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Erklärungen gemäß Regel 4.17:

— *hinsichtlich der Identität des Erfinders (Regel 4.17 Ziffer i)*
— *hinsichtlich der Berechtigung des Anmelders, ein Patent zu beantragen und zu erhalten (Regel 4.17 Ziffer ii)*
— *hinsichtlich der Berechtigung des Anmelders, die Priorität einer früheren Anmeldung zu beanspruchen (Regel 4.17 Ziffer iii)*
— *Erfindererklärung (Regel 4.17 Ziffer iv)*

[Fortsetzung auf der nächsten Seite]

(54) Title: GEAR WITH HELICAL TOOTHING, AND SEGMENT FOR A GEAR

(54) Bezeichnung : ZAHNRAD MIT SCHRÄGVERZAHNUNG UND SEGMENT FÜR EIN ZAHNRAD

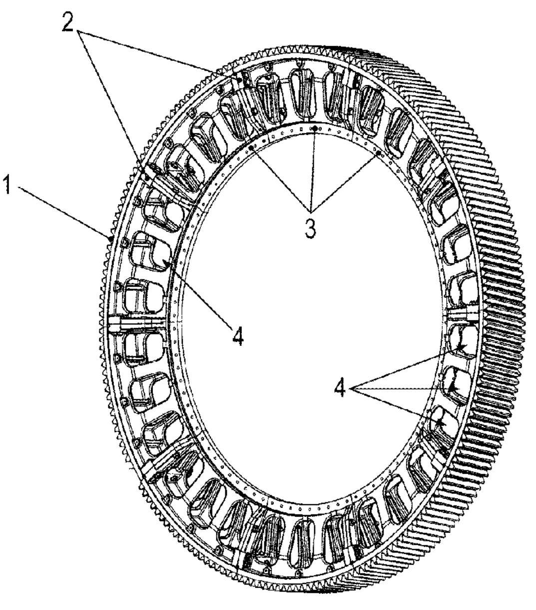

Fig. 1

(57) Abstract: The invention relates to a gear with helical toothing, said gear being assembled from segments. Each segment has a toothing section which has a helical toothing, and in each segment the toothing section is connected to the connection region via first (22) and second webs (23) and connection sections (2). The connection sections (2) and the first (22) and the second webs (23) are each spaced from one another or are spaced from one another at least in some sections, in particular such that the segment has multiple axially continuous recesses, in particular three or more recesses. In particular, the axial region covered by the first webs (22) is arranged at a distance from the axial region covered by the second webs (23), in particular such that the segment has at least one recess which is continuous in the circumferential direction.

(57) Zusammenfassung: Zahnrad mit Schrägverzahnung, welches aus Segmenten zusammengesetzt ist,wobei jedes Segment einen Verzahnungsabschnitt aufweist, der eine Schrägverzahnung aufweist, wobei bei jedem Segment der Verzahnungsabschnitt über erste (22) und zweite Stege (23) sowie Verbindungsabschnitte (2) mit dem Verbindungsbereich verbunden ist, wobei die Verbindungsabschnitte (2), die ersten (22) und die zweiten Stege (23) jeweils beabstandet voneinander sind oder zumindest abschnittsweise voneinander beabstandet sind, insbesondere so dass das Segment mehrere, insbesondere drei oder mehr, axial durchgehende Ausnehmungen aufweist, insbesondere wobei der von den ersten Stegen (22) überdeckte axiale Bereich beabstandet ist von dem von den zweiten Stegen (23) überdeckten axialen Bereich, insbesondere so dass das Segment zumindest eine in Umfangsrichtung durchgehende Ausnehmung aufweist.

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— *mit internationalem Recherchenbericht (Artikel 21 Absatz 3)*

Gear With Helical Toothing, and Segment for a Gear

Description:

TECHNICAL FIELD

The present invention relates to a gear with helical toothing and to a segment for a gear.

BACKGROUND ART

A segmented gear is known from the document WO 2013/020639 A1.

In some forms the gear or gear segment may have the benefit of reducing development of noise when toothings are in engagement.

It is to be understood that a reference herein to a prior art document does not constitute an admission that the document forms part of the common general knowledge in the art in Australia or in any other country.

SUMMARY

Disclosed is a gear with helical toothing, which is composed of segments, each segment has a toothing section with helical toothing, wherein the toothing section in each segment is connected to the connection region via first and second webs and via connecting sections, the connecting sections, and the first and the second webs are set apart from one another in each case or are at least regionally set apart from one another.

In some forms the gear or gear segment is configured in such a way that the segment has a plurality of axially uninterrupted recesses, for example three or more. The axial region covered by the first webs may be set apart from the axial region covered by the second webs, for example so that the segment has at least one uninterrupted recess in the circumferential direction.

In some forms this may mean that with the aid of the helical toothing, it is possible to transmit torque in a low-noise manner using a toothed part that is in engagement despite the fact that the gear is made up of segments.

For in a segmented gear according to the related art, the gear is made up of segments in the circumferential direction, and each segment represents a circumferential section, i.e. a circumferential angular region of the gear. In other words, the segment is cut out of the gear using a cutting plane that extends in the axial and in the radial direction from the direction of the gear axis. As a result, the toothing in the related art has to be implemented as a straight toothing because teeth would otherwise be cut and the risk of broken teeth would thus arise.

