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(54) **Title:** CRANKSHAFT BEARING SEAT INCLUDING AN EMBEDDED REINFORCEMENT RING

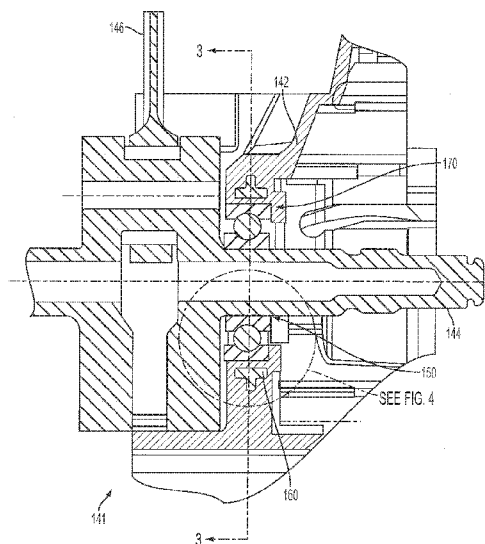


FIG. 2

(57) **Abstract:** A hand-held power tool including a housing, a power unit disposed within the housing, the power unit including a crankcase and a crankshaft rotatably supported therein by a bearing assembly that is received in a bearing seat defined by a portion of the crankcase, a working assembly powered responsive to operation of the power unit, and a reinforcement ring that is embedded in the crankcase about the bearing seat.

CRANKSHAFT BEARING SEAT INCLUDING AN EMBEDDED REINFORCEMENT RING

TECHNICAL FIELD

5 Example embodiments generally relate to hand held power equipment and, more particularly, relate to a reinforced bearing seat arrangement for a crankshaft of a chainsaw.

BACKGROUND

Chainsaws are commonly used in both commercial and private settings to cut
10 timber or perform other rigorous cutting operations. Because chainsaws are typically employed in outdoor environments, and the work they are employed to perform often inherently generates debris, chainsaws are typically relatively robust hand held machines. They can be powered by gasoline engines or electric motors (e.g., via batteries or wired connections) to turn a chain around a bar at relatively high speeds. The chain includes
15 cutting teeth that engage lumber or another medium in order to cut the medium as the teeth are passed over a surface of the medium at high speed. In an effort to reduce fatigue experienced by an operator, many chainsaws are designed with engine components, i.e., the crankcase, that are comprised of materials, such as, but not limited to magnesium, aluminum, etc., that are lighter than the traditional steel components.

20 Given that the chainsaw is expected to operate outdoors, it can be further expected that the chainsaw is likely to operate in different ambient temperatures. For instance, many chainsaws can be expected to operate in regions with high ambient temperatures for portions of, if not the entire, year. The high ambient temperatures, as well as increased temperatures due to regular cutting operations, can lead to various issues where parts
25 comprised of different metals come into contact, such as where a steel bearing race for a crankshaft is supported in a bearing seat formed in a crankcase formed of a lightweight material such as magnesium or aluminum. Specifically, the lightweight materials typically experience greater amounts of expansion / deformation than the steel race which can lead to undesired gaps between components, loose bearing races, etc.

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BRIEF SUMMARY OF SOME EXAMPLES

Some example embodiments may provide a way to reinforce bearing seats in crankcases constructed of lightweight materials such as magnesium, aluminum, etc. In this regard, some example embodiments may provide for a reinforcing ring that is

disposed in the crankcase about the bearing seat. Accordingly, improved performance of the chainsaw or power tool at elevated temperatures may be facilitated. Additionally, an improved lifespan of the chainsaw may be experienced.

5 In one example embodiment, a hand-held power tool is provided. The hand-held power tool may include a housing, a power unit disposed within the housing, the power unit including a crankcase and a crankshaft rotatably supported therein by a bearing assembly that is received in a bearing seat defined by a portion of the crankcase, and a working assembly powered responsive to operation of the power unit. A reinforcement ring is embedded in the crankcase about the bearing seat.

10 In another example embodiment, a method of producing a power unit is provided. The power unit of a hand-held power tool, includes providing a crankshaft, casting a crankcase for rotatably supporting the crankshaft, forming a bearing seat in the crankcase, providing a reinforcement ring, and providing a bearing assembly that rotatably supports the crankshaft within the crankcase. A reinforcement ring is embedded in the crankcase so
15 that the reinforcement ring surrounds the bearing seat.

BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWING(S)

Having thus described the invention in general terms, reference will now be made to the accompanying drawings, which are not necessarily drawn to scale, and wherein:

20 FIG. 1 illustrates a perspective view of a chainsaw according to an example embodiment;

FIG. 2 illustrates a partial cross sectional view of the gasoline engine of the chainsaw shown in FIG. 1;

25 FIG. 3 illustrates a partial cross sectional view of the gasoline engine of the chainsaw shown in FIG. 1;

FIG. 4 illustrates a close-up view of the indicated portion of the reinforced bearing seat shown in FIG. 2;

FIG. 5 illustrates perspective view of the reinforcing ring used in the reinforced bearing seat shown in FIGS. 2 through 4;

30 FIG. 6, which includes FIGS. 6A and 6B, illustrates front and side views of a reinforcing ring and bearing race according to an example embodiment; and

FIG. 7, which includes FIGS. 7A and 7B, illustrates front and side views of a reinforcing ring and bearing race according to an alternate example embodiment; and

FIG. 8, which includes FIGS. 8A and 8B, illustrates steps in the manufacture of a reinforced bearing seat in accordance with an example embodiment.

DETAILED DESCRIPTION

5 Some example embodiments now will be described more fully hereinafter with reference to the accompanying drawings, in which some, but not all example embodiments are shown. Indeed, the examples described and pictured herein should not be construed as being limiting as to the scope, applicability or configuration of the present disclosure. Rather, these example embodiments are provided so that this disclosure will satisfy
10 applicable legal requirements. Like reference numerals refer to like elements throughout. Furthermore, as used herein, the term "or" is to be interpreted as a logical operator that results in true whenever one or more of its operands are true. As used herein, operable coupling should be understood to relate to direct or indirect connection that, in either case, enables functional interconnection of components that are operably coupled to each other.

15 FIG. 1 illustrates a perspective view of a chainsaw 100 according to an example embodiment. It should be appreciated that the chainsaw 100 is merely one example of power equipment that includes a working assembly (i.e., the cutting components of the chainsaw 100) that may benefit from a single step starting system of an example embodiment. Thus, example embodiments could also be practiced in connection with
20 some other power equipment such as, but not limited to motor saws, trimmers, hedge trimmers, power cutters, brush cutters, blowers, etc., that may include working assemblies of different types.

As shown in FIG. 1, the chainsaw 100 may include a housing 110 inside which a power unit (e.g., a gasoline or petrol engine) is housed. In the present embodiment, a
25 gasoline powered engine 141 (FIG. 2) is used. In some embodiments, the power unit may be an internal combustion engine. Furthermore, in some embodiments, the power unit may power a working assembly of the chainsaw 100. The chainsaw 100 may further include a guide bar 120 that is attached to the housing 110 along one side thereof. A chain 122 may be driven around the guide bar 120 responsive to operation of the power unit in
30 order to enable the chainsaw 100 to cut lumber or other materials. The guide bar 120 and the chain 122 may form the working assembly of the chainsaw 100.

