(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
13 January 2011 (13.01.2011)

PCT

(10) International Publication Number
WO 2011/005259 A1

(51) International Patent Classification:
*B23D 63/16* (2006.01)

(21) International Application Number:
PCT/US2009/050134

(22) International Filing Date:
9 July 2009 (09.07.2009)

(25) Filing Language: English

(26) Publication Language: English

(71) Applicant *(for all designated States except US)*: **HUSQNARNA CONSUMER OUTDOOR PRODUCTS N.A., INC.** [US/US]; 1030 Stevens Creek Rd., Augusta, GA 30907 (US).

(72) Inventors; and

(75) Inventors/Applicants *(for US only)*: **ROBERTS, Dennis** [US/US]; 359 Akin Rd., Texarkana, TX 75503 (US). **PERRYMAN, Roy** [US/US]; 33 Dustin Terrace, Nash, TX 75569 (US). **FOX, Robert** [US/US]; 212 Laurel St., Apt. 104, Texarkana, AR 71854 (US).

(74) Agents: **DRUCE, Tracy, W.** et al.; Novak Druce + Quigg, LLP, 1000 Louisiana St., Fifty-third Floor, Houston, TX 77002 (US).

(81) Designated States *(unless otherwise indicated, for every kind of national protection available)*: AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PE, PG, PH, PL, PT, RO, RS, RU, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States *(unless otherwise indicated, for every kind of regional protection available)*: ARIPO (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

**Published**:

— *with international search report (Art. 21(3))*

(54) **Title**: SHARPENING MECHANISM

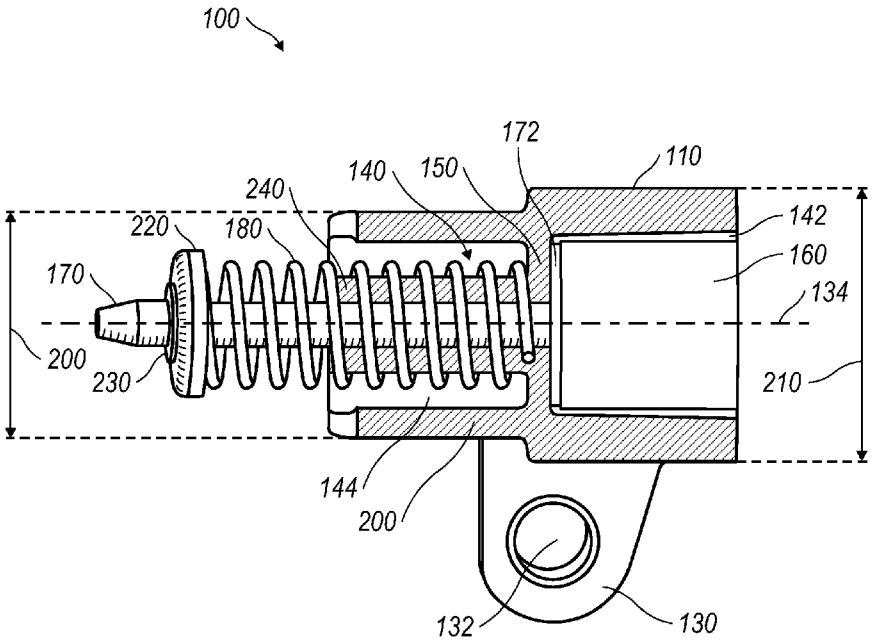


*FIG. 3*

(57) **Abstract**: A sharpening cartridge (100) includes a body (110) including a partition wall (150). The sharpening cartridge includes a stone (160) that is located on a first side of the partition wall (150). The stone (160) is coupled to a rod (170) that extends from the first side of the partition wall (150) to an opposite side of the partition wall (150). The sharpening cartridge also includes a bias member (180) that biases the stone (160) in a retracted position, whereby the stone (160) is disengaged from a cutting surface.

WO 2011/005259 A1

# SHARPENING MECHANISM

## FIELD

[0001] This disclosure relates to the field of cutting machines, and more particularly, to sharpening mechanisms, including chain sharpening mechanisms for chain saws.

## BACKGROUND

[0002] Devices with cutting tools require replacement or sharpening of the cutting tool in order to maintain their efficiency and/or ability to perform their intended purpose. For example, cutting tools such as chain saws have chains that are used to cut wood. Over time, the chain can become dull. Maintaining the sharpness of a chain saw is particularly important for maintaining cutting efficiency.

[0003] Industrial-sized sharpeners are available to sharpen chain saws, but their use is cumbersome and time-consuming. The saw chain must be removed from the chain saw and left with the operator of the industrial-sized chain sharpener until the chain has been sharpened and is ready for pickup. Such sharpeners are inconvenient for someone who does not have the time or resources to travel to or pay for a professional chain sharpener.

[0004] Other sharpeners are available that allow the saw chain to remain on the saw during sharpening. Such devices include a fixture that is clamped on to the chain saw to guide a hand file for sharpening each saw tooth individually. While such devices are portable, their use is time-consuming because the operator must hand file each tooth separately.

[0005] Therefore, there is a need for a sharpening mechanism that can be self-contained, self-aligning to the chain, and/or easily removable for replacement of worn sharpening stones.

## SUMMARY

**[0006]** One embodiment takes the form of a sharpening cartridge that has a body including a partition wall and a fastener for releasably attaching the body to a power tool. The sharpening cartridge includes a stone located on a first side of the partition wall. Additionally, the sharpening cartridge has a rod that is coupled to the stone and extends from the first side of the partition wall to an opposite side of the partition wall. A bias member can also be included. The bias member biases the stone in a retracted configuration, whereby the stone is disengaged from the cutting surface(s).

## BRIEF DESCRIPTION OF THE DRAWINGS

**[0007]** The foregoing features of the disclosure will be more readily understood by reference to the following detailed description, taken with reference to the accompanying drawings, in which:

**[0008]** FIG. 1 is an elevational view of one embodiment of the sharpening mechanism configured according to the teachings of this disclosure;

**[0009]** FIG. 2 is an elevational view of the opposite side of the sharpening mechanism depicted in FIG. 1;

**[0010]** FIG. 3 is a cross-sectional view of the sharpening mechanism depicted in FIG. 2 in a retracted configuration;

**[0011]** FIG. 4 is a cross-sectional view of the sharpening mechanism depicted in FIG. 2 in an exposed or extended configuration;

**[0012]** FIG. 5 is a cut-away view of the chain saw sharpening mechanism installed on a chain saw;

**[0013]** FIG. 6 is a cut-away view of the chain saw depicted in FIG. 5 with the chain saw sharpening mechanism removed exposing a second connector; and

**[0014]** FIG. 7 is a side cut-away view of the chain saw with the sharpening mechanism assembled for selective engagement with the cutting chain of a chain saw.

## DETAILED DESCRIPTION

**[0015]** A sharpening mechanism configured according to the present teachings will hereinafter be described more fully with reference to the accompanying drawings in which embodiments of the sharpening mechanism and an exemplary system are illustrated. The sharpening mechanism can, however, be embodied in many different forms and should not be construed as limited to the embodiments set forth herein. Rather, these embodiments are provided so that this disclosure will be thorough and complete, and will fully convey the scope of the disclosure to those persons skilled in the art. In the figures and description, like reference numbers refer to like elements throughout.

