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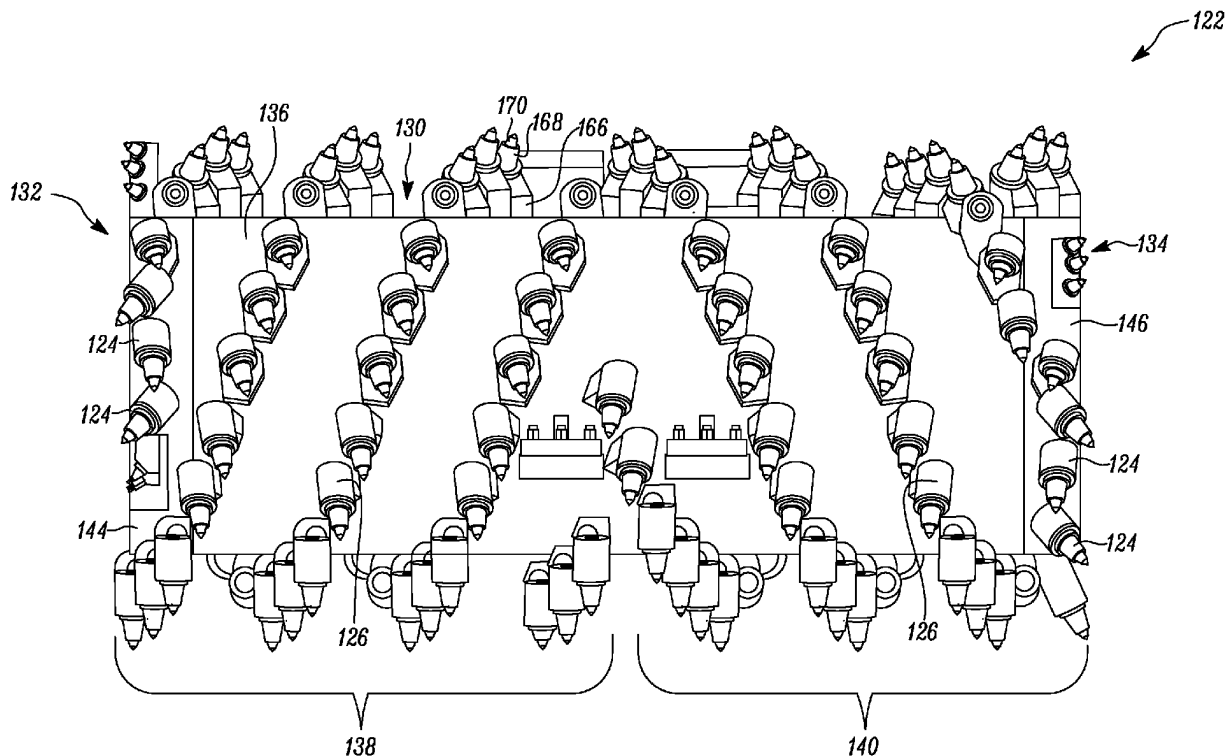
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(54) CUTTING ROTOR FOR MACHINE

(57) A rotor associated with a machine includes a shell member. The rotor also includes at least one end ring adapted to couple to an edge of the shell member.

The end ring includes an annular body defining an exterior surface. The end ring also includes a plurality of angled faces formed on the exterior surface.

**FIG. 2****EP 3 404 144 A1**

Description

Technical Field

[0001] The present disclosure relates to a cutting rotor associated with a machine.

Background

[0002] Machines, such as cold planers, rotary mixers, and other milling machines, are used for scarifying, removing, mixing, or reclaiming material from surfaces, such as, grounds, roadbeds, and the like. Such machines include a rotor enclosed within a rotor chamber. The rotor includes a cylindrical shell member and a number of cutting assemblies mounted on the shell member. When the machine is performing a cutting operation, cutting bits of the cutting assemblies impact the surface and break it apart. Thus, the cutting assemblies are arranged to cut the surface and to leave a milled surface that meets a known texture requirement. Another function of the cutting assemblies is to form an auger that moves material within the rotor chamber to a central area of the rotor chamber from where it can be moved by a conveyor to a truck.

[0003] U.S. Published Application Number 2016/024919 describes degradation picks comprising hardened tips that may be secured to an exterior of a rotatable drum so as to be repeatedly brought into contact with a surface of a material to be degraded. To secure such degradation picks to the rotatable drum, a toroidal body comprising an interior surface rigidly attachable to the rotatable body and an exterior surface comprising a plurality of bore holes disposed there around may receive a plurality of degradation picks secured within the bore holes

Summary of the Disclosure

[0004] In an aspect of the present disclosure, a rotor associated with a machine is provided. The rotor includes a shell member. The rotor also includes at least one end ring adapted to couple to an edge of the shell member. The end ring includes an annular body defining an exterior surface. The end ring also includes a plurality of angled faces formed on the exterior surface.

