HU000033523T2

(19) **HU**

(11) Lajstromszám: **E 033 523**

(13) **T2**

MAGYARORSZÁG
Szellemi Tulajdon Nemzeti Hivatala

EURÓPAI SZABADALOM
SZÖVEGÉNEK FORDÍTÁSA

(21) Magyar ügyszám: **E 12 784262**
(22) A bejelentés napja: **2012. 11. 13.**

(96) Az európai bejelentés bejelentési száma:
EP 20120784262
(97) Az európai bejelentés közzétételi adatai:
EP 2791539 A1 **2013. 06. 20.**
(97) Az európai szabadalom megadásának meghirdetési adatai:
EP 2791539 B1 **2017. 03. 29.**

(51) Int. Cl.: ***F16D 65/12*** *(2006.01)*

(86) A nemzetközi (PCT) bejelentési szám:
PCT/EP 12/072472
(87) A nemzetközi közzétételi szám:
WO 13087322

(30) Elsőbbségi adatok:
202011052265 U **2011. 12. 12.** **DE**

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(54) **Szerelt tengely féktárcsa**

Az európai szabadalom ellen, megadásának az Európai Szabadalmi Közlönyben való meghirdetésétől számított kilenc hónapon belül, felszólalást lehet benyújtani az Európai Szabadalmi Hivatalnál. (Európai Szabadalmi Egyezmény 99. cikk(1))

A fordítást a szabadalmas az 1995. évi XXXIII. törvény 84/H. §-a szerint nyújtotta be. A fordítás tartalmi helyességét a Szellemi Tulajdon Nemzeti Hivatala nem vizsgálta.

ASSEMBLED AXLE BRAKE DISC

SZTNH-100055514

Description

The present invention relates to an assembled axle-mounted brake disc having a hub and two friction rings which are arranged parallel and spaced apart with respect to each other.

Assembled axle-mounted brake discs are used in particular for rail vehicles and, as a result of the assembled form of the axle-mounted brake discs, they may be composed of a plurality of single components.

An assembled axle-mounted brake disc is in this instance intended to be understood to be an axle-mounted brake disc which is assembled from at least two components. In particular, an assembled axle-mounted brake disc is intended to describe a brake disc which has two friction rings which are not formed in one piece and in a structurally uniform manner with each other, for example, as known in an initial shaping method, but which are instead provided individually and preferably assembled by means of additional elements to form a friction ring pair by means of joining techniques. The hub may in this instance be joined during assembly to the friction ring pair as an additional individual component.

There are known, for example, axle-mounted brake discs which have a hub on which two friction rings are fitted parallel and with spacing with respect to each other. Between the friction rings, there may be connection elements which are constructed to absorb axially acting liner pressing forces. In particular with heavy rail vehicles, the liner pressing forces which are applied by the brake rod assembly via the brake liners to the friction ring pair may reach very high values. There is therefore the requirement to construct axle-mounted brake discs with connection elements which are arranged between the friction rings in a correspondingly rigid manner and so as to be able to withstand high mechanical loads.

Furthermore, a good heat discharge is required and there is often provision for there to be produced between the friction rings an air flow which, for example, flows onto the axle-mounted brake disc axially at the hub side and flows away radially at the outer side. As a result of this air throughflow, the brake disc can be cooled as a result of thermal convection between the friction rings, and the air flow is produced by means of the rotation of the axle-mounted brake disc about the rotation axis thereof. In particular with cast axle-mounted brake discs, there are known between the friction rings cast geometries which imitate the geometry of a radial ventilator so that the corresponding air throughflow is produced by the axle-mounted brake disc.

In particular, assembled axle-mounted brake discs are known in the form of ceramic brake discs which have friction rings of a ceramic material, but generally of a material from the group of carbons. Often, the hub of such non-metal brake discs is produced from a steel material and complex connection geometries are required in order to prevent heat-related distortions between the ceramic or carbon material and the metal hub for receiving the friction rings.

Prior Art

DE 195 07 922 C2 discloses an assembled axle-mounted brake disc which has two friction rings which are arranged on a hub parallel and spaced apart with respect to each other. Between the friction rings there is a

ventilator insert which serves to improve the cooling at the inner side of the friction rings. However, the ventilator insert shown is unsuitable for absorbing axially acting liner pressing forces for the braking operation, and axial forces which act as a result of the brake calliper via the brake liners on the friction rings have to be absorbed via the connection of the friction rings to the hub. There is therefore produced an axle-mounted brake disc construction which can withstand rather less mechanical loading.

DE 195 43 799 A1 discloses another assembled axle-mounted brake disc and connection elements extend between friction rings which are produced from a material of the group of carbons in order to absorb the high axially acting liner pressing forces. Such a construction is known for assembled axle-mounted brake discs with friction rings which are produced from ceramic material or a material from the group of carbons. The assembled form of the axle-mounted brake disc is used in particular since materially engaging connections between the friction rings of a material from the group of carbons having a hub which is generally produced from a steel material cannot be used in a simple manner. Consequently, screw connections or other non-positive-locking or positive-locking connection techniques are used, wherein in the assembly joint between the friction rings and the hub there are still often arranged elements which compensate for the different thermal expansion between the hub of a steel material and the friction rings of ceramic material or a material from the group of carbons, for example, formed by means of sliding blocks.

In particular when a rigid, highly durable, solid connection is used between the friction rings, there is the disadvantage of a high degree of space filling between the friction rings, by means of which the ventilation of the axle-mounted brake disc is again impeded.

Statement of invention: Problem, Solution, Advantages

An object of the present invention is therefore to provide an assembled axle-mounted brake disc with friction rings which can withstand high mechanical loads and which enables good internal ventilation.

This object is achieved based on an assembled axle-mounted brake disc having a hub and friction rings according to the prior art with the characterising features of claim 1 and the characterising features of claim 11. Advantageous developments of the invention are set out in the dependent claims.

The invention includes the technical teaching that an insert element with arms which extend radially outwards in a star-like manner is arranged between the friction rings.

As a result of the arrangement according to the invention of an insert element which has arms which extend radially outwards in a star-like manner, an axle-mounted brake disc with a high mechanical durability is provided since the insert element can be formed from a solid body, preferably produced from a steel material. If liner pressing forces act on the friction rings when the axle-mounted brake disc is actuated, these forces can be absorbed without significant resilient deformations by the solid structure type of the friction rings in the assembly with the insert element. On the other hand, however, the insert element is, in spite of the high level of axial rigidity of the axle-mounted brake disc, configured for good internal ventilation of the axle brake disc since the co-rotating arms of the insert element bring about a good ventilation of the axle-mounted brake disc.