**[0016]** Power tools equipped with cutting elements can lose some of their efficiency and/or effectiveness over time as the cutting elements dull or otherwise become worn. For example, the cutting chain of a chain saw can be rapidly dulled by unintentional brief contact with dirt or other abrasive materials during use. The user needs a sharpening mechanism that can allow the cutting chain to be sharpened quickly and/or easily in the work area. Utilizing such a sharpening mechanism, the user can continue cutting with minimum delay or inconvenience. As described herein, a sharpening mechanism is disclosed that conveniently enables sharpening of the cutting element on the power tool. While the embodiments described herein focus on the implementation of the sharpening mechanism with respect to a chain saw and its cutting chain, other power tools having cutting element(s) are also considered within the scope of this disclosure. Examples of other power tools having cutting elements include edgers, reciprocating saws, and the like.

**[0017]** Referring to FIGs. 1-4, the sharpening mechanism, which includes a sharpening cartridge 100, is illustrated. The sharpening cartridge 100 can include a partition wall 150 coupled to a fastener 130 for releasably attaching the sharpening cartridge 100 to a power tool. The fastener 130 can be configured such that it accepts a screw via a through hole. The fastener

can also be configured to receive a pin, a mounting screw, and/or other components arranged to releasably attach the sharpening cartridge 100 to the power tool. The sharpening cartridge 100 also can include a stone 160 located on a first side of the partition wall 150. Additionally a rod 170 can be coupled to the stone 160, and the rod 170 can extend from the first side of the partition wall 150 to an opposite side of the partition wall 150. The stone 160 as described herein can be a sharpening stone or grinding stone such as an aluminum oxide grinding stone, silicon carbide grinding stone, a ceramic grain grinding stone or the like. A bias member 180 can be included to bias the stone 160 in a retracted configuration whereby the stone 160 is disengaged from the cutting element(s).

**[0018]** In the embodiment illustrated in FIG. 1, the fastener 130 is provided with a through hole 132 to releasably attach the sharpening cartridge 100 to the power tool and to provide a secured engagement of the sharpening cartridge 100 to the power tool. The fastener can take the form of a tab, ear, or flange such that the fastener extends from the body 110. A bolt, screw, pin, or other similar securing member is inserted through the through hole 132 to further secure the sharpening cartridge 100 to the chain saw. Although only one fastener 130 is needed to secure the sharpening cartridge during operation of the power tool, additional fasteners can be used.

**[0019]** In at least one example, a first connector 120 can be included in addition to the fastener 130 as described above. The first connector 120 can be coupled to the fastener 130. Additionally, the first connector 120 is configured for mating engagement with a second connector 122 on the power tool. The first connector 120 and corresponding second connector 122 are arranged such that the second connector 122 couples with the first connector 120. Any configuration of a first connector 120 and a second connector 122 that couple together is considered within the scope of this disclosure. The following examples are provided for illustrative purposes.

**[0020]** In the exemplary embodiment depicted in FIG. 1, the first connector 120 on the sharpening cartridge 100 is shaped for mating engagement with a second connector 122 on the body of the chain saw 500, as shown in FIG. 6. For example, the first connector 120 of the sharpening cartridge 100 can be a protrusion that fits into a second connector 122, such as a

recessed portion, on the body 520 of the chain saw 500. In other embodiments, the recess can be on the sharpening cartridge 100, and the protrusion can be on the body 520 of the chain saw 500. Other types of mating connectors in the scope of this disclosure include snap-fit connectors, press-fit connectors, lock-fit connectors, interference-fit connectors, plug and socket connectors, detent connectors, tongue and groove connectors, or other similar connectors. In other embodiments, the first connector 120 can be a screw and the second connector 122 can be an aperture to receive the screw for mating engagement. In alternative embodiments, the first connector 120 can be a surface having pegs, screws or the like configured for mating engagement with the second connector 122. For example, in such alternative embodiments, the second connector 122 can be a surface having apertures that receive the pegs, screws, or the like of the first connector 120. The inclusion of a first connector 120 and second connector 122 provide another connection, in addition to the fastener 130, between the sharpening cartridge 100 and the power tool. Additionally, the first connector 120 can assist in substantially aligning the sharpening cartridge 100 with the cutting surface of the power tool.

**[0021]** As illustrated in FIG. 1, the first connector 120 can be substantially parallelogram shaped. With such a first connector 120, the second connector 122 is shaped to securely receive the parallelogram shape of the first connector 120. In other embodiments, the first connector 120 can be rectangular in shape, elliptical in shape, or other similar shape. In these other embodiments, the second connector 122 is shaped accordingly to receive the shape of the first connector 120.

**[0022]** Alternatively, an end 124 of the first connector 120 can have a particular shape, such as a curvilinear shape. In this alternative embodiment, the second connector is shaped accordingly to securely receive the first connector 120 and ensure a secure fit between the sharpening cartridge 100 and the engine housing 520.

**[0023]** The first connector 120 can also be orientated at an angle relative to a centerline 134 of the sharpening cartridge 100, and the second connector 122 shaped accordingly to accommodate the angled orientation of the first connector 120. In FIG. 1, the first connector 120 is orientated at approximately twenty degrees to the centerline 134. In other embodiments, the first connector 120 can be orientated at less than twenty degrees, such as

fifteen or ten degrees. The first connector 120 can also be orientated at greater than twenty degrees, such as twenty-five degrees relative to the centerline 134.

**[0024]** In the illustrated embodiment, the sharpening cartridge includes a body 110. The body 110 can be utilized to improve cartridge life and provide a self contained mechanism as will be more fully described below. In the illustrated embodiment, the body 110 is a housing covering a majority of the components of the sharpening cartridge. In other embodiments, the body 110 can leave at least some of the components uncovered. In yet other embodiments, the body 110 can be in the form of a cover that protects the components of the sharpening cartridge 100. The body 110 in the illustrated embodiment includes the first connector 120, which can be configured as described above for mating engagement with a second connector 122 on the power tool.

**[0025]** In the illustrated embodiment of FIGs. 1-4, the body 110 of the sharpening cartridge 100 is substantially cylindrical in shape. In alternative embodiments, the body 110 can be rectangular in shape, semi-circular in shape, or other suitable shape. Additionally, in other embodiments, the body 110 can have a first exterior dimension 200 and a second exterior dimension 210 such that the first exterior dimension 200 is on one side of the partition wall and the second exterior dimension 210 is on the other side of the partition wall, as shown in FIGs. 3 and 4. In this further embodiment, the body 110 of the sharpening cartridge 100 is not uniform in shape. A portion 190 of the body 110 can also be substantially flat. This portion 190 can be adjacent to the first connector 120, as shown in FIG. 1. The flat portion 190 can be flush with a part of the power tool when the sharpening cartridge 100 is assembled on the housing of the power tool. This flat portion 190 can ensure that the sharpening cartridge 100 is in substantial alignment for sharpening the power tool. In other embodiments, the portion 190 can have different shapes configured for different mounting locations on the power tool. The portion 190 can be further configured to provide for a more accurate alignment of the sharpening cartridge 100 to the cutting element based upon the corresponding portion of the power tool to which the portion 190 abuts.

**[0026]** In at least one embodiment, the body 110 can have a cavity 140 formed within the body 110. The cavity 140 refers to a region that accommodates one or more components as

described below. The cavity 140 can be divided into a first portion 142 and second portion 144 by the partition wall 150.