[0005] In another aspect of the present disclosure, an end ring associated with a rotor is provided. The end ring includes an annular body defining an exterior surface. The end ring also includes a plurality of angled faces formed on the exterior surface.

[0006] In yet another aspect of the present disclosure, a machine is provided. The machine includes a frame. The machine also includes a rotor rotatably supported on the frame. The rotor includes a shell member. The rotor also includes at least one end ring adapted to couple to an edge of the shell member. The end ring includes an annular body defining an exterior surface. The end

ring also includes a plurality of angled faces formed on the exterior surface. Further, the rotor includes a plurality of cutting assemblies coupled to the plurality of angled faces.

[0007] Other features and aspects of this disclosure will be apparent from the following description and the accompanying drawings.

Brief Description of the Drawings

[0008]

FIG. 1 is a side view of an exemplary machine, according to one embodiment of the present disclosure;

FIG. 2 is a rear view of a rotor of the machine, according to an embodiment of the present disclosure; FIG. 3 is a perspective view of an end ring coupled to the rotor, according to an embodiment of the present disclosure;

FIG. 4 is an exploded view of the end ring and the rotor; and

FIG. 5 is an exploded view of a segmented end ring and the rotor, according to an embodiment of the present disclosure.

Detailed Description

[0009] Wherever possible, the same reference numbers will be used throughout the drawings to refer to the same or the like parts. Also, corresponding or similar reference numbers will be used throughout the drawings to refer to the same or corresponding parts.

[0010] FIG. 1 is a side view of an exemplary machine 100, according to one embodiment of the present disclosure. The machine 100 is embodied as a cold planer. Alternatively, the machine 100 may embody another machine that removes materials from a ground surface or roadbed, such as a rotary mixer or any milling machine, known in the art. The machine 100 has a frame 102. An engine enclosure 104 is attached to the frame 102 and houses an engine (not shown). The engine is generally an internal combustion engine and provides propulsion power to the machine 100 and also powers various components of the machine 100.

[0011] The machine 100 has a front end 106 and a rear end 108. The front end 106 of the machine 100 has a front drive assembly 110 and the rear end 108 has a rear drive assembly 112. Each of the front and rear drive assemblies 110, 112 include a pair of tracks 114. The tracks 114 may be driven by a hydraulic system of the machine 100. Alternatively, the machine 100 may include wheels (not shown). The machine 100 has an operator platform 118. When the machine 100 is embodied as a manual or semi-autonomous machine, an operator of the machine 100 may sit or stand at the operator platform 118 to operate the machine 100.

[0012] Further, the machine 100 includes a rotor cham-

ber 120 positioned between the front and rear drive assemblies 110, 112. The rotor chamber 120 is an enclosed space defined by a first side plate 128 and a second side plate (not shown) disposed on a right side and a left side of the machine 100 respectively. A rotor 122 rotatably coupled to the frame 102 lies within the rotor chamber 120. The rotor 122 is positioned between the first side plate 122 and the second side plate. In one example, the rotor 122 is embodied as a height adjustable rotor.

[0013] As shown in FIG. 2, the rotor 122 includes a generally cylindrical shell member 130 having a first edge 132 and a second edge 134. Further, the rotor 122 includes a number of cutting assemblies 124, 126 disposed on an outer surface 136 thereof. Each cutting assembly 124 includes a tool block 158, a tool holder 160, and a cutting bit 162 (see FIGS. 3 and 4). Similarly, each cutting assembly 126 includes a tool block 166, a tool holder 168, and a cutting bit 170. The cutting bits 162, 170 contact the ground surface for removing material therefrom. According to a need of the application, the rotor 122 can be lowered so that the rotor 122 contacts and cuts the ground surface through force applied by the cutting assemblies 124, 126 on the ground surface.

[0014] In the illustrated embodiment, the cutting assemblies 124, 126 are spirally arranged on the shell member 130. More particularly, the cutting assemblies 124, 126 at a first side 138 of the rotor 122 are arranged in a clockwise spiral starting from the first edge 132 of the rotor 122. Whereas, the cutting assemblies 124, 126 at a second side 140 of the rotor 122 are arranged in an anti-clockwise spiral starting from the second edge 134 of the rotor 122. This arrangement of the cutting assemblies 124, 126 allows movement of removed material to a central portion of the rotor 122 from where the removed material can be moved by a conveyor 142 (see FIG. 1) to another machine (not shown), such as a truck.

[0015] Further, the rotor 122 includes a first end ring 144 and a second end ring 146. The first and second end rings 144, 146 are coupled at the first and second edges 132, 134 of the rotor 122, respectively. In one example, the first and second end rings 144, 146 may be coupled to the shell member 130 by welding. In other examples, soldering or brazing may be used to couple the first and second end rings 144, 146 with the shell member 130. Alternatively, the first and second end rings 144, 146 may be coupled to the shell member 130 using mechanical fasteners, such as bolts, screw, rivets, pins, and the like, without any limitations. It should be further noted that the first and second end rings 144, 146 may be coupled to the shell member 130 using any other joining technique known in the art, without limiting the scope of the present disclosure.