Furthermore, there may be provided support bolts which are arranged in addition to the insert element between the friction rings. In this instance, the support bolts must not have any connection to the insert element, in particular to the arms of the insert element. For example, the support bolts may be arranged between the arms

of the insert element, preferably in order to produce a tangential air flow between the friction rings in addition to a radial air flow produced by the arms. In this instance, the support bolts may, for example, have a cylindrical structure and, in addition to the supporting function for further absorbing liner pressing forces on the friction rings, take on a cooling function.

The friction rings may preferably also be constructed from a steel material, but with a material from the group of carbons also being able to be used for the friction rings. In a particularly advantageous manner, the friction rings may be constructed from a heat-resistant steel material, whereas for the insert element a cost-effective tempering steel may be selected.

In order to provide a simple, low-cost and rapid production of the assembled axle-mounted brake disc, according to another advantage of the invention there is provision for the friction rings to be soldered to the insert element. The solder may be arranged in the form of a paste or a film in the joints between the insert element and the friction rings. The soldering may be carried out as hard soldering and in a particularly preferred manner as high-temperature soldering, wherein in particular the high-temperature soldering can be carried out under reduced pressure or under a protective gas atmosphere. If the high-temperature soldering is carried out under a protective gas atmosphere, it is possible to use in particular nitrogen as a protective gas. In particular the connection between the support bolts and the inner sides of the friction rings may also have a solder connection and the bolts may be placed in a flush manner on the inner surface of the friction rings without the support bolts having to be received in holes in the friction rings.

As an alternative to the connection technique of soldering, the connections between the insert element or the support bolts and the friction rings may also have screw connections, rivet connections or, for example, weld connections.

With the assembly comprising the insert element and the friction rings, there is produced a friction ring pair which can be handled individually without the hub. In particular the friction ring pair which is provided as an individual replacement part affords the advantage that with a hub which can be mounted, for example, on an axle in a rail vehicle, an old friction ring pair can be replaced with a new friction ring pair.

In a further advantageous manner, for connection between the friction ring pair and the hub, there may be provision for the connection to be produced between the insert element and the hub. The connection between the insert element and the hub may, for example, be produced by means of a plurality of screw connections, wherein the insert element has an internal opening in which the hub is arranged and connected to the insert element.

In order to form the screw connections, the insert element may have a plurality of holes. and there may be provided on the hub a plurality of radially outwardly directed protrusions, which are also constructed with holes. In order to produce the screw connections, there may be used screw elements which are guided both through the holes in the insert element and through the holes in the protrusions on the hub. For example, nine screw connections which are equally spaced apart from each other may be arranged in a state distributed on the periphery between the hub and the opening in the insert element.

According to another advantage, one, preferably a plurality, and in a particularly preferred manner, three screw connections may be constructed with a sliding block in order to position the insert element with the friction rings on the hub. The sliding blocks may be located with one body portion in a pocket which is milled in

the protrusion of the hub, with another body portion the sliding block may be inserted into a centering hole which is arranged on the insert element. Alternatively, it is advantageously possible to insert the sliding blocks in pockets which are arranged at the inner side on the insert element.

It is further advantageous for the screw connections to comprise screw nuts which are screwed to the screw elements when they are guided through the holes in the insert element and in the protrusions of the hub. It is also advantageous to use a retention ring against which the screw nuts are tensioned. The retention ring may have an annular shape and there are introduced in the ring a number of holes through which the screw elements are guided. Subsequently, the screw nuts can be screwed onto the ends of the screw elements and tensioned against the retention ring, in particular using clamping discs.

The insert element may have a planar extent and, for example, the insert element may have approximately double the thickness of a friction element. Centrally in the insert element there may be introduced an opening which is constructed to be circular and which extends centrally around the rotation axis of the axle-mounted brake disc. The insert element may substantially be constructed from a base portion and the arms extend in a radially outward direction from the base portion. The insert element thereby forms a star and the arms form the significant supporting members between the friction rings in order to absorb the liner pressing forces acting in an axial direction on the axle-mounted brake disc. The friction rings also have a hub-side opening in which the hub is inserted. The base portion of the insert element may in this instance have a maximum diameter which is smaller than the central opening in the friction rings. Consequently, only the arms of the insert element extend between the friction rings.

For example, the insert element may comprise from 6 to 30, preferably from 12 to 24 and in a particularly preferred manner 18 arms, wherein there may be provided arms with a broad form and arms with a narrow form which are in particular alternately arranged in broad and narrow form on the base portion of the insert element. Consequently, an arm of a broad form is adjoined at both sides by arms of a narrow form and arms with the narrow form are adjoined at both sides with arms of the broad form. Consequently, nine arms of the narrow form and nine arms of the broad form may be arranged on the base portion of the insert element.

In particular in order to improve the ventilation for the inner ventilation of the axle-mounted brake disc, it is advantageous for a portion of the plurality of arms, in particular a portion of the arms of the narrow form, to be separated from the base portion. Consequently, only the arms of the broad form form a connection between the friction ring pair with the insert element and the hub. The separation of the arms from the base portion is carried out by removing material of the base portion so that, for example, the webs which extend between the arms and the central opening in the base portion of the insert element are removed. The removal of the webs may, for example, be carried out by means of a milling processing operation, but also by means of laser beam cutting or by means of water jet cutting. Consequently, the arms of the narrow form may extend from the outer side of the friction rings as far as the inner side of the friction rings, and the arms of the broad form may extend from the outer side of the friction rings as far as the fixing on the protrusions of the hub.

The insert element may be formed by two part-elements which adjoin each other in a planar manner and which are in particular soldered to each other so that the part-elements may have a starting material which has only half the thickness of the insert element and the part-elements may also be connected to each other by means of a hard soldering operation or by means of a high-temperature soldering operation.

The object of the present invention is further achieved by a method for producing an axle-mounted brake disc having a hub and two friction rings which are arranged parallel and with spacing with respect to each other. The method makes provision in this instance for at least the steps of providing a planar insert element with arms which extend radially outwards in a star-like manner and joining the friction rings at the planar sides of the insert element so that the insert element is arranged between the friction rings, and furthermore the step of joining the insert element to the hub is provided.

