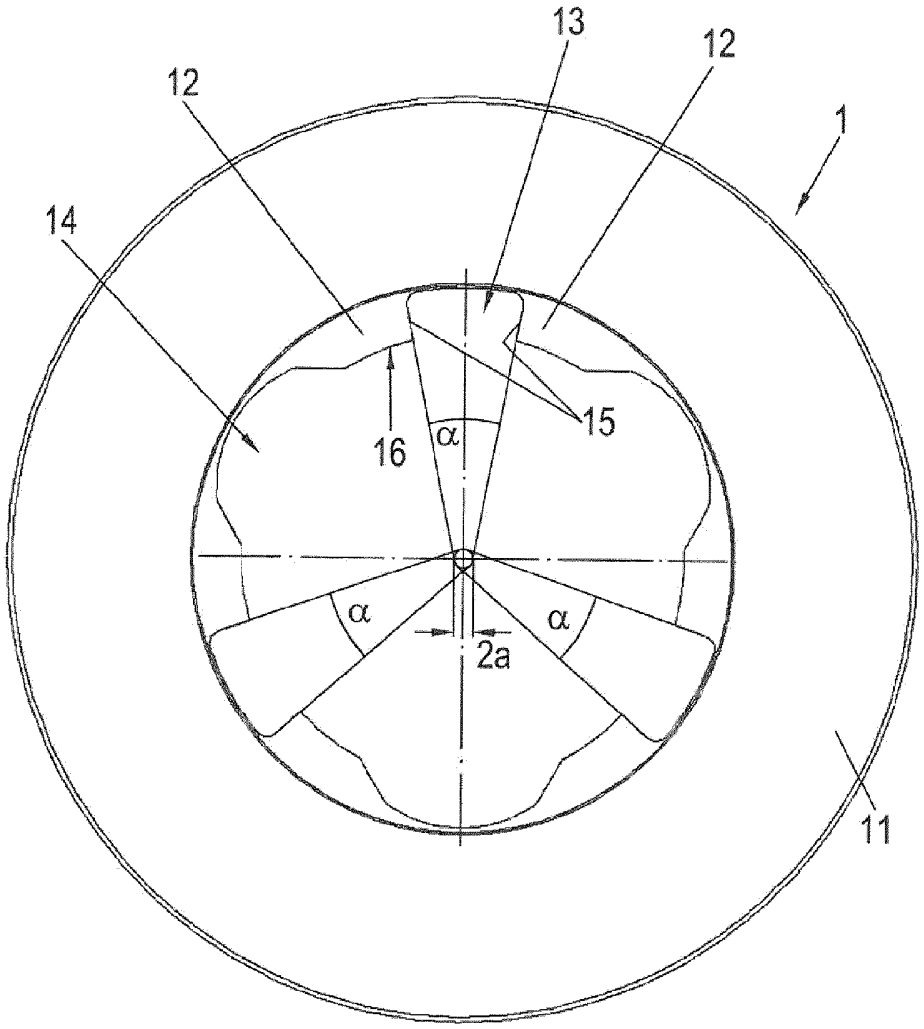


Fig. 3

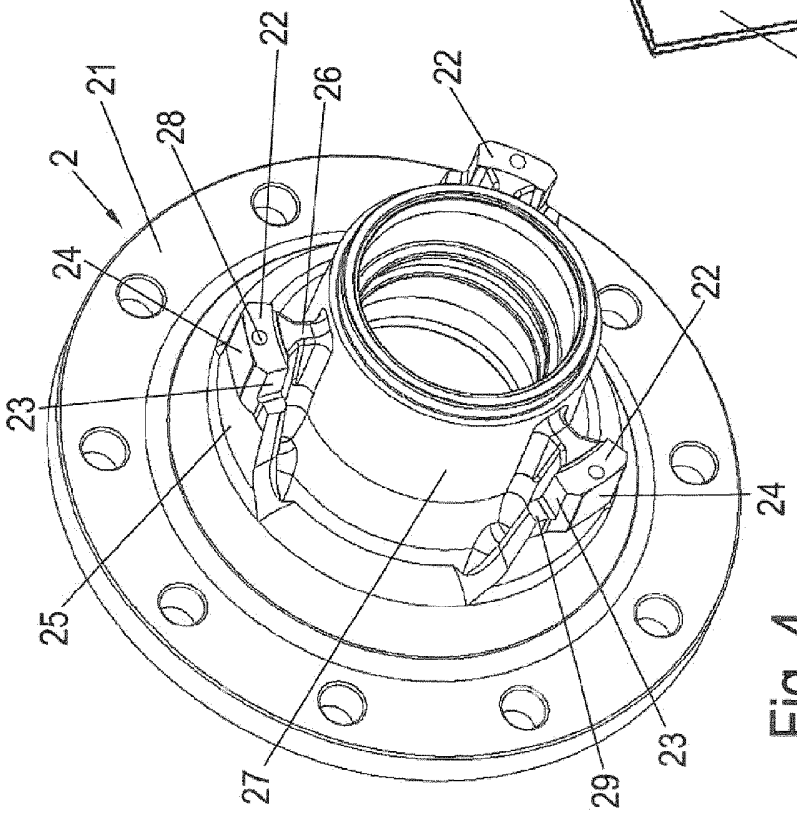


Fig. 4

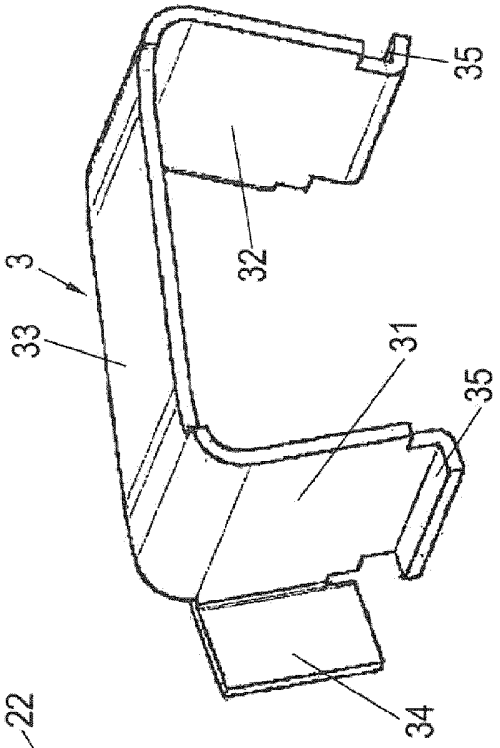


Fig. 5