The chainsaw 100 may include a front handle 130 and a rear handle 132. A chain brake and front hand guard 134 may be positioned forward of the front handle 130 to stop the movement of the chain 122 in the event of a kickback. In an example embodiment, the

hand guard 134 may be tripped by rotating forward in response to contact with a portion of the arm (e.g., the hand/wrist) of the operator of the chainsaw 100. In some cases, the hand guard 134 may also be tripped in response to detection of inertial measurements indicative of a kickback.

5 The rear handle 132 may include a trigger 136 to facilitate operation of the power unit relative to turning the working assembly when the trigger 136 is actuated. In this regard, for example, when the trigger 136 is actuated (e.g., depressed), the rotating forces generated by the power unit may be coupled to the chain 122 either directly or indirectly. The term "trigger," as used herein, should be understood to represent any actuator that is
10 capable of being operated by a hand or finger of the user. Thus, the trigger 136 may represent a button, switch, or other such component that can be actuated by a hand or portion thereof. In some cases, the trigger 136 may be locked or inoperable until another actuator 140 is depressed to indicate presence of the operators hand firmly on the rear handle 132 so that the trigger 136 cannot be accidentally actuated.

15 Some power units may employ a clutch to provide operable coupling of the power unit to a sprocket that turns the chain 122. In some cases (e.g., for a gasoline engine), if the trigger 136 is released, the engine may idle and application of power from the power unit to turn the chain 122 may be stopped. The housing 110 may include a fuel tank for providing fuel to the power unit. The housing 110 may also include or at least partially
20 define an oil reservoir, access to which may be provided to allow the operator to pour oil into the oil reservoir. The oil in the oil reservoir may be used to lubricate the chain 122 as the chain 122 is turned.

As can be appreciated from the description above, actuation of the trigger 136 may initiate movement of the chain 122 around the guide bar 120. For power units that employ
25 gasoline or petrol engines, the engine may operate in an idle state after starting of the engine until the trigger 136 is pressed. The idle state may represent a condition during which the engine operates at a lower RPM to sustain continuous operation of the engine and maintain the engine in a ready state to respond to actuation of the trigger 136 to increase RPM and turn the chain 122 for cutting, e.g., via engagement of a clutch.

30 Referring now to FIGS. 2 through 5, the power unit for chainsaw 100 is shown, specifically a gasoline or petrol powered engine 141. As best seen in the cross-section views of FIGS. 2 and 3, engine 141 includes a crankshaft 144 which is rotatably supported within a crankcase 142 by one or more bearing assemblies 170, one of which is shown. A piston rod 146 is rotatably connected to crankshaft 144 and configured for reciprocating

motion within crankcase 142, as is commonly known. Bearing assembly 170 is inserted in a bearing seat 150 in a press-fit. In the present embodiment, the bearing seat 150 includes a continuous cylindrical surface 152 that is machined directly on the material from which the crankcase 142 is formed, in the instant case, that being magnesium. As shown, bearing assembly 170 includes an outer race 172, an inner race 176, and a plurality of roller elements 178 disposed therebetween. As best seen in FIG. 4, a cylindrical outer surface 174 of the bearing assembly's outer race 172 is in direct contact with the cylindrical surface 152 of the bearing seat 150. An inner cylindrical surface 177 of the inner race 176 is disposed adjacent the outer circumference of the crankshaft 144. As shown, roller elements 178 are preferably ball roller elements. Note, however, in alternate embodiments needle roller elements or tapered roller elements may also be utilized.

Referring now to FIG. 6, which includes FIGS 6A and 6B, front and side views of a reinforcement ring 160 and outer race 172 of the corresponding bearing assembly are shown. As shown, reinforcement ring 160 includes a cylindrical ring 162 that defines a cylindrical inner surface 163, and an outer flange 164 that depends radially outwardly from an outer surface of the ring 162. A plurality of recesses 166 is formed in the outer perimeter of the flange 164 and is used to position the reinforcement ring 160 within a casting tool 180 (FIGS. 8A and 8B). Specifically, each recess 166 receives a corresponding projection 182 that depends outwardly from the casting tool 180. This helps insure the reinforcement ring 160 is properly positioned throughout the casting process.

As best seen in FIGS. 3 and 4, in the present embodiment, reinforcement ring 160 is embedded within the material from which crankcase 142 is cast, and a portion of the crankcase 142 that defines the bearing seat 150 is disposed radially inwardly of the ring 162. Specifically, after casting, an annular layer 154 of magnesium is disposed radially inwardly of the inner surface 163 of the reinforcement ring 160. As previously noted, the layer of magnesium is preferably machined such that a cylindrical surface 152 is provided as the bearing seat 150. Typically, when using a cast procedure, the layer 154 of magnesium will be in the 1-1.5 millimeter range. As shown in FIGS. 6A and 6B, this layer 154 is disposed in the gap 158 that is defined between the outer surface 174 of the bearing assembly's outer race 172 and the inner surface 163 of the reinforcement ring 160. Typically, the reinforcement ring 160 has a radial thickness of approximately 2-6 millimeters, at its greatest radial width, depending, for example, on the size of the engine in which it is used. Specifically, the noted range would preferably be used with engine

sizes that dictate an inner diameter of 30-50 millimeters for the ring 162. As shown, the outer race 172 of the bearing assembly 170 is received in the bearing seat 150, specifically in the cylindrical surface 152 of the magnesium layer 154 in a press-fit.

As is known, prior art engine assemblies where components such as steel bearing
5 races are press-fit into a portion of a crankcase constructed of a lightweight material, such as magnesium or aluminum, it is possible at elevated operating temperatures for the portion of the crankcase that is adjacent the steel component to deform to a greater extent than the steel component. Specifically, this is known to occur where steel bearing races are press-fit into bearing seats formed in a corresponding crankcase. As such, it is
10 possible that press-fits between steel components in the lightweight crankcase may be weakened, leading to reduced bearing performance. However, in the presently discussed embodiment of the invention, at elevated operating temperatures, because both the outer race 172 of the bearing assembly 170 and the reinforcement ring 160 are both constructed of steel, they will exhibit similar expansion characteristics. As well, because the layer 154
15 of magnesium disposed between the reinforcement ring 160 and the outer race 172 expands to a greater extent than do the steel components, enhanced retention force is exerted between the reinforcement ring 160 and the outer race 172, as compared to known prior art devices that do not include the reinforcement ring 160. In short, the use of reinforcement rings 160, as disclosed, may reduce the possibility that a press-fit between a
20 steel bearing race and bearing seat will be degraded at high operating temperatures. Additionally, the use of the disclosed reinforcement rings in crankcases constructed of lightweight materials may help reduce the potential deformation of the corresponding bearing races at elevated operating temperatures, contributing to enhanced performance and longer bearing life. Note, also, that because the cylindrical surface 152 of the bearing
25 seat 150 is machined on the magnesium layer 153 rather than steel, the potential for the production of sparks is reduced and therefore safety enhanced during manufacturing.