In contrast, the present disclosure provides a helical toothing on a toothing section. The toothing section is cut off or restricted along a tooth gap. This allows for a low-noise operation of the gear; however, the toothing section has a boundary surface that extends at a helix angle in accordance with the helix angle of the toothing. According to the present disclosure, such boundary surfaces of adjacent segments are spaced apart, i.e. developed without a force transmission, and the connection or the associated power flow is implemented only in the region of the contact faces that are disposed on the connecting sections.

The contact face is composed of flange surfaces in each case, which extend exclusively radially and axially, and thus not in the circumferential direction.

The flange surfaces of the respective segment therefore lie against corresponding flange surfaces of the most proximate segment. In other words, contact without backlash is realized in the circumferential direction, whereas no contact of surfaces is realized in the axial direction since the steps situated between the flange surfaces are set apart from one another by an air gap in each case. A positive contact is not realized in the radial direction either. A transmission of noise, its vibration mode, without essential losses is therefore able to take place from one segment to the most proximate segment in the circumferential direction, yet other vibration modes are heavily damped because there is no positive contact between the segments in the radial and in the axial direction. This makes it possible to keep the noise development to a minimum, in particular in comparison with a gear that is developed in one piece.

In one advantageous development, first and second webs, a toothing section, a connecting section and a connection region are developed in one part and/or as one piece in each segment. This is advantageous since the segment has a high load-bearing capacity and is able to be machined in a clamping setup so that the relative spacing of the bore holes also in relation to the toothing is able to be produced in a very precise manner.

In one advantageous development, the first and the second webs are developed in curved form, and may be in convexly curved form, the first webs may be axially bent toward the front, and the second webs may be axially bent toward the back. This has the advantage of

2016333343 17 Aug 2020

increasing the load-bearing capacity of the segment while requiring little material and thus little machining work.

In one advantageous further development, a first connecting section is disposed in the end region of the segment situated in front in the circumferential direction, and in some embodiments, a second connecting section is disposed in the end region of the segment situated in back in the circumferential direction, and the first connecting section has a contact face by which the segment is resting against the most proximate segment, in some embodiments against the corresponding contact face of the second connecting section of the most proximate segment, the contact face having a stepped design so that it includes at least three flange surfaces which are realized in flat, i.e. especially planar form, each flange surface being situated in a respective circumferential angular position and covering a respective axial region, these respective axial regions being situated at a distance from one another or, at most, being situated so as to adjoin one another, the respective axial regions in some forms not overlapping one another, the circumferential angular positions of the flange surfaces being spaced apart from one another and, in some forms, increasing strictly monotonically in the circumferential direction with an increasing axial position of the flange surfaces. This offers the advantage of simplifying the mutual alignment of the segments and of providing a positive engagement in the axial direction.

In one advantageous further refinement, the toothing is an external toothing, which has the advantage of being easy to produce.

In one advantageous development, the toothing section has a first boundary surface in its end regions disposed in the circumferential direction, the first boundary facing the adjacent segment and extending parallel to a tooth gap of the toothing, the first boundary surface may extend in the radial direction and along a helix whose screw axis is the gear axis and whose helix angle corresponds to the helix angle of the toothing. This is advantageous since it makes it possible to provide a helical toothing in the toothing section that extends without interrupted teeth and thus has a high load-bearing capacity.

In one advantageous further development, the toothing section projects beyond the connecting section in the circumferential direction, in some embodiments via a section that includes a section of the first boundary surface, and the toothing section, in some embodiments via another section that includes another section of the first boundary surface, has a smaller extension than the connecting section in the circumferential direction. This provides the advantage that the connecting section has a different cut or boundary than the toothing section in its end region situated in the circumferential direction. This is so because the connecting section is restricted at a circumferential position and thus extends via its end face only in the radial and the axial direction here; in contrast, the toothing section is restricted according to a helical toothing, i.e. it extends according to a helix and radially from the direction of the gear axis.

In one advantageous further refinement, the connecting section includes a second boundary surface, which extends in the circumferential direction and in the axial direction and is radially situated across from the radial inner side of the section of the toothing section of the adjacent segment projecting beyond the associated connecting section in the circumferential direction. This is advantageous because the connection is particularly easy to produce and can be implemented in an accurate manner.

In one advantageous further refinement, a first clearance is developed between the first boundary surfaces of two adjacent segments. This has the advantage that no direct force transmission takes place between the toothing sections of two adjacent segments.

In one advantageous further refinement, a second clearance is provided between the second boundary surface and the radial inner side of the projecting section of the toothing section of the adjacent segment. This offers the advantage that no direct force transmission takes place between the connecting section and the toothing section of the adjacent segment.

In one advantageous further refinement, the connecting section has a connection area against which the corresponding connection area of the adjacent segment is pressed with the aid of connecting screws. This has the advantage that the force transmission is carried out between the connecting sections, and a load-bearing connection is able to be implemented in a circumferential position. The respective flange surfaces contact one another and are able to be pressed against one another by the connecting screws for the force transmission.

In one advantageous further refinement, the respective flange surface extends in the radial and the axial direction but especially not in the circumferential direction, and, thus in some forms, is disposed at a single circumferential position in each case. This is advantageous since it allows the respective flange surface to be produced in an uncomplicated and economical manner.

In one advantageous further refinement, a second flange surface is situated between a first and a third flange surface in the axial direction, the first and the third flange surfaces each having a bore hole for a screw for the mutual alignment of the segments. This offers the advantage that an accurate alignment and a subsequent tightening of the screws is possible. As a result, a force transmission is able to take place between the connecting sections and not between the toothing sections.

