US 20250262735A1

(19) **United States**

(12) **Patent Application Publication** (10) **Pub. No.: US 2025/0262735 A1**

Broda et al. (43) **Pub. Date: Aug. 21, 2025**

(54) **POWERED FASTENER DRIVER**

(71) Applicant: **MILWAUKEE ELECTRIC TOOL CORPORATION**, Brookfield, WI (US)

(72) Inventors: **Kevin R. Broda**, Waukesha, WI (US); **Coby A. Nettleton**, Milwaukee, WI (US)

(21) Appl. No.: **19/056,877**

(22) Filed: **Feb. 19, 2025**

Related U.S. Application Data

(60) Provisional application No. 63/575,133, filed on Apr. 5, 2024, provisional application No. 63/555,184, filed on Feb. 19, 2024.

Publication Classification

(51) **Int. Cl.**

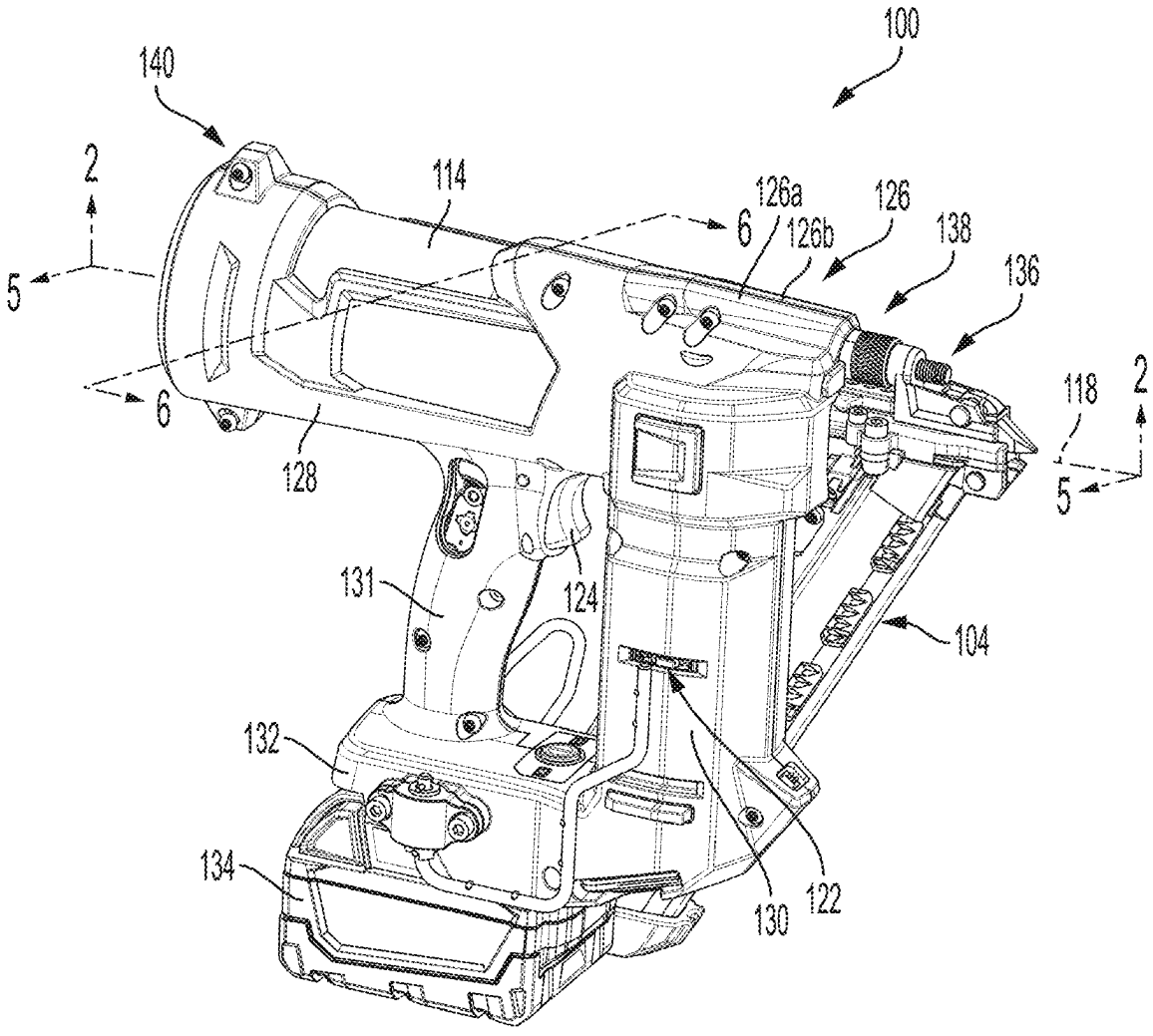
B25C 1/04	(2006.01)
B25C 1/00	(2006.01)
B25C 1/06	(2006.01)

(52) **U.S. Cl.**

CPC ***B25C 1/047*** (2013.01); ***B25C 1/06*** (2013.01); *B25C 1/005* (2013.01)

(57) **ABSTRACT**

A fastener driver may include an inner cylinder centrally defining an inner cylinder axis. A fastener driver may include a piston positioned within the inner cylinder. A fastener driver may include a driver blade coupled to the piston and movable therewith between a ready position and a driven position. A fastener driver may include a storage tank including a large portion centrally defining a large portion axis, the large portion surrounding at least a portion of the inner cylinder. A fastener driver may include a housing supporting the storage tank and including a handle portion, the handle portion defining a handle portion axis extending transverse to the inner cylinder axis, wherein the inner cylinder axis extends within a dividing plane that centrally and longitudinally divides the inner cylinder into a first half and a second half.



