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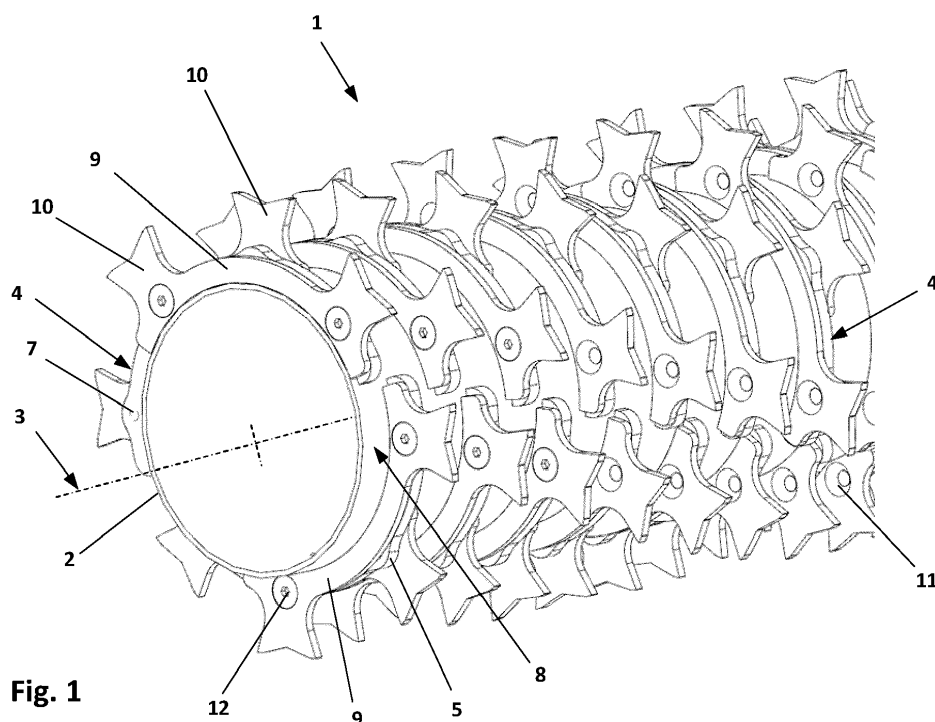
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(54) EXTRACTION ROLLER

(57) The invention relates to an extraction roller (1) for mechanically opening fiber bales, having a base body (2) designed as a tube, a roller axis (3), and fastening elements (4, 5) situated on the base body (2) along the roller axis (3). The fastening elements (4) protrude perpendicularly from a surface (6) [sic; (8)] of the base body (2), and each fastening element (4) has at least one through opening (5) [sic; (7)], parallel to the roller axis (3), for fastening tooth elements (7) [sic; (9)]. Two tooth elements (7) [sic; (9)] in each case, having at least two

teeth 8 [sic; (10)] in each case, are mounted on each fastening element (4). The two tooth elements (7) [sic; (9)] are situated at the particular fastening element (4) on opposite sides thereof. The tooth elements (7) [sic; (9)] are arranged in a circumferential direction of the base body (2) in such a way that the teeth 8 [sic; (10)] of the respective tooth elements (7) [sic; (9)] fastened to a fastening element (4) are offset relative to one another in the circumferential direction.

**Fig. 1****EP 3 663 443 A1**

Description

[0001] The invention relates to an extraction roller for mechanically opening fiber bales.

[0002] Extraction rollers are used in so-called bale take-off machines or bale openers to extract fibers or fiber flocks from pressed fiber bales. For this purpose, one or more extraction rollers are moved across the fiber bales. Bale openers are also known from the prior art in which the fiber bales are moved past a stationary extraction roller.

[0003] Such extraction rollers are fitted with teeth which engage in the fiber bales and tear or pluck fibers or fiber flocks from the fiber bales due to the rotation of the extraction roller. The bale take-off machine is located at the beginning of processing lines in a spinning preparation (blow room) for processing fiber material, for example cotton or synthetic fibers or mixtures thereof, and has a decisive influence on the continuity of the sequence within the spinning preparation. In the bale take-off machine, the fiber material delivered in bales is extracted from the bales by taking off fiber flocks, and is transferred to a pneumatic transport system. The pneumatic transport system carries the fiber flocks through pipelines to the downstream cleaning machines. A grid is normally provided between the extraction roller and the fiber bales. The teeth of the extraction roller extend through the grid. The grid is thus used as a retaining element for the fiber bales. As the result of the grid elements which rest on the surface of the fiber bales, the teeth of the extraction roller are prevented from pulling oversized or irregular fiber flocks from the fiber bales.