In one advantageous further refinement, the webs are disposed at a smaller radial distance range than the toothing section. This has the advantage that the webs carry the radially placed toothing section, and the connecting screws for connecting the connecting sections of the adjacent segments do not break through the toothing of the gear or hamper it in some other manner since they are also disposed at a smaller radial distance than the toothing section and are able to be axially accommodated between the first and the second webs.

In one advantageous further refinement, the segment includes a connection region for the connection to a drum or a shaft, and the gear is situated at a greater radial distance than the drum or the shaft. This has the advantage that a drum may be provided with a large gear on its outer circumference so that a high torque is able to be transmitted.

In one advantageous further refinement, a respective step is situated between the flange surfaces that are most proximate to one another in the axial direction, and an axial clearance, i.e. in some forms an air gap, is present between the respective step of the segment and a corresponding step of the most proximate segment in each case. This is advantageous since it allows for an uncomplicated production.

In one advantageous further refinement, the quotient of the first clearance and the outer diameter of the gear is less than 0.0005, in some forms less than 0.00025, or even less than 0.000125, and/or the quotient of the second clearance and the outer diameter of the gear is less than 0.0005, in some forms less than 0.00025 or even less than 0.000125. This has the advantage of reliably avoiding a force transmission within the framework of the production tolerances and thermally induced expansions and of enabling a low-noise operation despite the clearances. The reason for this is that the clearances are located outside the engagement region of the teeth since the slot of the tooth gap produced by the clearances thus runs along the bottom of the tooth gap, for example.

Important features of the segment are that the segment is produced from ADI or GGG cast steel. This is advantageous since the toothing is able to withstand heavy loading because ADI is a material on the basis of cast iron and includes spheroidal graphite. High strength with excellent elongation, and high wear resistance with excellent, constant damping are achieved by a special thermal treatment.

The projecting region of the toothing section, i.e. the region that projects beyond the connecting section in the circumferential direction, thus has a high load-bearing capacity since ADI possesses high strength. As a result, the toothing in this region is able to withstand high loading despite the projecting region.

Additional advantages result from the dependent claims disclosed herein.

2016333343 17 Aug 2020

BRIEF DESCRIPTION OF THE FIGURES

Embodiment(s) will now be described by way of example only, with reference to the accompanying figures in which :

Figure 1 shows a gear with helical toothing, which is composed of identically developed segments that are situated one behind the other in the circumferential direction.

Figure 2 shows an oblique view of two of the segments that are detached from each other.

Figure 3 shows the first of the two segments.

Figure 4 shows a plan view of a tangential section in the connecting region of the two segments of the gear.

DETAILED DESCRIPTION

In the following detailed description, reference is made to accompanying drawings which form a part of the detailed description. The illustrative embodiments described in the detailed description, depicted in the drawings and defined in the claims, are not intended to be limiting. Other embodiments may be utilised, and other changes may be made without departing from the spirit or scope of the subject matter presented. It will be readily understood that the aspects of the present disclosure, as generally described herein and illustrated in the drawings can be arranged, substituted, combined, separated and designed in a wide variety of different configurations, all of which are contemplated in this disclosure.

The gear is thus composed of similarly developed segments, i.e. is made up of identical segments.

Each segment includes a toothing section 1, which is developed as a cylinder envelope section provided with an external toothing.

Since ten segments are used in the circumferential direction for assembling the gear, toothing sections 1 resemble toothed rack segments, the rack having a shape that is curved according to the cylinder envelope of a cylinder corresponding to the gear.

The mentioned circumferential direction in this case relates to the gear, and thus is the circumferential direction of the gear. The radial clearance is related to the center of the gear, i.e. is able to be determined as the distance from the axis of rotation of the gear. The axial direction is a direction that is oriented parallel to the direction of the axis of rotation.

Toothing sections 1 are therefore able to be manufactured by producing an envelope section of a hollow cylinder and introducing a toothing in its outer side. In the axial direction, the envelope section is delimited by two planes, i.e. in some forms end face sections of the gear, whose normal is aligned parallel to the axis direction of the gear, that is to say, the axial direction. In addition, in the circumferential direction, toothing section 1 is delimited by a boundary surface 40 and a flange surface that includes a plurality of flange sections (24, 25, 26, 27, 28, 29). Adjoining the boundary surface 40 is boundary surface 41, whose normal is aligned in the radial direction.

A connecting region 3, which extends in the circumferential direction, is provided on the radial inner side of the segment for mounting on the outer surface of a drum.

Toothing section 1 is connected to connecting region 3 via webs (22, 23) in each segment. First webs 22 are axially disposed in front, and second webs 23 are axially situated in back, or in other words, first webs 22 are axially set apart from second webs 23. Exactly one second web 23 may be allocated to each first web 22, said first web 22 and the respective allocated second web 23 being situated in the same circumferential angular region in each case.

First webs 22 are spaced apart from one another at regular intervals in the circumferential direction, i.e. in the circumferential direction of the gear. As a result, second webs 23 are spaced apart from one another at regular intervals in the circumferential direction, i.e. in the circumferential direction of the gear.

A separate recess, which is developed in uninterrupted form in the axial direction, is situated between two most proximate first webs 22 in each case.

A separate recess, which is developed in uninterrupted form in the axial direction, is situated between two most proximate second webs 23 in each case.

In addition, first webs 22 and second webs 23 include a bending region in each case so that they are developed in axially outwardly bent form, and thus have a convex development. This enlarges the hollow space developed in the segment axially between the first and the second webs (22, 23) and therefore makes it suitable for accommodating large connecting screws and for providing a sufficiently sized free space region, which is also adequately developed to implement the screwed connection to be established with the aid of the connecting screws, for example.