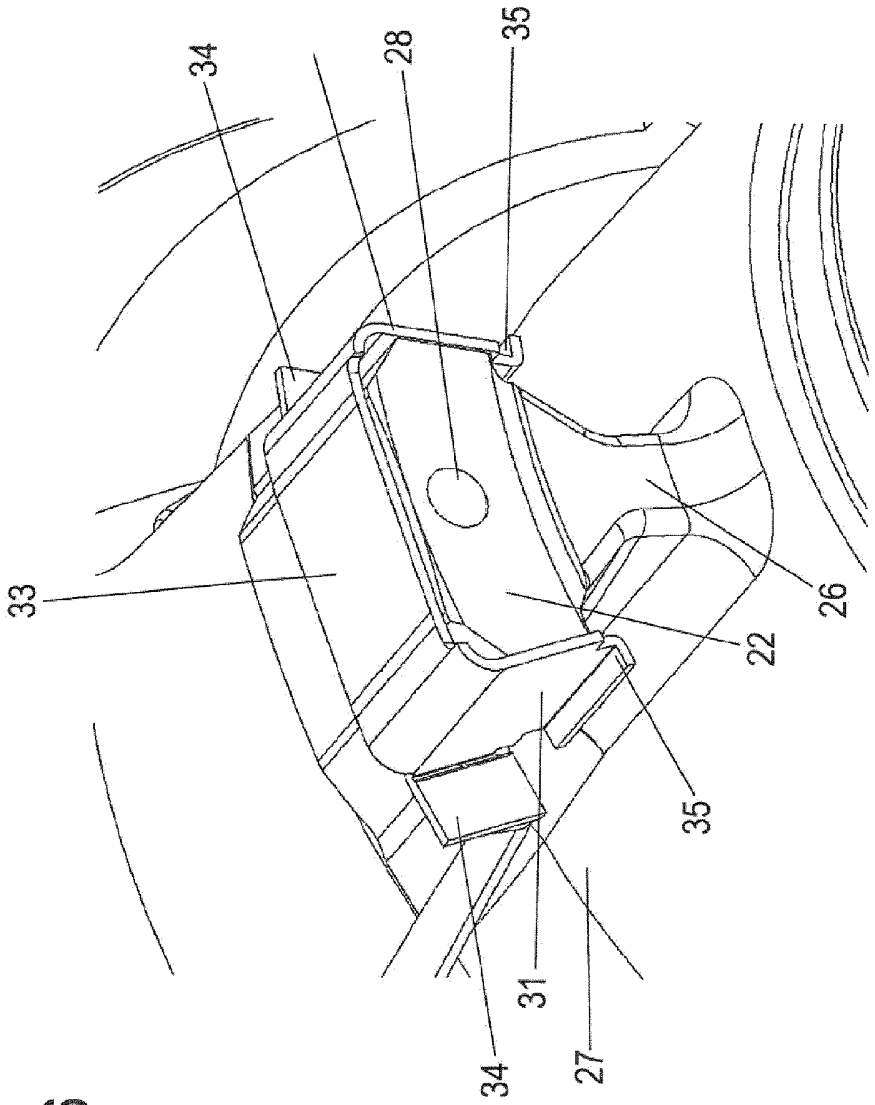


Fig. 6

Fig. 7

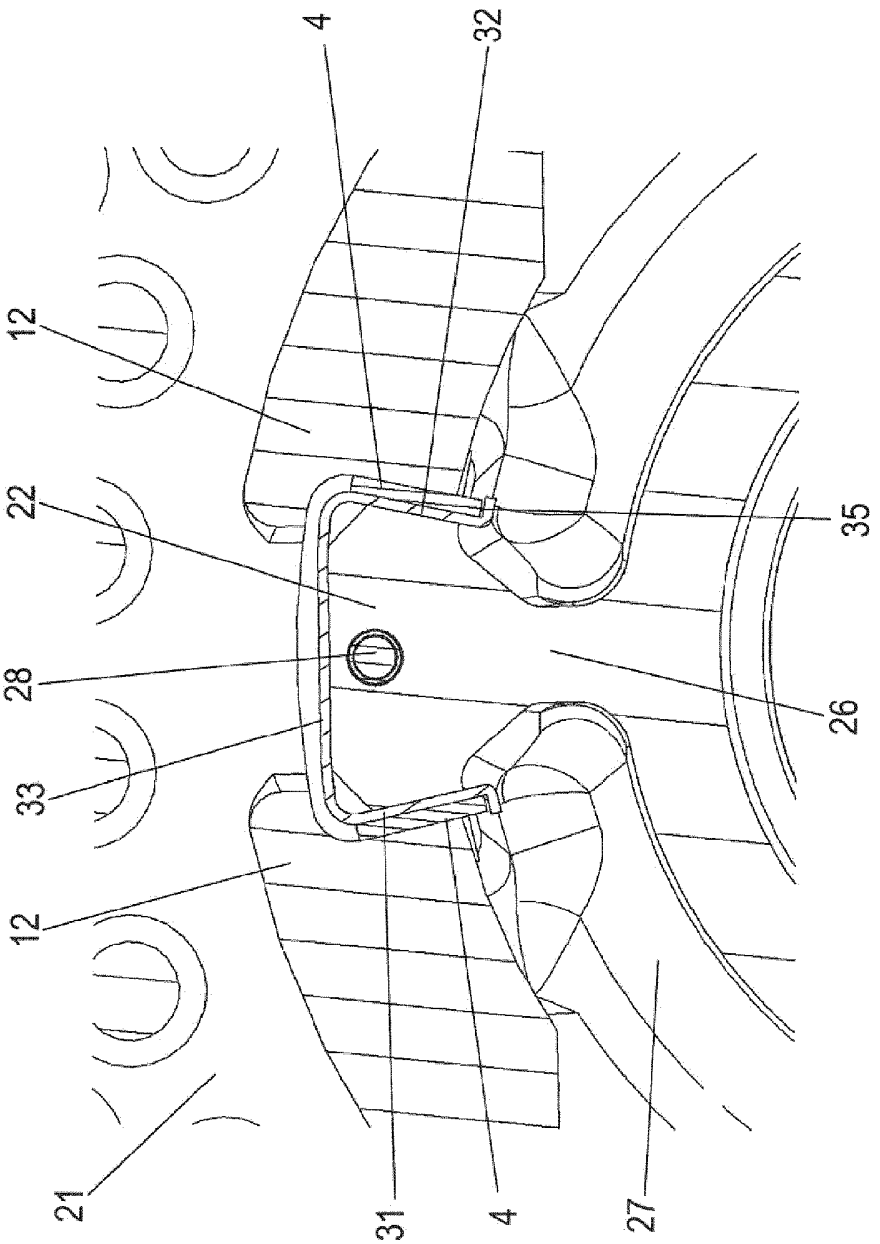


Fig. 8

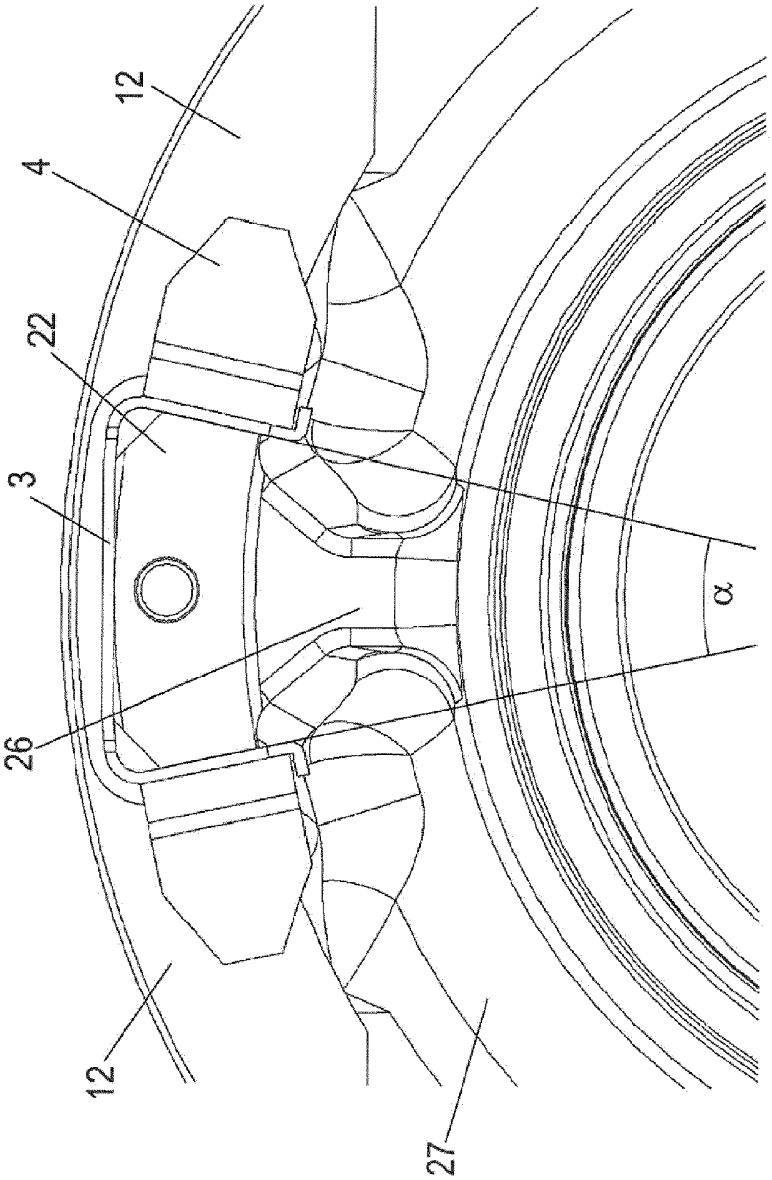
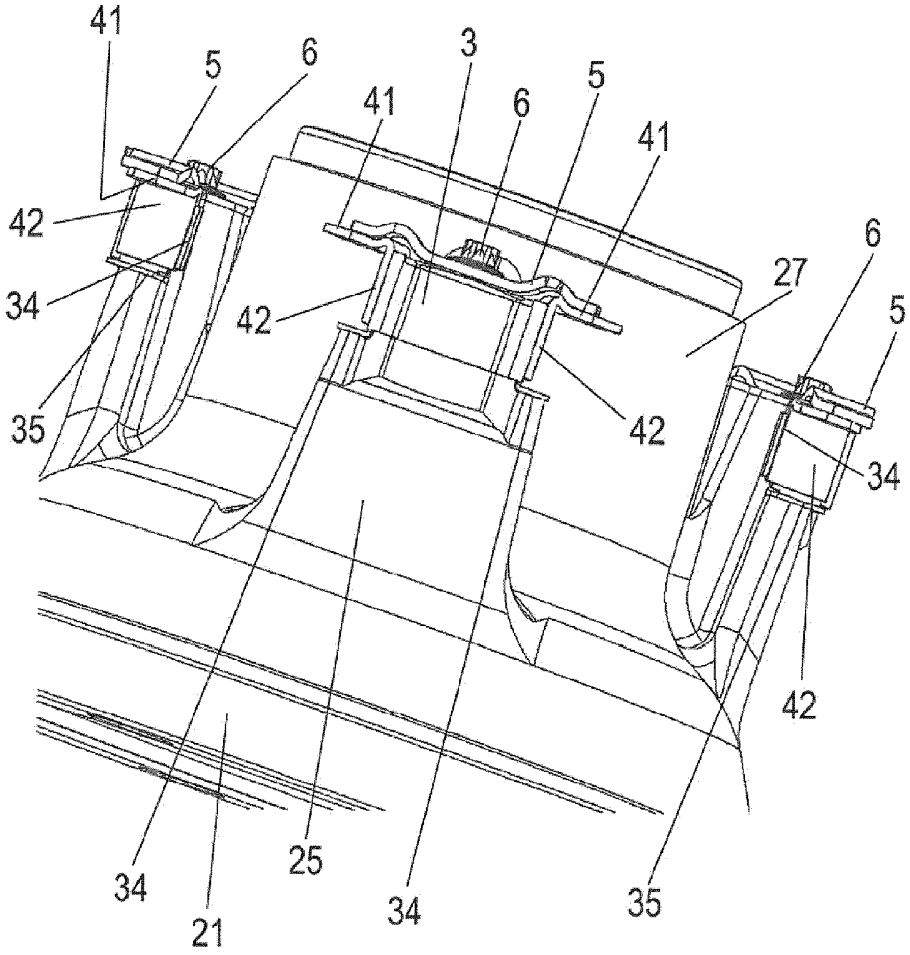