The joining of the friction rings to the insert element may be carried out by means of a soldering operation, preferably by means of a hard soldering operation and in a particularly preferred manner by means of a high-temperature soldering operation under reduced pressure or under a protective gas atmosphere. In particular, the insert element and/or the friction rings may be thermally processed, wherein the thermal processing can be carried out in particular in combination with the method step of hard soldering or high-temperature soldering under reduced pressure or under a protective gas atmosphere.

Firstly, the friction rings and/or the insert element may be cut out from sheet metal strips by means of a thermal and/or an abrasive separation method, in particular by means of laser beam cutting or by means of water jet cutting. In this instance, the insert element may be provided from two part-elements which are constructed identically to each other and which are arranged one on the other in a plane-parallel manner. In this instance, the part-elements may also be connected to each other by means of a soldering operation. Alternatively, the production can be carried out from round material of diameter 640 sawn to the corresponding thickness.

When the friction rings and the insert element are produced, holes may be provided in the friction rings and in the insert element by means of the laser beam cutting or by means of the water jet cutting and, when the friction rings and the insert element are placed one on the other in their assembly arrangement, clamping pins may be guided through the holes. A centring of the friction rings on the insert element is thereby achieved and after solder has been arranged in the joints between the part-elements of the insert element and between the friction rings and the insert element, the assembly can be transferred from the insert element and the friction rings into a vacuum furnace. This can heat the friction rings and the insert element to a soldering temperature of, for example, from 1050°C to 1070°C and the temperature is maintained until the solder melts and a connection is formed in the respective separation joints. Subsequently, the assembly comprising the insert element and the friction rings by means of which a singly manoeuvrable friction ring pair is formed, can be quenched and tempered in the vacuum furnace, for example, using nitrogen. The soldering process is thereby accompanied by the desired process of thermal processing. In this instance, the entire process can take place in the vacuum furnace. Alternatively, only the soldering process may also take place in the vacuum furnace, but with the friction ring pair subsequently being moved to a separate furnace for thermal processing, and, for example, oil can be used as a quenching medium in order to achieve a higher cooling rate, wherein the use of water, polymer or other media is also possible. It is thereby possible to achieve in the friction rings, but also in the insert element a specific microstructure which gives the axle-mounted brake disc particularly advantageous material properties. After the soldering or the thermal processing, the friction ring pair can be brought to a defined thickness by means of a machining processing operation of the outer faces of the friction rings. The clamping pins may have a length which is smaller than the thickness of the friction ring pair. Alternatively, protruding portions of the clamping pins may be planed away by the machining processing operation or the clamping pins are removed

again from the friction ring pair after the soldering process.

The insert element may have a base portion on which there are arranged the arms which extend radially outwards and, as an additional, in particular last, method step for processing the friction ring pair, there may be provision for a portion of the number of the arms to be separated from the base portion, in particular by means of a material removal processing operation of the base portion. In particular, the arms of the narrow form can be released from the base portion by the root region of the narrow arms being milled out at the transition into the base portion by means of a milling processing operation so that the arms of the narrow form extend radially only from the outer side of the friction rings to the inner side of the friction rings. In contrast, the arms of the broad form extend from the outer side of the friction rings so as to overlap with the protrusions in the hub in a radially inward direction in order to produce the screw connections between the hub and the arms. In particular the inner ventilation of the axle-mounted brake disc is thereby improved since the base member of the insert element does not impede an air throughflow.

Brief description of the drawings

Other measures which improve the invention are illustrated in greater detail below together with the description of preferred embodiments of the invention with reference to the Figures, in which;

Figure 1 is a perspective view of an embodiment of an axle-mounted brake disc with the features of the present invention,

Figure 2 is a cross-section through an axle-mounted brake disc with an insert element and friction rings which are arranged thereon,

Figure 3 is a perspective view of another embodiment of an insert element,

Figure 4 is a cross-section through the insert element and the friction rings, wherein a clamping pin for positioning the friction rings on the insert element is shown,

Figure 5 is a plan view of the axle-mounted brake disc, with the friction rings and the insert element before a milling processing operation of the insert element, and

Figure 6 is a plan view of the axle-mounted brake disc after a milling processing operation has been carried out on the insert element and wherein the hub is connected to the insert element.

The same reference numerals of different embodiments refer to the same functional components with slightly different features.

Preferred embodiments of the invention

Figure 1 is a perspective view of an embodiment of an axle-mounted brake disc 100 according to the invention and the axle-mounted brake disc 100 is composed of several individual components so that the axle-mounted brake disc 100 is constructed as an assembled axle-mounted brake disc 100.

The axle-mounted brake disc 100 has a hub 10 and there is introduced in the hub 10 a central passage through which there may extend an axle on which the axle-mounted brake disc 100 is arranged. Furthermore, the axle-mounted brake disc 100 has friction rings 11 and 12, which are arranged parallel and spaced apart with respect to each other and which form the friction faces for adjoining brake liners.

According to the invention there is inserted between the friction rings 11 and 12 an insert element 13

which has arms 14 which extend radially outwards in a star-like manner. The arms 14 are arranged with identical spacing over the periphery of the axle-mounted brake disc 100, wherein the embodiment has nine arms 14. The arms 14 are constructed with a length so that they terminate flush with the outer periphery of the friction rings 11 and 12.

There are arranged on the hub 10 protrusions 20 which extend over a base portion 24 of the insert element 13 and which are moved so as to overlap therewith. Between the base portion 24 of the insert element 13 and the protrusions 20 of the hub 10, there are provided screw connections 15 which are formed substantially by means of screw elements 18. Consequently, the friction rings 11 and 12 are connected by means of the insert element 13 to the hub 10 and the friction rings 11 and 12 form together with the insert element 13 a friction ring pair which can be arranged as a singly manoeuvrable subassembly on the hub 10. If, for example, in the context of a maintenance operation, a replacement of a worn friction ring pair of the axle-mounted brake disc 100 is required, the friction ring pair only has to be released from the hub 10 and replaced with a new friction ring pair.

As a result of the star-like construction of the insert element 13 with the base portion 24 and the arms 14 which extend radially outwards from the base portion 24, there is produced through the axle-mounted brake disc 100 an air flow which flows through the axle-mounted brake disc 100 from the inner side to the outer side and the flow takes place between the arms 14.

In a manner not shown in greater detail, there may be provided between the friction rings 11 and 12 cooling elements which are arranged, for example, on at least one of the inner sides of the friction rings 11 and 12. The cooling elements may, for example, be arranged by means of stud welding, but also by means of screwing or by means of soldering at the inner side of the friction rings 11 and 12. The ventilation of the axle-mounted brake disc 100 can thereby be further improved.