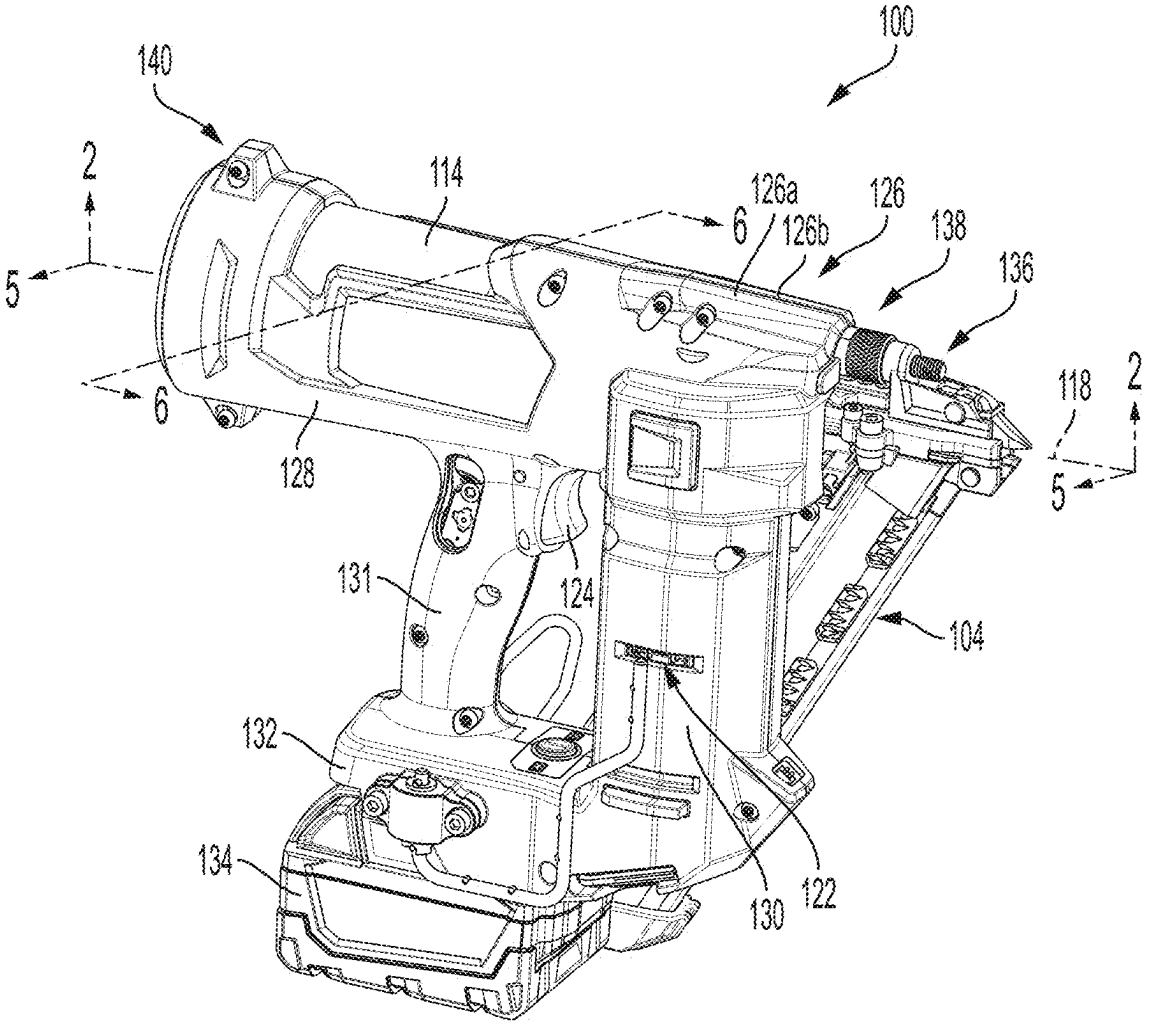

100
140
2
5
114
6
126a
126b
126
138
136
118
2
5
6
128
131
124
104
132
134
130
122