Referring now to FIG. 7, which includes FIGS. 7A and 7B, a front view and a side view, respectively, with an alternate embodiment of a reinforcement ring 160' are shown. Reinforcement ring 160' differs only from the previously discussed embodiment in that the
30 cylindrical inner surface 163 of reinforcement ring 160 is left exposed during a casting process in which the crankcase 142 is formed. As such, the inner surface 163 of the reinforcement ring 160' comes into direct contact with the outer surface 174 of the bearing assembly's outer race 172. As such, the inner surface of the reinforcement ring 160 functions as the bearing seat for the bearing assembly 170. Note also, yet further

embodiments may include the configurations shown in FIGS. 6A, 6B, 7A and 7B, but include components constructed of differing materials than those discussed above. Specifically, in alternate embodiments, steel reinforcement rings may be used with aluminum crankcases, and aluminum reinforcement rings may be used with crankcases constructed of plastic materials or fiber-reinforced plastic materials.

Many modifications and other embodiments of the inventions set forth herein will come to mind to one skilled in the art to which these inventions pertain having the benefit of the teachings presented in the foregoing descriptions and the associated drawings. Therefore, it is to be understood that the inventions are not to be limited to the specific embodiments disclosed and that modifications and other embodiments are intended to be included within the scope of the appended claims. Moreover, although the foregoing descriptions and the associated drawings describe exemplary embodiments in the context of certain exemplary combinations of elements and/or functions, it should be appreciated that different combinations of elements and/or functions may be provided by alternative embodiments without departing from the scope of the appended claims. In this regard, for example, different combinations of elements and/or functions than those explicitly described above are also contemplated as may be set forth in some of the appended claims. In cases where advantages, benefits or solutions to problems are described herein, it should be appreciated that such advantages, benefits and/or solutions may be applicable to some example embodiments, but not necessarily all example embodiments. Thus, any advantages, benefits or solutions described herein should not be thought of as being critical, required or essential to all embodiments or to that which is claimed herein. Although specific terms are employed herein, they are used in a generic and descriptive sense only and not for purposes of limitation.

CLAIMS

1. A hand-held power tool (100) comprising:
a housing (110);
5 a power unit (141) disposed within the housing (110), the power unit (141) including a crankcase (142) and a crankshaft (144) rotatably supported therein by a bearing assembly (170) that is received in a bearing seat (150) defined by a portion of the crankcase (142); and
a working assembly (120, 122) powered responsive to operation of the power unit
10 (141),
characterized in that:
a reinforcement ring (160) is embedded in the crankcase (142) about the bearing seat (150).
- 15 2. The hand-held power tool (100) according to claim 1, characterized in that the power unit (141) is a gasoline engine.
3. The hand-held power tool (100) according to claims 1 or 2, characterized in that the portion of the crankcase (142) that defines the bearing seat (150) is disposed
20 between the reinforcement ring (160) and the bearing assembly (170).
4. The hand-held power tool (100) according to claims 1 to 3, characterized in that the portion of the crankcase (142) that defines the bearing seat (150) is a layer of material (184) from which the crankcase (142) is constructed, the layer of material (154)
25 defining a cylindrical bearing surface (152) that is in contact with an outer surface of the bearing assembly (170) about its circumference.
5. The hand-held power tool (100) according to claim 1, characterized in that the reinforced ring (160) is in contact with an outer surface of the bearing assembly (170)
30 about its circumference.
6. The hand-held power tool (100) according to any of claims 1 to 5, characterized in that the reinforcement ring (160) comprises a substantially cylindrical ring (162) and a flange (164) extending radially outward from an outer surface thereof.

7. The hand-held power tool (100) according to any of claims 1 to 6, characterized in that the reinforcement ring (160) is comprised of steel.

5 8. The hand-held power tool (100) according to any of claims 1 to 7, characterized in that the crankcase (142) is comprised of one of magnesium and aluminum.

10 9. The hand-held power tool (100) according to any of claims 1 to 6, characterized in that the reinforcement ring (160) is comprised of aluminum and the crankcase (142) is comprised of one of a plastic material and a fiber-reinforced plastic material.

15 10. A method of producing a power unit (141) of a hand-held power tool (100), comprising the steps of:
providing a crankshaft (144);
casting a crankcase (142) for rotatably supporting the crankshaft (144);
forming a bearing seat (150) in the crankcase (142);
providing a reinforcement ring (160); and
20 providing a bearing assembly (170) that rotatably supports the crankshaft (144) within the crankcase (142);
characterized in that:
providing the reinforcement ring (160) includes embedding the reinforcement ring (160) in the crankcase (142) so that the reinforcement ring (160) surrounds the bearing
25 seat (150).

11. The method of providing a power unit (141) according to claim 10, characterized in that forming the bearing seat (150) further comprises disposing a layer (154) of a material from which the crankcase (142) is comprised between an inner surface (163) of the reinforcement ring (160) and an outer surface (174) of the bearing assembly (170).

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12. The method of providing a power unit (141) according to claim 11, characterized in that forming the bearing seat (150) further comprises forming a

cylindrical bearing surface (152) on the layer (154) of material that abuts the outer surface (174) of the bearing assembly (170).

13. The method of providing a power unit (141) according to claim 10,
5 characterized in that forming the bearing seat (150) further comprises forming a cylindrical inner surface (163) on the reinforcement ring (160) that abuts an outer surface (174) of the bearing assembly (170).

14. The method of providing a power unit (141) according to any of claims 10
10 to 13, characterized in that providing the reinforcement ring (160) further comprises providing a substantially cylindrical ring (162) and a flange (164) that extends radially outwardly from an outer surface thereof.

15. The method of providing a power unit (141) according to any of claims 10
15 to 14, characterized in that the reinforcement ring (160) is comprised of steel.

16. The method of providing a power unit (141) according to any of claims 10
to 15, characterized in that the crankcase (142) is comprised of one of magnesium and
aluminum.

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17. The method of providing a power unit (141) according to any of claims 10
to 14, characterized in that the reinforcement ring (160) is comprised of aluminum and the
crankcase (142) is comprised of one of a plastic material and a fiber-reinforced plastic
material.

25

18. A power unit (141) for hand-held power tool (100) including a housing
(110), comprising:

a crankcase (142) disposed within the housing (110);

a crankshaft (144) rotatably supported with the crankcase (142) by a bearing
30 assembly (170) that is received in a bearing seat (150) defined by the crankcase (142) in a
press-fit; and

a reinforcement ring (160) embedded in the crankcase (142),

characterized in that:

the reinforcement ring (160) is configured to enhance the press-fit between the

bearing assembly (170) and the crankcase (142) at elevated operating temperatures.

19. The power unit (141) according to claim 18, characterized in that the reinforcement ring (160) is configured to reduce an amount to which an outer race (172) of the bearing assembly (170) may deform at elevated operating temperatures.

20. A crankcase (142) for an engine (141) of a hand-held power tool (100), the engine (141) having a crankshaft (144) rotatably supported therein by a bearing assembly (170), the crankcase (142) comprising:

- 10 a bearing seat (150) defined by a portion of the crankcase (142);
the bearing seat (150) receiving the bearing assembly (170) therein,
characterized in that:
a reinforcement ring (160) is embedded in the crankcase (142) about the bearing seat (150).

AMENDED CLAIMS

received by the International Bureau on 12 April 2016 (12.04.16)

1. A hand-held power tool (100) comprising:

a housing (110);

a power unit (141) disposed within the housing (110), the power unit (141) including a
5 crankcase (142) and a crankshaft (144) rotatably supported therein by a bearing assembly (170)
that is received in a bearing seat (150) defined by a portion of the crankcase (142); and

a working assembly (120, 122) powered responsive to operation of the power unit (141),
characterized in that

a reinforcement ring (160) is embedded in the crankcase (142) about the bearing seat
10 (150), wherein the reinforcement ring (160) comprises a substantially cylindrical ring (162) and a
flange (164) extending radially outward from an outer surface thereof.