[0004] Many designs of extraction rollers are known from the prior art. For example, EP 0 058 781 discloses a extraction roller in which the toothed disks are fastened to semicircular shells. Two of these half-shells in each case enclose the shaft of the extraction roller, and are fastened to one another in such a way that a press fit results between the half-shells and the shaft. One disadvantage of the disclosed design of the extraction roller is the complicated structure of the half-shells, and, due to a press fit, a detachable fastening of the toothed disks which may come loose, also during operation.

[0005] EP 2 836 630 A1 discloses another embodiment of an extraction roller. The toothed disks have a ring-shaped design with an elliptically shaped central cutout. The toothed disks are pushed onto a shaft and rotatably fixedly connected to the shaft. The toothed disks that follow are each turned relative to one another in such a way that their teeth, viewed in an axial direction, are not aligned one behind the other. In addition, the toothed disks are arranged at an angle of inclination with respect to the shaft axis. One disadvantage of this design is that replacing individual toothed disks is not possible. It is a frequent occurrence that a tooth breaks off, or the teeth are worn down more in a particular area than in other areas. However, such signs of wear cannot be easily dealt with, since it is not possible to either replace indi-

vidual teeth or to replace individual toothed disks.

[0006] The object of the invention is to provide an extraction roller that has a simple design, and that allows easy replacement of individual tooth elements.

[0007] The object is achieved by an extraction roller having the features of the independent claim.

[0008] To achieve the object, a novel extraction roller for mechanically opening fiber bales is proposed, having a base body designed as a tube, a roller axis, and fastening elements situated on the base body along the roller axis. The fastening elements protrude perpendicularly from a surface of the base body, and each fastening element has at least one through opening, parallel to the roller axis, for fastening tooth elements. Two tooth elements in each case, having at least two teeth in each case, are mounted on each fastening element, the two tooth elements being situated at the particular fastening element, on opposite sides thereof. The tooth elements are arranged in a circumferential direction of the base body in such a way that the teeth of the respective tooth elements fastened to a fastening element are offset relative to one another in the circumferential direction.

[0009] The fastening elements are fastened to the base body by welding or adhesive bonding, for example.

The fastening elements are arranged on the surface of the base body in the manner of ribs. The fastening elements may be designed as closed rings or as ring segments. Due to the design of the tooth elements in the form of ring segments, they may be individually mounted on the fastening elements, independently of the base body, and if necessary, may also be independently replaced without having to remove the base body or the entire extraction roller from the machine. It is possible to easily replace individual tooth segments in the installed state of the extraction roller.

[0010] The fastening elements are advantageously each arranged in pairs, the fastening elements of one pair being offset by a certain distance in the axial direction with respect to a pair of fastening elements following in the axial direction. The distance between the pairs of fastening elements is determined by the clearance width of the grid through which the tooth elements, held on the fastening elements, extend. The distance between two pairs of fastening elements is preferably 20 mm to 35 mm, particularly preferably 27 mm. This distance is necessary in order to provide enough space between the tooth elements of adjacent pairs of fastening elements for a grid bar of the grid situated below the extraction roller.

[0011] The fastening elements of a pair are advantageously situated on the surface of the base body, opposite one another in the radial direction. A uniformly distributed load over the circumference of the base body may thus be achieved, and imbalance of the extraction roller is avoided due to the arrangement of the fastening elements or tooth elements.

[0012] The distance between the fastening elements of a pair is preferably 15 mm to 25 mm, particularly pref-

erably 18 mm. This distance has proven suitable, since the gap between the grid bars when the teeth extend through results in an optimal size of the flocks removed from the bales by the extraction roller.