FIG. 1

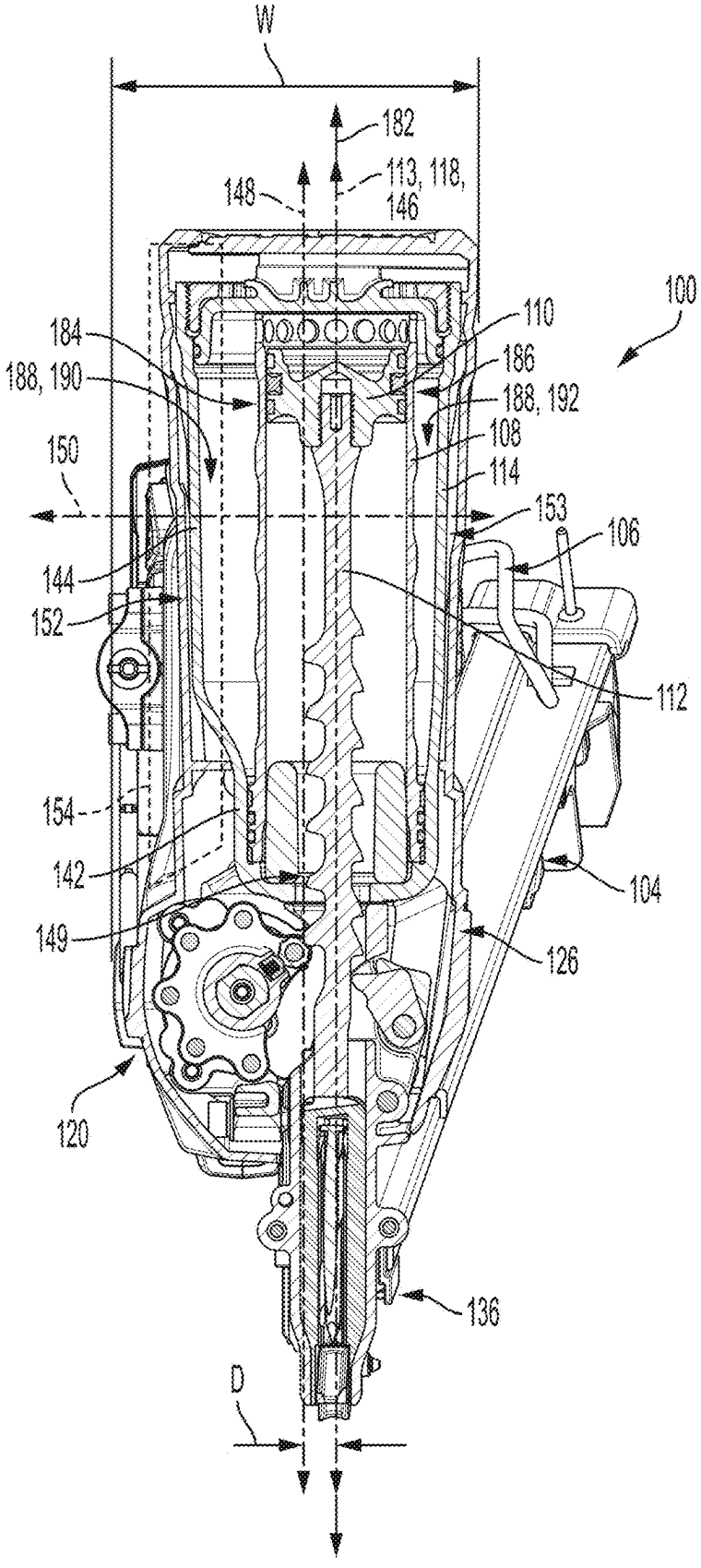

W
182
113, 118, 146
148
100
110
184
186
188, 190
188, 192
108
150
114
153
106
144
152
112
154
142
104
149
126
120
136
D

FIG. 2

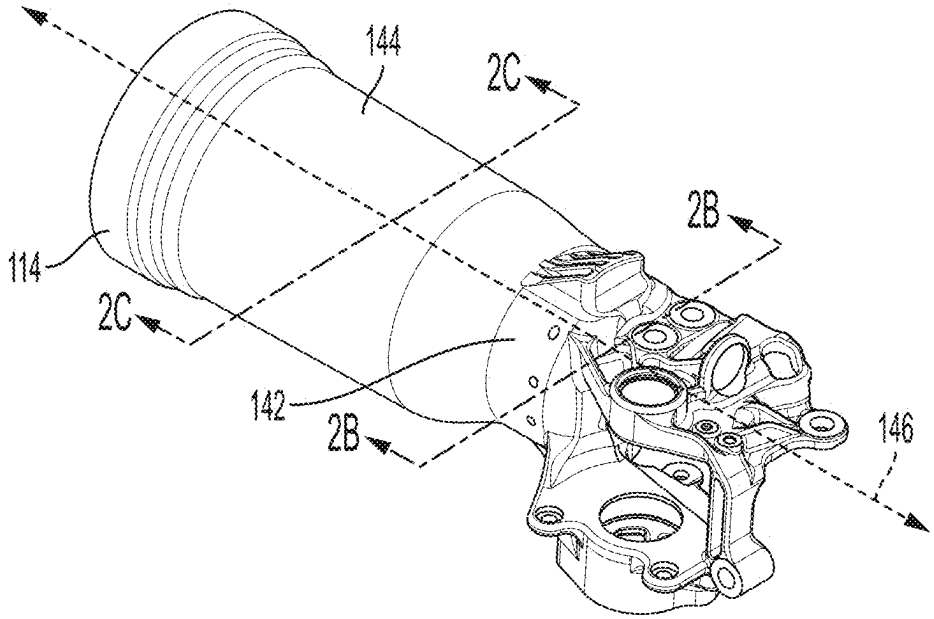


FIG. 2A

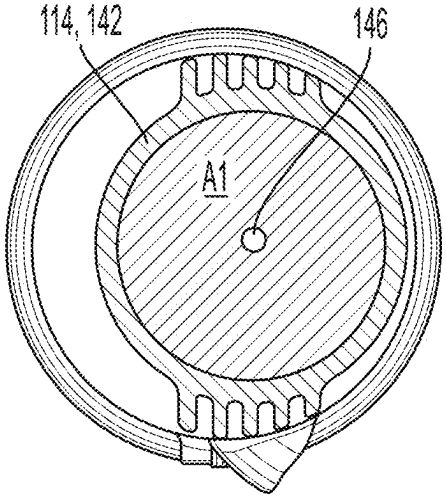


FIG. 2B

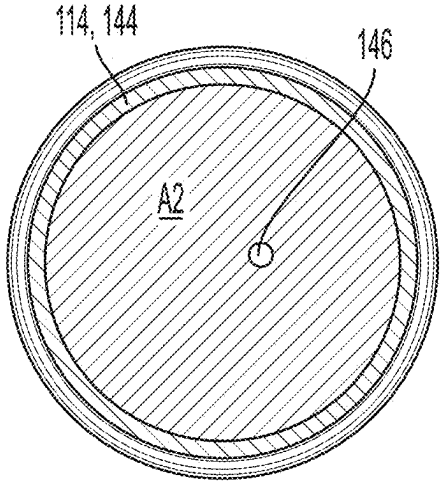


FIG. 2C

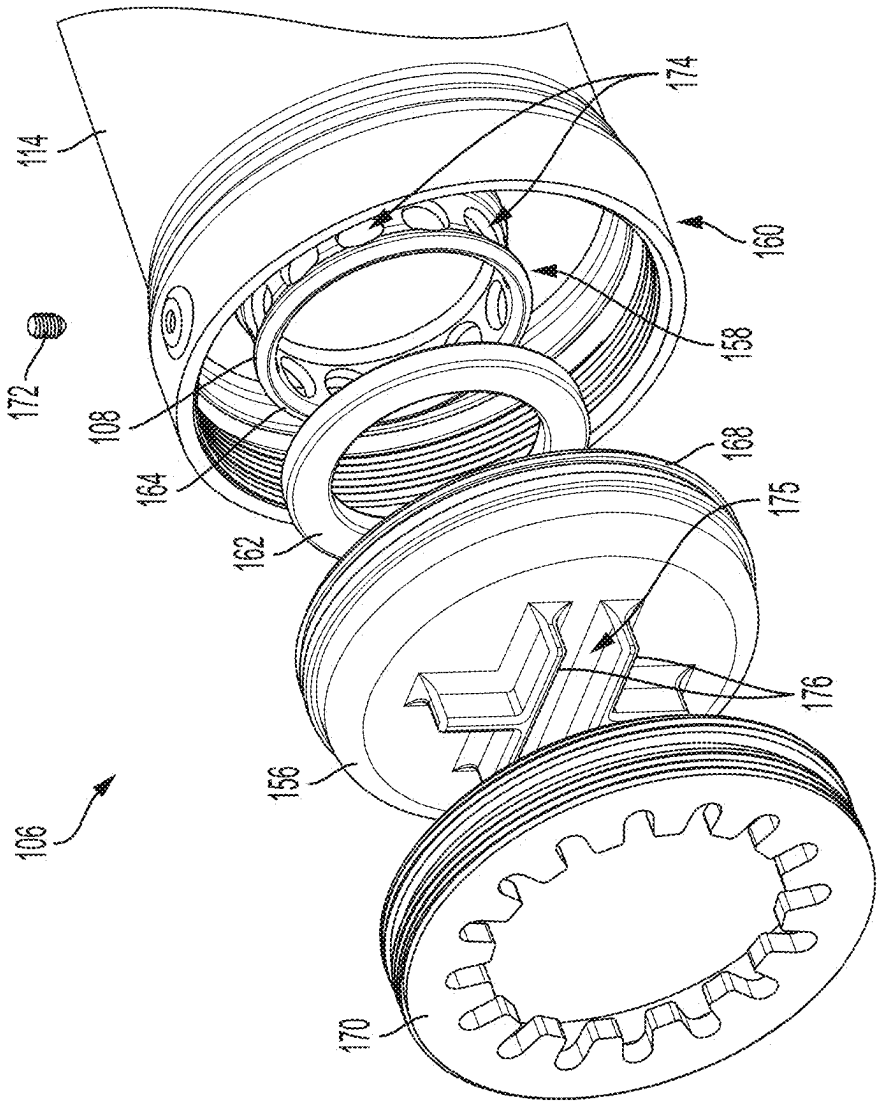


FIG. 3

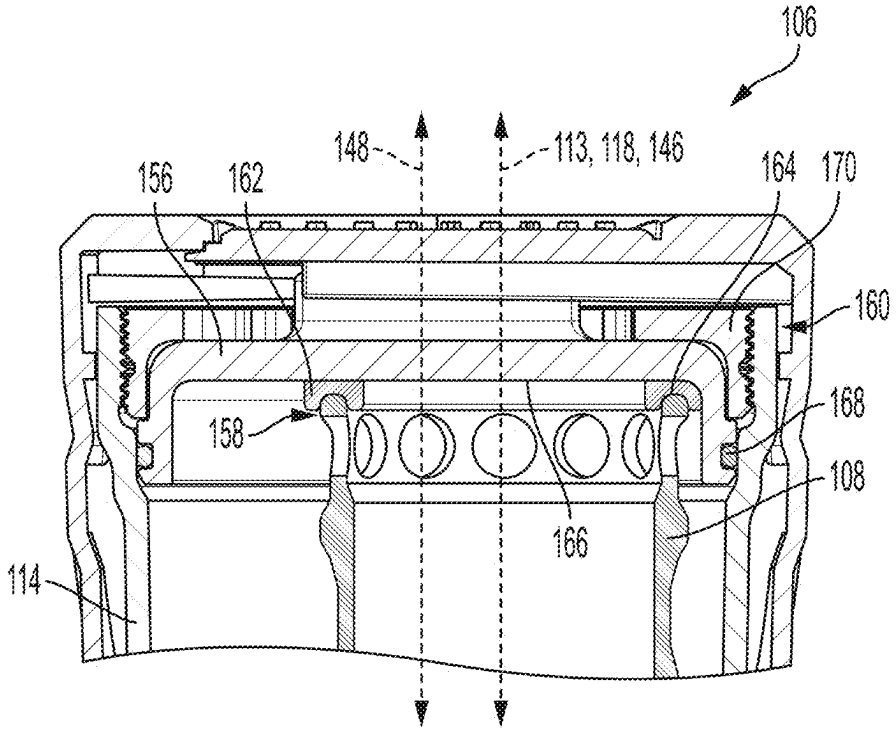

106
148
113, 118, 146
156
162
164
170
160
168
158
108
166
114

FIG. 4

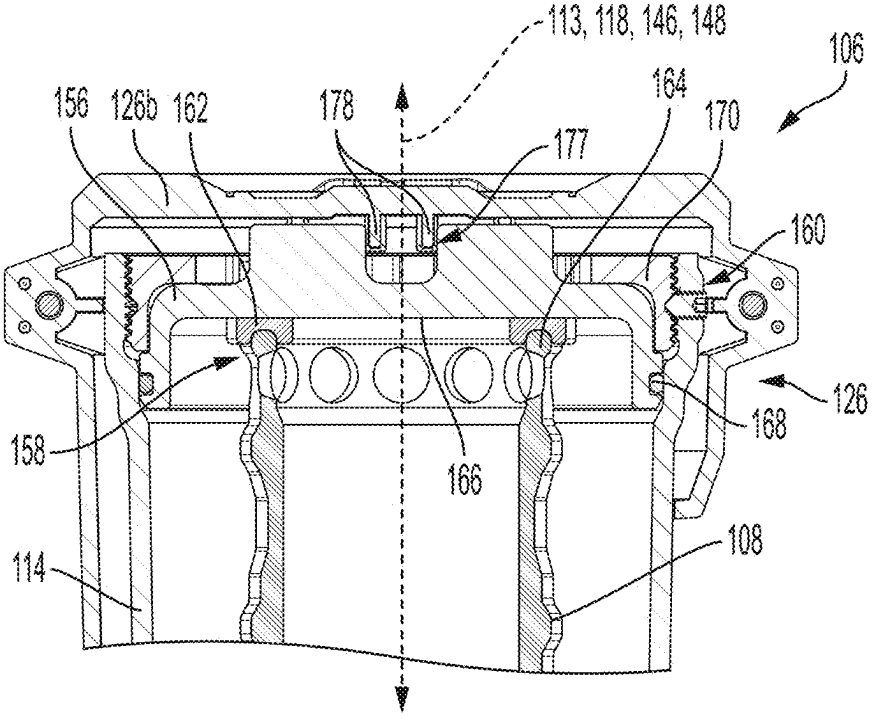

113, 118, 146, 148
106
156
126b
162
178
164
170
177
160
126
158
168
166
108
114

FIG. 5

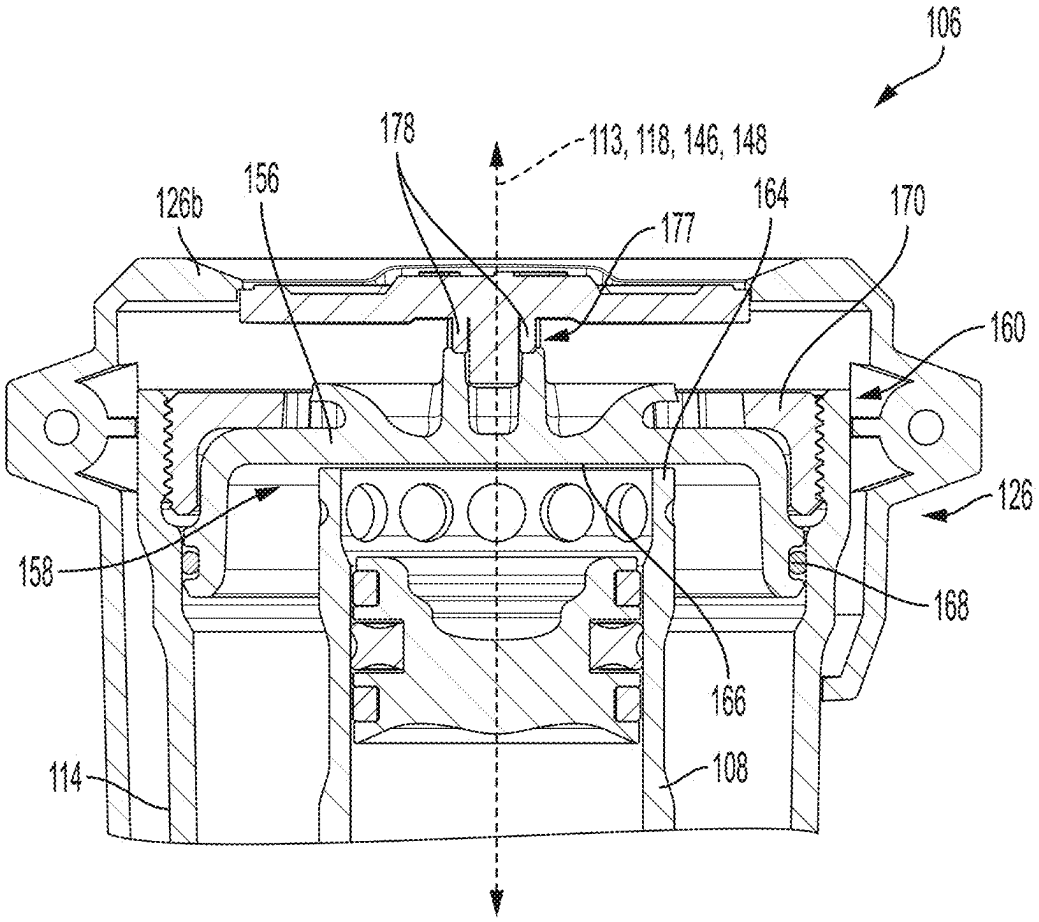

106
178
113, 118, 146, 148
126b
156
177
164
170
160
126
158
168
166
114
108

FIG. 6

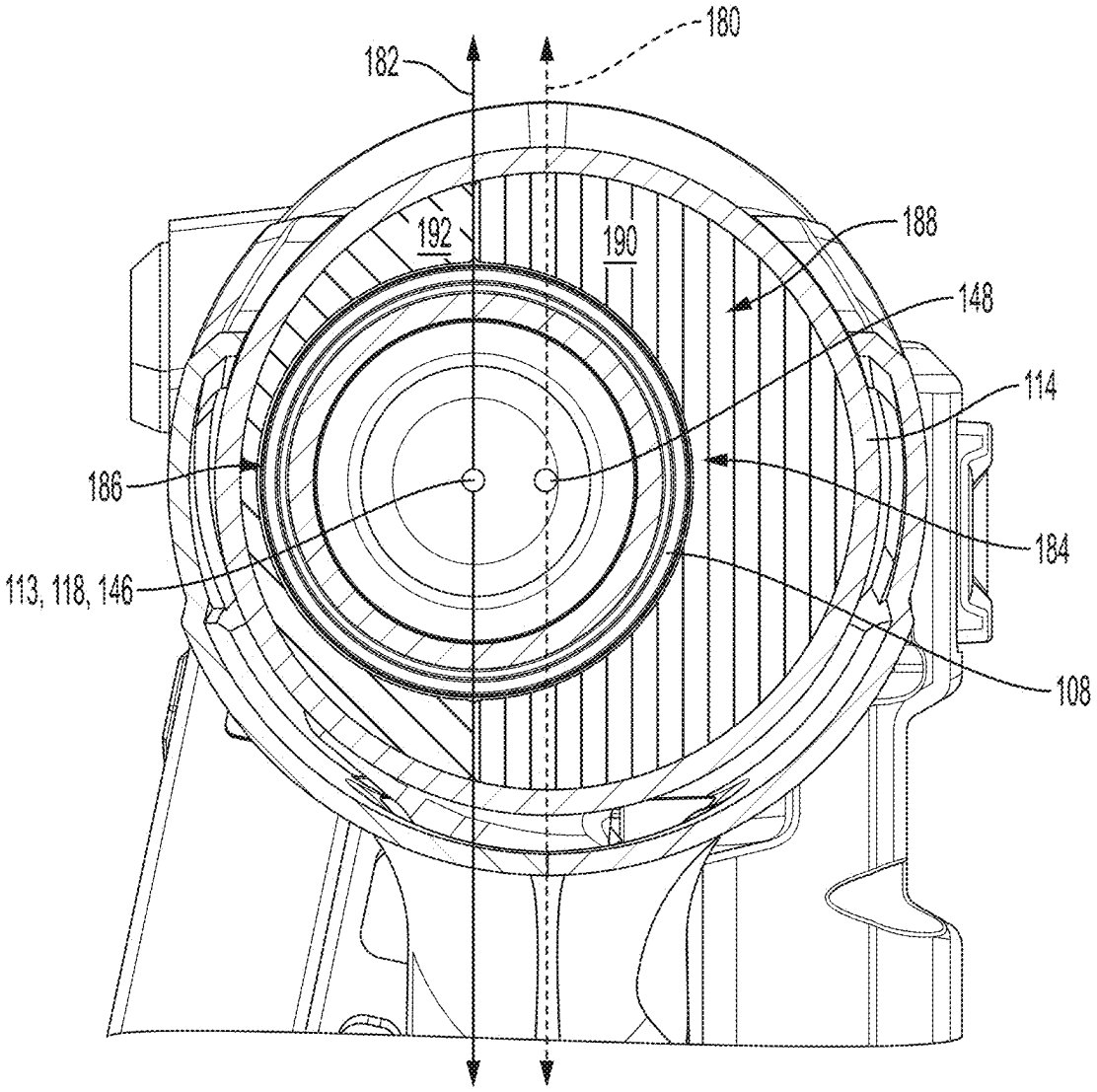


FIG. 7

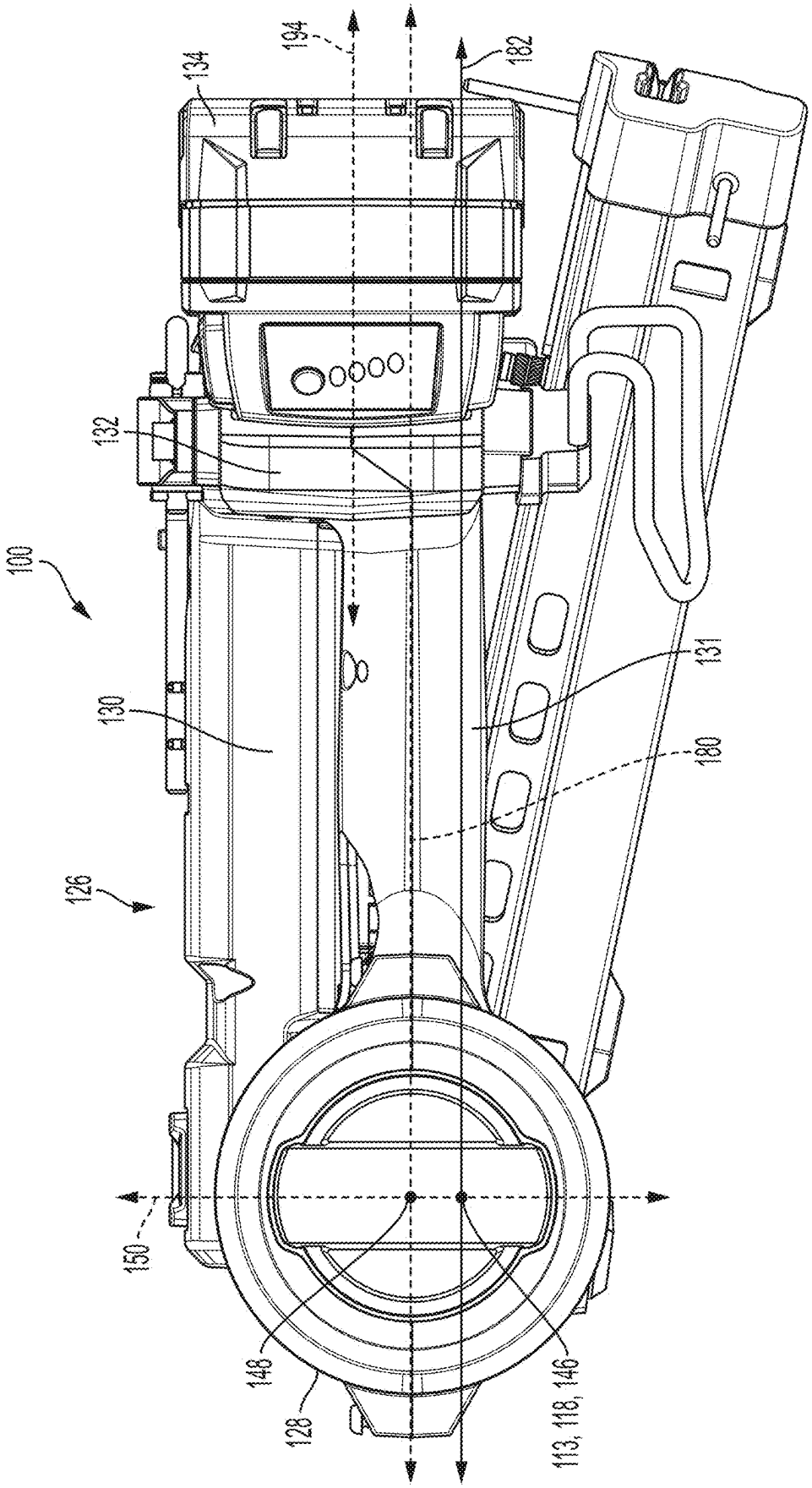


FIG. 8

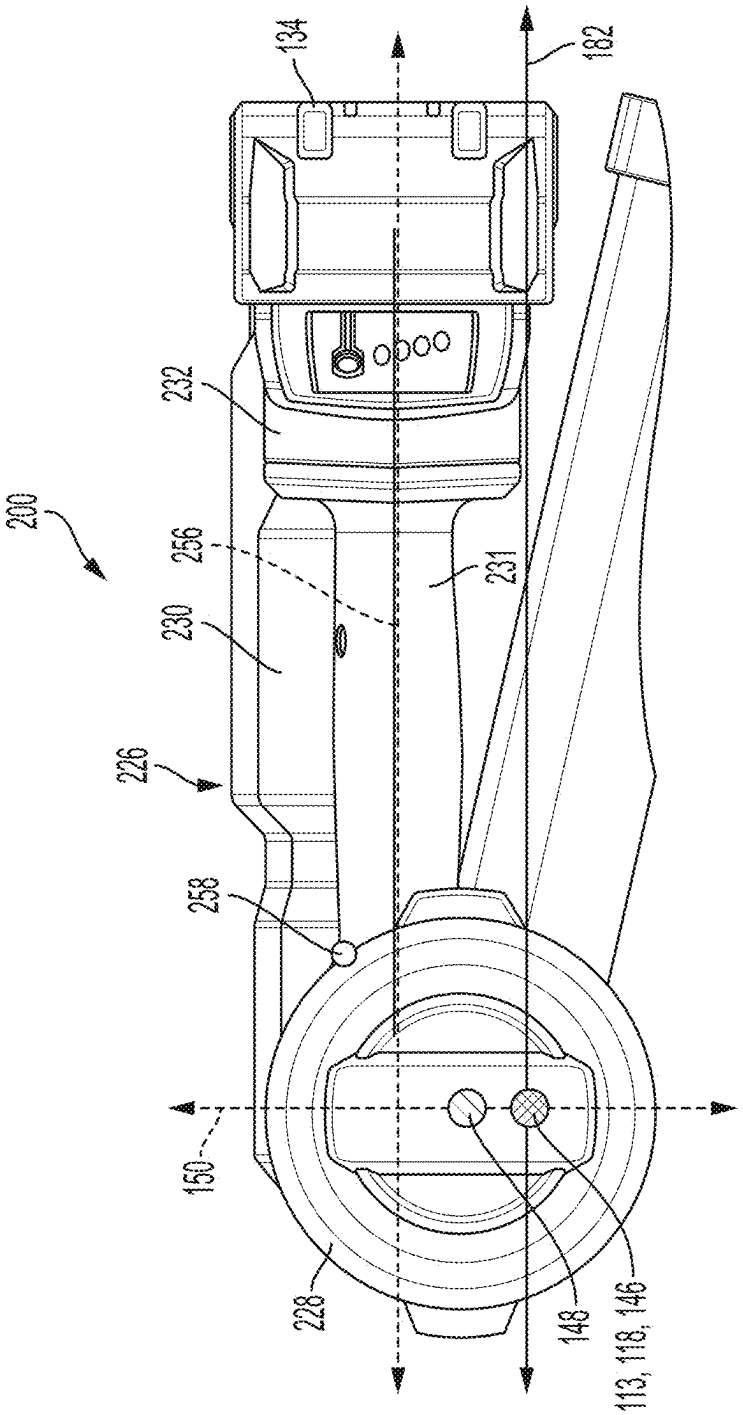


FIG. 9

POWERED FASTENER DRIVER