2. The hand-held power tool (100) according to claim 1, characterized in that the
power unit (141) is a gasoline engine.

3. The hand-held power tool (100) according to claims 1 or 2, characterized in that
the portion of the crankcase (142) that defines the bearing seat (150) is disposed between the
reinforcement ring (160) and the bearing assembly (170).

4. The hand-held power tool (100) according to claims 1 to 3, characterized in that
the portion of the crankcase (142) that defines the bearing seat (150) is a layer of material (184)
from which the crankcase (142) is constructed, the layer of material (184) defining a cylindrical
bearing surface (152) that is in contact with an outer surface of the bearing assembly (170) about
its circumference.

5. The hand-held power tool (100) according to claim 1, characterized in that the
reinforced ring (160) is in contact with an outer surface of the bearing assembly (170) about its
circumference.

6. The hand-held power tool (100) according to any of claims 1 to 5, characterized
in that the reinforcement ring (160) is comprised of steel.

7. The hand-held power tool (100) according to any of claims 1 to 6, characterized in that the crankcase (142) is comprised of one of magnesium and aluminum.

8. The hand-held power tool (100) according to any of claims 1 to 5, characterized in that the reinforcement ring (160) is comprised of aluminum and the crankcase (142) is comprised of one of a plastic material and a fiber-reinforced plastic material.

9. A method of producing a power unit (141) of a hand-held power tool (100), comprising the steps of:

providing a crankshaft (144);
casting a crankcase (142) for rotatably supporting the crankshaft (144);
forming a bearing seat (150) in the crankcase (142);
providing a reinforcement ring (160); and
providing a bearing assembly (170) that rotatably supports the crankshaft (144) within the crankcase (142); characterized by
embedding the reinforcement ring (160) in the crankcase (142) so that the reinforcement ring (160) surrounds the bearing seat (150). and having a substantially cylindrical ring (162) and a flange (164) that extends radially outwardly from an outer surface thereof.

10. The method of producing the power unit (141) according to claim 9, characterized by forming the bearing seat (150) further comprises disposing a layer (154) of a material from which the crankcase (142) is comprised between an inner surface (163) of the reinforcement ring (160) and an outer surface (174) of the bearing assembly (170).

11. The method of producing the power unit (141) according to claim 10, characterized by forming the bearing seat (150) further comprises forming a cylindrical bearing surface (152) on the layer (154) of material that abuts the outer surface (174) of the bearing assembly (170).

12. The method of producing the power unit (141) according to claim 9, characterized by forming the bearing seat (150) further comprises forming a cylindrical inner surface (163) on

the reinforcement ring (160) that abuts an outer surface (174) of the bearing assembly (170).

13. The method of producing the power unit (141) according to any of claims 9 to 12, characterized by the reinforcement ring (160) is comprised of steel.

5

14. The method of producing the power unit (141) according to any of claims 9 to 13, characterized by the crankcase (142) is comprised of one of magnesium and aluminum.

15. The method of producing the power unit (141) according to any of claims 9 to 12, characterized by the reinforcement ring (160) is comprised of aluminum and the crankcase (142) is comprised of one of a plastic material and a fiber-reinforced plastic material.

10

16. A power unit (141) for hand-held power tool (100) including a housing (110), comprising:

15 a crankcase (142) constructed of lightweight materials such as magnesium or aluminum and disposed within the housing (110);

a crankshaft (144) rotatably supported with the crankcase (142) by a bearing assembly (170) that is received in a bearing seat (150) defined by the crankcase (142) in a press-fit; and

a reinforcement ring (160) embedded in the crankcase (142),

20 characterized in that the reinforcement ring (160) is embedded in the crankcase (142) about the bearing seat (150) to enhance the press-fit between the bearing assembly (170) and the crankcase (142) at elevated operating temperatures.

17. The power unit (141) according to claim 16, characterized in that the reinforcement ring (160) is configured to reduce an amount to which an outer race (172) of the bearing assembly (170) may deform at elevated operating temperatures.

25

18. A crankcase (142) constructed of lightweight materials such as magnesium or aluminum for an engine (141) of a hand-held power tool (100), the engine (141) having a crankshaft (144) rotatably supported therein by a bearing assembly (170), the crankcase (142) comprising:

30

a bearing seat (150) defined by a portion of the crankcase (142);
the bearing seat (150) receiving the bearing assembly (170) therein,
characterized in that a reinforcement ring (160) is embedded in the crankcase (142) about
the bearing seat (150).