**[0027]** The stone 160 can be at least partially located within the first portion 142 of the cavity 140 on one side of the partition wall 150. As illustrated in FIG. 3, the stone 160 can also be screwed on to the rod 170, adhesively affixed to the rod 170, bonded to the rod 170, or coupled to the rod 170 in other similar ways. Additionally, a plate 172 or washer can be placed at the top surface of the stone 160; that is, the surface of the stone 160 to which or through which the rod 170 extends. The washer 172 can be a metal washer, a plastic washer, or other similar washer. The washer 172 can be included to serve as an additional bonding element for the stone 160 and can be affixed to the rod 170 via a weld, epoxy or the like.

**[0028]** The partition wall 150 accommodates the extension of a rod 170 from one side of the partition wall 150 to another side of the partition wall 150. The rod 170 can extend from the first portion 142 of the cavity 140 on one side of the partition wall 150 to the second portion 144 of the cavity 140 on the opposite side of the partition wall 150. Additionally in the illustrated embodiment of FIG. 1, the distal end of the rod 170 extends beyond an edge of the body 110. In other embodiments, the rod 170 can be concealed within the body 110. The rod 170 is coupled to the sharpening stone 160 such that it moves the stone 160 from a retracted configuration (illustrated in FIG. 3) to an extended configuration (illustrated in FIG. 4).

**[0029]** The sharpening cartridge 100 can also have a rod support structure 240 affixed to the partition wall 150. The rod support structure 240 can include a sleeve with an interior passage within which the rod 170 reciprocates. As illustrated in FIGs. 3-4, the rod support structure 240 is integrally formed with the partition wall 150. However, the rod support structure 240 can be connected in other ways such as being welded to the partition wall 150. In other embodiments, the coupling of the rod support structure 240 to the partition wall 150 can include fasteners as well.

**[0030]** As described above, the sharpening mechanism can include a bias member 180. The bias member 180 can be coupled to the body 110 of the sharpening cartridge 100 at a first end and coupled to the rod 170 at a second end. The partition wall 150 can also serve as a point of coupling for the bias member 180. The bias member 180 can be a coil spring, a compression

spring, or other resilient-type bias member. The bias member 180 can be provided to bias the stone 160 in the retracted configuration, where the majority of the stone 160 is located within the first portion 142 of the cavity 140. In this retracted configuration, the bias member 180 can be described as being in a home configuration. In this configuration, the end of the stone 160, to which the rod 170 is coupled, moves toward and away from the partition wall 150 in close proximity thereto. In at least one embodiment, additional components such as a metal plate 172 or washer can be located between the stone 160 and the partition wall 150. In at least one embodiment, the bias member 180 can be located between the stone 160 and the partition wall 150.

**[0031]** The bias member 180 can be operatively coupled to the rod 170 using a ring shaped connector 220, as illustrated in FIGs. 1-4. Additionally, a spring clip 230 that further secures the bias member 180 to the rod 170 is included in the illustrated embodiments. However, a D-ring, retaining ring, retainer clip, or other securing connector can be used to secure the bias member 180 to the rod 170 instead of the ring shaped connector 220 and spring clip 230. When the sharpening cartridge 100 is assembled, the bias member 180 is at least partially located in the second portion 144 of the cavity 140 of the sharpening cartridge body 110. As described above, the bias member 180 also rests against the side of the partition wall 150 that is opposite to the side facing the sharpening stone 160. In this configuration, the bias member 180 maintains the stone 160 in the retracted position when no force is applied to the rod 170, as will be further described below. In an alternative embodiment, the bias member 180 can be on the same side of the partition wall 150 as the sharpening stone 160 and can be located between the partition wall 150 and the top surface of the sharpening stone 160. Because the bias member 180 is a resilient member, the bias member 180 biases the sharpening stone 160 in a retracted configuration when the biasing member 180 is in its natural neutral configuration. In another embodiment, there can be more than one bias member. For example, there can be a bias member on both sides of the partition wall 150.

**[0032]** While the following description is presented in relation to a sharpening cartridge 100 for a chain saw and its cutting chain, the sharpening cartridge 100 as described herein can be implemented on other power tools that have cutting surfaces. For example, such other power tools include but are not limited to edgers, reciprocating saws, rotary saws, and the

like. The corresponding first connector 120 and second connector 122 can be positioned on appropriate surfaces depending on the power tool that the sharpening cartridge is designed to fit on or within.

**[0033]** The assembly of the sharpening cartridge 100 to a chain saw 500 having an engine housing 520 and a cutting chain trained about a drive sprocket is achieved by mating the first connector 120 of the sharpening cartridge 100 with the second connector 122 of the chain saw 500 that is located on the engine housing 520 of the chain saw 500, as illustrated in FIGs. 5 and 7. Trained as used herein indicates that at least a portion of the cutting chain is in contact with a drive sprocket so as to move the cutting chain in a given direction about the drive sprocket. The first connector 120 and second connector 122 align the stone 160 of the sharpening cartridge 100 with the cutting chain. Because the first connector 120 and second connector 122 are shaped for mating engagement, the sharpening cartridge 100 fits into place without the need for additional fastening components. In alternative embodiments, the sharpening cartridge 100 can snap into place, slide into place, screw into place, clasp into place, or otherwise fit in place, depending on the type of mating engagement of the first connector 120 and second connector 122. Additionally, a fastener as described herein above can be implemented.

**[0034]** FIG. 6 illustrates the second connector 122 located where the cutting chain is trained about the drive sprocket (not shown). However, the second connector 122 can be placed anywhere on the chain saw 500 such that the sharpening stone 160 can be moved to an extended configuration whereby the sharpening stone 160 contacts the cutting chain. Additionally, the location at which the second connector 122 is located allows for the stone 160 to disengage from contact with the cutting chain in the retracted configuration. Some examples of possible locations of the sharpening cartridge 100 with respect to the center of the sprocket are given herein for illustrative purposes. Using the center point of the sprocket as a reference, the following configurations are compared to positions relative to hourly positions of a clock. In one embodiment, the sharpening cartridge 100 can be placed anywhere between the six o'clock to noon positions. For example, in FIG. 7, the sharpening cartridge 100 is located at an approximately ten o'clock position. When the sharpening cartridge 100 is used in other applications, the location of the sharpening cartridge 100 relative to the cutting surface can

similarly be controlled or positioned by the fastener 130 and/or the first connector 120 and second connector 122 of the sharpening cartridge 100. It will also be appreciated by one of ordinary skill in the art that the sharpening cartridge 100 can be configured to releasably attach to a clutch cover, front handle, or other component of the cutting tool, chain saw 500, or other similar power tool.