[0013] The through openings provided in the tooth elements for fastening the tooth elements to the fastening elements are preferably situated in each case at one location on a tooth. The connection of two teeth may thus be established to form a tooth element in the form of a narrow web, so that weight may be saved.

[0014] In one preferred embodiment, the fastening elements or the through openings in the fastening elements in their sequence are turned relative to one another on the base body in the direction of the roller axis by a certain angle β in the circumferential direction. The radial turning between two successive teeth is preferably provided at an angle β of 6 to 36 degrees. This results in a full revolution after a certain number of teeth. For example, for a turning angle β of 36 degrees, the tenth tooth element is identical to the first tooth element. The turning angle β is selected as a function of the number of tooth elements on the overall extraction roller, resulting in a whole number of helical curves. The individual teeth or tooth elements are particularly preferably turned relative to one another by an angle β that corresponds to the n th portion of 360° or a multiple thereof, where n stands for the number of pairs of fastening elements on the extraction roller in the direction of the roller axis.

[0015] The individual tooth elements situated in succession on the shaft have an identical design. However, the tooth elements have different radial arrangements in order to achieve better running characteristics of the extraction roller. As a result, not all successively arranged teeth engage in the fiber bales at the same time. Due to the radial turning, a tooth of one tooth element engages in the fiber bales, and only after the extraction roller has been further rotated does a tooth of a subsequent tooth element come into engagement. This also results in continuous removal of fibers from the fiber bales, viewed over the entire length of the extraction roller. In addition, transmission of vibrations is reduced due to the staggered engagement of the individual tooth elements. The required number of fastening elements may be limited by mounting a tooth element in each case on each side of a fastening element (in the direction of the roller axis).

[0016] The fastening elements advantageously enclose the base body by less than 180 degrees. This type of design prevents the extraction roller from becoming too heavy. In addition, it is thus possible for all used fastening elements to have the same design, and for the offset of the tooth elements, and thus the teeth, to be achieved solely by their arrangement on the base body.

[0017] Two fastening elements are particularly preferably situated in a shared plane. This measure also results in a reduction in the number of fastening elements. In addition, tooth elements or teeth are provided over the entire circumference of the extraction roller, and therefore teeth do not engage in the fiber bales just at a certain

location of the grid during a partial revolution.

[0018] In each case the tooth elements advantageously have two through holes and the fastening elements have at least three through holes, the through holes of the fastening elements being designed as a female thread. It is thus possible to easily screw the tooth elements to the fastening elements. However, other types of fastening, such as a clip connection, are also conceivable.

[0019] The fastening elements are preferably welded to the base body. Alternatively, in a design of the base body as a cast part, integral molding of the fastening elements is conceivable. It is advantageous for the base body to have a circular cross section. A cross section in the shape of a polygon would also be conceivable, although a circular cross section has advantages for simpler balancing.

[0020] The teeth are situated on the outer circumference of the tooth elements. The outer circumference of the tooth elements has a circular design. A rotationally symmetrical arrangement of the teeth is thus possible. A tooth element preferably has two teeth. The teeth on their outer surface are preferably subjected to heat treatment to impart a certain wear resistance. Tempering or hardening is used as heat treatment. However, other processes for increasing the wear resistance are also conceivable, such as coating instead of heat treatment. In some cases, sufficient wear resistance may also be achieved by appropriately selecting the material to be used for the toothed disks.

[0021] The teeth preferably have an external shape that allows operation of the extraction roller in both directions. The extraction roller may thus be moved in both directions across the fiber bales, which may also be removed in both directions.

[0022] A bearing element is advantageously provided at both ends of the extraction roller. A simple tube may thus be used as the base body. The bearing element may be provided with a journal that engages in the tube and is welded to the tube. Alternatively, the tube and the bearing element may be provided with a flange. The flange may in turn be welded or screwed on. However, the bearing element is preferably provided with a projection that engages in the base body. This allows precisely fitting positioning of the bearing element as well as a rotationally symmetrical arrangement of the bearing element with respect to the base body. The bearing element has a shaft stub via which the extraction roller may be rotatably held in appropriate bearings.

[0023] Also claimed is a tooth element for use in an extraction roller according to the above description.

[0024] The invention is explained in greater detail below based on one exemplary embodiment, with reference to the drawings.