Fig. 9



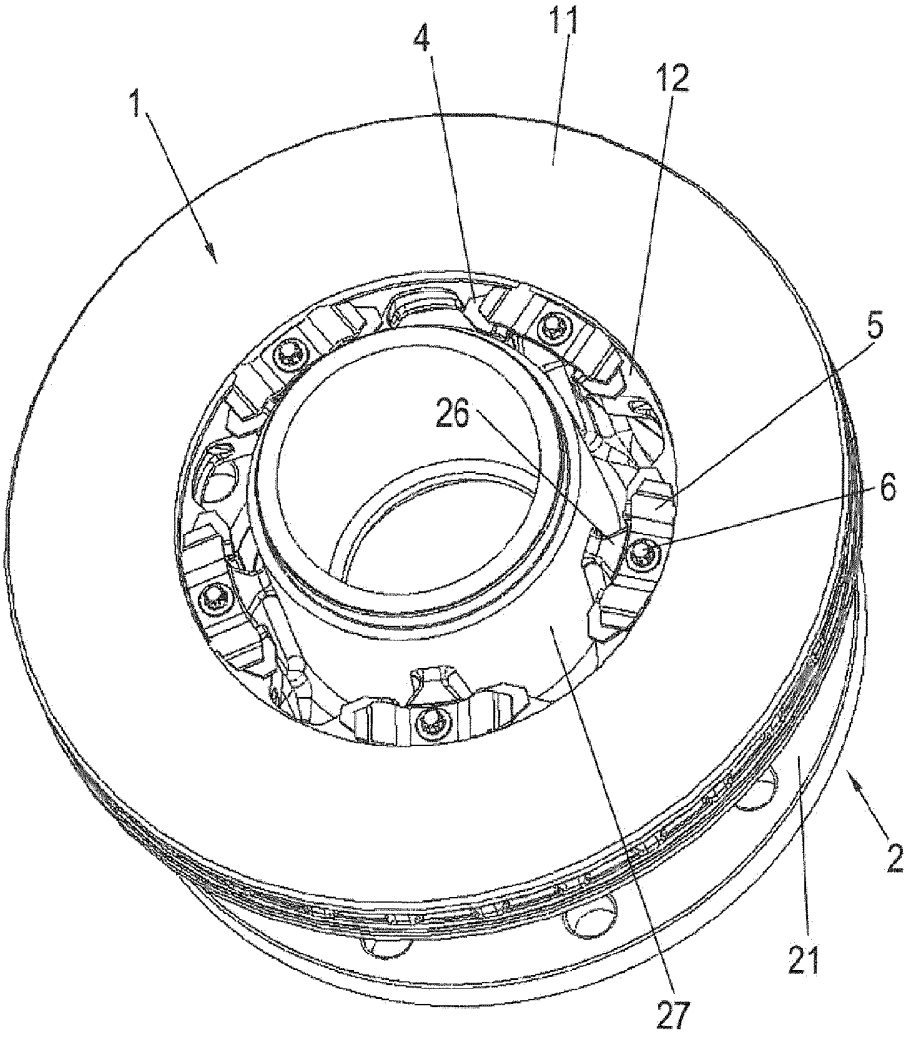


Fig. 10

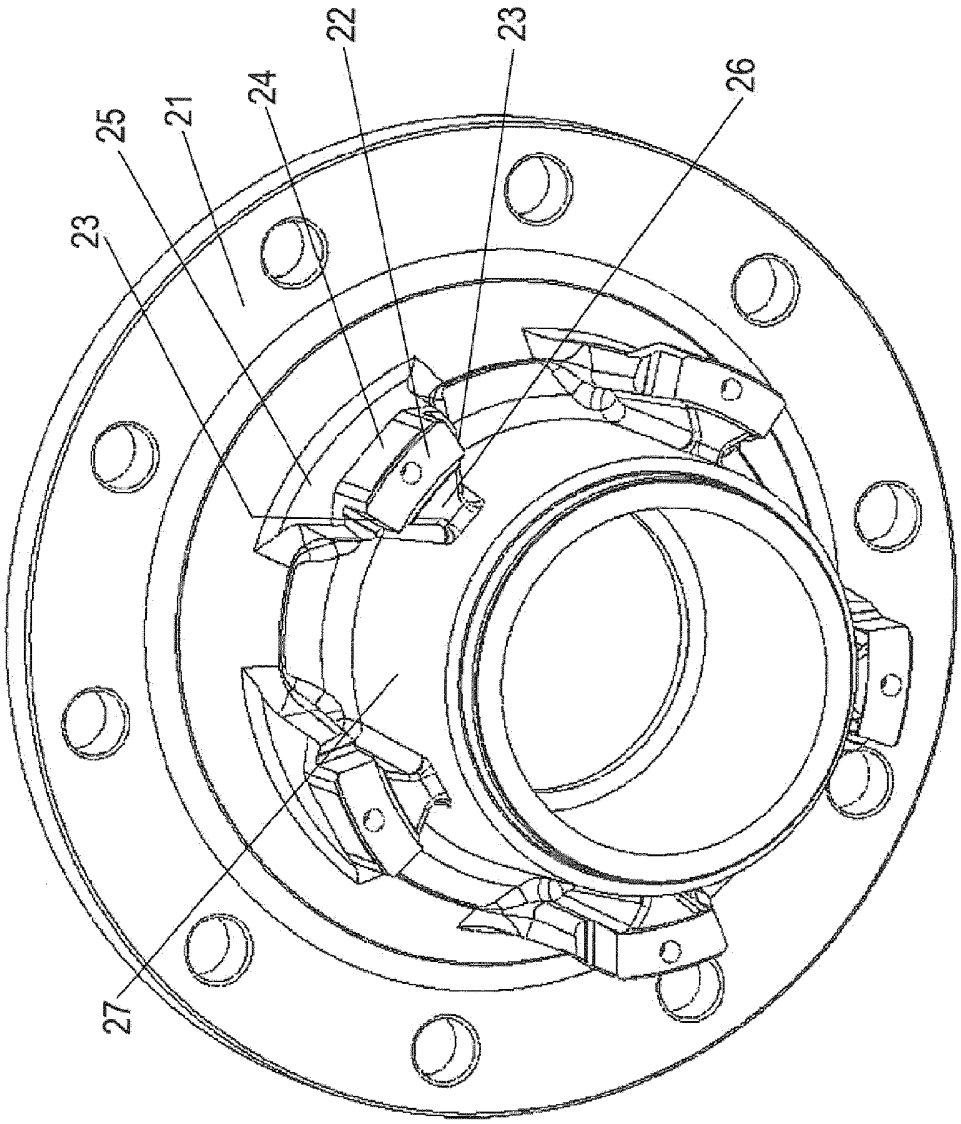
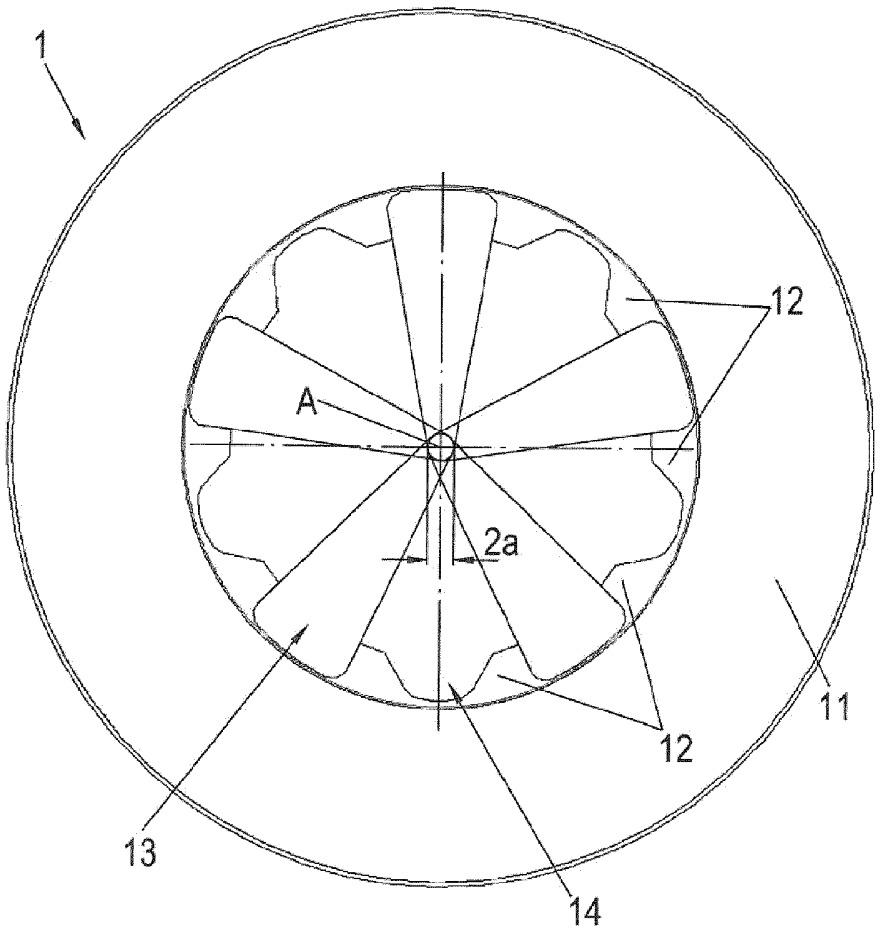