The hollow space is developed in such a way that it extends through the segment in uninterrupted form also in the circumferential direction. Due to the described development of the first and the second webs (2, 23) **[22, 23]**, the hollow space is also uninterrupted in the axial direction, at least in the angular position regions that are not covered by the webs (22, 23) and the connecting sections 2.

Connecting section 2 of a first segment situated in front in the circumferential direction is resting against connecting section 2 of a further segment disposed in back in the circumferential direction.

The contact face disposed in front in the circumferential direction has a stepped design so that it is made up of three flange surfaces (24, 25, 26), which are developed, in flat, i.e. planar form, in each case. Each flange surface (24, 25, 26) is disposed in a respective circumferential angular position and covers a respective axial region. These respective axial regions are set apart from one another, or at most adjoin one another. As a result, the respective axial regions do not overlap. The circumferential angular positions of the flange surfaces (24, 25, 26) are set apart from one another and increase in the circumferential direction with an increasing axial position of the flange surfaces (24, 25, 26).

The contact face disposed in back in the circumferential direction is stepped accordingly so that its flat, i.e. planar, flange surfaces (27, 28, 29) rest against a respective flange surface (24, 25, 26) of the most proximate segment in each case.

The flange surfaces (24, 25, 26, 27, 28, 29) are provided with bore holes 20 for connecting screws, and the axially outer flange surfaces (24, 26, 27, 29) have at least one bore hole 21 for centering screws or screws for aligning the segments relative to one another.

As a result, it is possible that flange surface 24 rests against flange surface 29, flange surface 25 rests against flange surface 28, and flange surface 26 rests against flange surface 27, and the segments are able to be aligned relative to one another with the aid of the centering screws. The segments are then connected to one another by introducing the connecting screws.

The aforementioned hollow space, which is uninterrupted in the circumferential direction and at least partially also in the axial direction, offers sufficient space for executing the screw connections, i.e. for placing and operating the screw heads with the aid of a tool. The bulbous, i.e. convex, development of webs 22 also enlarges this space.

As illustrated in Figure 4 by tangentially sectioned segments, the contact area between connecting sections 2 of the two segments runs monotonically in the axial direction, but not strictly monotonically in the circumferential direction, especially also within the sectional plane of the illustration in Figure 4. A gap, which may be in the form of an air gap, is situated between the steps. As a result, there is an air gap between the step that is situated between flange surface 24 and flange surface 25, and the step that is situated between flange surface 29 and flange surface 28 so that the two steps are slightly set apart from one another in the axial direction.

Boundary surface 40 of toothing section 1 of the segment also lies against and contacts a corresponding boundary surface 40 of toothing section 1 of the most proximate segment.

Thus, the adjacent segment is screwed to connecting section 2 of a respective segment by way of its corresponding connecting section 2. Connecting section 2 extends in the radial and the axial direction. Entire connecting section 2 is therefore located in a circumferential winding (e.g., angular) region.

Bore holes (20, 21) oriented in the circumferential direction are situated in the connection surface. Bore holes 20 are provided for the introduction of screws by which the respective adjacent segments are pressed against one another. In addition, at least one bore hole 21 for the introduction of a screw for the relative mutual alignment of the segments is also provided, which means that the segments are able to be aligned before the connecting screws are tightened. After the alignment has been carried out, the connecting screws are firmly screwed in and the relative position of the segments is permanently secured in this way.

On its radially outer side, toothing section 1 has a toothing, which is developed as a helical toothing. Boundary surface 40 by which toothing section 1 of the segment adjoins the corresponding adjacent segment is developed along a gap in the toothing. As a result, boundary surface does not cut into any of the teeth. Boundary surface 40 thus extends according to the helical toothing, i.e. a helix section, and in the radial direction. It may be considered to be flat in a first approximation.

However, since the flange surfaces (24, 25, 26, 27, 28, 29) of connecting sections 2 are oriented in a purely radial and axial direction, toothing section 1 regionally projects beyond

2016333343 17 Aug 2020

connecting section 2. Toothing section 1 therefore projects beyond flange surface 26 in the circumferential direction at least in a first axial region; in a second axial region, toothing section 1 is recessed in the circumferential direction so that boundary surface 41 is visible. Boundary surface 41 extends in the axial direction and in the circumferential direction, and thus has a single radial clearance.

The segments are toleranced and implemented in such a way that two adjacent segments establish contact at their flange surfaces (24, 25, 26, 27, 28, 29) but a clearance exists in the region of boundary surfaces 40 and 41. A clearance of less than 1mm, and especially of less than 0.5mm is preferably maintained here given an outer diameter of the gear, composed of the segments, of more than 2 meters, and in particular of more than 4 meters. Therefore, the quotient of the clearance and the outer diameter is less than 0.0005, and in particular less than 0.00025 or even 0.000125.

Thermally induced and/or installation-related changes in the clearance are also able to be tolerated in this way because the force-transmitting flange surfaces (24, 25, 26, 27, 28, 29) fully take up the forces to be conducted between the adjacent segments.

The projecting part of toothing section 1 covers boundary surface 41 of the adjacent segment, in particular in the radial direction.

In the same way, boundary surfaces 40 of two adjacent segments in each case are situated opposite one another when viewed in the circumferential and also the axial direction.