Figure 1 shows a schematic perspective illustration of an extraction roller

Figure 2 shows a schematic illustration of a partial

- side view of an extraction roller
- Figure 3 shows a schematic illustration of an enlarged detail from Figure 2
- Figure 4 shows a schematic illustration of a view in the direction X in Figure 2

[0025] Figure 1 shows a schematic perspective illustration of an extraction roller 1. The extraction roller 1 has a roller axis 3, and includes a base body 2, on the surface 8 of which a series of a plurality of first fastening elements 4 and second fastening elements 5 are arranged in a plane and in concentric adjacent planes. In each case two tooth elements 9 are mounted on the fastening elements 4 and 5 via screws 12, wherein the screws 12 engage in through openings 11 formed in the tooth elements 9, and engage in the fastening elements 4 or 5 via through openings 7 designed as a female thread. Two tooth elements 9 are mounted in each case on the fastening elements 4 and 5. Each tooth element 9 is fitted with two teeth 10. The fastening elements 4 and 5, and thus also the tooth elements 9, are arranged in the circumferential direction in an offset sequence in the direction of the roller axis 3. The arrangement of the teeth 10 has a helical configuration due to the identical design of all tooth elements 9.

[0026] Figure 2 schematically shows a partial side view of the extraction roller 1, having a roller axis 3 and a base body 2. A bearing element 14, which in the shown embodiment is welded to the base body 2, is situated on the end of the base body 2. Mutually offset fastening elements 4 and 5 are provided on the surface 8 of the base body 2 in the circumferential direction. A first fastening element 4 and a second fastening element 5 in each case form a pair 6. Tooth elements 9 having teeth 10 are in each case mounted on both sides of the fastening elements 4 and 5, viewed in the direction of the roller axis 3. The tooth elements 9 are fastened to the fastening elements 4 and 5 via screws 12. The fastening elements 4 and 5 of a pair 6 are spaced apart by a distance B in the axial direction, and are situated opposite one another on the surface 8 of the base body 2 in the circumferential direction. The first fastening element 4 of a pair 6 is situated at a distance A from the second fastening element 5 of a pair 6 that successively follows in the axial direction.

[0027] Figure 3 shows a schematic sectional illustration of an enlarged detail from Figure 2. The figure shows a section of the base body 2, designed as a tube, and a fastening element 4 that is affixed thereto via a weld 13. The fastening element 4 has a through opening 7 that is designed as a female thread. The design of the through opening 7 as a female thread allows a tooth element 9 to be fastened from both sides of the fastening element 4. The tooth element 9 has a tooth 10 on an end opposite from the surface 8 of the base body 2. In the embodiment shown, the through opening 11 provided in the tooth element 9 is designed for the use of a countersunk screw.

[0028] Figure 4 shows a schematic illustration of a view in the direction X in Figure 2. On its surface 8 situated

about the roller axis 3, the base body 2 bears the fastening elements 4 and 5. The fastening elements 4 and 5 are provided with through openings 7 in which the tooth elements 9 are held via the screws 12. The fastening elements 4 and 5 or the pairs of fastening elements 4 and 5, and thus the tooth elements 9, in their sequence are arranged at a radial turning angle β in the direction of the roller axis 3. Since all fastening elements 4 and 5 and also the tooth elements 9 have identical designs in each case, turning about the angle β results in an offset of the teeth 10 of the tooth elements 9 following in succession in the axial direction, likewise by the angle β .