Fig. 11

Fig. 12



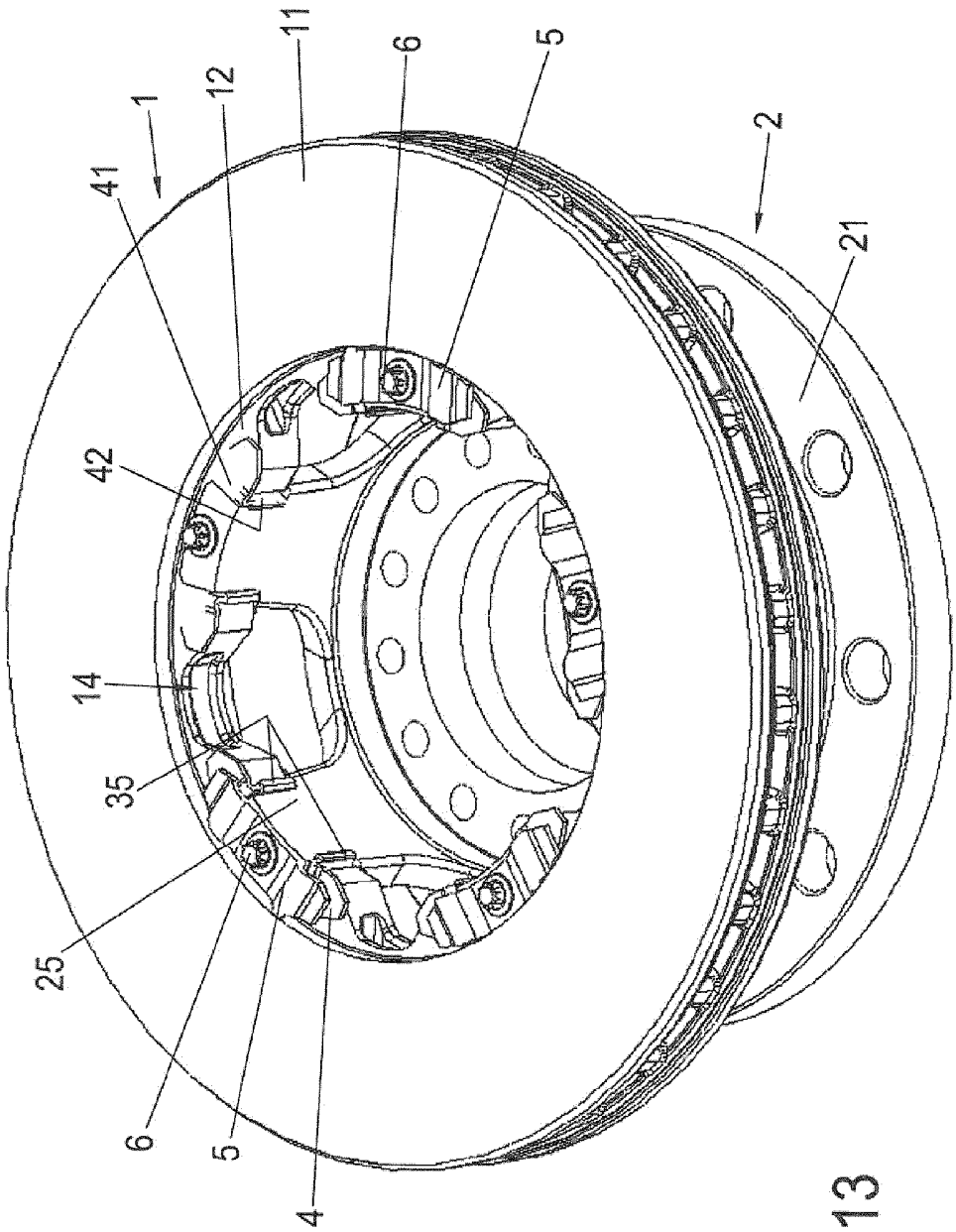


Fig. 13

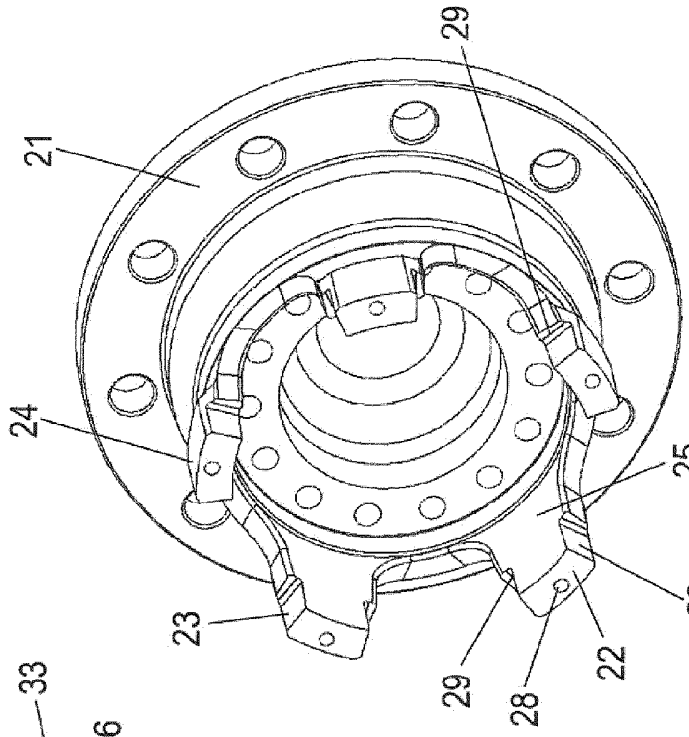


Fig. 15