In further exemplary embodiments of the present disclosure, the gear is not implemented as a helical toothing but as a straight toothing, in which case boundary surface 41 may be omitted. Nevertheless, an air gap, although a very narrow air gap, once again remains between mutually facing boundary surfaces 40 of the respective most proximate segments.

While the technology has been described in reference to its embodiments, it is to be understood that the words which have been used are words of description rather than limitation and that changes may be made without departing from its scope as defined by the appended claims.

In the claims which follow and in the preceding description, except where the context requires otherwise due to express language or necessary implication, the word “comprise” or variations such as “comprises” or “comprising” is used in an inclusive sense, i.e. to specify the presence of the stated features but not to preclude the presence or addition of further features in various embodiments of the technology.

2016333343 17 Aug 2020

List of Reference Numerals

1 toothing section

2 connecting section

3 connection region for drum

4 recess

20 bore hole for connecting screws

21 bore hole for centering screws or screws for the alignment

22 web, in particular axially in front

23 web, in particular axially in back

24 flat flange surface

25 flat flange surface

26 flat flange surface

27 flat flange surface

28 flat flange surface

29 flat flange surface

40 boundary surface

41 boundary surface

Claims:

1. A gear with helical toothing, which is composed of segments,

each segment having a toothing section with a helical toothing,

wherein

the toothing section in each segment is connected to a connection region via first and second webs and via connecting sections,

the connecting sections, and the first and the second webs are set apart from one another in each case, or are at least regionally set apart from one another,

the segment having a plurality of axially uninterrupted recesses,
and an axial region covered by the first webs being set apart from an axial region covered by the second webs, such that the segment has at least one recess that is uninterrupted in the circumferential direction; wherein the first and the second webs are developed in curved form.

2. The gear as recited in claim 1,
wherein in each segment, first and second webs, a toothing section, connecting sections, and a connection region are developed in one part and/or as one piece.

3. The gear as recited in claim 1 or claim 2, wherein the first and second webs are in convexly curved form, the first webs being curved axially frontwardly, and the second webs being axially curved rearwardly.

4. The gear as recited in at least one of the preceding claims,
wherein a first connecting section is situated in a end region of the segment that is situated in front in the circumferential direction, and a second connecting section is situated in a end region of the segment that is situated in back in the circumferential direction, and the first

2016333343 17 Aug 2020

connecting section has a contact face by which the segment rests against against a corresponding contact face of the second connecting section of a most proximate segment.

5. The gear as recited in claim 4, wherein the contact face has a stepped design so that it includes at least three flat, i.e. especially planar, flange surfaces, each one of the flange surfaces being disposed in a respective circumferential angular position and covering a respective axial region, and these respective axial regions are set apart from one another or are situated so as to adjoin one another.

6. The gear as recited in claim 5, wherein the respective axial regions do not overlap one another, the circumferential angular positions of the flange surfaces being set apart from one another, and increasing evenly in the circumferential direction with an increasing axial position of the flange surfaces.

7. The gear as recited in at least one of the preceding claims,
wherein the toothing is an external toothing.

8. The gear as recited in at least one of the preceding claims,
wherein the toothing section has a first boundary surface in its end regions disposed in the circumferential direction, the first boundary surface facing an adjacent segment and extending parallel to a tooth gap of the toothing.

9. The gear as recited in claim 8,
wherein the first boundary surface extends in the radial direction and along a helix whose screw axis is the gear axis and whose helix angle corresponds to the helix angle of the toothing.

10. The gear as recited in at least one of the preceding claims,
wherein the toothing section projects beyond the connecting section in the circumferential direction, in particular by a section that includes a section of the first boundary surface, the toothing section having a smaller extension than the connecting section in the circumferential direction.

11. The gear as recited in at least one of the preceding claims,
wherein the connecting section has a second boundary surface, which extends in the circumferential direction and in the axial direction and lies radially across from a radial inner side of the section of the toothing section of the adjacent segment that projects beyond an associated connecting section in the circumferential direction.

2016333343 17 Aug 2020

12. The gear as recited in at least one of the preceding claims,
wherein a first clearance is implemented between the first boundary surfaces of two adjacent segments.

13. The gear as recited in at least one of the preceding claims,
wherein a second clearance is provided between the second boundary surface and the radial inner side of the projecting section of the toothing section of the adjacent segment.

14. The gear as recited in at least one of the preceding claims,
wherein the connecting section has a contact face against which the corresponding contact face of the respective adjacent segment is pressed with the aid of connecting screws.

15. The gear as recited in at least one of the preceding claims,
wherein each of the flange surfaces of the contact face extends in the radial direction and in the axial direction, but not in the circumferential direction, and thus is disposed in a respective single circumferential position.

16. The gear as recited in at least one of the preceding claims,
wherein a second flange surface is situated in the axial direction between a first and a third flange surface, the first and the third flange surfaces each having a bore hole for a screw for the mutual alignment of the segments.

17. The gear as recited in at least one of the preceding claims,
wherein the connecting section is disposed at a smaller radial distance range than the toothing section.

18. The gear as recited in at least one of the preceding claims,
wherein the connecting region is connected to a drum or a shaft, and the gear is disposed at a greater radial distance than the drum or the shaft.

19. The gear as recited in at least one of the preceding claims,
wherein the segment is produced from ADI or GGG steel cast.

20. The gear as recited in at least one of the preceding claims,

wherein a step is disposed between mutually most proximate flange surfaces in the axial direction, and an axial clearance exists between a respective step of the segment and a respective step of the respective most proximate segment.

21. The gear as recited in at least one of the preceding claims,
wherein a quotient of the first clearance and an outer diameter of the gear is less than 0.0005.