**[0035]** Operation of the sharpening cartridge 100 in connection with the chain saw 500 will now be described. The sharpening cartridge 100 has a retracted configuration (shown in FIG. 3) and an extended configuration (shown in FIG. 4). In the retracted configuration, the distal end of the rod 170 extends beyond the edge of the sharpening cartridge 100 with the bias member 180 in its retracted configuration holding the stone 160 within the first portion 142 of the cavity 140. A majority of the stone 160 can be located within the first portion 142 of the cavity 140 in the retracted configuration. In an exemplary embodiment as illustrated in FIG. 3, the stone 160 is located within the first portion 142 of the cavity 140 so that a bottom face of the stone 160 is flush with the body 110 of the sharpening cartridge 100 before the sharpening cartridge 100 has been used for sharpening. In order to sharpen the cutting chain, the stone 160 of the sharpening cartridge 100 is moved into an extended configuration. This is accomplished by applying a force against the rod 170. The force on the rod 170 compresses the bias member 180 against the partition wall 150 and moves the stone 160 from the retracted configuration to the extended configuration. The force can be applied by a lever 510 engaged with the tip of the rod 170, a knob coupled to the rod 170, or similar other actuation mechanism or system, such as shown in FIGs. 5-7. As illustrated, an actuation mechanism 530 applies force via the lever 510. This actuation mechanism 530 allows for fine movement of the stone 160 as it is extended to engage with the cutting chain. This ensures the life of and prevents undue wear on the stone 160 that can occur if the stone 160 is extended outside the sharpening cartridge 100 more than is necessary to sharpen the cutting chain. In other embodiments, the actuation mechanism 530 can include different components. For example, the rod 170 can be coupled directly to an actuation mechanism 530 which depresses the rod 170 thereby extending the stone 160 to the extended position. Additionally, other mechanisms that allow for extension of the stone 160 to the extended position are within the scope of this disclosure.

**[0036]** In the extended configuration illustrated in FIG. 4, the stone 160 can contact and sharpen the cutting chain, which is driven by the chain saw engine. The stone 160 is self-aligning because of the fastener 130 and/or first and second connectors 120, 122, with the cutting chain. Additionally, the sharpening cartridge 100 is positioned such that the stone 160 can be aligned with the cutting chain at zero degrees. However, in other configurations the stone 160 can be aligned with the cutting chain between zero to five degrees. In at least one embodiment the stone 160 is aligned with the cutting chain at two and a half degrees.

**[0037]** Once the cutting chain has been sharpened, the stone 160 can be returned to its retracted configuration, wherein the bias member 180 biases the stone 160 so that the top face of the stone 160 is proximate the partition wall 150. In alternative embodiments, if a washer or metal plate is placed in between the stone 160 and the partition wall 150, the bias member 180 biases the stone 160 so that the washer or metal plate 172 can be approximately flush with the partition wall 170.

**[0038]** In any of the previously described embodiments of the chain sharpening cartridge 100, as the cutting chain is sharpened, the stone 160 of the sharpening cartridge 100 wears down. When the stone 160 has been excessively worn due to repeated sharpening operations, it is necessary to replace the sharpening cartridge 100. The operator can replace either the entire chain sharpening cartridge 100 or just the stone 160. In either instance, the sharpening cartridge 100 must be removed from the engine housing 520. For example, the clutch cover can be removed to allow access to the sharpening cartridge 100. In alternative embodiments, the cutting chain can be removed from around the drive sprocket. The securing member is removed from the fastener 130 to release the sharpening cartridge 100 from the engine housing 520. The sharpening cartridge 100 is removed from the engine housing 520 by disengaging or un-mating the first connector 120 from the second connector 122. For example, the sharpening cartridge 100 can be snapped or slid out of the engine housing 520. With the sharpening cartridge 100 removed from the engine housing 520, a new stone 160 can be coupled to the sharpening cartridge 100. The new stone 160 can be mounted to the existing rod 170 of the sharpening cartridge 100 or a new rod 170 having a new stone 160 can be inserted into the cavity 140 of the sharpening body 110. In the alternative, a completely new sharpening cartridge 100 can be snapped or slid onto the engine housing 520. Either replacement method

requires fewer and/or simpler tools to remove the sharpening cartridge 100 from the engine housing 520 than previous self-sharpening chain saws have required. Also, either replacement method minimizes disassembly of the chain saw and minimizes the complexity of the replacement service.

**[0039]** The sharpening cartridge 100 described herein can provide the operator with a self-aligning chain sharpening cartridge 100 that is easily replaceable when the sharpening stone 160 is worn down.

**[0040]** Exemplary embodiments have been described hereinabove regarding sharpening cartridges, their operation within a chain saw, and replacement of the sharpening cartridge. While the sharpening cartridge can be used in relation to any type of cutting surface that can be sharpened with a stone or other similar material, one particular example as described herein is in relation to chain saws and other powered tools could be arranged with the sharpening cartridge as disclosed herein. The sharpening mechanism as described herein can be a self-aligning sharpening mechanism, thereby assuring that the stone engages the cutting surface at the proper location. Additionally, the sharpening mechanism can further be removed and replaced as desired with minimal disassembly of the power tool. In most cases this will involve simple removal of an outer covering and removal of the fastener holding the cartridge in place.

**[0041]** INDUSTRIAL APPLICABILITY: The present disclosure finds applicability in the power tool and industrial tool industries.

## CLAIMS

**What is claimed is:**

1. A sharpening cartridge (100) comprising:

a body (110) including a partition wall (150) and a fastener (130) for releasably attaching the body (110) to a power tool;

a stone (160), wherein said stone (160) is located on a first side of said partition wall (150);

a rod (170) coupled to the stone (160) and extending from the first side of the partition wall (150) to an opposite side of the partition wall (150); and

a bias member (180) biasing the stone (160) in a retracted position, whereby the stone (160) is disengaged from a cutting surface.

2. The sharpening cartridge (100) as recited in claim 1, wherein said body (110) has a cavity (140) formed therein.

3. The sharpening cartridge (100) as recited in claim 2, further comprising a first portion (142) of the cavity (140) located on the first side of said partition wall (150) and a second portion (144) of the cavity (140) located on the opposite side of the partition wall (150).

4. The sharpening cartridge (100) as recited in claim 3, wherein the bias member (180) is at least partially located in the second portion (144) of the cavity (140).

5. The sharpening cartridge (100) as recited in any one of claims 3-4, wherein the majority of the stone (160) is located within said first portion (142) of the cavity (140) in the retracted position.

6. The sharpening cartridge as recited in any one of claims 1-5, wherein the body (110) has a first connector (120) for mating engagement with a second connector (122) on a power

tool, wherein said first connector (120) and second connector (122) align the sharpening cartridge (100) with a cutting surface.

7. The sharpening cartridge (100) as recited in claim 6, wherein said first connector (120) is substantially parallelogram shaped.

8. The sharpening cartridge (100) as recited in any one of claims 6-7, wherein an end of the first connector (120) has a curvilinear shape.

9. The sharpening cartridge (100) as recited in any one of claims 6-8, wherein said body (110) is substantially cylindrical in shape.

10. The sharpening cartridge (100) as recited in claim 9, wherein a portion (190) of said body (110) adjacent to the first connector (120) is substantially flat.

11. The sharpening cartridge (100) as recited in any one of claims 1-10, wherein said fastener (130) comprises a through hole (132).

12. The sharpening cartridge (100) as recited in any one of claims 1-11, wherein said body (110) has a first exterior dimension (200) and a second exterior dimension (210), wherein said first exterior dimension (200) is on one side of the partition wall (150) and said second exterior dimension (200) is on the other side of the partition wall (150).

13. The sharpening cartridge (100) as recited in any one of claims 1-12, wherein said bias member (180) is coupled to the body (110) at a first end and coupled to the rod (170) at a second end.

14. The sharpening cartridge (100) as recited in claim 13, further comprising a ring shaped connector (220) and a spring clip (230), wherein said spring clip (230) and ring shaped connector (220) couple the bias member (180) to the rod (170).