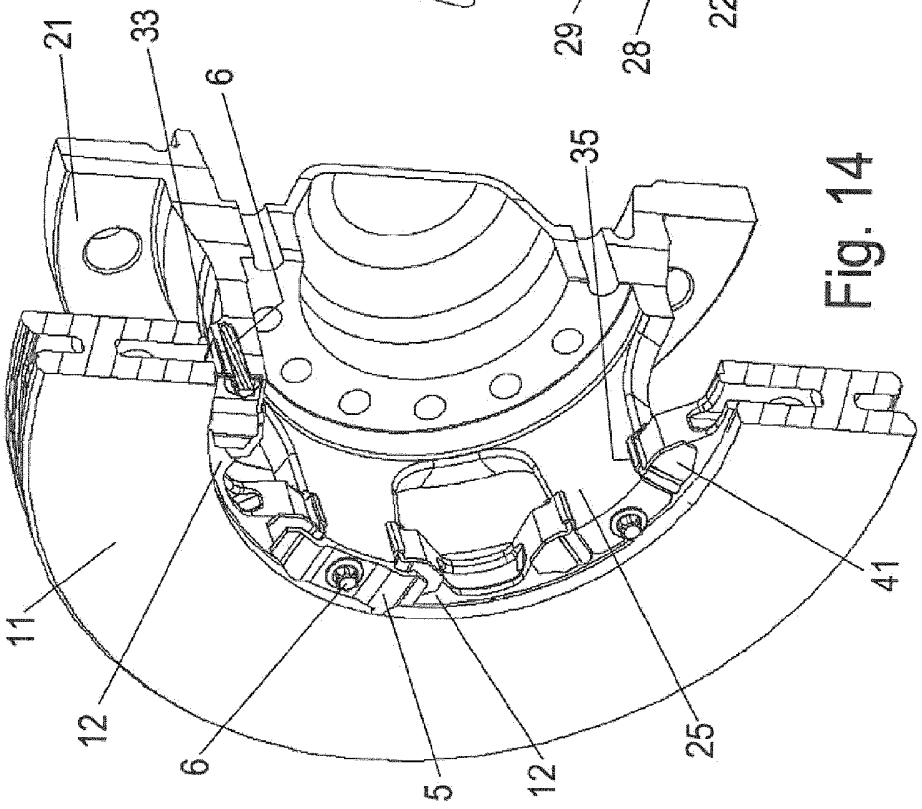


Fig. 14

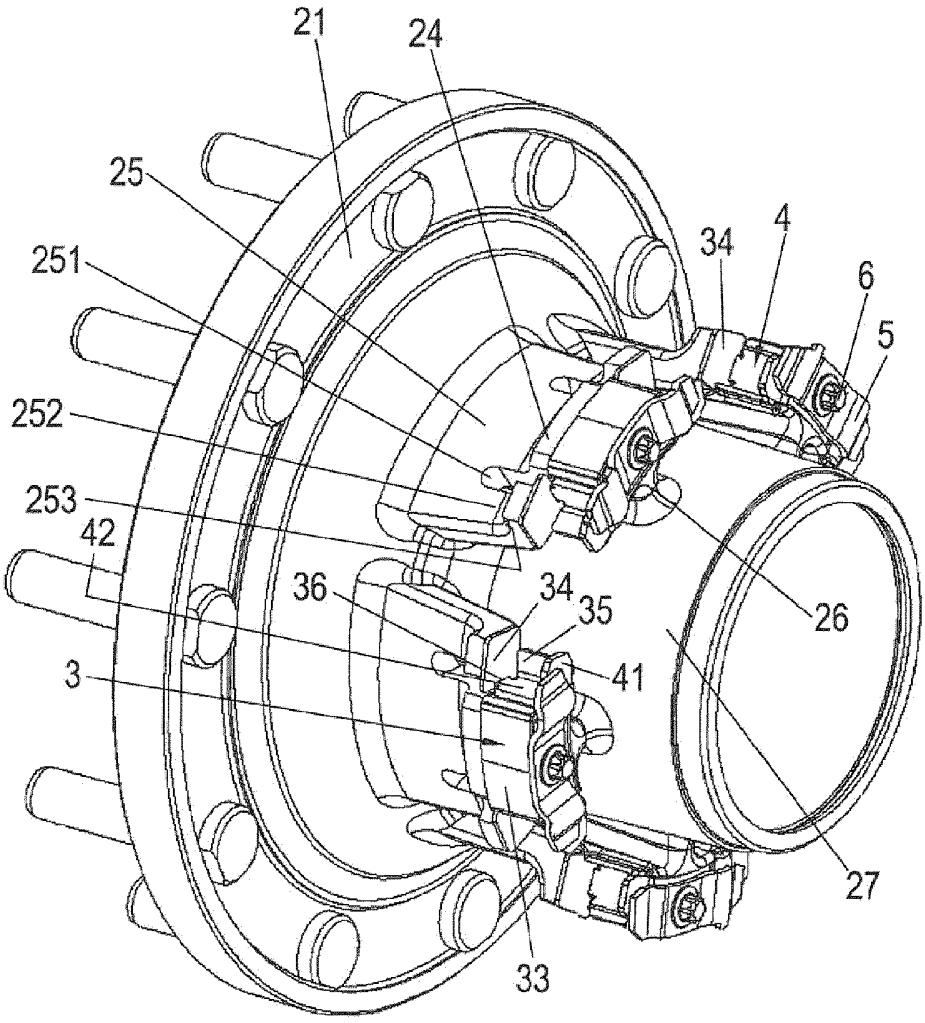


Fig. 16

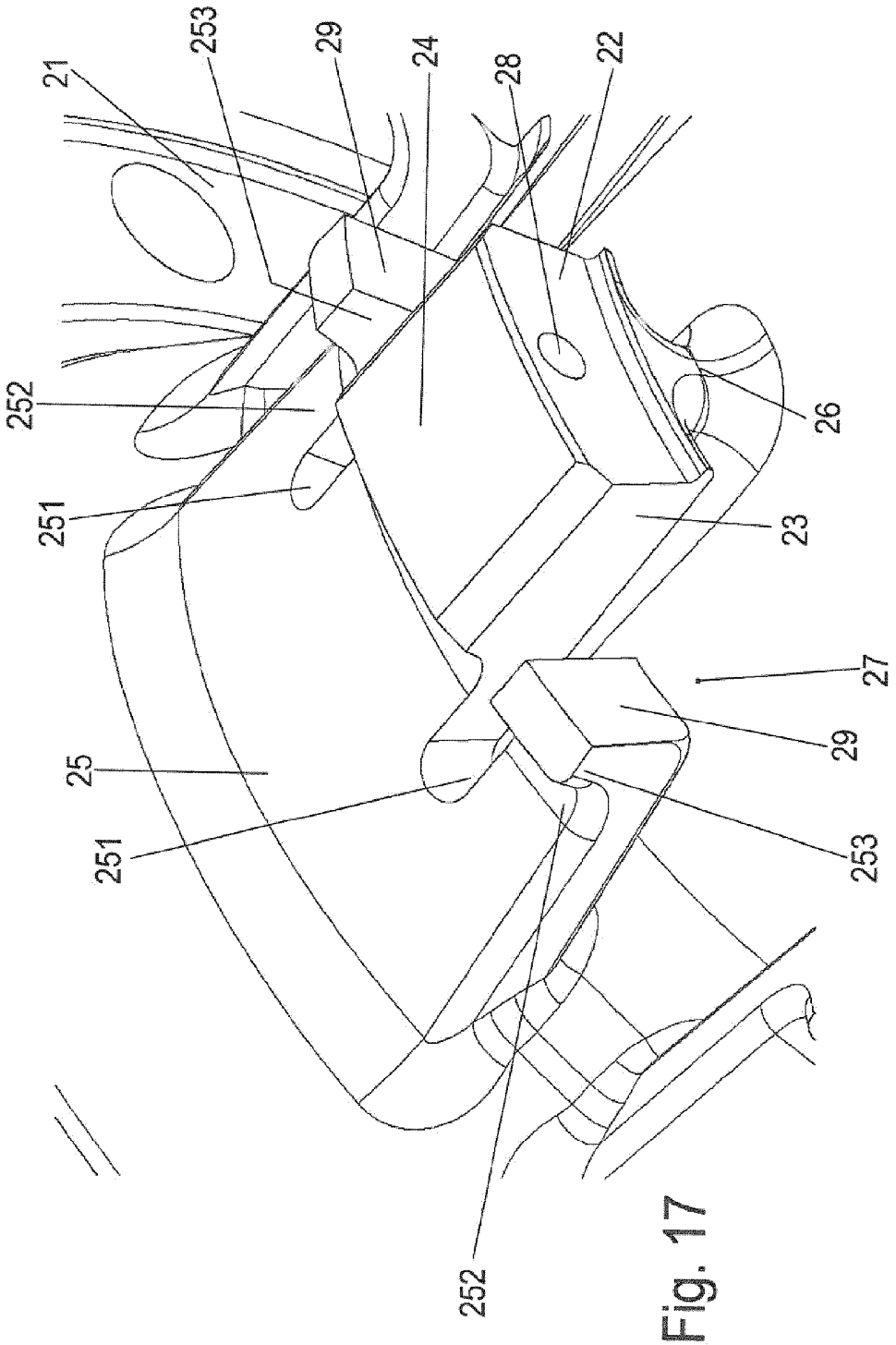