5

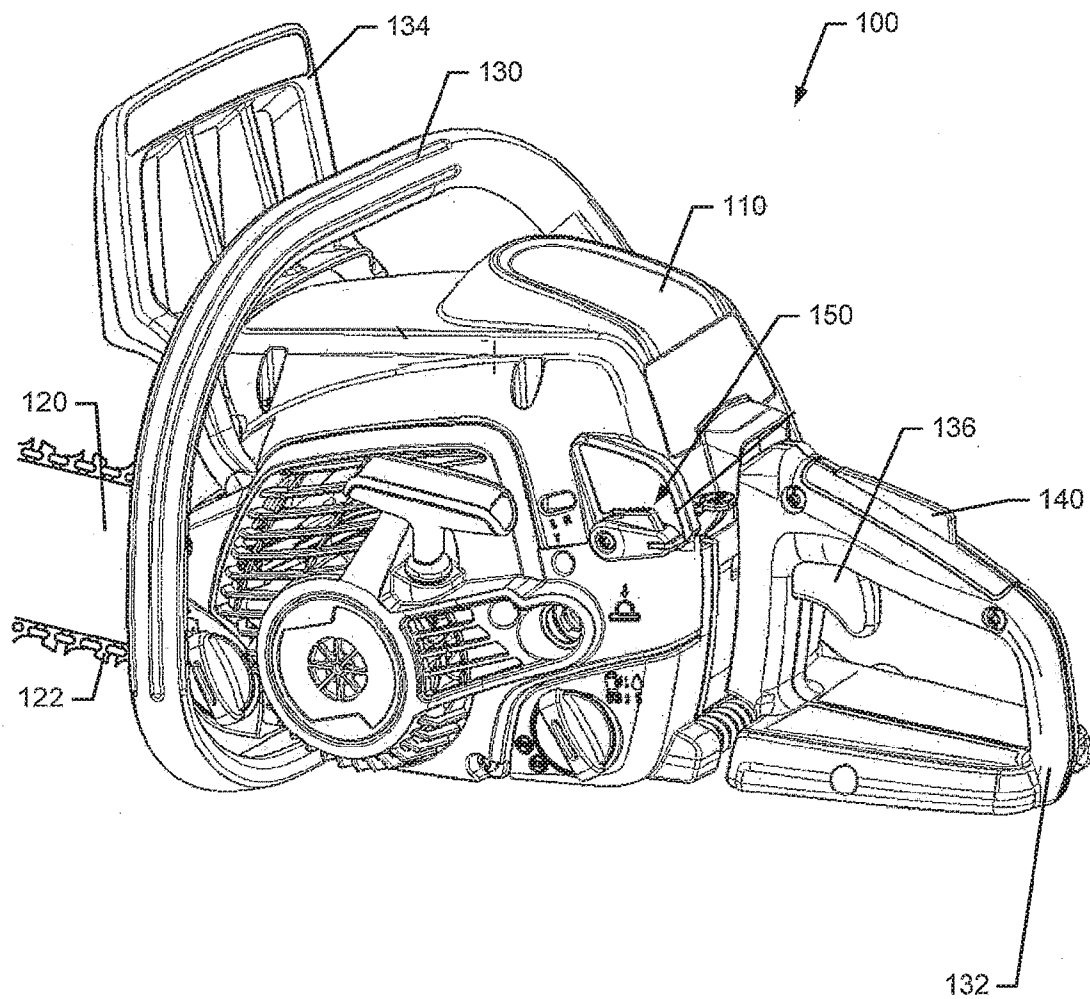


FIG. 1

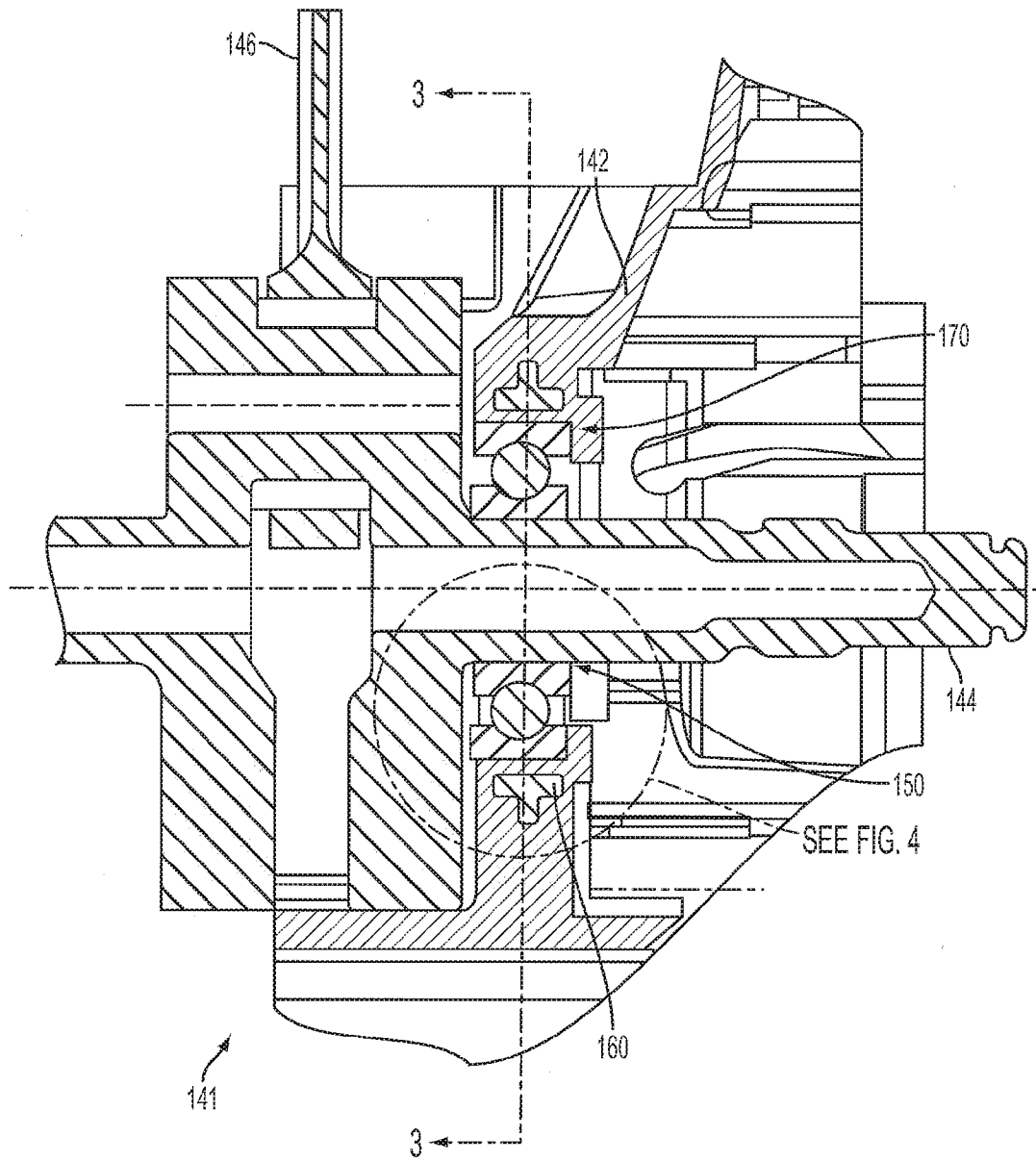


FIG. 2

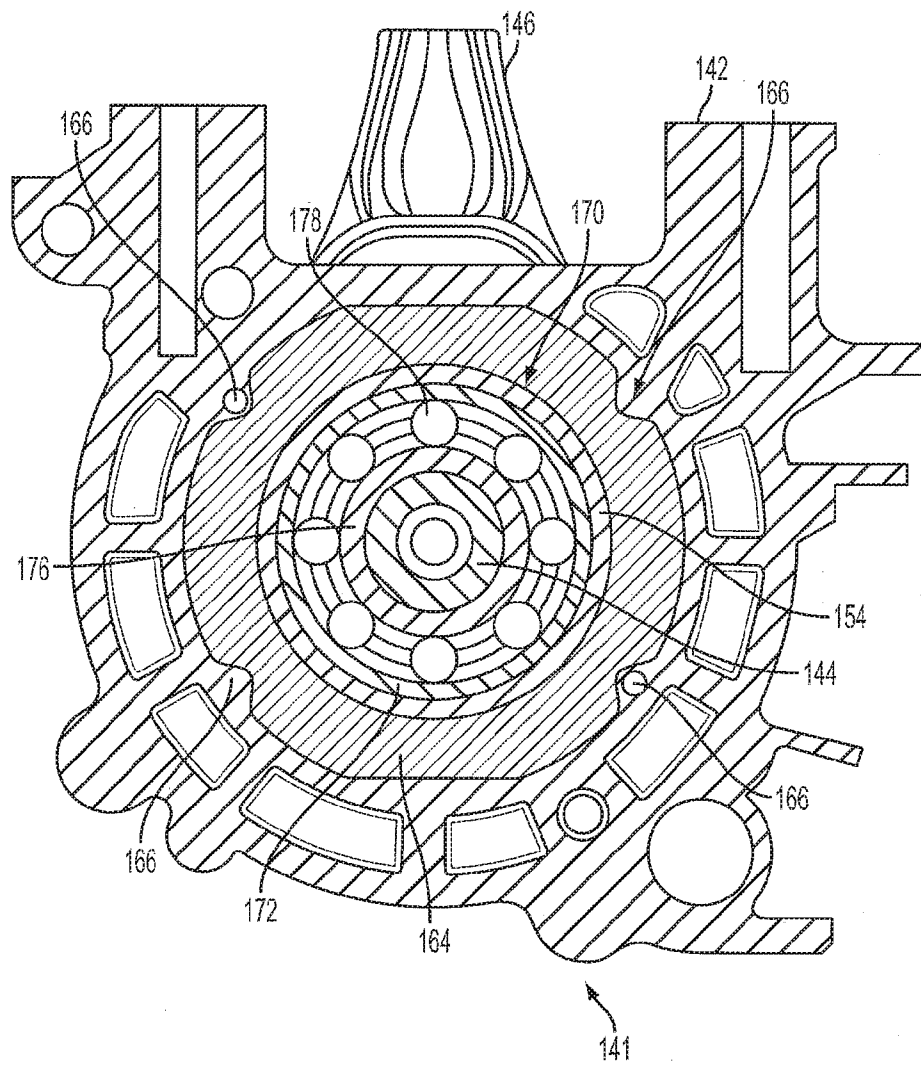


FIG. 3

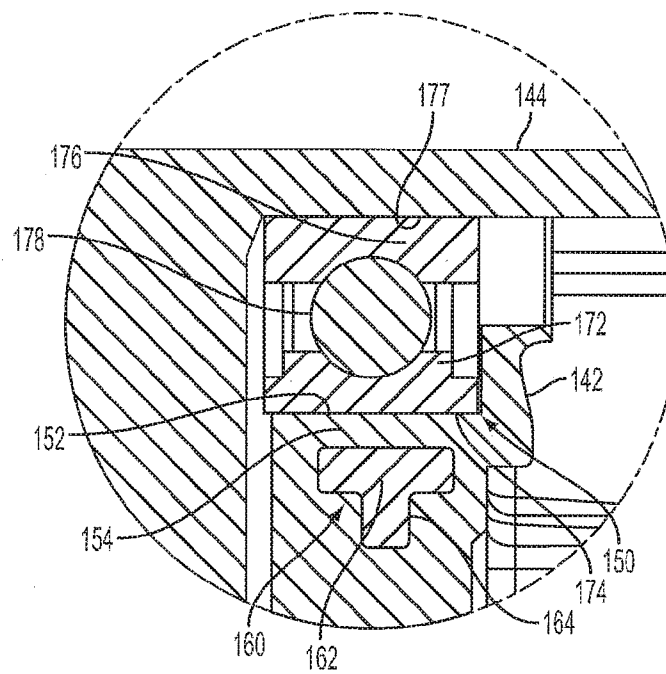


FIG. 4

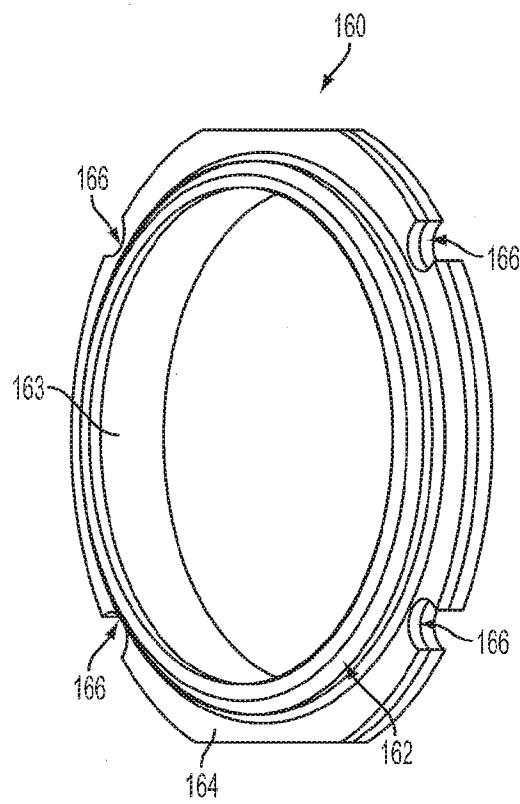


FIG. 5

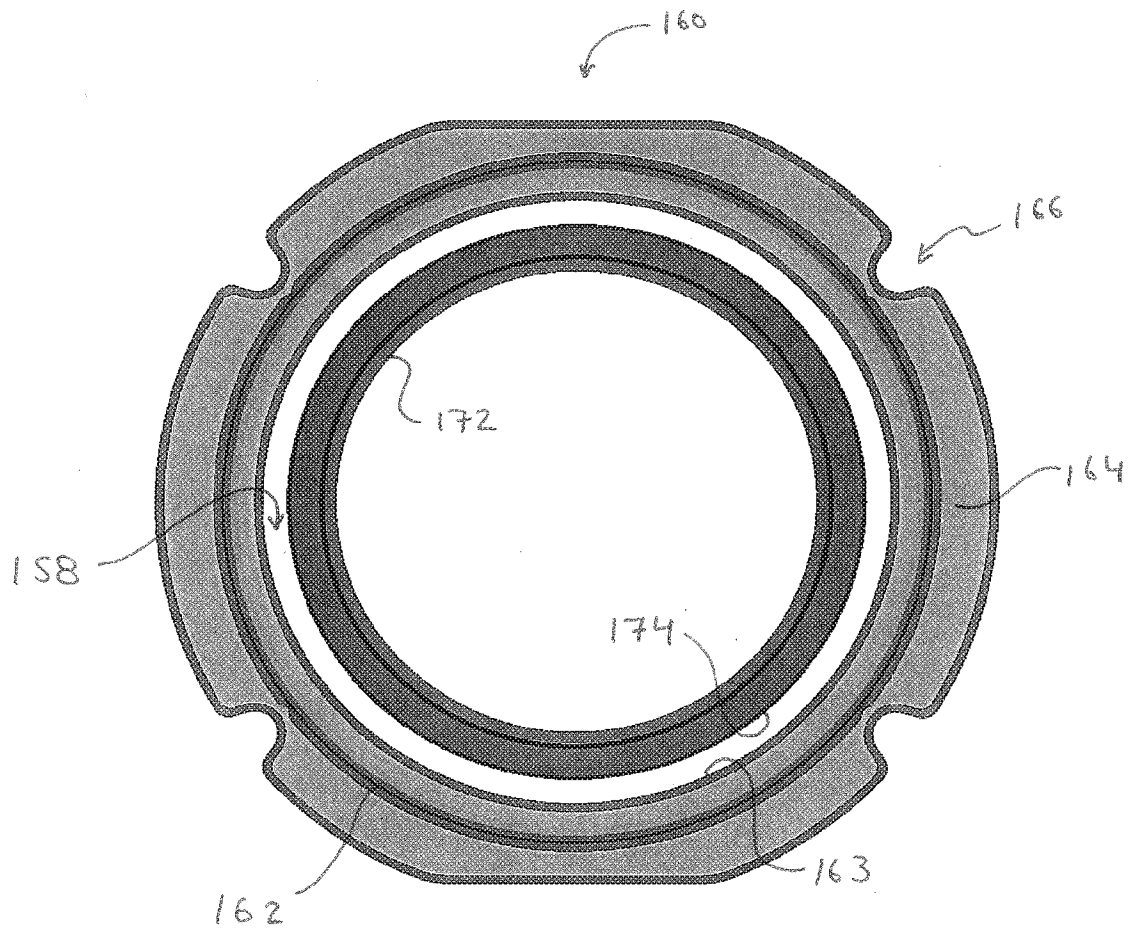


FIG. 6A

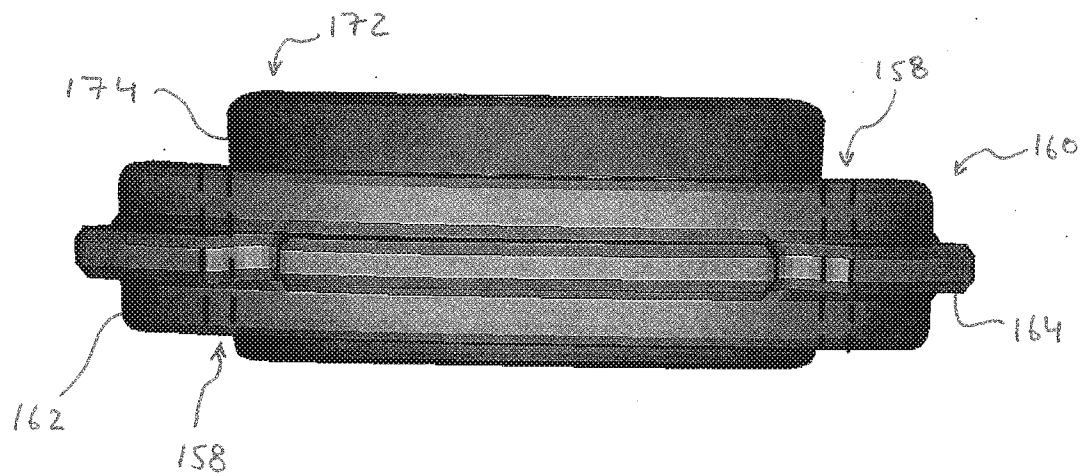


FIG. 6B

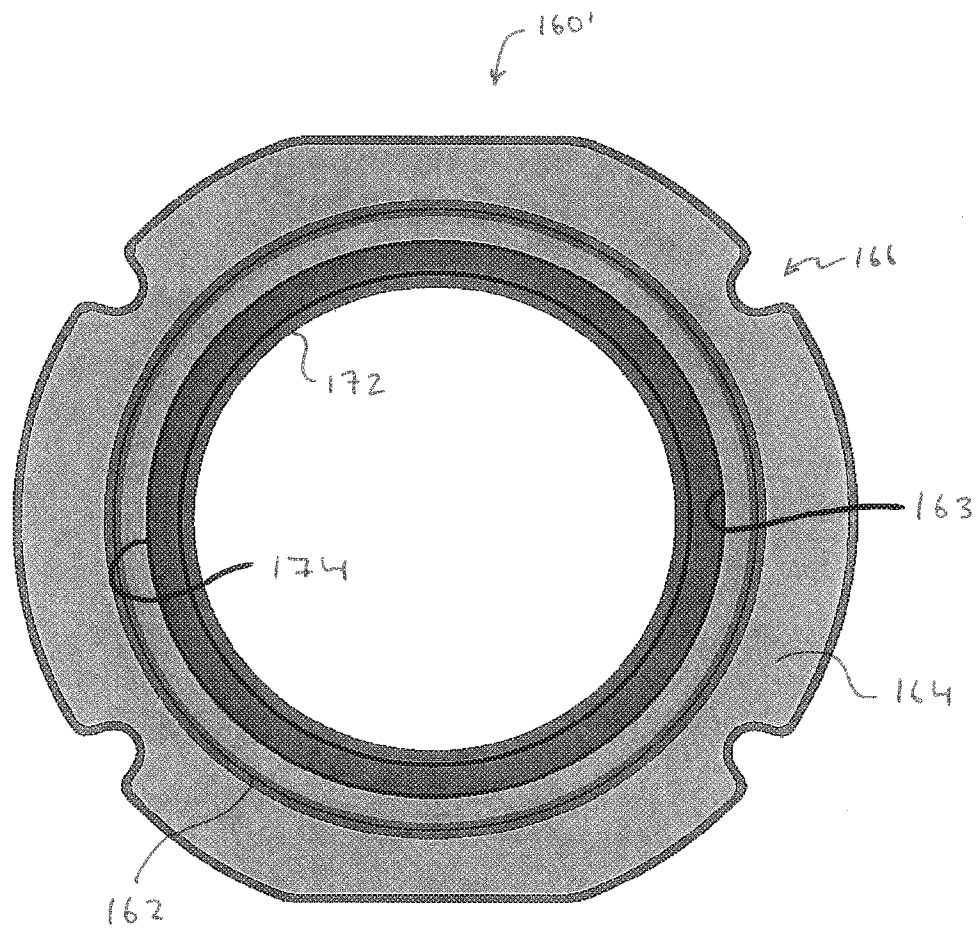


FIG. 7A

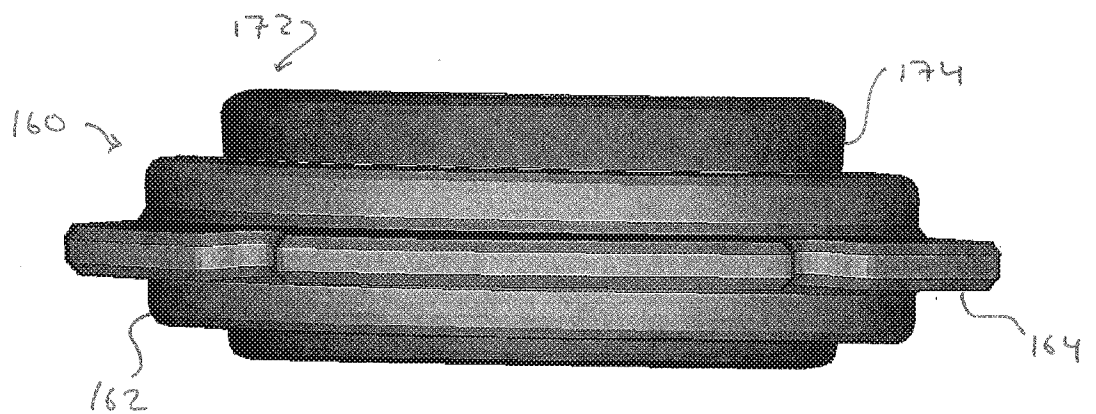