List of reference symbols

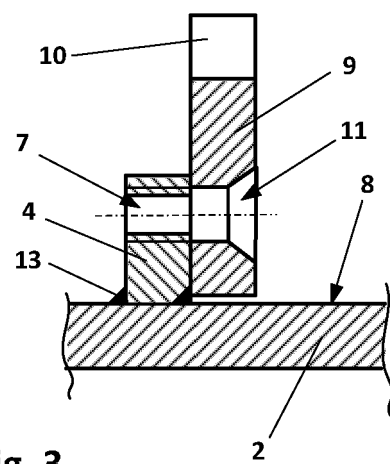
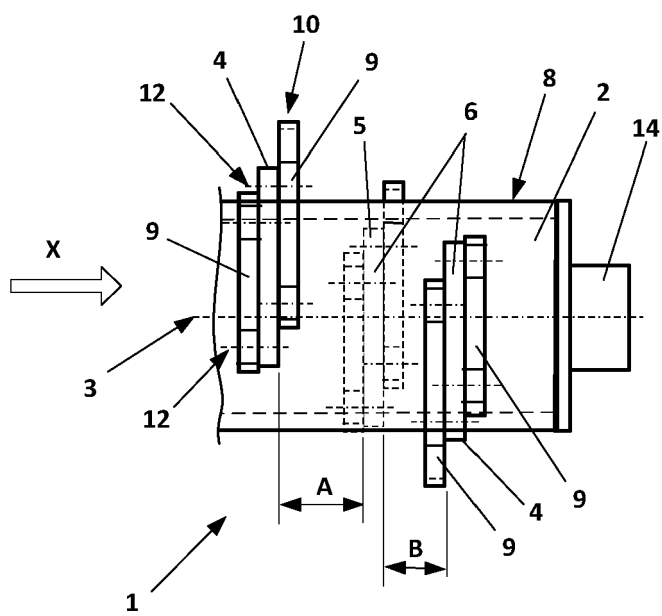
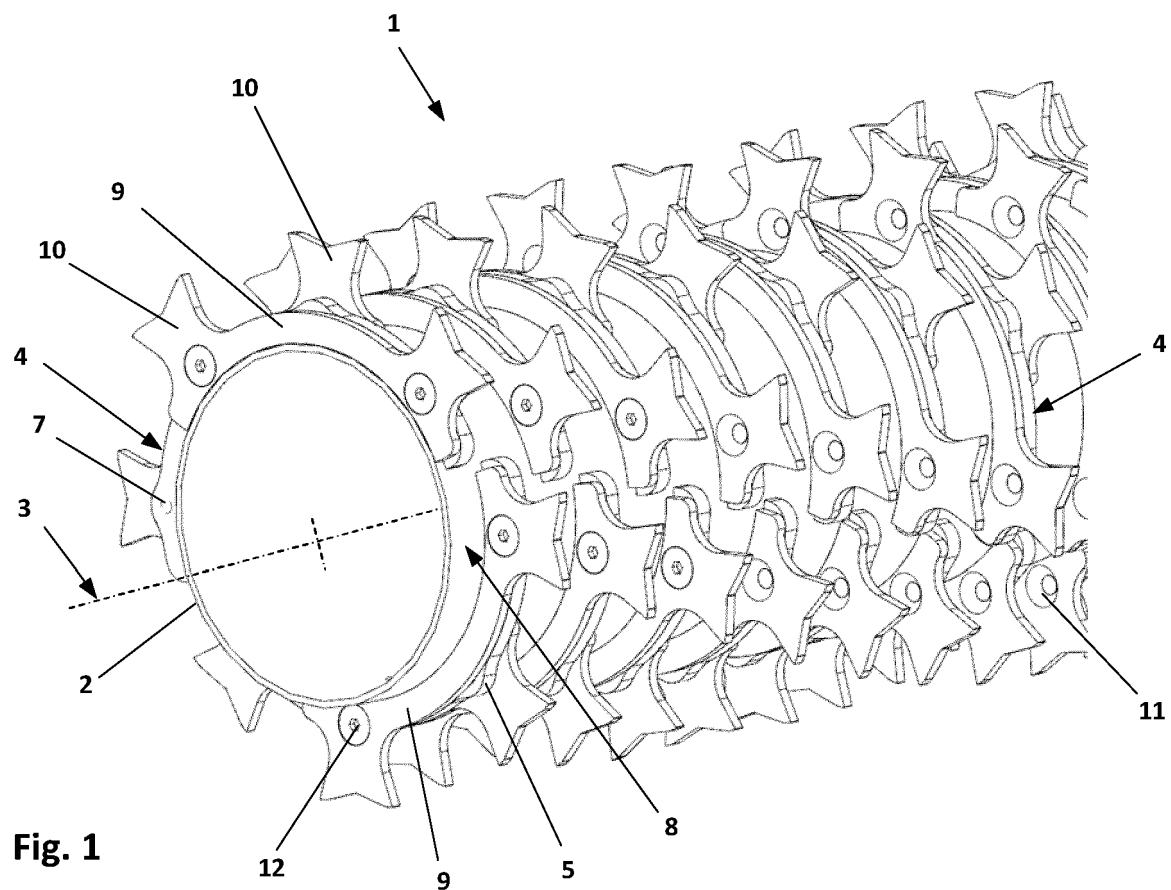
[0029]