15. The sharpening cartridge (100) as recited in any one of claims 1-14, wherein said bias member (180) is a coil spring.

16. The sharpening cartridge (100) as recited in any one of claim 1-15, further comprising a rod support structure (240) affixed to said partition wall (150), wherein said rod support structure (240) and partition wall (150) have a passage for reciprocation of said rod (170).

17. The sharpening cartridge (100) as recited in one of claims 1-16, wherein said rod (170) moves the stone (160) from a retracted position to an extended position.

18. The sharpening cartridge (100) as recited in one of claims 1-17, wherein said sharpening cartridge (100) is a chain sharpening cartridge and said power tool is a chain saw (500).

19. The sharpening cartridge (100) as recited in one of claims 1-18, wherein a distal end of the rod (170) extends beyond an edge of the body (110).

20. A chain saw (500) comprising:
an engine housing (520);
a cutting chain trained about a drive sprocket; and
a sharpening cartridge (100) comprising:
a body (110) having a partition wall (150) and a fastener (130) for releasably attaching the body (110) to the power tool;
a stone (160), wherein said stone (160) is located on a first side of said partition wall (150);
a rod (170) coupled to the stone (160) and extending from the first side of the partition wall (150) to an opposite side of the partition wall (150; and
a bias member (180) biasing the stone (160) in a retracted position, whereby the stone (160) is disengaged from a cutting surface.

21. The chain saw (500) as recited in claim 20, wherein said body (110) has a cavity (140) formed therein.

22. The chain saw (500) as recited in claim 21, further comprising a first portion (142) of the cavity (140) located on the first side of said partition wall (150) and a second portion (144) of the cavity (140) located on the opposite side of the partition wall (150).

23. The chain saw (500) as recited in claim 22, wherein the bias member (180) is at least partially located in the second portion (144) of the cavity (140).

24. The chain saw (500) as recited in any one of claims 22-23, wherein the majority of the stone (160) is located within said first portion (142) of the cavity (140) in the retracted position.

25. The chain saw (500) as recited in any one of claims 20-24, wherein the body (110) has a first connector (120) for mating engagement with a second connector (122) on a power tool, wherein said first connector (120) and second connector (122) align the sharpening cartridge (100) with a cutting surface.

26. The chain saw (500) as recited in claim 25, wherein said first connector (120) is substantially parallelogram shaped.

27. The chain saw (500) as recited in any one of claims 25-26, wherein an end of the first connector (120) has a curvilinear shape.

28. The chain saw (500) as recited in any one of claims 25-27, wherein said body (110) is substantially cylindrical in shape.

29. The chain saw (500) as recited in claim 28, wherein a portion (190) of said body (110) adjacent to the first connector (120) is substantially flat.

30. The chain saw (500) as recited in any one of claims 20-29, wherein said fastener (130) comprises a through hole (132).

31. The chain saw (500) as recited in any one of claims 20-30, wherein said body (110) has a first exterior dimension (200) and a second exterior dimension (210), wherein said first exterior dimension (200) is on one side of the partition wall (150) and said second exterior dimension (200) is on the other side of the partition wall (150).

32. The chain saw (500) as recited in any one of claims 20-31, wherein said bias member (180) is coupled to the body (110) at a first end and coupled to the rod (170) at a second end.

33. The chain saw (500) as recited in claim 32, further comprising a ring shaped connector (220) and a spring clip (230), wherein said spring clip (230) and ring shaped connector (220) couple the bias member (180) to the rod (170).

34. The chain saw (500) as recited in any one of claims 20-33, wherein said bias member (180) is a coil spring.

35. The chain saw (500) as recited in any one of claim 20-34, further comprising a rod support structure (240) affixed to said partition wall (150), wherein said rod support structure (240) and partition wall (150) have a passage for reciprocation of said rod (170).

36. The chain saw (500) as recited in one of claims 20-35, wherein said rod (170) moves the stone (160) from a retracted position to an extended position.

37. The chain saw (500) as recited in one of claims 20-36, wherein said sharpening cartridge (100) is a chain sharpening cartridge and said power tool is a chain saw (500).

38. The chain saw (500) as recited in one of claims 20-37, wherein a distal end of the rod (170) extends beyond an edge of the body (110).