Fig. 17

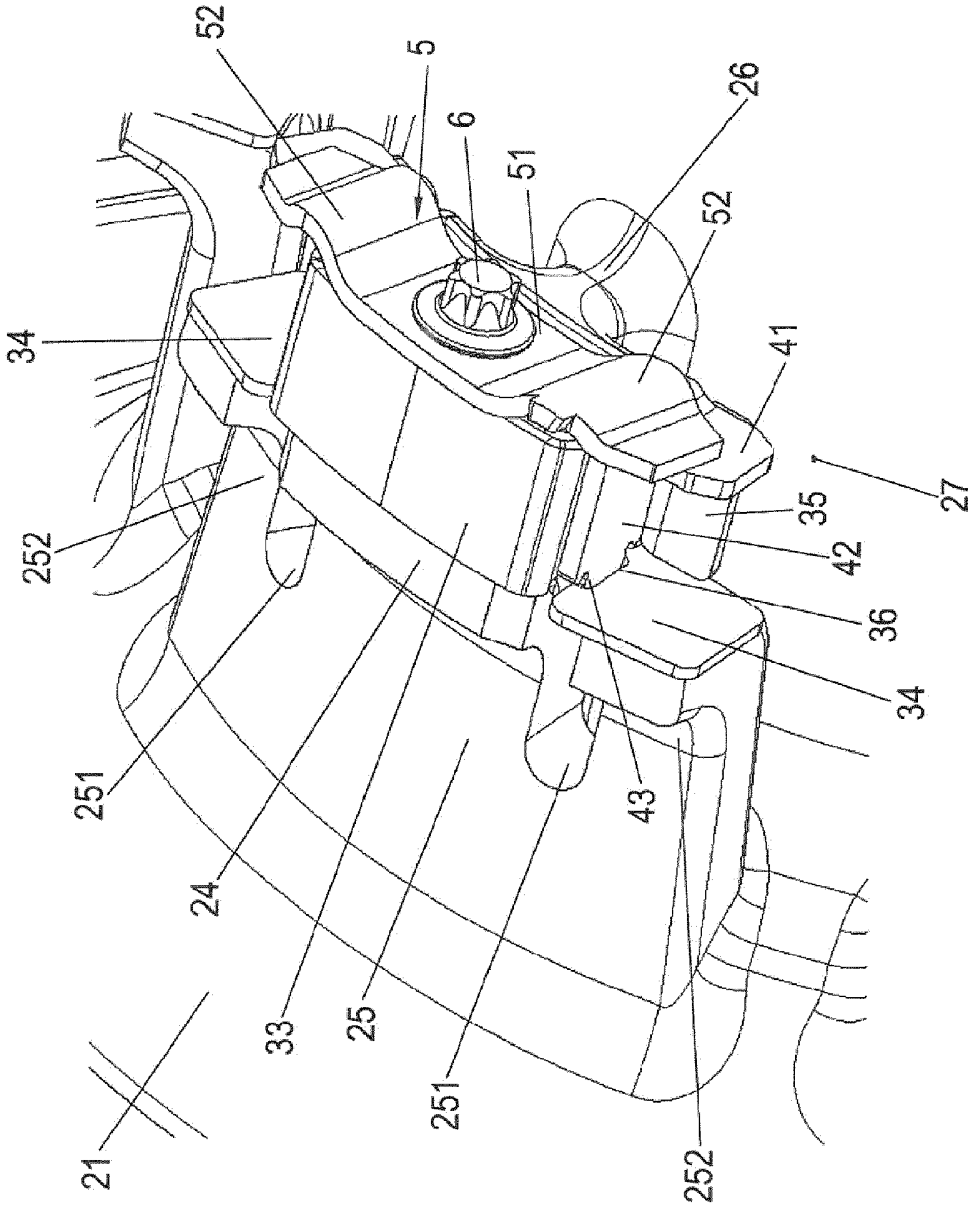


Fig. 18

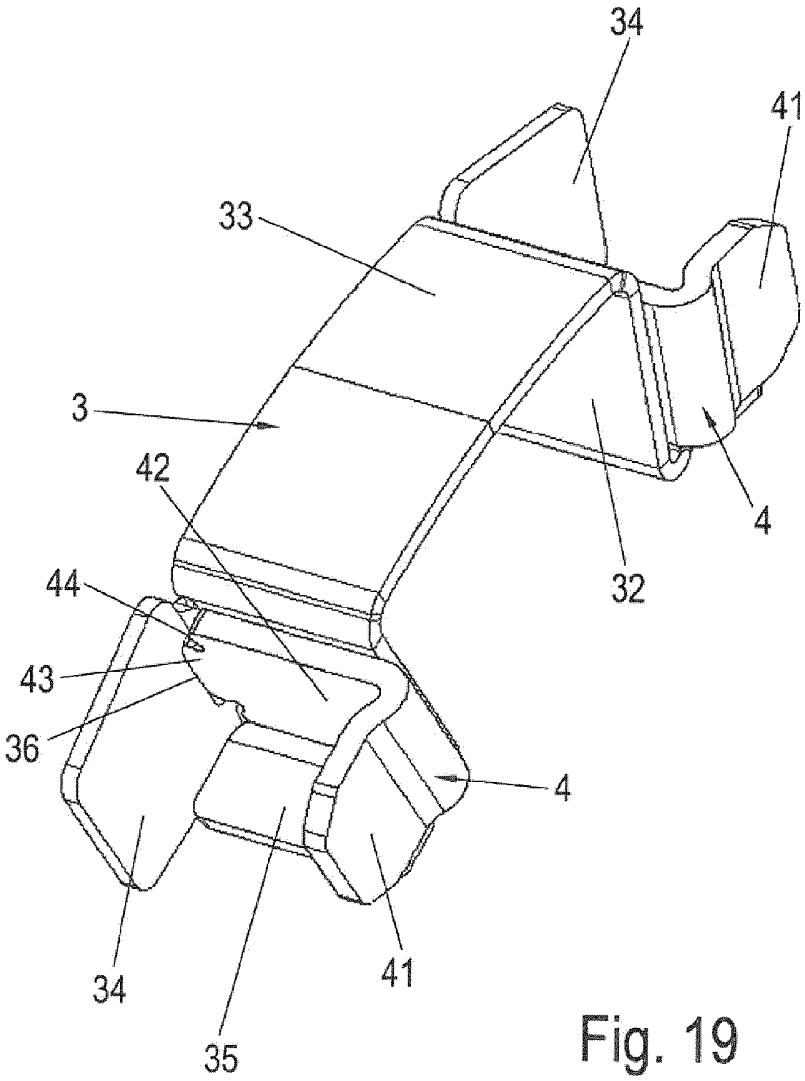


Fig. 19