[0016] Each of the first and second end rings 144, 146 includes the number of cutting assemblies 124. In one example, the first and second end rings 144, 146 are identical in design, dimension, and manufacturing. For exemplary purposes, various embodiments of the first end ring 144 coupled at the first edge 132 will now be

explained in detail with reference to FIGS. 3, 4, and 5. However, it should be noted that the details of the first end ring 144 is equally applicable to the second end ring 146, without any limitations.

[0017] An embodiment of the first end ring 144 will now be explained with reference to FIGS. 3 and 4. In the illustrated embodiment, the first end ring 144 is embodied as a unitary component. Alternatively, the first end ring 144 may embody a segmented end ring, without any limitations. The first end ring 144 is coupled to the shell member 130 by welding (see FIG. 3), without limiting the scope of the present disclosure. The first end ring 144 includes an annular body 148. More particularly, the first end ring 144 has a disc-shaped structure, defining an interior surface 150 and an exterior surface 152. The interior surface 150 is defined by a central opening of the annular body 148. When assembled with the shell member 130, a surface 151 (see FIG. 4) of the first end ring 144 is in contact with a front surface 153 (see FIG. 4) of the shell member 130. Further, a central axis X-X' of the first end ring 144 coincides with a central axis of the shell member 130, when the first end ring 144 is coupled to the shell member 130.

[0018] Further, the exterior surface 152 of the first end ring 144 includes a number of angled faces 154. The angled faces 154 are provided at various angles with respect to the central axis X-X' of the first end ring 144. In some examples, some of the angled faces 154 may be inclined at equal angles. Alternatively, all the angled faces 154 may have different angles, based on system requirements. The number of angled faces 154 allows arrangement of the cutting assemblies 124 on the exterior surface 152 in a desired configuration. For clarity purposes, a single cutting assembly 124 is shown in the accompanying figure. In one example, the arrangement of the angled faces 154, a number of the angled faces 154, and their respective angles are decided based on a type of cut to be achieved. In one example, a person in charge of designing the first end ring 144 may use historical data for providing the angled faces 154 on the exterior surface 152.

[0019] The first end ring 144 may include five to twenty-five angled faces 154. However, it should be noted that the number of angled faces 154 may vary and is defined by a specific pattern and layout of the cutting assembly 124. Each of the angled faces 154 includes a pair of apertures 156. The apertures 156 may be embodied as blind holes. The apertures 156 are aligned with apertures (not shown) provided in the tool block 158 of the cutting assemblies 126 for receiving locators (not shown), such as dowels. The locators locate the cutting assemblies 124 on the respective angled faces 154. Further, the cutting assembly 124 is then coupled or secured to the first end ring 144 by welding. Alternatively, the cutting assembly 124 can be coupled to the first end ring 144 by soldering, brazing, or by using mechanical fasteners, such as, bolts, screw, rivets, pins, and the like, without any limitations. Further, the exterior surface 152 also includes

non-angled faces 164. In the illustrated embodiment, the first end ring 144 includes three non-angled faces 164, without any limitations.

[0020] FIG. 5 illustrates another embodiment of the present disclosure. In this embodiment, the first end ring 172 includes multiple segments 174 that are coupled to the shell member 176 for forming the first end ring 172. In the illustrated embodiment, the first end ring 172 includes four segments 174 that are arcuate in shape. In other examples, the first end ring 172 may include two segments that are semi-circular in shape or three segments, without any limitations. Alternatively, the first end ring 172 may be embodied as a unitary component.

[0021] In the illustrated embodiment, the segments 174 of the first end ring 172 are coupled to the shell member 176 by mechanical fasteners 178, without limiting the scope of the present disclosure. Each segment 174 includes a number of apertures 180. The apertures 180 are embodied as through-holes that align with apertures 182 provided on the shell member 176 for receiving the mechanical fasteners 178. The mechanical fasteners 178 may include bolts, screw, rivets, pins, and the like, without any limitations. In other examples, the segments 174 of the first end ring 172 may be coupled to the shell member 176 by welding, brazing, soldering, and the like. When assembled with the shell member 176, a surface 184 of each of the segments 174 is in contact with a front surface 186 of the shell member 176. Further, a central axis Y-Y' of the first end ring 172 coincides with a central axis of the shell member 176, when the first end ring 172 is coupled to the shell member 176.