- | | |
|---------|---|
| 1 | extraction roller |
| 2 | base body |
| 3 | roller axis |
| 4 | first fastening element |
| 5 | second fastening element |
| 6 | pair of fastening elements |
| 7 | through opening in the fastening element |
| 8 | surface of the base body |
| 9 | tooth element |
| 10 | tooth |
| 11 | through opening in the tooth element |
| 12 | screw |
| 13 | weld |
| 14 | bearing element |
| A | distance between two pairs of fastening elements |
| B | distance between the fastening elements of a pair |
| β | turning angle |

Claims

1. An extraction roller (1) for mechanically opening fiber bales, having a base body (2) designed as a tube, a roller axis (3), and fastening elements (4, 5) situated on the base body (2) along the roller axis (3), wherein the fastening elements (4, 5) protrude perpendicularly from a surface (8) of the base body (2), and each fastening element (4, 5) has at least one through opening (7), parallel to the roller axis (3), for fastening tooth elements (9), **characterized in that** two tooth elements (9) in each case, having at least two teeth (10) in each case, are mounted on each fastening element (4, 5), the two tooth elements (9) being situated at the particular fastening element (4, 5) on opposite sides thereof, and the tooth elements (9) are arranged in a circumferential direction of the base body (2) in such a way that the teeth (10) of the respective tooth elements (9) fastened to a fastening element (4, 5) are offset relative to one another in the circumferential direction.

2. The extraction roller (1) according to Claim 1, **characterized in that** the fastening elements (4, 5) are each arranged in pairs, the fastening elements (4, 5) of one pair (6) being offset by a certain distance (A) in the axial direction with respect to a pair (6) of fastening elements (4, 5) following in the axial direction. 5
3. The extraction roller (1) according to Claim 2, **characterized in that** a distance (A) between two pairs (6) of fastening elements (4, 5) is 20 mm to 35 mm. 10
4. The extraction roller (1) according to Claim 2 or 3, **characterized in that** the fastening elements (4, 5) of a pair (6) are situated on the surface (8) of the base body (2), opposite one another in the radial direction. 15
5. The extraction roller (1) according to one of Claims 2 to 4, **characterized in that** the distance (B) between a first fastening element (4) and a second fastening element (5) of a pair (6) is 15 mm to 25 mm. 20
6. The extraction roller (1) according to one of the preceding claims, **characterized in that** the fastening elements (4, 5) or the through openings (7) in the fastening elements (4, 5) in their sequence are turned relative to one another on the base body in the direction of the roller axis (3) by a certain angle (β) in the circumferential direction (2). 25 30
7. The extraction roller (1) according to one of the preceding claims, **characterized in that** the fastening elements (4, 5) enclose the base body (2) by less than 180 degrees. 35
8. The extraction roller (1) according to one of the preceding claims, **characterized in that** the tooth elements (9) in each case have two through holes (11) and the fastening elements have at least three through holes (4, 5), the through holes (7) of the fastening elements (4, 5) being designed as a female thread. 40
9. The extraction roller (1) according to one of the preceding claims, **characterized in that** the fastening elements (4, 5) are welded to the base body (2). 45
10. The extraction roller (1) according to one of the preceding claims, **characterized in that** the base body (2) has a circular cross section. 50
11. The extraction roller (1) according to one of the preceding claims, **characterized in that** the teeth (10) on their outer surface are subjected to heat treatment. 55
12. The extraction roller (1) according to one of the preceding claims, **characterized in that** the teeth (10) have an external shape that allows operation in both directions for opening the fiber bales with the extraction roller (1).
13. Tooth elements (4) [sic; (9)] for use in a extraction roller (1) according to one of Claims 1 to 12.