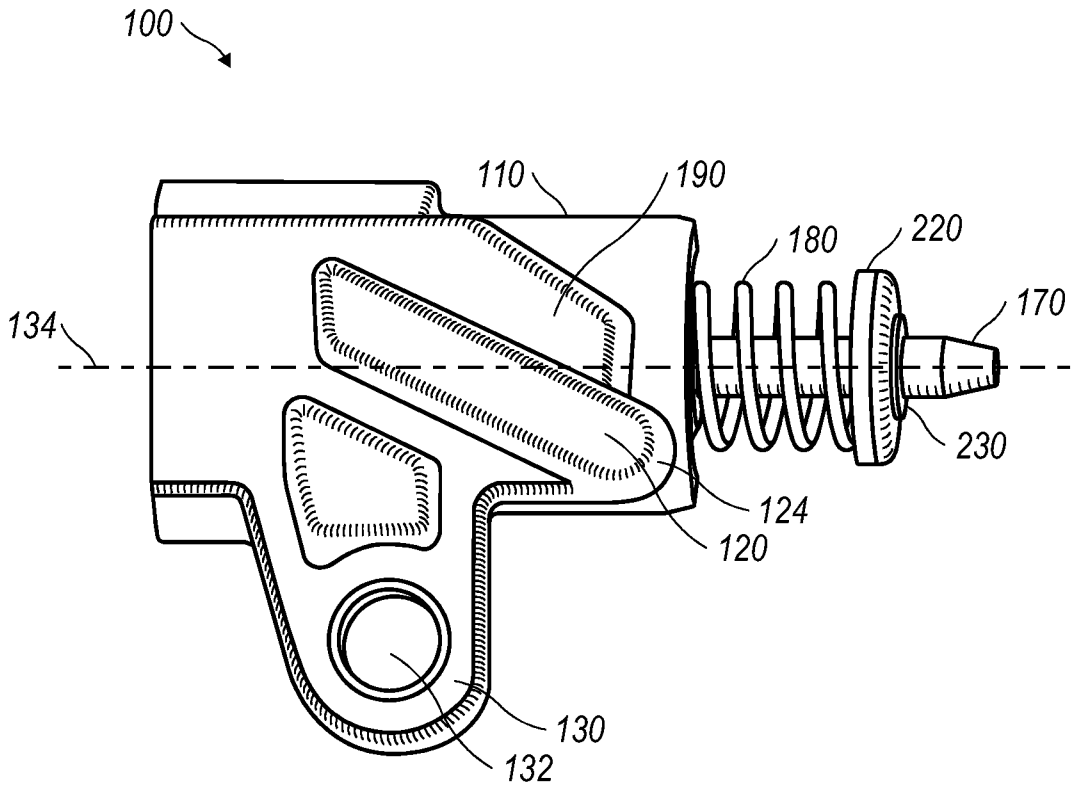


FIG. 1

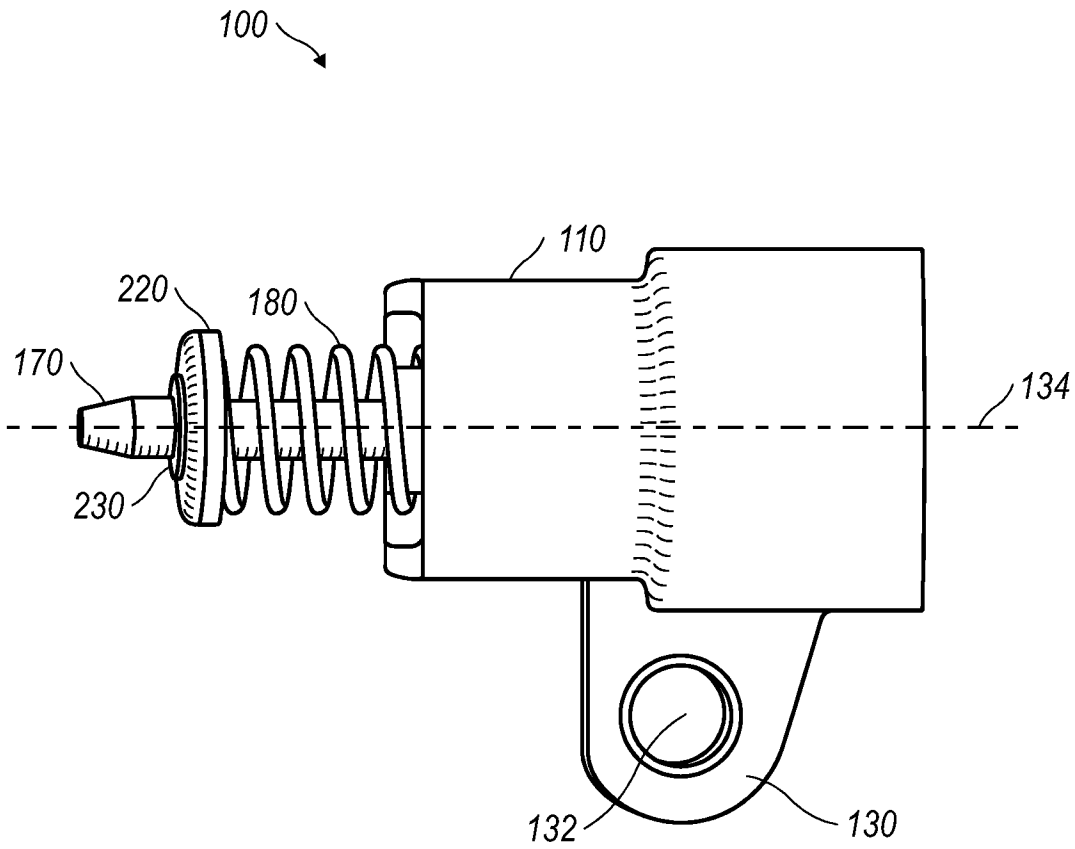


FIG. 2

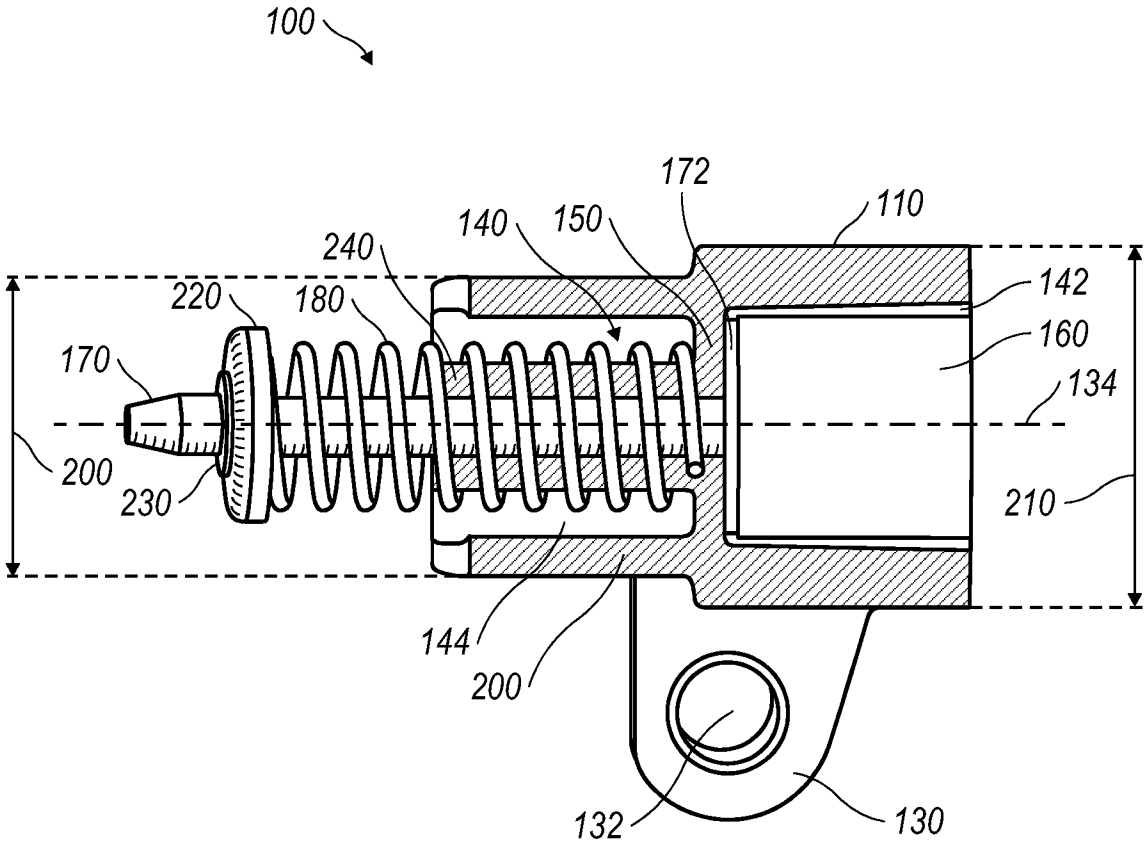
100
172
110
140
150
240
142
220
180
160
170
134
200
230
210
144
200
132
130