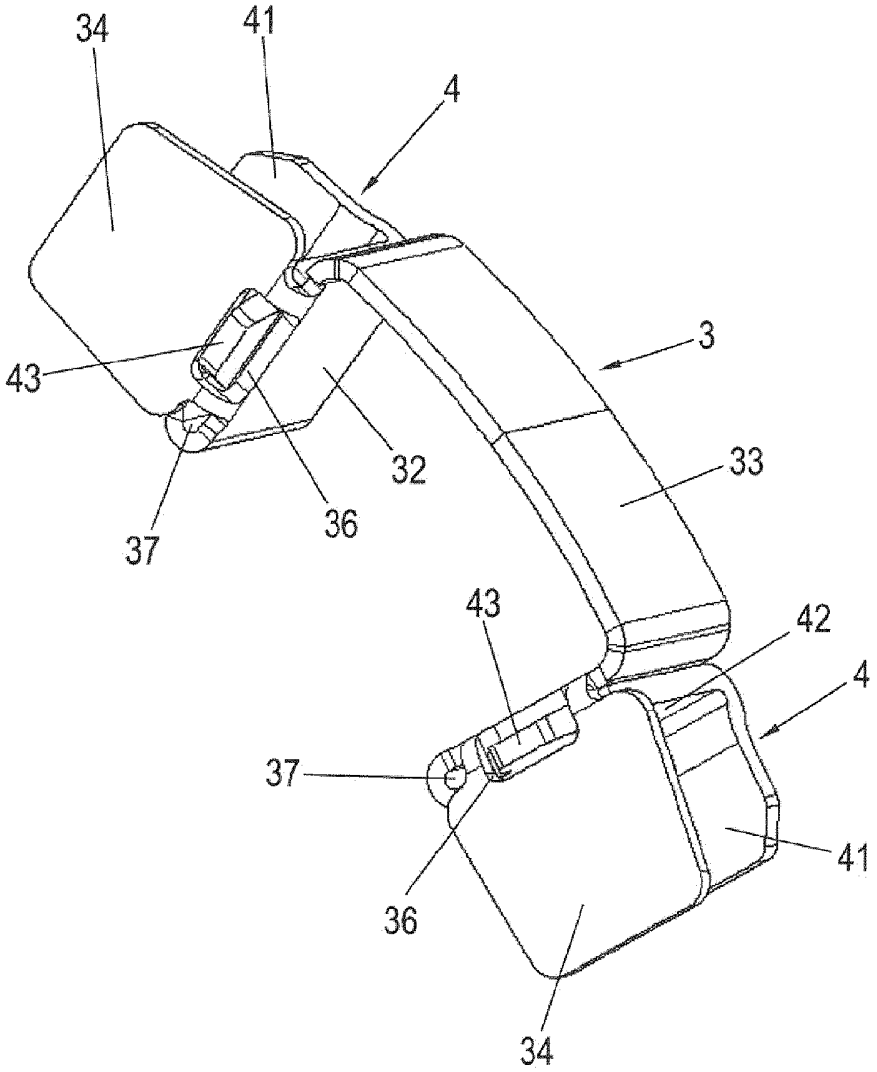


Fig. 20

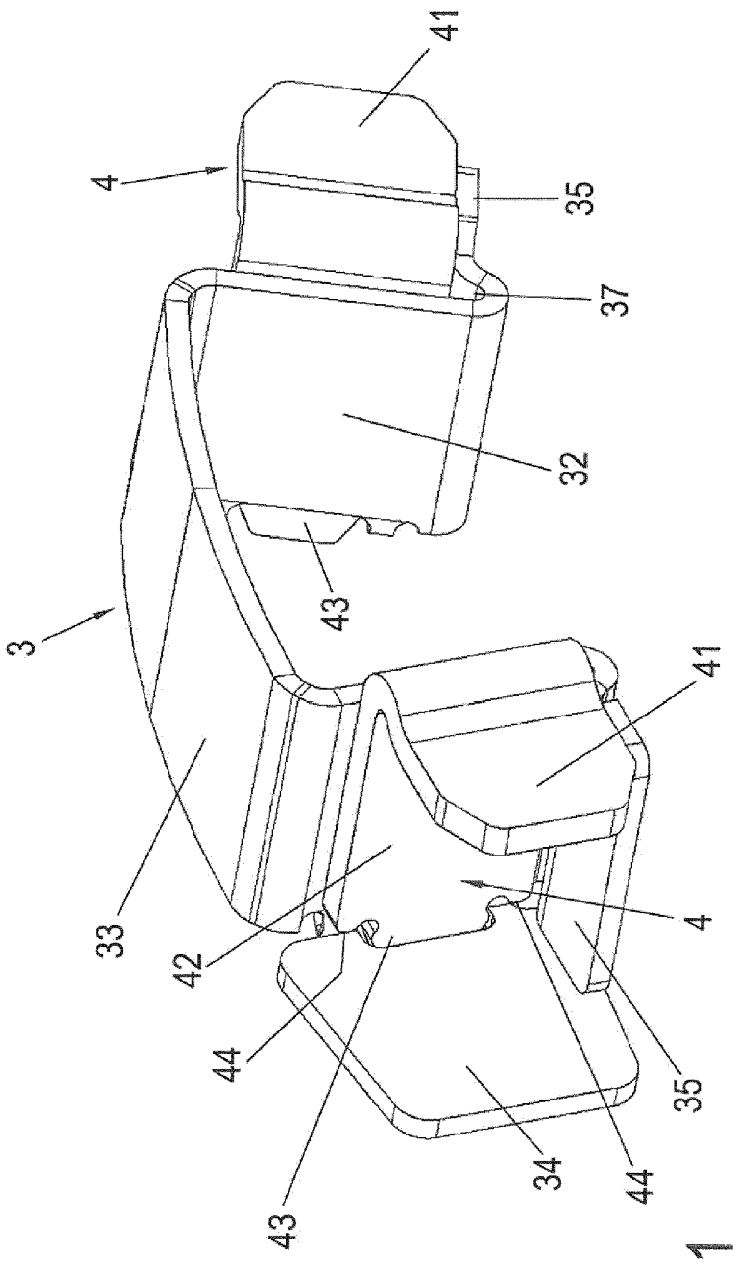


Fig. 21

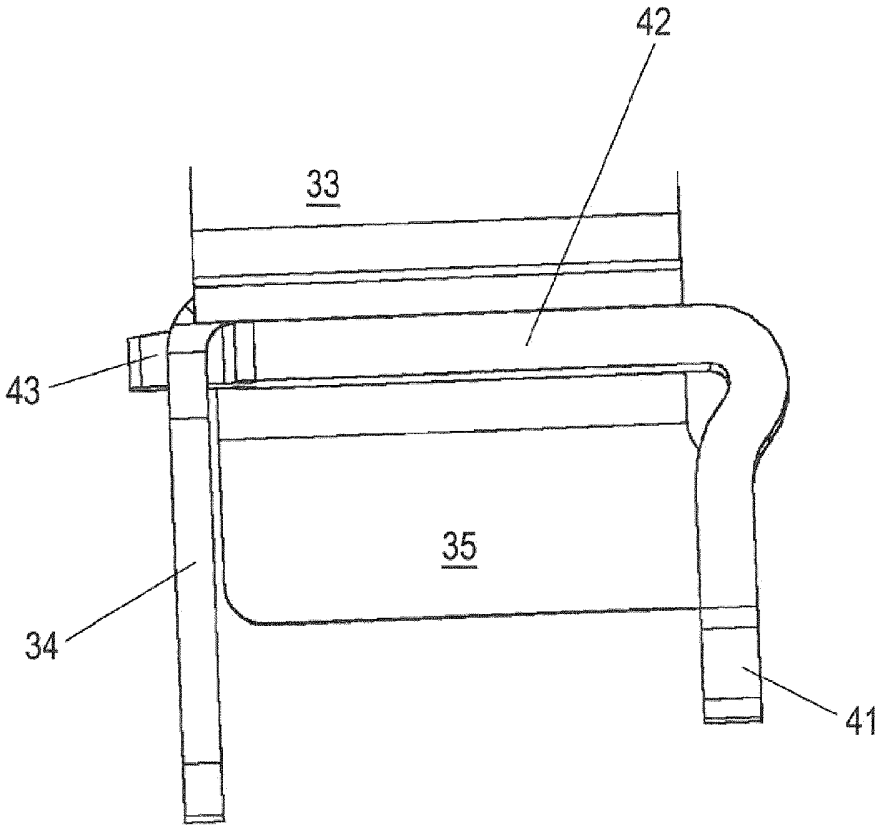