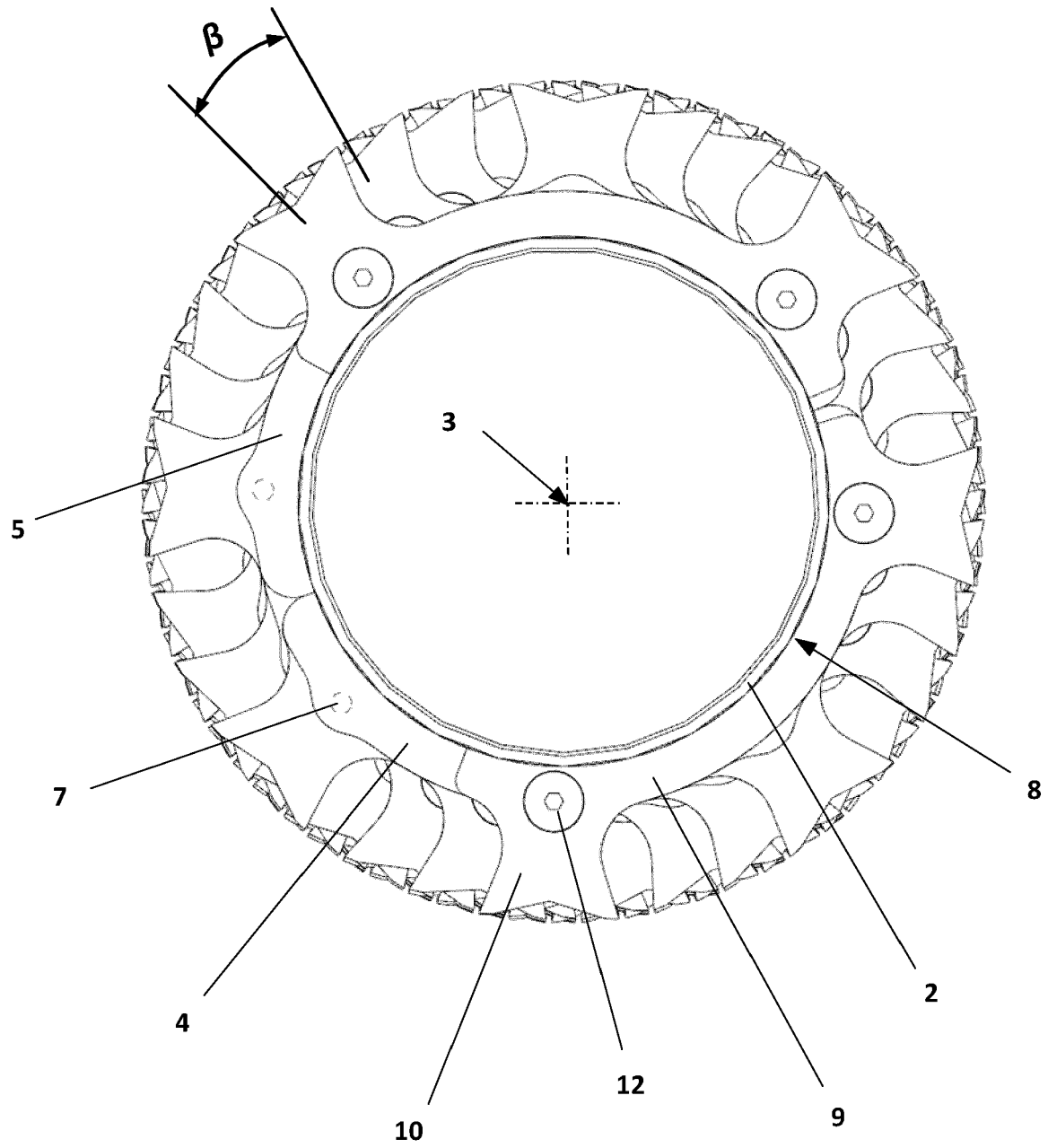


Fig. 4



EUROPEAN SEARCH REPORT

 Application Number
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Place of search Munich		Date of completion of the search 21 April 2020	Examiner Todarello, Giovanni
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EUROPEAN SEARCH REPORT

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