Figure 2 is a cross-section through the axle-mounted brake disc 100, which is illustrated only as a half side. In this instance, the hub 10 is illustrated with a protrusion 20 in cross-section and on the protrusion 20 the insert element 13 is arranged by means of a screw connection 15. The screw connection 15 shows the screw element 18 which extends through a hole 16 in the insert element 13 and through a hole 17 in the protrusion 20. Adjacent to the protrusion 20 there is arranged a sliding block 21 which sits in a precisely fitting manner in a pocket which is milled in the protrusion 20. Another portion of the sliding block 21 extends in a precisely fitting manner into the hole 16 in the insert element 13 so that the insert element 12 is centred via the sliding block 21 on the hub 10.

Furthermore, the screw connection 15 comprises a screw nut 22 which is screwed onto the free end of the screw shaft of the screw element 18. Below the screw nut 22 there is arranged a washer 28 and a retention ring 23 which extends around the hub 10, and there are provided in the retention ring 23 a number of holes in order to guide the corresponding number of screw elements 18 through the retention ring 23.

Friction rings 11 and 12 are arranged on the insert element 13 at the outer side, and the insert element 13 is formed from a first part-element 13a and a second part-element 13b and the part-elements 13a and 13b are fitted one on the other in a plane-parallel manner. The joints 29 between the friction rings 11 and 12 and between the part-elements 13a and 13b of the insert element 13 are constructed as solder joints and the friction rings 11 and 12 with the insert element 13, in particular also together with the part-elements 13a and 13b, are soldered to each other in a vacuum furnace by means of a high-temperature soldering process. The insert

element 13 may also be constructed in one piece so that the joints 29 are limited to the connections between the friction rings 11 and 12 and the insert element 13.

Figure 3 is a perspective view of an insert element 13 with a base portion 24 from which a total of 18 arms 14 extend radially outwards. There is introduced in the base portion 24 an opening 19 in which the hub 10 can be arranged.

The arms 14 are formed by arms 14 of a broad form and arms 14 of a narrow form, which are arranged alternately in broad and narrow from adjacent to the base portion 24 of the insert element 13. The embodiment of the insert element 13 shows the arms 14 with forms which are curved in a lateral direction so that the arms 14 have a protruding contour and the arms 14 of the narrow form have in the arm root 30 thereof at the transition to the base portion 24 a significant tapering. In contrast, the arms 14 of the broad form have a correspondingly large transition cross-section with respect to the base portion 24 without any tapering.

Furthermore, there are introduced, for example, into three arms 14, holes 27 via which the friction rings 11 and 12 can be positioned on the insert element 13, as shown in greater detail in Figure 4 below.

Figure 4 is a cross-section through the friction ring pair with the friction rings 11 and 12 and the insert element 13 which is constructed, for example, from the two part-elements 13a and 13b. In the insert element 13, the hole 16 for guiding the screw element 18 is shown in order to connect the friction ring pair via the insert element 13 to the hub 10, as already described in Figure 2.

In order to centre the friction rings 11 and 12 on the insert element 13, a hole 26 is introduced in each case into the friction rings 11 and 12 and the holes 26 are in alignment with the hole 27 in the insert element 13. A clamping pin 25 is inserted into the holes 26 and 27, whereby the friction rings 11 and 12 are positioned on the insert element 13. On the whole, holes 27 can be introduced into three arms 14 and, in a state corresponding to the holes 27 in the arms 14, three holes 26 are also introduced in each friction ring 11 and 12. In this instance, during the production of the friction rings 11 and 12, but also during the production of the insert element 13, the holes 26 and 27 can already be produced by means of the thermal and/or abrasive separation process. The dimensional precision of the holes 26 and 27 may, for example, by means of a laser beam cutting operation or by means of a water jet cutting operation already be sufficient to ensure a required centring of the friction rings 11 and 12 on the insert element 13.

Figure 5 is a plan view of the axle-mounted brake disc 100 and the friction rings 11 and 12 are illustrated in an arranged manner on the insert element 13. The friction rings 11 and 12 are already soldered to the insert element 13, and the base portion 24 of the insert element 13 protrudes at the inner side from the respective central opening 31 of the friction rings 11 and 12. The insert element 13 has arms 14 in a broad and a narrow form, and in an arm 14 of the narrow form a material portion 32 is shown in the base portion 24 of the insert element 13, which portion comprises the arm root 30 of the arm 14.

The method for producing the axle-mounted brake disc 100 comprises in accordance with the embodiment shown a method step in which the material portion 32 has been removed from the base portion 24 of the insert element 13 on each arm 14 of the narrow form by means of a machining processing operation. For example, the material portion 32 may be milled from the base portion 24 so that the arm 14 of the narrow form remains between the friction rings 11 and 12. The connection to the hub 10 is consequently carried out by means of the radially inwardly facing ends of the arms 14 with the broad form in which the holes 16 are introduced. In

this instance, holes 16' are constructed as through-holes and the holes 16 which have a larger diameter serve to receive a portion of the sliding block 21, as shown in Figure 2.

Figure 6 finally shows the axle-mounted brake disc 100 in a completed form. Between the friction rings 11 and 12 there is the insert element 13 which is now formed from the arms 14 which extend radially between the friction rings 11 and 12. The arms 14 of the narrow form extend from the central opening 31 of the friction rings 11 and 12 as far as the outer edge and the arms 14 of the broad form extend from the outer side of the friction rings 11 and 12 into the opening 31 in order to overlap with the protrusions 20 of the hub 10. Finally, the arms 14 of the broad form with the protrusions 20 may be secured to the hub 10 by means of the screw connections 15. Consequently, the arrangement of the friction ring pair with the friction rings 11 and 12 is carried out via the arms 14 of the broad form with the hub 10. The insert element 13 is shown with the material portions 32 which have already been removed by means of a machining processing operation, see in this regard Figure 5. After the material portions 32 have been removed, the arms 14 are released from each other so that the base portion 24 of the insert element 13 is now limited to the radially inwardly facing ends of the arms 14.

As a result of the insert element 13 which is limited only to the arms 14, the ventilation of the axle-mounted brake disc 100 is further optimised since a free air flow from the inner side to the outer side may be produced between the friction rings 11 and 12. At the same time, a high level of rigidity of the axle-mounted brake disc 100 is achieved with a comparatively low weight since the arms 14 form a sufficiently rigid insert between the friction rings 11 and 12.