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application claims priority to U.S. Provisional Patent Application No. 63/575,133, filed Apr. 5, 2024, and to U.S. Provisional Patent Application No. 63/555,184, filed Feb. 19, 2024, the entire contents of all of which are incorporated herein by reference.

FIELD OF THE DISCLOSURE

[0002] The present disclosure relates to power tools, and more particularly to gas spring-powered fastener drivers.

BACKGROUND OF THE DISCLOSURE

[0003] Hardware, such as, joist hangers, straps, hurricane ties, etc., are typically attached with fasteners (e.g., nails) to building frames, studs, beams, joists, etc. Typically, such fasteners are driven into a workpiece by a powered fastener driver. The fasteners are collated into a strip and positioned within a magazine of the powered fastener driver.

SUMMARY OF THE DISCLOSURE

[0004] The present disclosure provides, in one aspect, a fastener driver including: an inner cylinder centrally defining an inner cylinder axis; a piston positioned within the inner cylinder; a driver blade coupled to the piston and movable therewith between a ready position and a driven position; a storage tank including a large portion centrally defining a large portion axis, the large portion surrounding at least a portion of the inner cylinder; a housing supporting the storage tank and including a handle portion, the handle portion defining a handle portion axis extending transverse to the inner cylinder axis; wherein the inner cylinder axis extends within a dividing plane that centrally and longitudinally divides the inner cylinder into a first half and a second half; wherein one of: (a) the dividing plane is parallel to the handle portion axis; or (b) the handle portion axis extends within the dividing plane; and wherein the large portion axis is offset from the dividing plane by a distance D that is greater than or equal to 1.0 mm.