[0022] When the multiple segments 174 of the first end ring 172 are coupled with the shell member 176, the first end ring 172 defines the annular body thereof. The exterior surface 188 defined by the segments 174 includes the number of angled faces 190. The angled faces 190 are formed at various angles with respect to a central axis Y-Y' of the first end ring 172. In some examples, some of the angled faces 190 may be inclined at equal angles. Alternatively, all the angled faces 190 may have different angles, based on system requirements. The number of angled faces 190 allows arrangement of the cutting assemblies 124 thereon in a desired configuration. For clarity purposes, a single cutting assembly 124 is shown in the accompanying figure. In one example, the arrangement of the angled faces 190, a number of the angled faces 190, and their respective angles are decided on a type of cut to be achieved. For example, a person in charge of designing the first end ring 172 may use historical data for providing the angled faces 190 on the exterior surface 188.

[0023] The first end ring 172 may include five to twenty-five angled faces 190, without limiting the scope of the present disclosure. However, it should be noted that the number of angled faces 190 may vary and is defined by a specific pattern and layout of the cutting assembly 124. Each of the angled faces 190 includes a pair of apertures 192. The apertures 192 may be embodied as blind holes.

The apertures 192 are aligned with apertures (not shown) provided in the in the tool block 158 of the cutting assembly 124 for receiving locators (not shown), such as, dowels. The locators locate the cutting assembly 124 on the respective angled face 190. Further, the cutting assembly 124 is then coupled or secured to the first end ring 172 by welding. Alternatively, the cutting assembly 124 can be coupled to the first end ring 172 by soldering, brazing, or by using mechanical fasteners, such as, bolts, screw, rivets, pins, and the like, without any limitations. Further, the exterior surface 188 also includes non-angled faces 194. In the illustrated embodiment, each segment 174 includes four non-angled faces 194, without any limitations. The non-angled faces 194 are provided between adjacent angled faces 190 to separate the adjacent angled faces 190 from each other.

[0024] It should be noted that the first end ring 144 and the multiple segments 174 of the first end ring 172 may be manufactured by a known additive manufacturing process, such as casting, molding, 3D printing, or a subtractive manufacturing process, such as machining, without any limitations. Further, in one example, the angled faces 154, 190 may be formed by machining the first end ring 144 and the multiple segments 174 of the first end ring 172. Alternatively, the first end ring 144 and the multiple segments 174 of the first end ring 172 are designed such that a final product of the first end ring 144 and the multiple segments 174 of the first end ring 172 includes the angled faces 154, 190, respectively, without any limitations.

Industrial Applicability

[0025] The present disclosure relates to the end ring 144, 192 for coupling with the rotor 122. The end ring 144, 172 is simple to design and manufacture, and is cost effective. Further, the end ring 144, 172 disclosed herein can be easily retrofitted to an existing machine. The end ring 144, 172 allows arrangement of the cutting assemblies 124 in a manner that provides an improved cutting action on an edge of cut and also evacuates the removed material efficiently away from the edge of the cut. Further, the end ring design improves a quality of the cut performed by the rotor 122. The end ring design also increases tool life of the cutting assembly 124, as the cutting bits 162 of the cutting assemblies 124 are arranged in a way to protect the next bit behind it in the cut from wearing.

[0026] While aspects of the present disclosure have been particularly shown and described with reference to the embodiments above, it will be understood by those skilled in the art that various additional embodiments may be contemplated by the modification of the disclosed machines, systems and methods without departing from the spirit and scope of what is disclosed. Such embodiments should be understood to fall within the scope of the present disclosure as determined based upon the claims and any equivalents thereof.

Claims

1. A rotor associated with a machine, the rotor comprising:

a shell member; and

at least one end ring adapted to couple to an edge of the shell member, the at least one end ring comprising:

an annular body defining an exterior surface; and

a plurality of angled faces formed on the exterior surface.
2. The rotor of claim 1, wherein the end ring is embodied as a unitary component.
3. The rotor of claim 1, wherein the end ring includes multiple segments adapted for coupling with the shell member.
4. The rotor of any preceding claim, wherein the end ring is coupled to the shell member by welding.
5. The rotor of any preceding claim, wherein the end ring is coupled to the shell member using mechanical fasteners.
6. The rotor of any preceding claim, wherein each of the plurality of angled faces includes at least one aperture to receive at least one locator for locating a cutting assembly on the end ring.
7. The rotor of claim 1, wherein the rotor is associated with at least one of a cold planer, a rotary mixer, and a milling machine.
8. An end ring associated with a rotor, the end ring comprising:

an annular body defining an exterior surface; and

a plurality of angled faces formed on the exterior surface.
9. The end ring of claim 8, wherein the end ring is embodied as a unitary component.
10. The end ring of claim 8, wherein the end ring includes multiple segments adapted for coupling with a shell member of the rotor.
11. The end ring of claim 8, wherein the end ring is coupled to a shell member of the rotor by welding.
12. The end ring of claim 8, wherein the end ring is coupled to a shell member of the rotor using mechanical

fasteners.