FIG. 7B

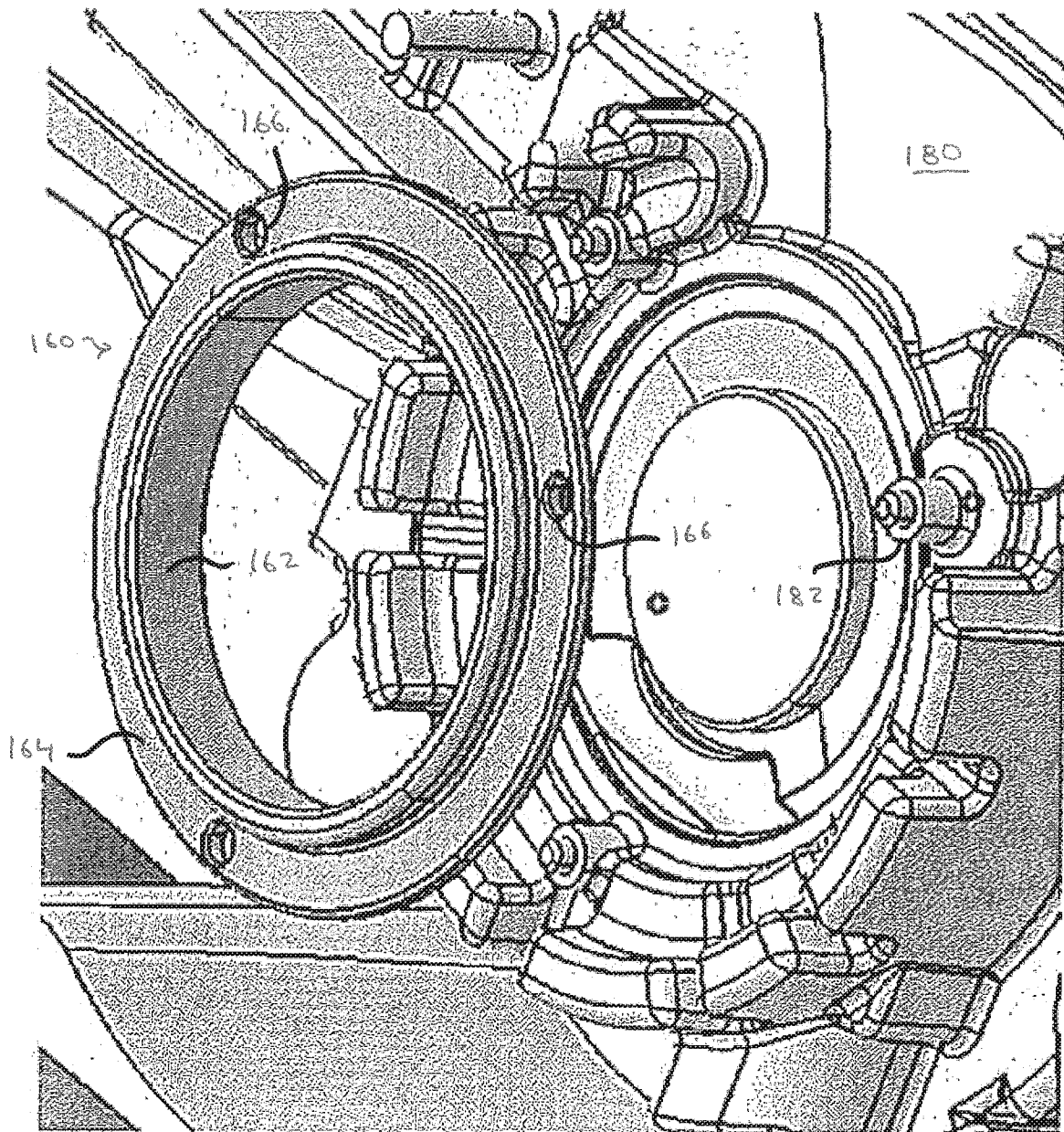


FIG.8A

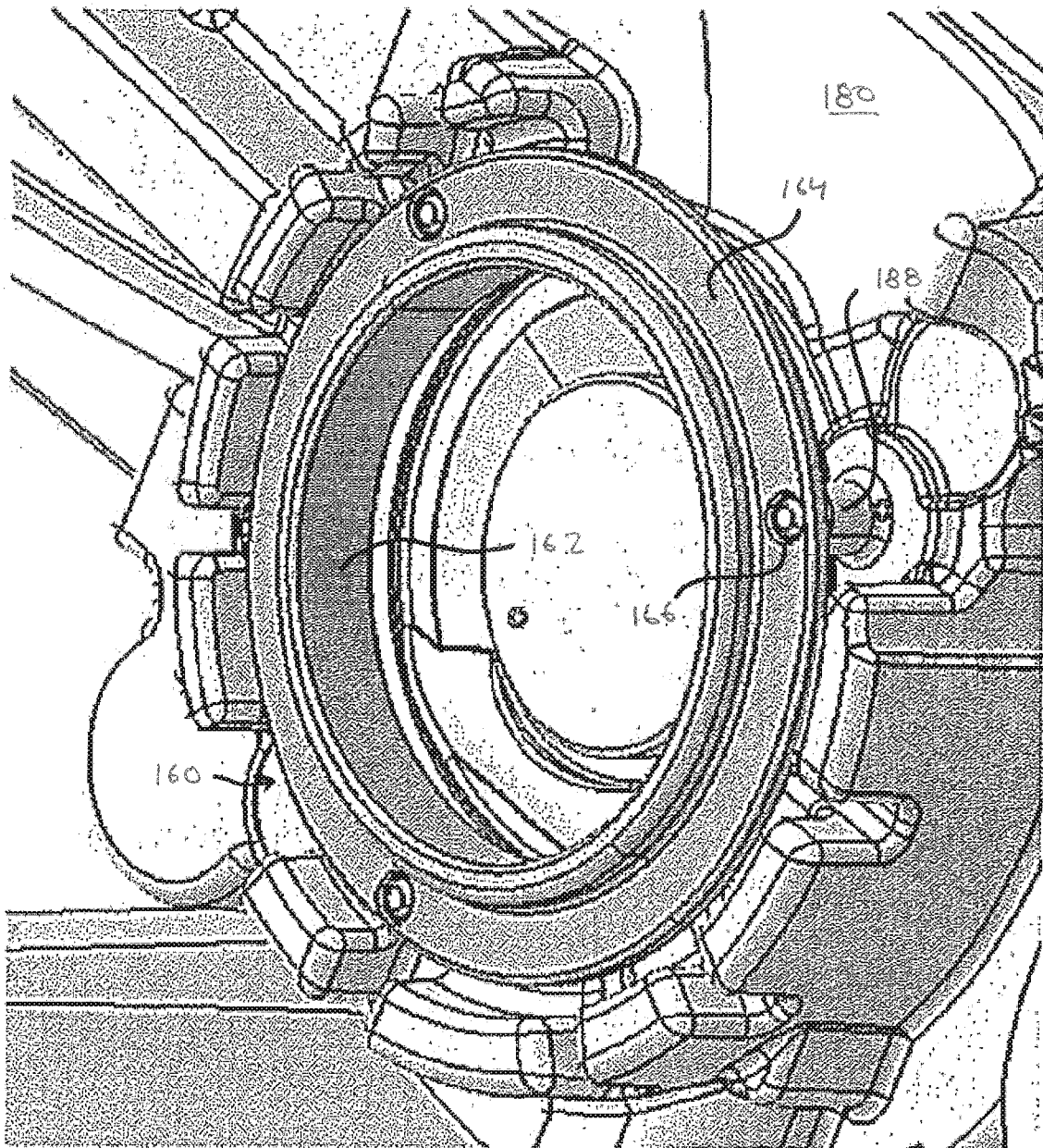


FIG. 8B

INTERNATIONAL SEARCH REPORT

International application No

PCT/IB2014/067395

A. CLASSIFICATION OF SUBJECT MATTER

INV. B27B17/00 F02F7/00
ADD.

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

B27B F02F

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EP0-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 2008/069703 A1 (HUSQVARNA AB [SE]; BJOERKMAN PETER [SE]; GRANSTEDT MATS [SE]) 12 June 2008 (2008-06-12)	1-4, 10-13, 18-20
Y	page 1, lines 4-14	5
A	page 6, lines 3-27	7,15
	page 8, line 29 - page 9, line 13	
	figure 1	

Y	DE 32 22 457 A1 (ELECTROLUX MOTOR AB [SE]) 30 December 1982 (1982-12-30)	5
A	page 5, lines 16-19	1,10,18, 20
	figure 2	

A	DE 196 17 607 A1 (MAN B & W DIESEL GMBH [DK]) 13 November 1997 (1997-11-13)	1,10,18, 20
	the whole document	

☐ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

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"&" document member of the same patent family

Date of the actual completion of the international search

14 August 2015

Date of mailing of the international search report

26/08/2015

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

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