22. The gear as recited in at least one of the preceding claims wherein
a quotient of the second clearance and an outer diameter of the gear is less than 0.0005.

23. The gear as recited in any one of the preceding claims, wherein a quotient of the first clearance and an outer diameter of the gear is less than 0.00025.

24. The gear as recited in any one of the preceding claims, wherein a quotient of the second clearance and an outer diameter is less than 0.00025.

25. The gear as recited in any one of the preceding claims, wherein a quotient of the first clearance and an outer diameter of the gear is less than 0.000125.

26. The gear as recited in any one of the preceding claims, wherein a quotient of the second clearance and an outer diameter is less than 0.000125.

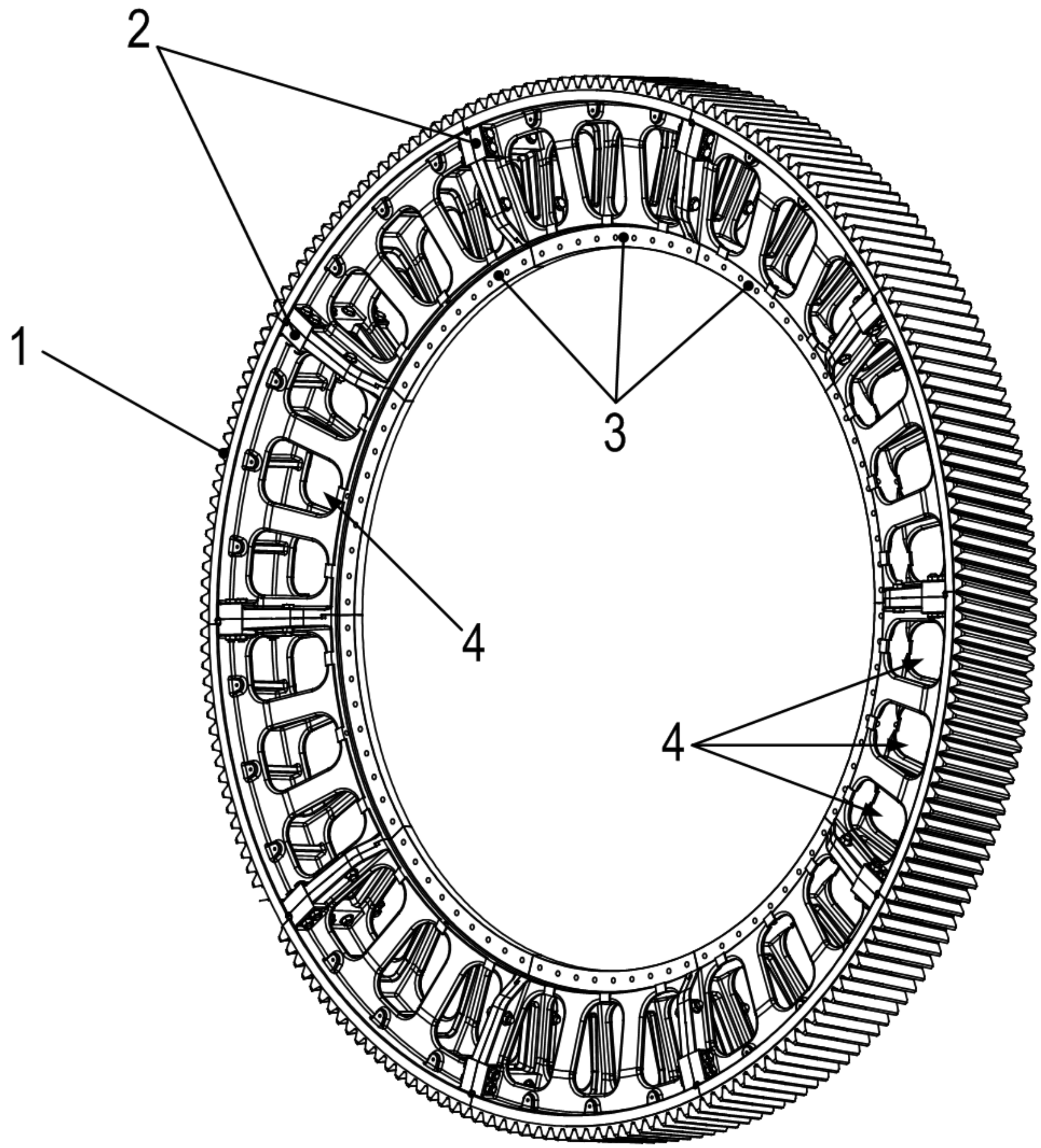

Fig. 1

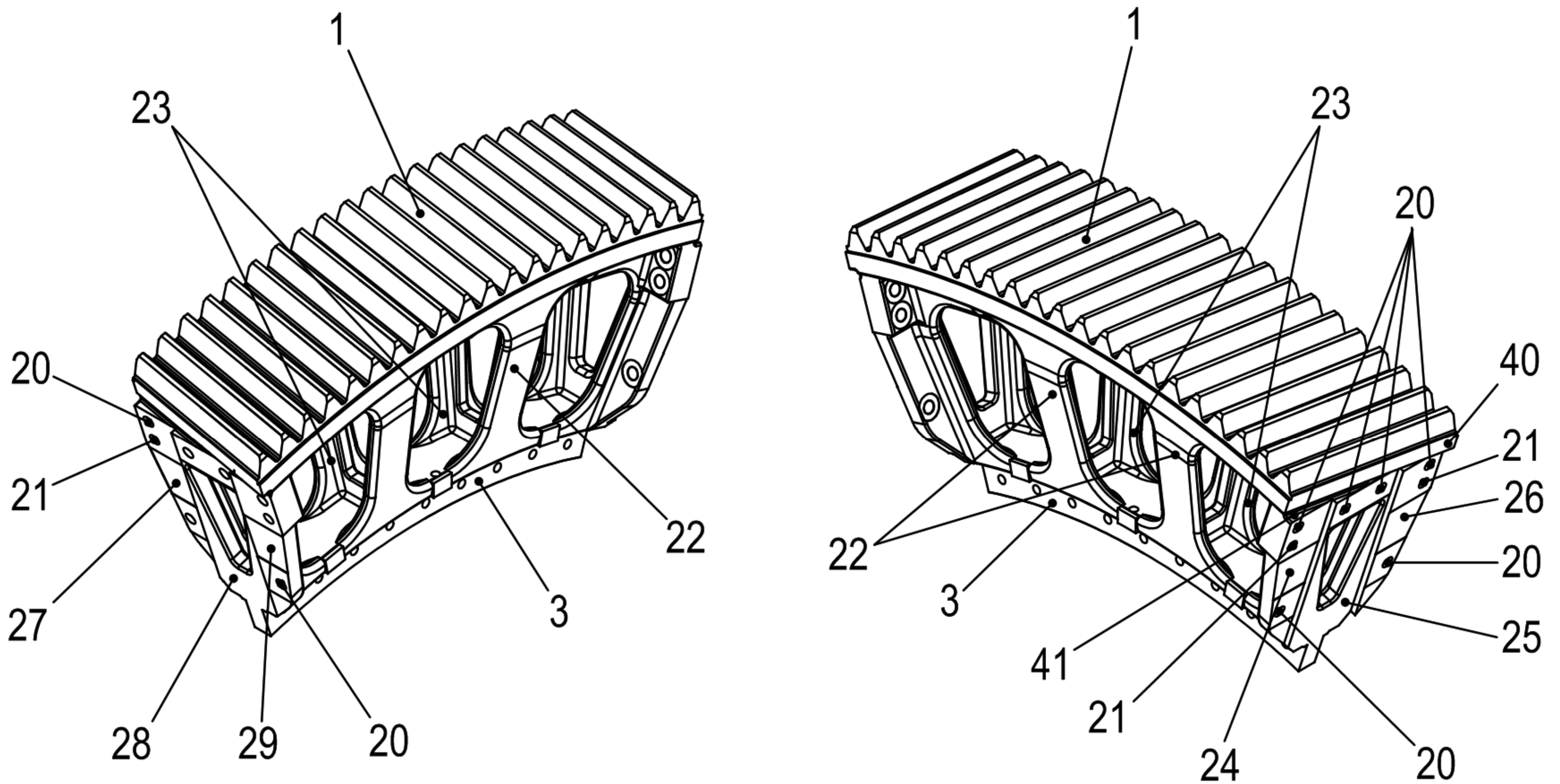

Fig. 2

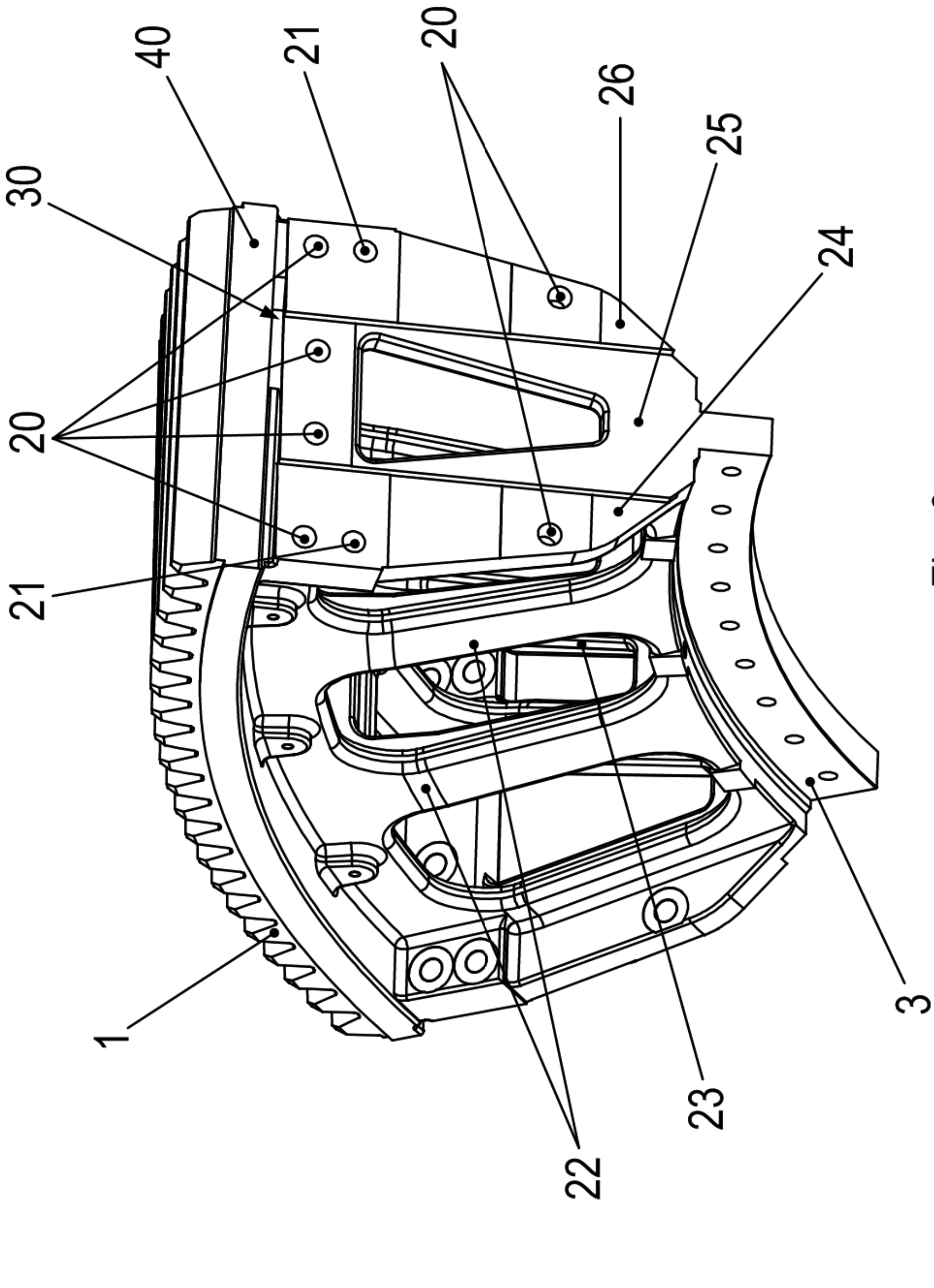

Fig. 3

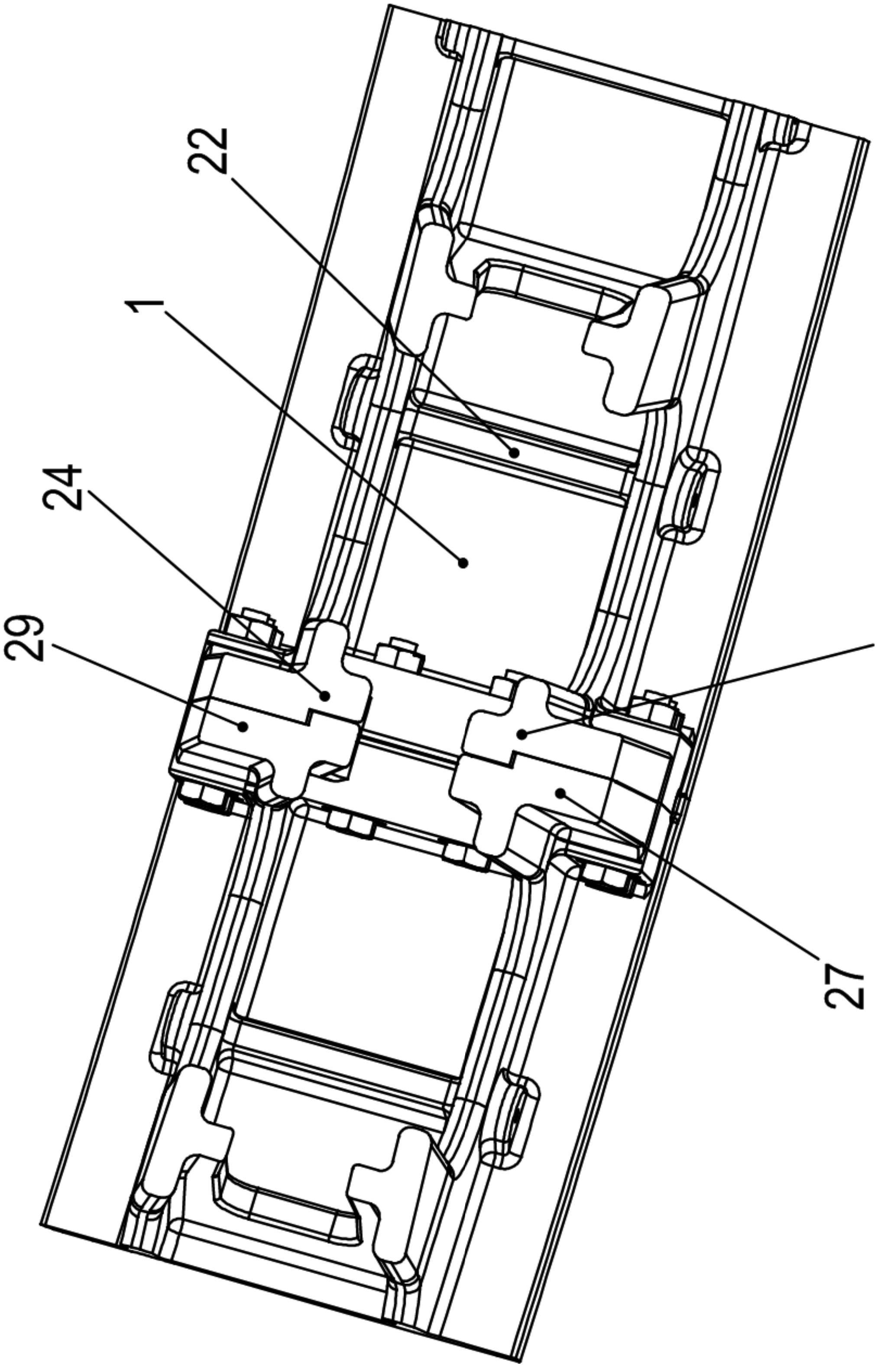

Fig. 4