The invention is not limited in the construction thereof to the above-mentioned preferred embodiment. Instead a number of variants which make use of the illustrated solution even with fundamentally different types of constructions are conceivable. All the features and/or advantages set out in the claims, the description or the drawings, including structural details or spatial arrangements, may be inventively significant both per se and in extremely different combinations.

LIST OF REFERENCE NUMERALS

100 Axle-mounted brake disc
10 Hub
11 Friction ring
12 Friction ring
13 Insert element
13a First part-element
13b Second part-element
14 Arm
15 Screw connection
16 Hole (in the insert element)
17 Hole (in the protrusion)
18 Screw element
19 Opening

20 Protrusion
21 Sliding block
22 Screw nut
23 Retention ring
24 Base portion
25 Clamping pin
26 Hole (in the friction ring)
27 Hole (in the insert element)
28 Washer
29 Joint
30 Arm root
31 Opening
32 Material portion

SZERELT TENGELY FÉKTÁRCSA

SZABADALMI IGÉNYPONTOK

1. Szerelt tengely féktárcsa (100) kerékaggyal (10) és két súrlódó gyűrűvel (11, 12), amik egymással párhuzamosan és távközzel vannak elrendezve, **azzal jellemezve,** hogy a súrlódó gyűrűk (11, 12) között egy csillag alakú, sugárirányban kifelé nyúló karokkal (14) ellátott betét elem (13) van elrendezve oly módon, hogy a súrlódó gyűrűk (11, 12) a betét elem (13) sík oldalain fekszenek fel.
2. Az 1. igénypont szerinti féktárcsa, **azzal jellemezve,** hogy a súrlódó gyűrűk (11, 12) a betét elemmel (13) össze vannak forrasztva, előnyösen kényforrasztással, még előnyösebben magas hőmérsékletű, vákuumban vagy védőgázban végzett forrasztással.
3. Az 1. vagy 2. igénypont szerinti féktárcsa, **azzal jellemezve,** hogy a betét elem (13) a kerékaggyal (10) legalább egy helyen kapcsolatban (15), előnyösen több csavarkapcsolatban (15) áll, ahol a betét elemnek (13) van egy belső nyílása (19), amelybe a kerékagy (10) van bevezetve.
4. A 3. igénypont szerinti féktárcsa, **azzal jellemezve,** hogy a betét elem (13) lyukakkal (16) van ellátva, a kerékagyon (10) pedig lyukakkal (17) ellátott nyúlványok (20) vannak, ahol a csavarkötéseket (15) legalább olyan csavar elemek (18) alkotják, amik legalább a betét elem (13) lyukain (16) és a nyúlványok (20) lyukain (17) keresztül vannak vezetve.
5. A 4. igénypont szerinti féktárcsa, **azzal jellemezve,** hogy legalább egy, előnyösen több, még előnyösebben három csavarkötés (15) egy kulisszakövet (21) alkot, hogy a betét elemet (13) a súrlódó gyűrűkkel (11, 12) a kerékagyon (10) pozícionálja.

SZTNH-100055515

6. A 3 – 5. igénypontok bármelyike szerinti féktárcsa, **azzal jellemezve,** hogy a csavarkötések (15) csavaranyákat (22) tartalmaznak, ahol előnyösen van egy tartógyűrű (23), amihez a csavaranyák (22), előnyösen alátét tárcsákon (28) keresztül vannak meghúzva.
7. Az előző igénypontok bármelyike szerinti féktárcsa, **azzal jellemezve,** hogy a betét elem (13) sík kiterjedésű, és olyan alapszelvénye (24) van, amiben a nyílás (19) van kialakítva, ahol a karok (14) az alapszelvényben (24) vannak elrendezve és sugárirányban kifelé nyúlnak, és ahol a karok (14) előnyösen sugárirányú kiterjedésükhöz képest oldalirányba görbülő alakjuk van.
8. Az előző igénypontok bármelyike szerinti féktárcsa, **azzal jellemezve,** hogy a betét elem (13) 3 – 30, előnyösen 12 – 24, különösen előnyösen 18 karral (14) van ellátva, ahol vannak széles karok (14) és keskeny karok (14), amik előnyösen a betét elem (13) alapszelvényében (24) felváltva vannak elrendezve.
9. Az előző igénypontok bármelyike szerinti féktárcsa, **azzal jellemezve,** hogy a karok (14) egy része, előnyösen a keskenyebb karok (14) az alapszelvénytől (24) le vannak választva.
10. Az előző igénypontok bármelyike szerinti féktárcsa, **azzal jellemezve,** hogy a betét elem (13) két, egymással síkban határos, előnyösen egymással összeforrasztott rész elemből (13a, 13b) áll.
11. Eljárás kerékaggyal (10) és két, egymással párhuzamosan és távközzel elrendezett súrlódó gyűrűvel (11, 12) ellátott tengely féktárcsa előállítására, aminek során legalább
    - előkészítünk egy csillag alakú, sugárirányban kifelé nyúló karokkal (14) ellátott sík betét elemet (13),
    - a súrlódó gyűrűket (11, 12) a betét elem (13) sík oldalára illesztjük oly módon, hogy a betét elem (13) a súrlódó gyűrűk (11, 12) között legyen elrendezve, és
    - a betét elemet (13) a kerékagyra (10) illesztjük.
12. A 11. igénypont szerinti eljárás, ahol a súrlódó gyűrűket (11, 12) összeforrasztjuk a betét elemmel (13), előnyösen keményforrasztással, még előnyösebben magas hőmérsékletű, vákuumban vagy védőgázban végzett forrasztással.
13. A 11. vagy 12. igénypont szerinti eljárás, ahol a betét elemet (13) két rész elemből (13a, 13b) állítjuk elő, amik egymással előnyösen össze vannak forrasztva, előnyösen együtt a súrlódó gyűrűknek (11, 12) a betét elemmel (13) történő összeforrasztásával.
14. A 11 - 13. igénypontok bármelyike szerinti eljárás, ahol a súrlódó gyűrűknek (11, 12) a betét elemre (13) történő illesztésére olyan, a súrlódó gyűrűket (11, 12) a betét elemen (13) pozicionáló eszközöket alkalmazunk, amik előnyösen feszítőcsapok (25), amiket a súrlódó gyűrűk (11, 12) lyukaiban (26) és a betét elem (13) lyukaiban (27) történő pozicionálásra alkalmasak.
15. A 11 - 14. igénypontok bármelyike szerinti eljárás, ahol a betét elemnek (13) olyan alapszelvénye (24) van, amiben a karok (14) vannak elrendezve és sugárirányban kifelé nyúlnak, ahol a karok (14) egy része az alapszelvénytől (24) le van választva, előnyösen az alapszelvény (24) forgácsoló megmunkálásával.
16. A 11 - 15. igénypontok bármelyike szerinti eljárás, ahol a súrlódó gyűrűk (11, 12) és/vagy a betét elem (13), előnyösen a rész elemek (13a, 13b) termikus és/vagy abrazív leválasztó eljárással, különösen lézersugaras vágással és/vagy vízsugaras vágással vannak egy lemezből előállítva.