Fig. 22

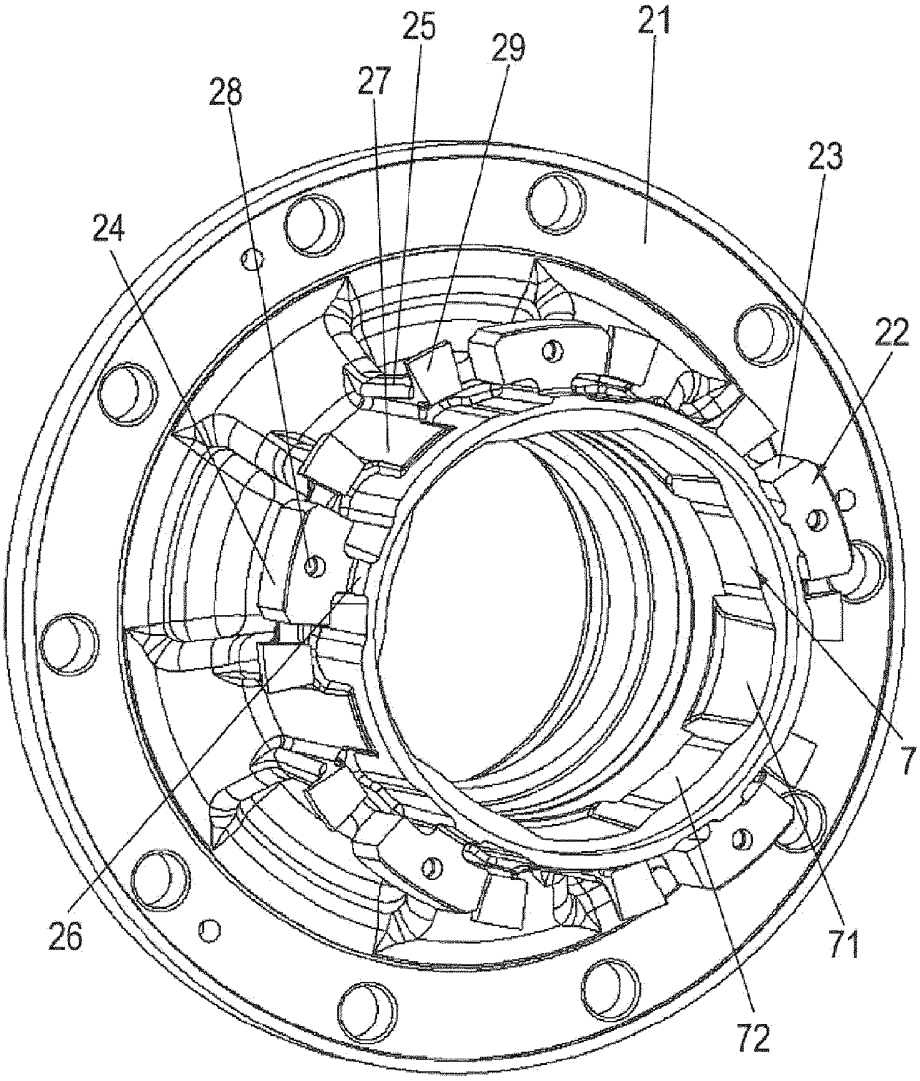


Fig. 23

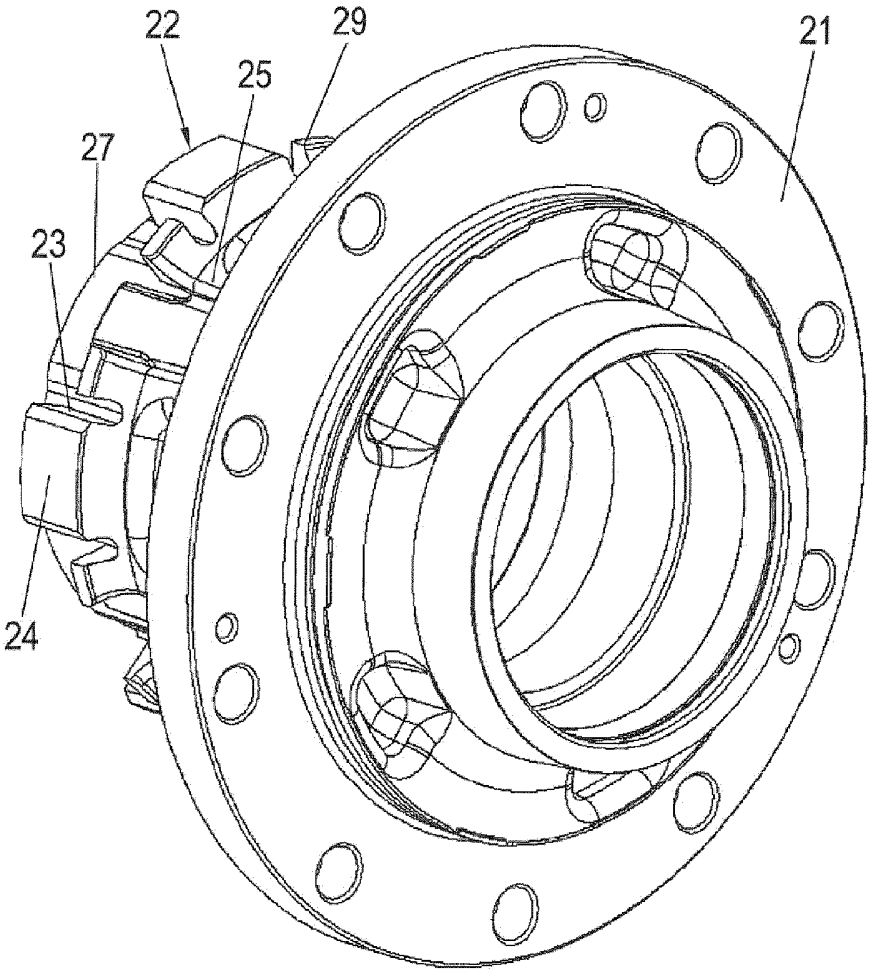


Fig. 24