[0005] In some aspects, the techniques described herein relate to a fastener driver, wherein the distance D is greater than or equal to 5.0 mm.

[0006] In some aspects, the techniques described herein relate to a fastener driver, further including a lifter operable to move the driver blade from the driven position to the ready position, wherein the lifter is positioned on a first side of the driver blade, and wherein the distance D is measured in a direction from the inner cylinder axis toward the first side.

[0007] In some aspects, the techniques described herein relate to a fastener driver, wherein the large portion is generally cylindrical.

[0008] In some aspects, the techniques described herein relate to a fastener driver, wherein the distance D is measured along an offset axis which extends transverse to the inner cylinder axis and transverse to the handle portion axis.

[0009] In some aspects, the techniques described herein relate to a fastener driver, wherein the handle portion axis is centrally defined by the handle portion and extends along a length of the handle portion, and wherein the handle portion axis intersects the large portion axis.

[0010] In some aspects, the techniques described herein relate to a fastener driver, further including: a lifter operable to move the driver blade from the driven position to the ready position; wherein the lifter is positioned on a first side of the driver blade; wherein the handle portion axis is centrally defined by the handle portion and extends along a length of the handle portion; and wherein the handle portion axis passes beside the large portion axis on the first side of the driver blade.

[0011] The present disclosure provides, in another aspect, a fastener driver including: an inner cylinder centrally defining an inner cylinder axis; a piston positioned within the inner cylinder; a driver blade coupled to the piston and movable therewith between a ready position and a driven position; a storage tank fluidly communicating with the inner cylinder; and a housing supporting the storage tank and including a handle portion, the handle portion defining a handle portion axis extending transverse to the inner cylinder axis; wherein the handle portion axis is offset from the inner cylinder axis.

[0012] In some aspects, the techniques described herein relate to a fastener driver, wherein the storage tank includes a large portion surrounding at least a portion of the inner cylinder, the large portion centrally defining a large portion axis, and wherein the large portion axis is offset from the inner cylinder axis by a distance D measured along an offset axis which extends transverse to the inner cylinder axis and transverse to the handle portion axis, and wherein the distance D is greater than or equal to 1.0 mm and less than or equal to 40.0 mm.

[0013] In some aspects, the techniques described herein relate to a fastener driver, further including a lifter operable to move the driver blade from the driven position to the ready position, wherein the lifter is positioned on a first side of the driver blade, and wherein the distance D is measured in a direction from the inner cylinder axis toward the first side.

[0014] In some aspects, the techniques described herein relate to a fastener driver, wherein the housing further includes a battery connection portion connected to the handle portion, the battery connection portion defining a battery portion centerline that extends parallel to the handle portion axis and offset from the handle portion axis, and wherein the handle portion axis extends between the inner cylinder axis and the battery portion centerline.

[0015] In some aspects, the techniques described herein relate to a fastener driver, further including: a lifter operable to move the driver blade from the driven position to the ready position; wherein the lifter is positioned on a first side of the driver blade; wherein the handle portion axis is centrally defined by the handle portion and extends along a length of the handle portion; and wherein the storage tank includes a large portion surrounding at least a portion of the inner cylinder, the large portion centrally defining a large portion axis, and wherein the handle portion axis passes beside the large portion axis on the first side of the driver blade.

[0016] In some aspects, the techniques described herein relate to a fastener driver, wherein: the inner cylinder axis extends within a dividing plane that centrally divides the inner cylinder into a first half and a second half; the handle portion axis extends parallel to the dividing plane; a storage tank volume is defined between an inner surface of the storage tank and an outer surface of the inner cylinder; the

dividing plane divides the storage tank volume into a first volume and a second volume; and the first volume is at least 5 percent greater than the second volume.

[0017] In some aspects, the techniques described herein relate to a fastener driver, further including: a cap dividing an open end of the inner cylinder from an open end of the storage tank; a first seal positioned between the cap and the inner cylinder; and a nut coupled to the open end of the storage tank and securing the cap to the storage tank.

[0018] The present disclosure provides, in another aspect, a fastener driver including: an inner cylinder centrally defining an inner cylinder axis, the inner cylinder axis extending within a dividing plane which centrally divides the inner cylinder into a first half and a second half; a piston positioned within the inner cylinder; a driver blade coupled to the piston and movable therewith between a ready position and a driven position; a storage tank surrounding at least a portion of the inner cylinder; a housing supporting the storage tank and including a handle portion, the handle portion defining a handle portion axis extending transverse to the inner cylinder axis and one of: (a) within the dividing plane, and (b) parallel to the dividing plane; wherein a storage tank volume is defined between an inner surface of the storage tank and an outer surface of the inner cylinder; wherein the dividing plane divides the storage tank volume into a first volume and a second volume; and wherein the first volume differs from the second volume by at least 5 percent.

[0019] In some aspects, the techniques described herein relate to a fastener driver, wherein the first volume is at least 20 percent greater than the second volume.

[0020] In some aspects, the techniques described herein relate to a fastener driver, wherein the storage tank includes a large diameter portion surrounding at least the portion of the inner cylinder, the large diameter portion centrally defining a large diameter portion axis, and wherein the large diameter portion axis is offset from the inner cylinder axis by a distance D that is greater than or equal to 1.0 mm.

[0021] In some aspects, the techniques described herein relate to a fastener driver, wherein: the storage tank includes a large diameter portion surrounding at least the portion of the inner cylinder, the large diameter portion centrally defining a large diameter portion axis; the handle portion axis is centrally defined by the handle portion and extends along a length of the handle portion; and the handle portion axis intersects the large diameter portion axis.

[0022] In some aspects, the techniques described herein relate to a fastener driver, further including: a lifter operable to move the driver blade from the driven position to the ready position; wherein the lifter is positioned on a first side of the driver blade; wherein the storage tank includes a large diameter portion surrounding at least the portion of the inner cylinder, the large diameter portion centrally defining a large diameter portion axis; wherein the handle portion axis is centrally defined by the handle portion and extends along a length of the handle portion; and wherein the handle portion axis passes beside the large diameter portion axis on the first side of the driver blade.

[0023] In some aspects, the techniques described herein relate to a fastener driver, further including: a cap dividing an open end of the inner cylinder from an open end of the storage tank; a first seal positioned between the cap and the inner cylinder; and a nut coupled to the open end of the storage tank and securing the cap to the storage tank.

[0024] Other features and aspects of the disclosure will become apparent by consideration of the following detailed description and accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

[0025] FIG. **1** is a perspective view of a gas spring-powered fastener driver in accordance with an embodiment of the disclosure.

[0026] FIG. **2** is a cross-sectional view of the fastener driver of FIG. **1**, taken along line **2-2** of FIG. **1**.

[0027] FIG. **2**A is a perspective view of a storage tank of the fastener driver of FIG. **1**.

[0028] FIG. **2**B is a cross-sectional view of the storage tank of FIG. **2**A, taken along line **2**B-**2**B of FIG. **2**A.

[0029] FIG. **2**C is another cross-sectional view of the storage tank of FIG. **2**A, taken along line **2**C-**2**C of FIG. **2**A.

[0030] FIG. **3** is a partially exploded view illustrating portions of the fastener driver of FIG. **1**.

[0031] FIG. **4** is detailed cross-sectional view illustrating portions of the fastener driver of FIG. **1**, taken along line **2-2** of FIG. **1**.

[0032] FIG. **5** is a cross-sectional view illustrating portions of the fastener driver of FIG. **1**, taken along line **5-5** of FIG. **1**.

[0033] FIG. **6** is another cross-sectional view illustrating portions of the fastener driver of FIG. **1**, taken along line **5-5** of FIG. **1**, according to another embodiment of the disclosure.

[0034] FIG. **7** is another cross-sectional view of the fastener driver of FIG. **1**, taken along line **6-6** of FIG. **1**.

[0035] FIG. **8** is rear end view of the fastener driver of FIG. **1**.

[0036] FIG. **9** is a rear end view of a fastener driver according to another embodiment of the disclosure.