FIG. 3

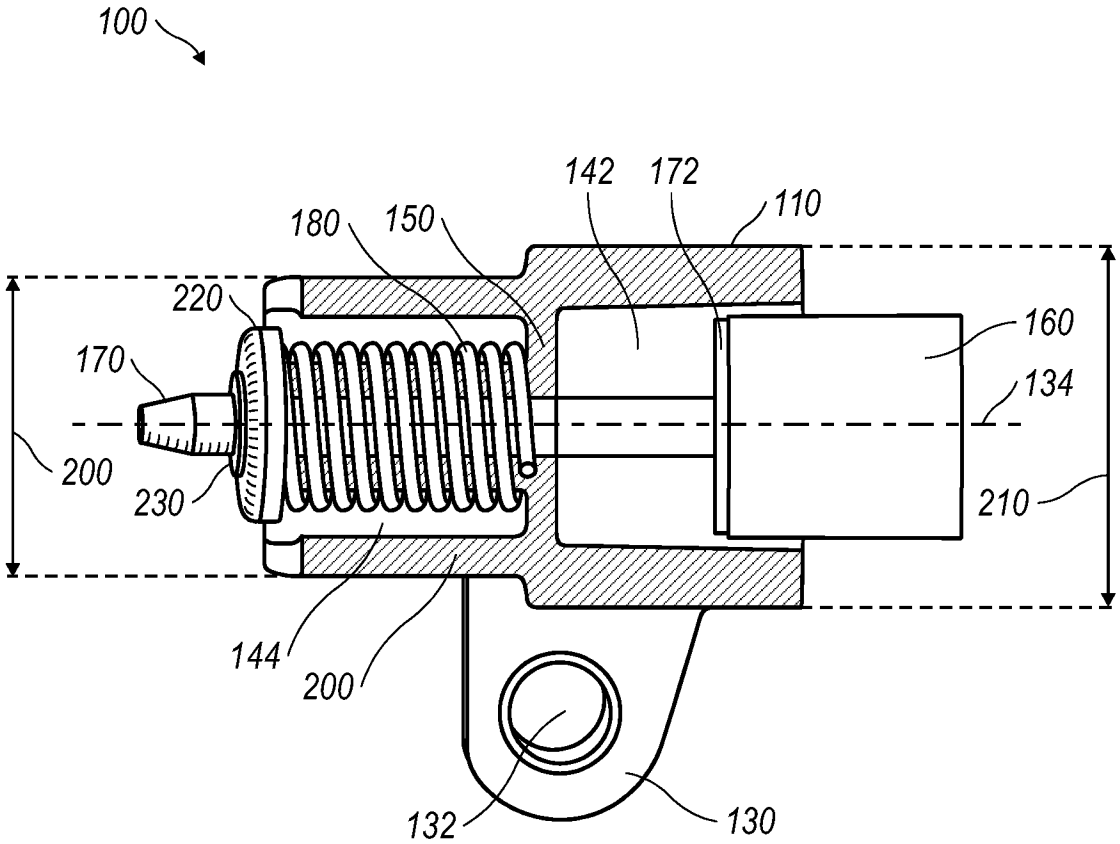
100
142
172
110
180
150
220
160
170
134
200
230
210
144
200
132
130