17. A 11 - 16. igénypontok bármelyike szerinti eljárás, ahol a súrlódó gyűrűket (11, 12) és/vagy a betét elemet (13), előnyösen a rész elemeket (13a, 13b) hőkezeljük, és ahol a hőkezelést előnyösen a keményforrasztással, még előnyösebben magas hőmérsékletű, vákuumban vagy védőgázban végzett forrasztással végezzük.

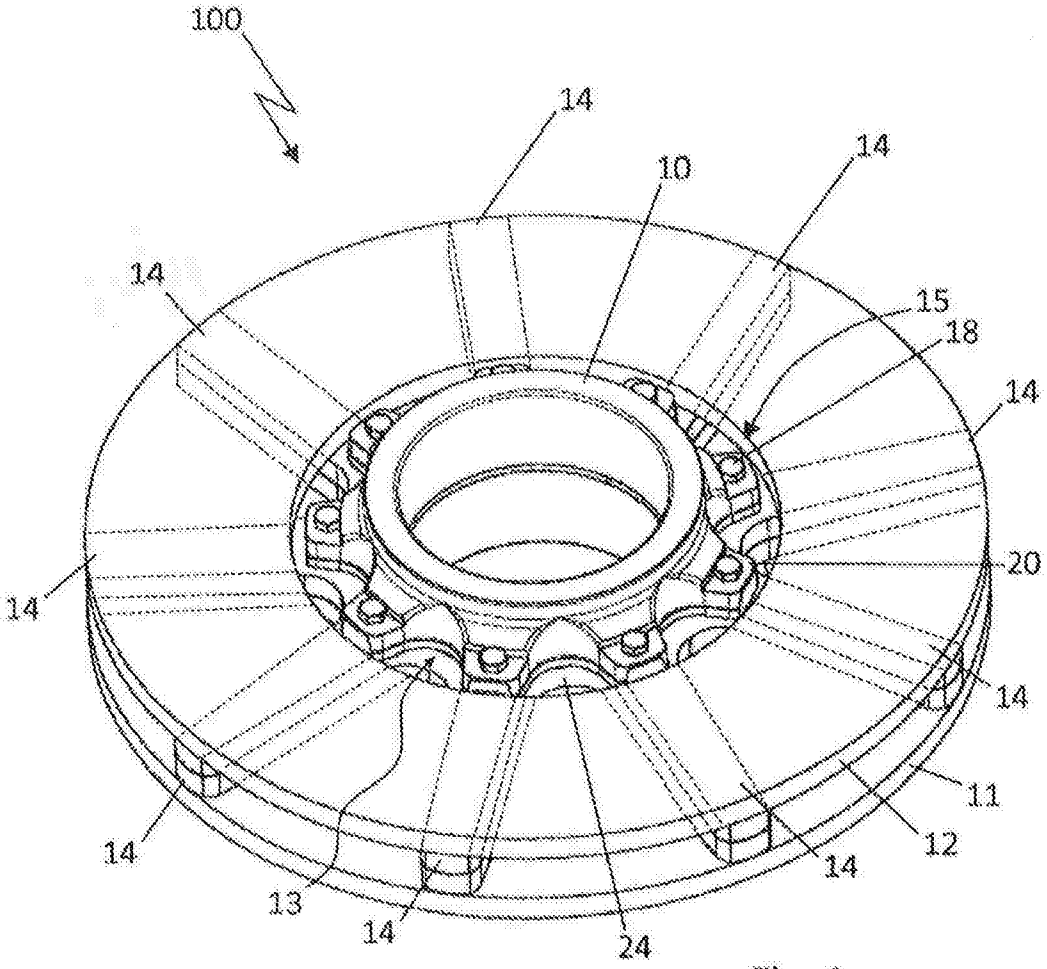

Fig. 1

SZTNH-100055516

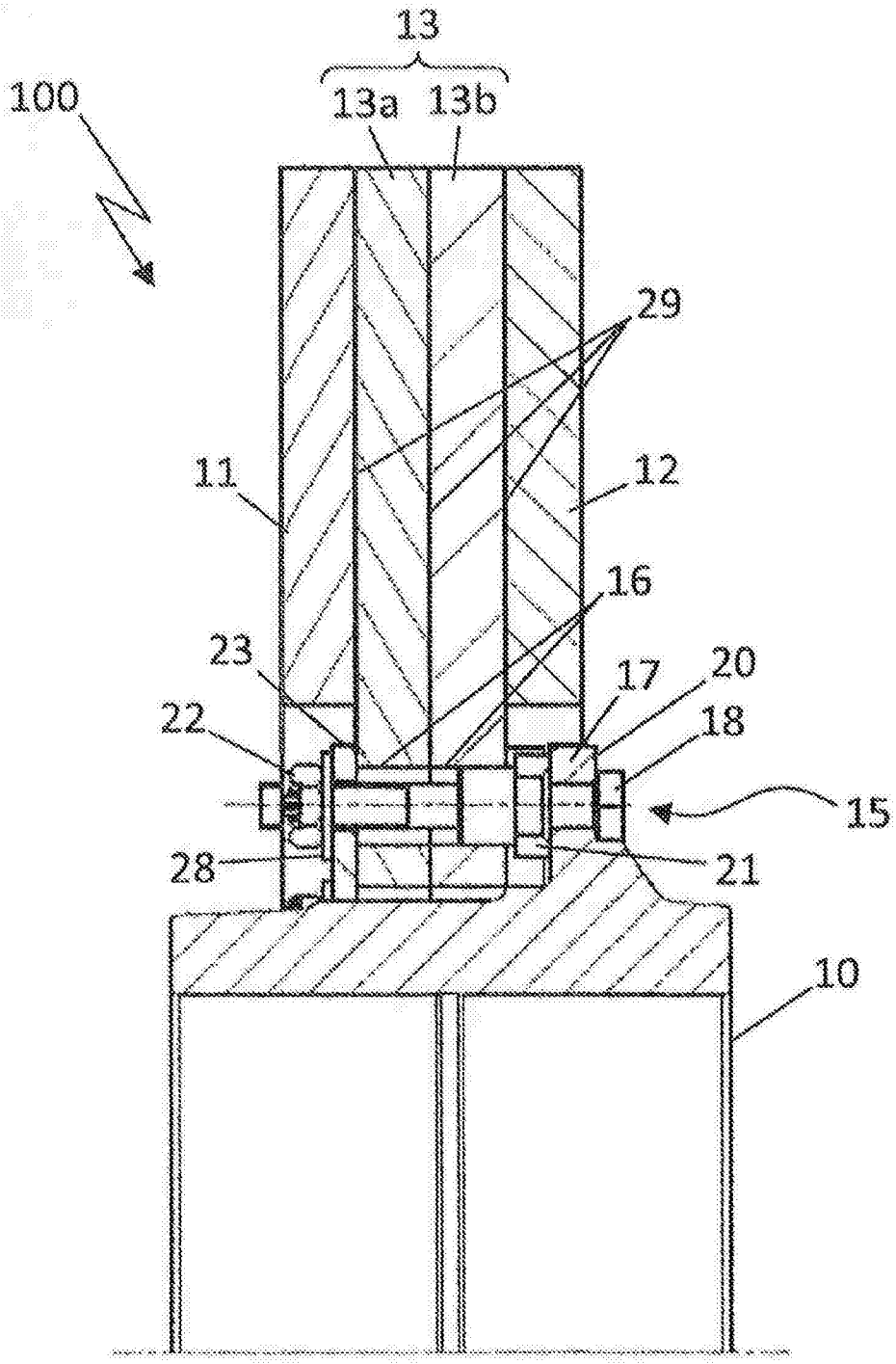