[0037] Before any embodiments of the disclosure are explained in detail, it is to be understood that the disclosure is not limited in its application to the details of construction and the arrangement of components set forth in the following description or illustrated in the following drawings. The disclosure is capable of other embodiments and of being practiced or of being carried out in various ways. Also, it is to be understood that the phraseology and terminology used herein is for the purpose of description and should not be regarded as limiting.

DETAILED DESCRIPTION

[0038] FIGS. **1-3** illustrate a power tool, such as a gas spring-powered fastener driver **100**, operable to drive fasteners (e.g., nails, tacks, staples, etc.) held within a magazine **104** into a workpiece. The fastener driver **100** is configured as a multi-shot powered nailer including the magazine **104** holding a collated strip of nails, allowing the user to perform multiple fastening operations without having to manually reload the fastener driver after each driving cycle. In other embodiments, the fasteners can instead be embodied as staples, brads, etc.

[0039] With reference to FIG. **2**, the gas spring-powered fastener driver **100** includes a gas spring assembly **106** having an inner cylinder **108** and a moveable piston **110** positioned within the inner cylinder **108**. The fastener driver **100** further includes a driver blade **112** that is attached to the piston **110** and moveable therewith. The fastener driver **100** does not require an external source of air pressure, but rather,

the gas spring assembly **106** includes a storage tank **114** of pressurized gas in fluid communication with the inner cylinder **108**. In the illustrated embodiment, the inner cylinder **108** and moveable piston **110** are positioned within the storage tank **114**.

[0040] The driver blade **112** defines a driving axis **118**. During a driving cycle, the driver blade **112** and the piston **110** are moveable along the driving axis **118** between a ready position (i.e., top dead center) and a driven position (i.e., bottom dead center, as shown in FIG. **2**). The inner cylinder **108** centrally defines an inner cylinder axis **113**. In the illustrated embodiment, the inner cylinder axis **113** is coaxial with the driving axis **118**.

[0041] The fastener driver **100** further includes a lifter or lifting assembly **120** which is powered by an electric motor **122** (FIG. **1**). The lifting assembly **120** is operable to move the driver blade **112** from the driven position to the ready position.

[0042] In operation, when the motor **122** is energized, the lifting assembly **120** drives the piston **110** and the driver blade **112** to the ready position. As the piston **110** and the driver blade **112** are moved to the ready position, the gas above the piston **110** and the gas within the storage tank **114** is compressed. The piston **110** and the driver blade **112** are then held in the ready position until released by user activation of a trigger **124** (FIG. **1**). When released, the compressed gas above the piston **110** and within the storage tank **114** drives the piston **110** and the driver blade **112** to the driven position, thereby driving the nail into the workpiece. The illustrated fastener driver **100** therefore operates on a gas spring principle, utilizing the lifting assembly **120** and the piston **110** to further compress the gas within the inner cylinder **108** and the storage tank **114**.

[0043] With reference to FIGS. **1** and **2**, the fastener driver **100** includes a housing **126** formed from clamshell housing halves **126***a*, **126***b*. The housing **126** includes a storage tank support portion **128** (FIG. **1**) in which the storage tank **114** is at least partially positioned, and a motor housing portion **130** in which the motor **122** and the lifting assembly **120** are at least partially positioned. The housing **126** further includes a handle portion **131** connected to the storage tank support portion **128**, and a battery connection portion **132** located at a base of the handle portion **131**. The battery connection portion **132** removably couples to a battery **134** (FIG. **1**). When the battery **134** is coupled to the battery connection portion **132**, the battery **134** is electrically connected to the motor **122**. The battery **134** can supply electrical power to the motor **122** and other electrical components of the fastener driver **100**. In alternative embodiments, the driver may be powered from an AC voltage input (i.e., from a wall outlet), or by an alternative DC voltage input (e.g., a DC power support).

[0044] With reference to FIG. **1**, the fastener driver **100** further includes a nosepiece assembly **136** that is supported at a first end **138** of the housing **126**. During the driving operation, the driver blade **112** ejects the fastener through the nosepiece assembly **136** and into the workpiece. The storage tank support portion **128** of the housing **126** defines a second end **140** that is located opposite from the first end **138** along a direction of the driving axis **118**.

[0045] With reference to FIGS. **2**-**2**C, the storage tank **114** includes a small portion **142** and a large portion **144**. The small portion **142** has a cross-sectional area A**1** (FIG. **2**B), measured along a cutting plane **2**B-**2**B extending perpendicular to the small portion central axis **146** and the driving axis **118**. The large portion **144** has a cross-sectional area A**2** (FIG. **2**C), measured along a cutting plane **2**C-**2**C extending perpendicular to the small portion central axis **146** and the driving axis **118**. The cross-sectional area A**1** is smaller than the cross-sectional area A**2**. In the illustrated embodiment, each of the small portion **142** and the large portion **144** is generally cylindrical in shape. In other embodiments, one or both portions **142**, **144** may instead be non-cylindrical (e.g., somewhat frustoconical, or having an ovoid cross-section, or a non-symmetrical cross-section). The small portion **142** is positioned adjacent the nosepiece assembly **136** and the lifting assembly **120** and centrally defines a small portion central axis **146**. The small portion central axis **146** is coaxial with the inner cylinder axis **113** and the driving axis **118** in the illustrated embodiment. As such, the small portion **142** is arranged concentrically about the inner cylinder **108**. The large portion **144** is adjacent the second end **140** and centrally defines a large portion central axis **148**. In the illustrated embodiment shown in FIG. **2**, the large portion central axis **148** is laterally offset from the inner cylinder axis **113** in a direction toward the lifting assembly **120**. As such, the large portion **144** is non-concentric with the inner cylinder **108**. The large portion **144** surrounds at least a portion of the inner cylinder **108**.

[0046] Because the inner cylinder axis **113**, the driving axis **118**, and the small portion central axis **146** are all coaxial in the illustrated embodiment, the large portion central axis **148** is also laterally offset from the driving axis **118** and the small portion central axis **146**. An offset distance D is measured perpendicularly between the inner cylinder axis **113** and the large portion central axis **148**. In the illustrated embodiment, the offset distance D measures 8.5 millimeters (mm). In other embodiments, the offset distance D is greater than or equal to 1.0 mm. In further embodiments, the offset distance D is greater than or equal to 1.0 mm and less than or equal to 40.0 mm. In other embodiments, the offset distance D is greater than or equal to 5.0 mm and less than or equal to 40.0 mm. In further embodiments, the offset distance D is greater than or equal to 5.0 mm and less than or equal to 30.0 mm.

[0047] As shown in FIG. **2**, the lifting assembly **120** is positioned on a first side **149** of the driver blade **112**. The offset distance D is measured in a direction from the inner cylinder axis **113** toward the first side **149**. The offset distance D is also measured along, or parallel to, an offset axis **150** which extends transverse to the inner cylinder axis **113** (see also FIG. **7**).

[0048] With continued reference to FIG. **2**, the large portion **144** of the storage tank **114** defines a bulge portion **152** on one lateral side thereof and defines a straight portion **153** on an opposite lateral side thereof. The bulge portion **152** generally protrudes into a space **154** located behind the lifting assembly **120** and above the battery connection portion **132**. The lifting assembly **120** is located laterally beside the driver blade **112**, which enables the lifting assembly **120** to rotatably engage the driver blade **112**. In many traditional gas spring-powered fastener drivers, the inner cylinder and the outer cylinder are concentrically arranged, leaving the space behind the lifting assembly substantially unoccupied. In the illustrated fastener driver **100**, the space **154** is substantially occupied by the bulge portion **152**. This reduces an overall form factor or width W of the of the fastener driver **100** and improves a user's lines of sight

toward the nosepiece assembly **136** and the workpiece during use. The width W is measured between the widest portions of the housing **126** in a direction perpendicular to the driving axis **118**.