FIG. 4

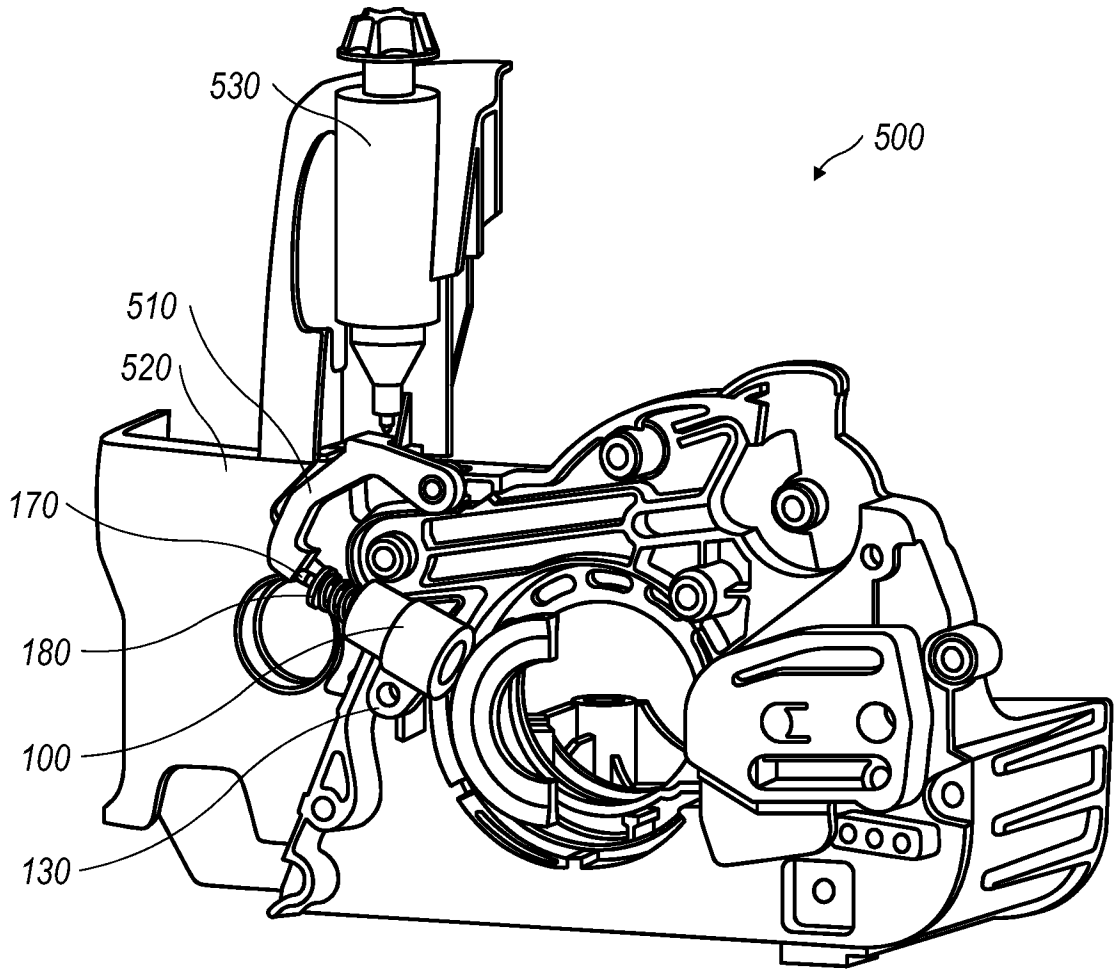


FIG. 5

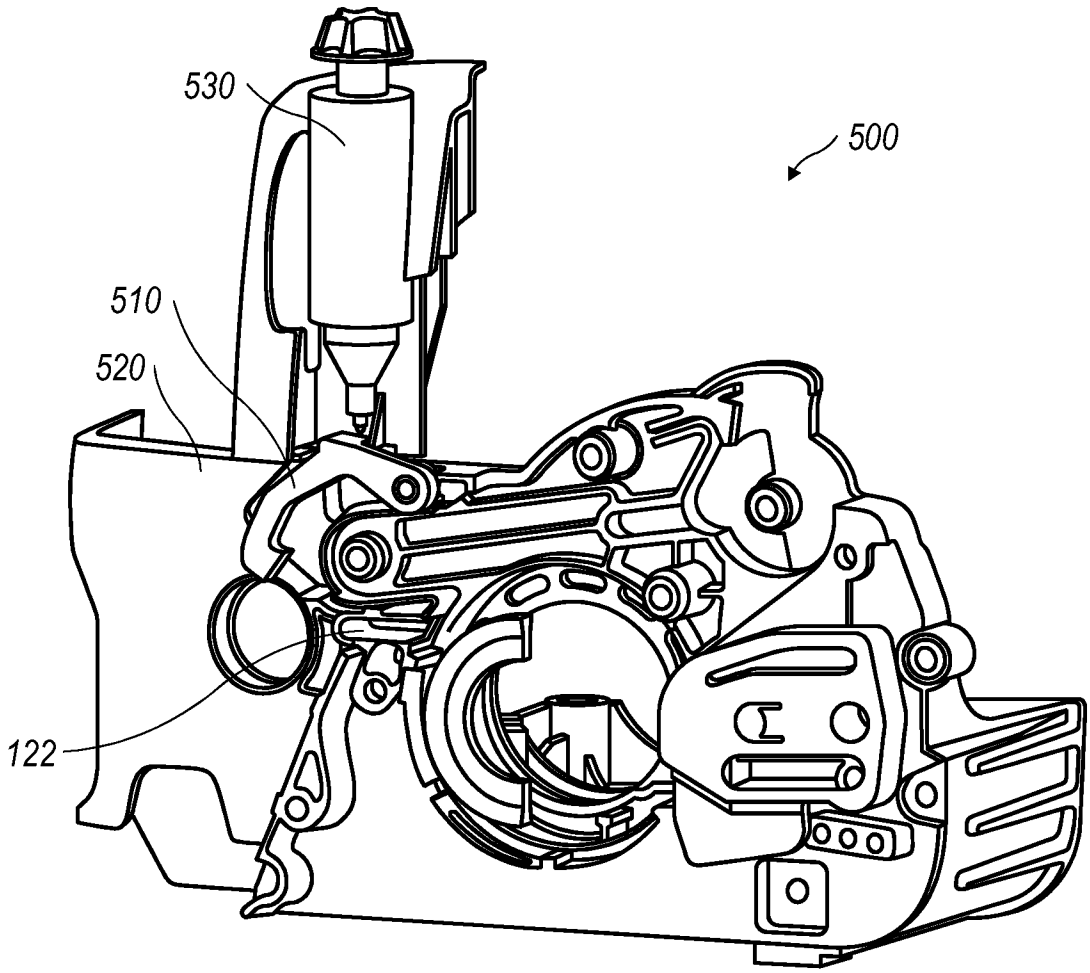


FIG. 6

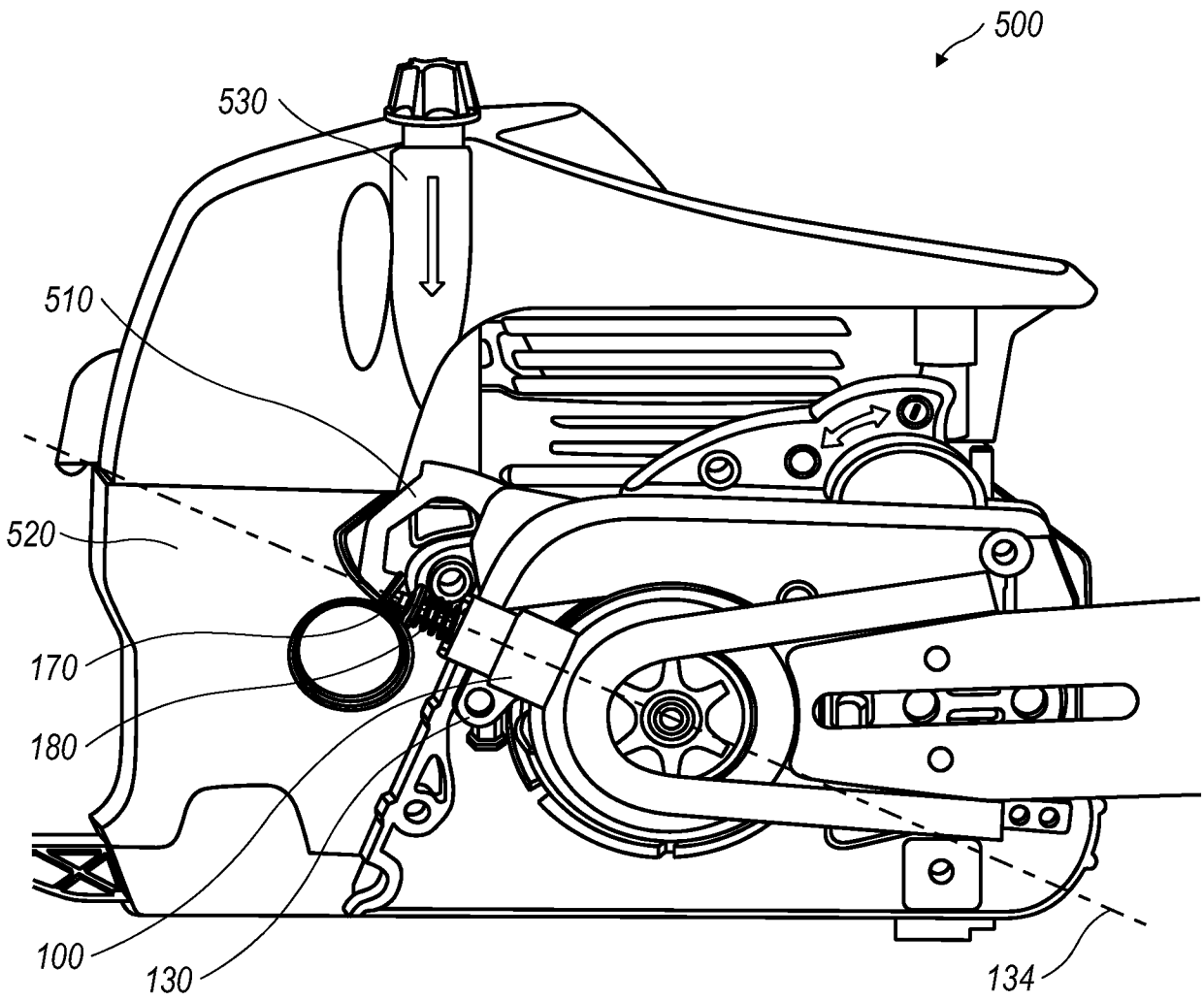


FIG. 7

# INTERNATIONAL SEARCH REPORT

International application No
PCT/US2009/050134

**A. CLASSIFICATION OF SUBJECT MATTER**
INV. B23D63/16

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)
B23D

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 practical, search terms used)
EPO-Internal

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

| Category* | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
|---|---|---|
| X | US 4 457 069 A (CLOSE ALBERT [US])<br>3 July 1984 (1984-07-03) | 1-4,<br>6-11,<br>13-23,<br>25-30,<br>32-38 |
| Y | column 3, line 30 - column 5, line 10;<br>figures | 5,12,24,<br>31 |
| Y | US 4 843 718 A (NAGASHIMA AKIRA [JP] ET<br>AL) 4 July 1989 (1989-07-04)<br>figures | 5,12,24,<br>31 |
| X | US 4 506 565 A (POTTER E L [US])<br>26 March 1985 (1985-03-26)<br>figures | 1-38 |
| X | US 4 062 253 A (DILWORTH JOHN LEWIS)<br>13 December 1977 (1977-12-13)<br>figures | 1-38 |

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

☒ See patent family annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

| Date of the actual completion of the international search | Date of mailing of the international search report |
|---|---|
| 25 March 2010 | 06/04/2010 |

| Name and mailing address of the ISA/ | Authorized officer |
|---|---|
| European Patent Office, P.B. 5818 Patentlaan 2<br>NL – 2280 HV Rijswijk<br>Tel. (+31-70) 340-2040,<br>Fax: (+31-70) 340-3016 | Vaglienti, Giovanni |

# INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/US2009/050134

| Patent document cited in search report | Publication date | Patent family member(s) | Publication date |
|---|---|---|---|
| US 4457069 A | 03-07-1984 | NONE | |
| US 4843718 A | 04-07-1989 | FR 2619329 A1 | 17-02-1989 |
| | | JP 5025781 Y2 | 29-06-1993 |
| | | JP 64030120 U | 23-02-1989 |
| US 4506565 A | 26-03-1985 | NONE | |
| US 4062253 A | 13-12-1977 | NONE | |