Fig. 2

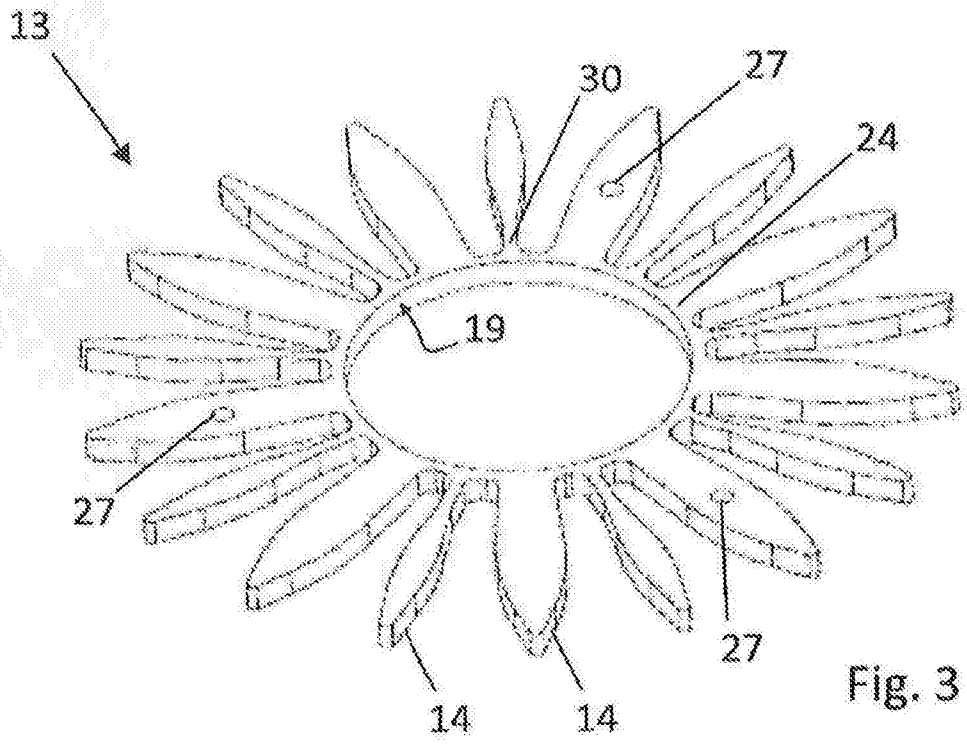

Fig. 3

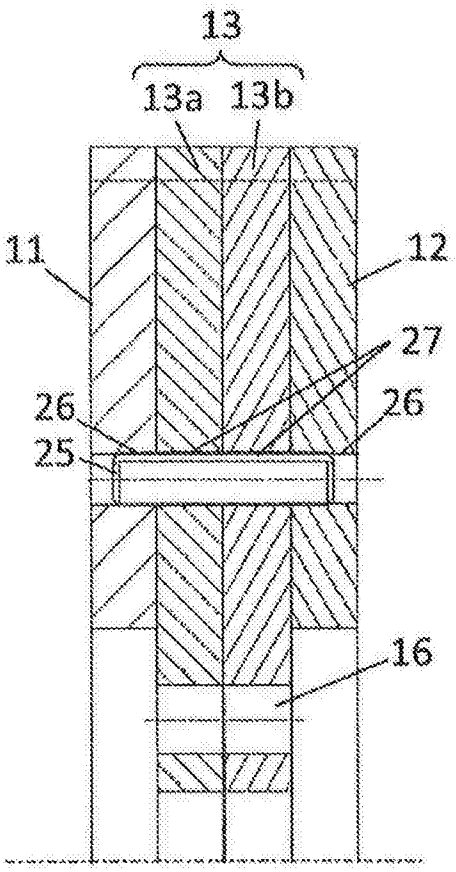

Fig. 4

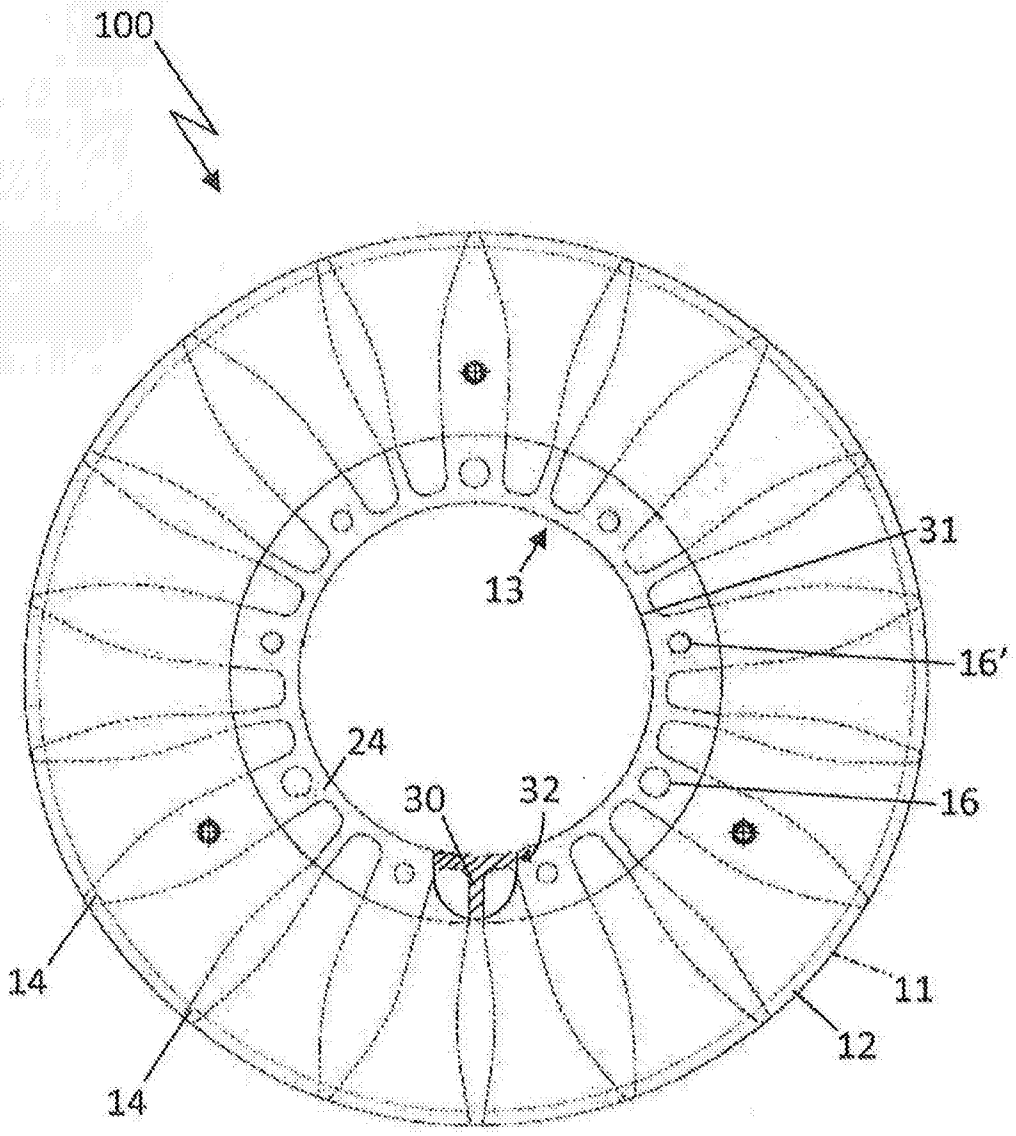

Fig. 5

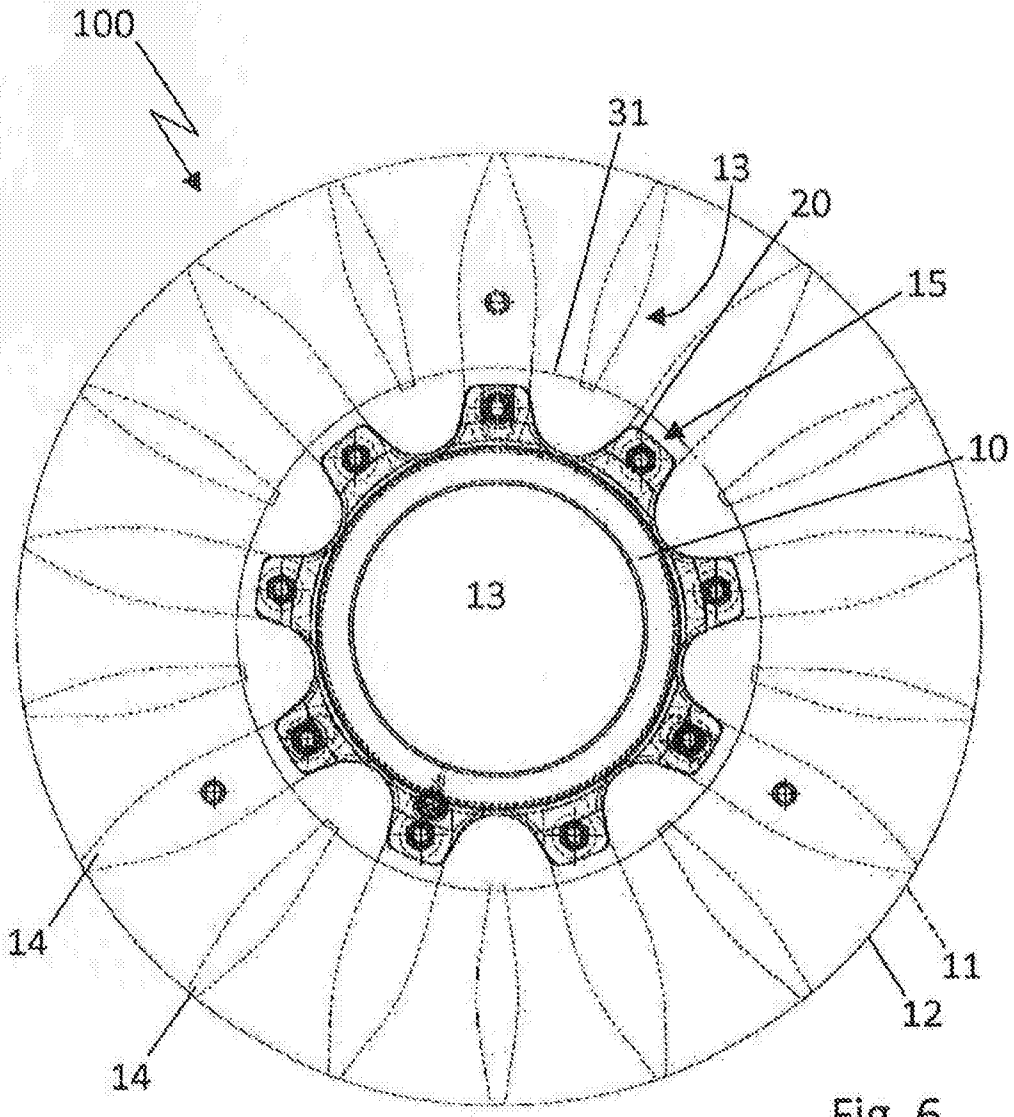

Fig. 6