13. The end ring of claim 8, wherein each of the plurality of angled faces includes at least one aperture to receive at least one locator for locating a cutting assembly on the end ring.
14. The end ring of claim 8, wherein the rotor is associated with at least one of a cold planer, a rotary mixer, and a milling machine.

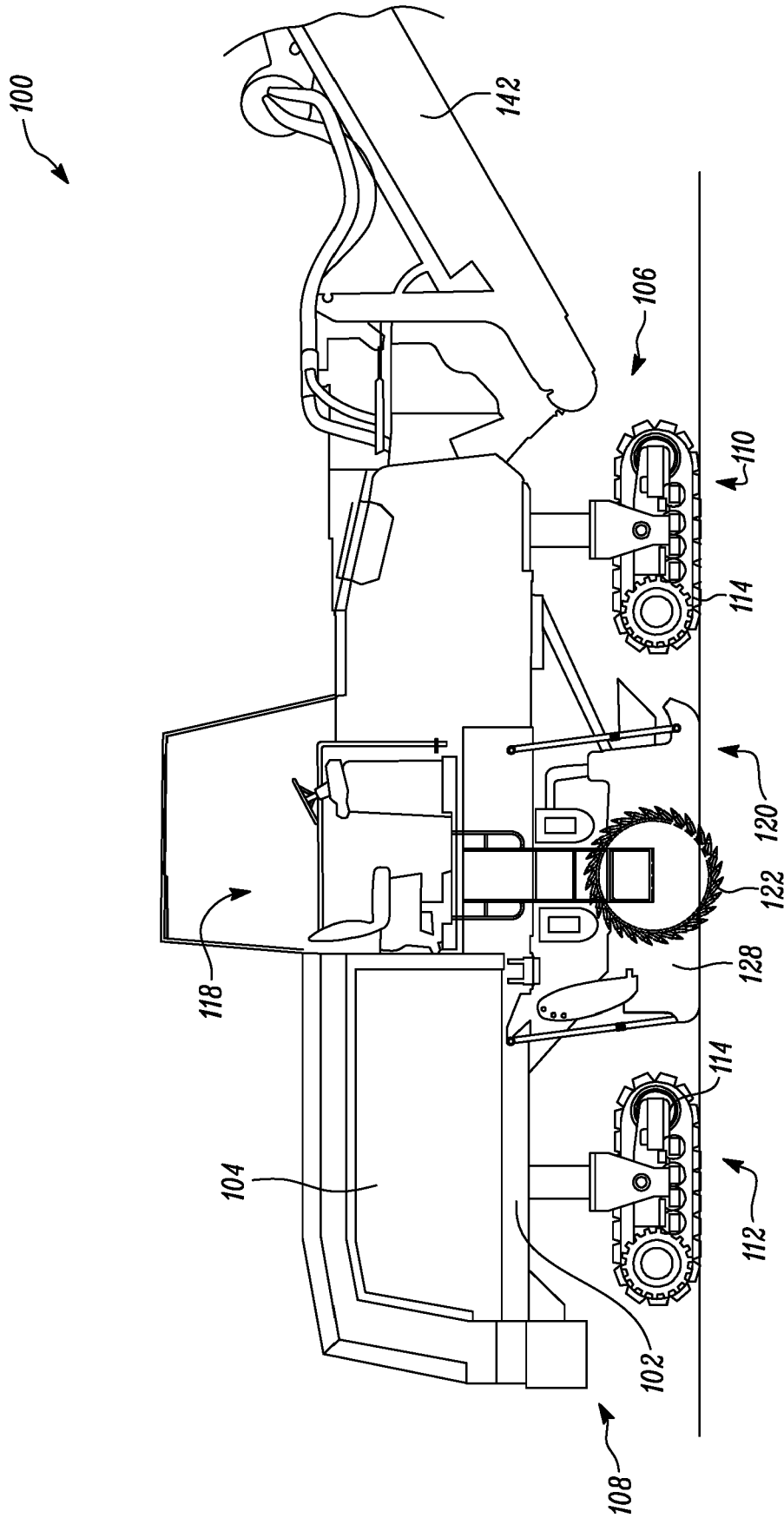


FIG. 1

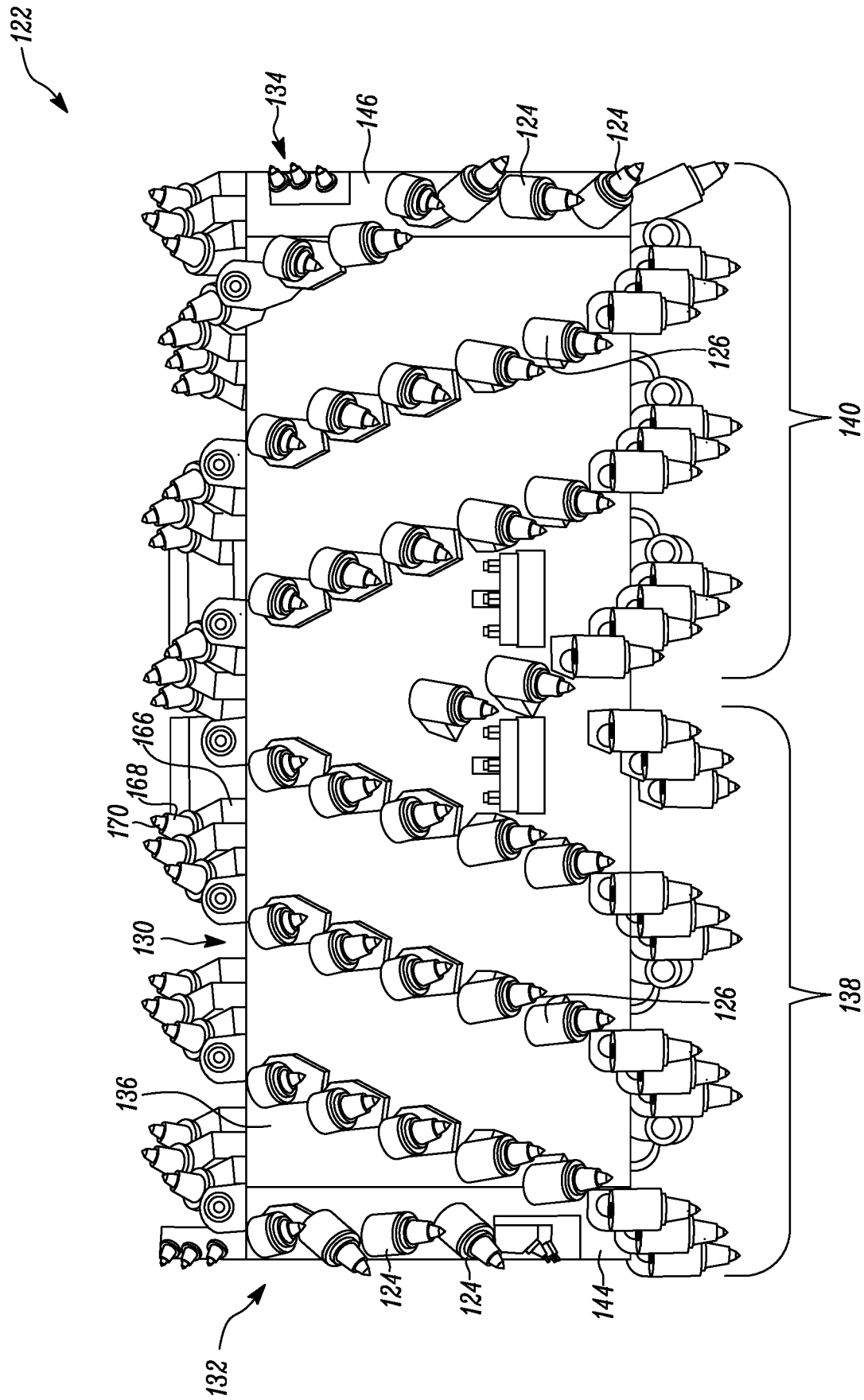


FIG. 2

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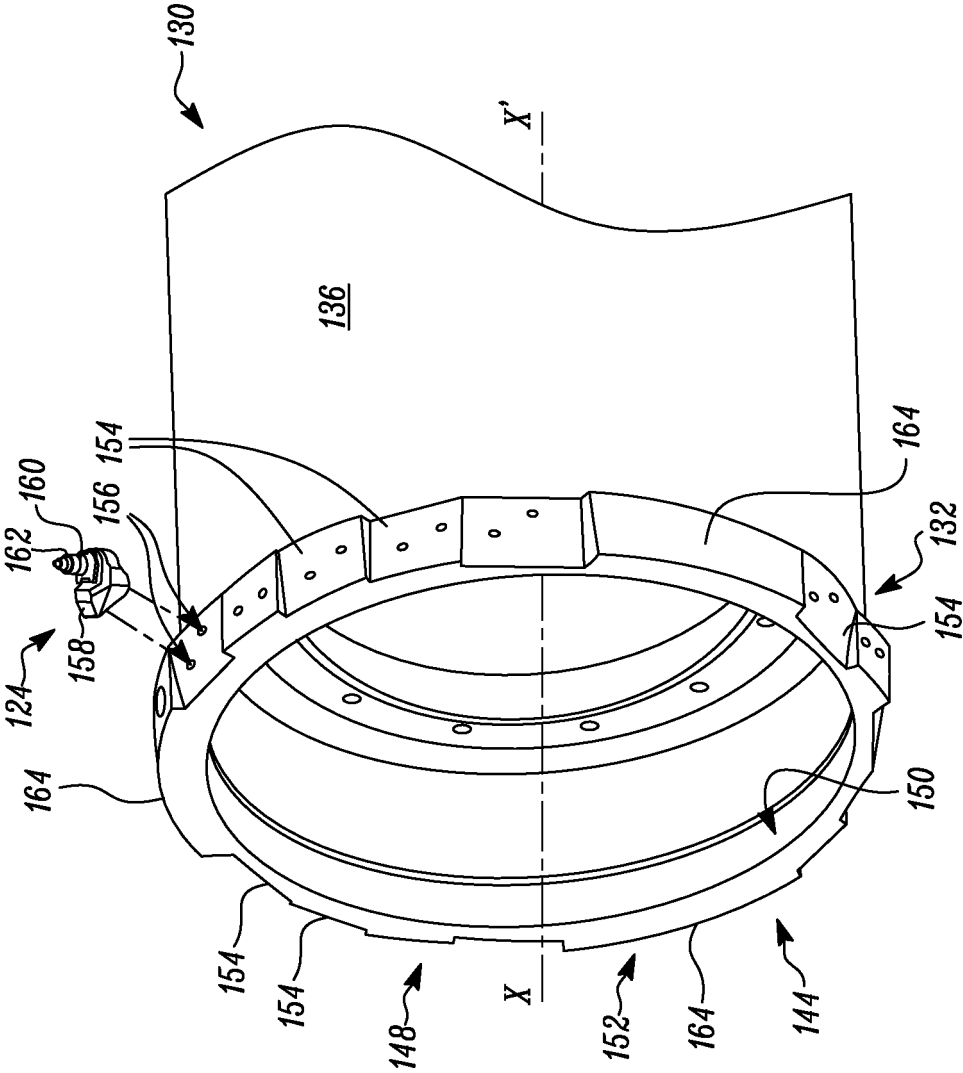


FIG. 3

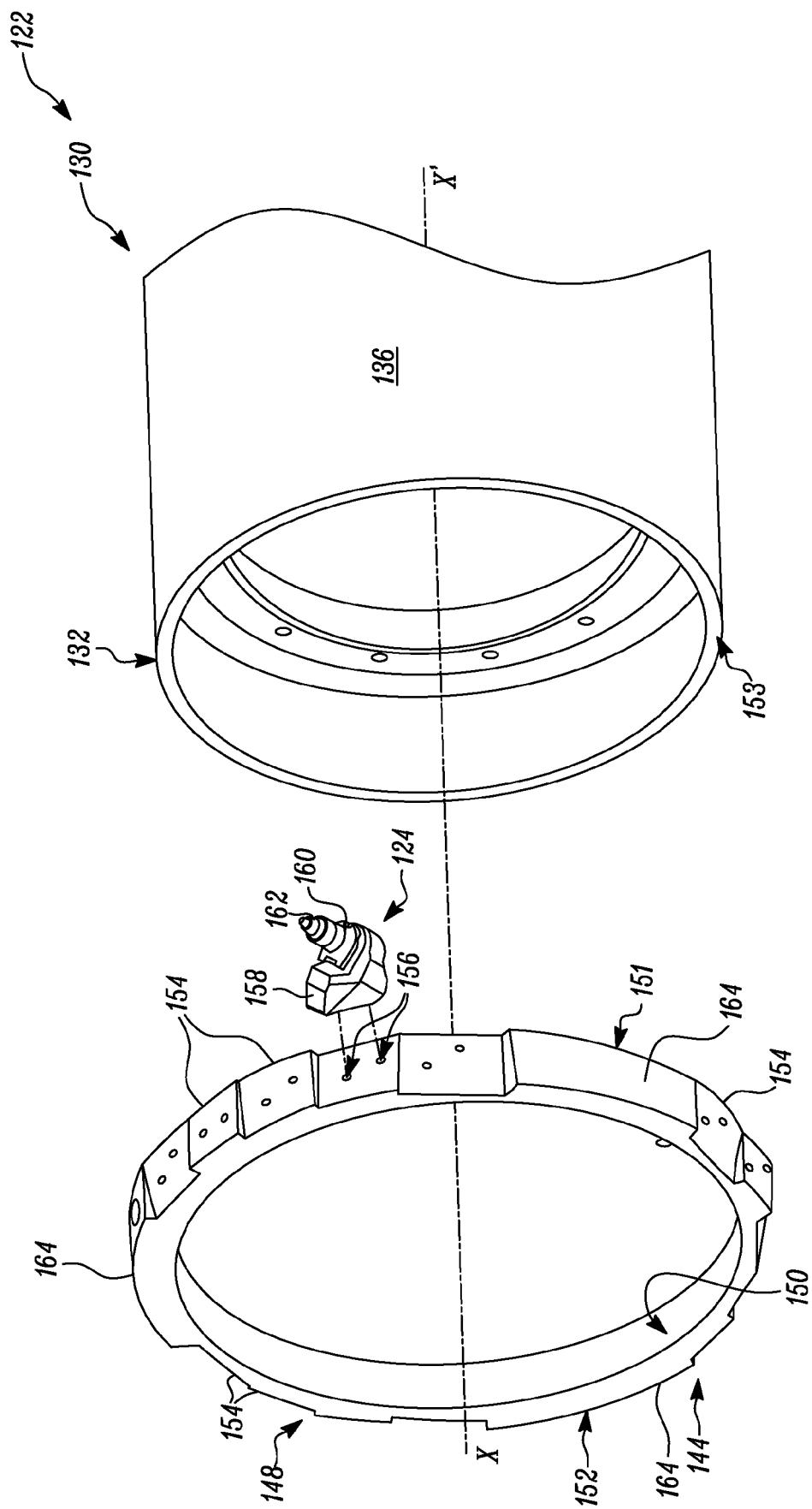


FIG. 4

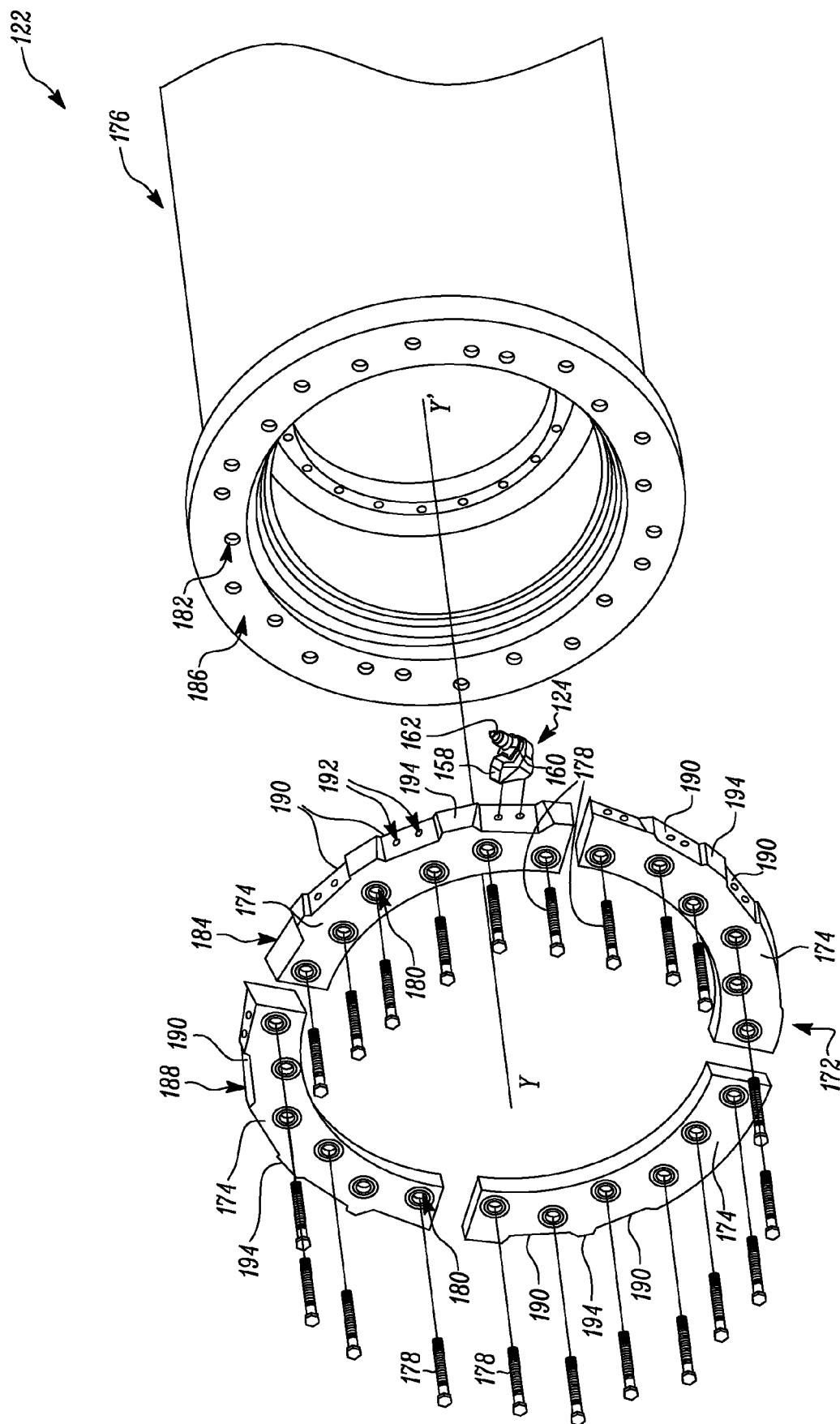


FIG. 5



EUROPEAN SEARCH REPORT

Application Number
EP 18 16 8104

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The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 28 September 2018	Examiner Movadat, Robin
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EPO FORM 1503 03/82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
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