[0049] With reference to FIGS. **3-5**, the gas spring assembly **106** also includes a cap **156** positioned adjacent the second end **140** of the housing **126**. The cap **156** functions as a barrier to partially divide an interior space within the inner cylinder **108** from an exterior space defined between an exterior surface of the inner cylinder **108** and an interior surface of the storage tank **114**. Each of the inner cylinder **108** and the storage tank **114** define respective open ends **158**, **160** located adjacent the second end **140** of the housing **126**. The cap **156** resides within the open end **160** of the storage tank **114** and separates the open end **160** from the open end **158** of the inner cylinder **108**. An inner seal **162** is positioned between a rim **164** of the open end **158** of the inner cylinder **108** and an inner surface **166** of the cap **156**. The inner seal **162** creates an air-tight seal between the rim **164** and the inner surface **166**, and can be made from, e.g., a relatively flexible material such as an elastomer (e.g., rubber). An outer seal **168** (e.g., an O-ring) is positioned between the cap **156** and the storage tank **114** adjacent the open end **160** thereof. The outer seal **168** creates an air-tight seal between the cap **156** and the storage tank **114**, and can likewise be made from, e.g., a relatively flexible material such as an elastomer (e.g., rubber).

[0050] As shown in FIGS. **3-5**, the cap **156** is generally cup-shaped and has a circular profile corresponding to the circular shape of the open end **160** of the storage tank **114**. However, due to the positioning of the bulge portion **152** relative to the inner cylinder **108**, the cap **156** is non-concentric with the rim **164** of the inner cylinder **108**. Thus, a separate, externally-threaded nut **170** secures the cap **156** to the storage tank **114**. The external threads of the nut **170** engage internal threads formed at the open end **160** of the storage tank **114**. Tightening the externally-threaded nut **170** forces the cap **156** toward the rim **164**, causing the inner seal **162** to compress. This ensures the integrity of the seal formed between the cap **156** and the rim **164**. When the externally-threaded nut **170** is sufficiently tightened, a set screw **172** threads and tightens into a wall of the storage tank **114** and abuts the cap **156** to hold the cap **156** in place.

[0051] As shown in FIG. **3**, the inner cylinder **108** defines a plurality of apertures **174** near the rim **164** at the open end **158** of the inner cylinder **108**. The apertures **174** communicate the interior space of the inner cylinder **108** with the exterior space of the storage tank **114** and allow the pressurized gas to flow therebetween.

[0052] With reference to FIGS. **3** and **5**, the housing **126** engages the cap **156** to maintain a correct orientation and position of the cap **156** relative to the inner cylinder **108** and the storage tank **114**. As shown in FIG. **3**, in the illustrated embodiment, the cap **156** includes a keyway **175** in the form of a slot or a channel. The keyway **175** is defined by a pair of protruding first ribs **176** which extend generally parallel to one another. As shown in FIG. **5**, the housing **126** (specifically, the clamshell housing half **126***b*) includes a key **177** which includes a pair of protruding second ribs **178** extending generally parallel to one another. The key **177** is closely received within the keyway **175** such that the second ribs **178** contact, or nearly contact, the first ribs **176**. Engagement between the key **177** and the keyway **175** ensures a correct orientation and position of the cap **156** relative to the inner cylinder **108** and the storage tank **114** during assembly of the fastener driver **100**, and further prevents the cap **156** from moving away from this correct position during use.

[0053] With reference to FIG. **6**, in another embodiment of the fastener driver **100**, the inner seal **162** may be omitted from the assembly. The embodiment of FIG. **6** is substantially similar to the embodiment of FIGS. **1-5**, except the inner seal **162** is omitted such that the rim **164** directly abuts (or, is nominally spaced apart from) the inner surface **166** of the cap **156**.

[0054] With reference to FIGS. **7** and **8**, the handle portion **131** centrally defines a handle portion axis **180** which extends along a length of the handle portion **131**. In the illustrated embodiment, the handle portion axis **180** extends perpendicular to the driving axis **118** and perpendicular to the inner cylinder axis **113**. In other embodiments, the handle portion axis **180** extends transverse to the inner cylinder axis **113** but may not extend perpendicular thereto. The handle portion axis **180** also extends transverse to the offset axis **150** (FIG. **2**). In the illustrated embodiment, the handle portion axis **180** is in line with the large portion central axis **148**. Moreover, the handle portion axis **180** intersects the large portion central axis **148** in the illustrated embodiment. As such, the handle portion **131** is generally centered beneath the large portion **144**. Because the handle portion axis **180** extends perpendicular to the driving axis **118** and intersects the large portion central axis **148**, the handle portion axis **180** is also laterally offset from the inner cylinder axis **113** by the offset distance D.

[0055] Referring to FIGS. **2**, and **6**, **7**, and **8**, the inner cylinder axis **113** extends within a dividing plane **182** that centrally divides the inner cylinder **108** into a first half **184** and a second half **186**. In the illustrated embodiment, dividing plane **182** extends parallel to the handle portion axis **180**. In other embodiments (not shown), the handle portion axis **180** may extend within the dividing plane **182**. In the illustrated embodiment, storage tank volume **188** is defined between an inner surface of the storage tank **114** and an outer surface of the inner cylinder **108**. The dividing plane **182** divides the storage tank volume **188** into a first volume **190** and a second volume **192**. In the illustrated embodiment, the first volume **190** is greater than the second volume **192**. In particular, the first volume is at least 5 percent greater than the second volume **192**. In some embodiments, the first volume is at least 20 percent greater than the second volume **192**. The first volume **190** is located on a same side of the dividing plane **182** as the lifting assembly **120**. In other embodiments, the first volume differs from the second volume by at least five percent. In other embodiments, the first volume differs from the second volume by at least 20 percent.

[0056] With continued reference to FIG. **8**, the battery connection portion **132** defines a battery centerline **194** extending parallel to the handle portion axis **180** and parallel to the dividing plane **182**. When the battery **134** is attached to the battery connection portion **132**, the battery centerline **194** bisects the battery **134** into two equal halves. The battery centerline **194** is laterally offset from the handle portion axis **180** in a direction toward the lifting assembly (not shown), and toward the motor housing portion **130**. The battery centerline **194** is also laterally offset from handle portion axis **180** in a direction away from the dividing plane **182** and away from the inner cylinder axis **113**. By laterally

offsetting the battery centerline **194** relative to the handle portion axis **180** in this manner, the form factor or width W of the of the fastener driver **100** (FIG. **2**) is minimized. This is because the battery **134** is displaced toward the space **154** (FIG. **2**), therefore the battery **134** (particularly for larger battery packs) is less likely to protrude laterally beyond the edge of the storage tank support portion **128** of the housing **126** (i.e., in a direction toward the magazine **104**).

[0057] FIG. **9** illustrates a fastener driver **200** that is similar to the fastener driver **100**, with like features having like reference numbers "plus 100". As shown in FIG. **8**, the fastener driver **200** includes a housing **226** with a storage tank support portion **228**, a motor housing portion **230**, a handle portion **231**, and a battery connection portion **232**. Although not shown in FIG. **8**, the fastener driver **200** includes a driver blade, an inner cylinder, and storage tank substantially the same as the driver blade **112**, the inner cylinder **108**, and the storage tank **114** described herein, and defining the same respective axes **113**, **118**, **146**, and **148**. The handle portion **231** centrally defines a handle portion axis **256** that extends perpendicular to the driving axis **118**. However, the handle portion **231** is not arranged in line with the large diameter portion of the storage tank. Instead, the handle portion **231** is offset from the large diameter portion, and as such, the handle portion axis **256** is laterally offset from the large portion central axis **148** in a direction toward the lifting assembly (not shown), and toward the motor housing portion **130**. The handle portion axis **256** also passes beside the large portion central axis **148** on the first side **149** (FIG. **2**) of the driver blade **112**, and passes beside the inner cylinder axis **113** on the first side **149**. The handle portion **231** is also arranged in line with the battery connection portion **232**. The fastener driver **200** includes a center of gravity (CG) **258** shown in FIG. **9**. Compared to the fastener driver **100**, the handle portion axis **256** of the fastener driver **200** is positioned relatively closer to the CG **258** due to its lateral offset relative to the large portion central axis **148**.

[0058] In the embodiment shown in FIG. **9**, the inner cylinder axis **113** extends within the dividing plane **182** which centrally divides the inner cylinder **108** into a first half **184** and a second half **186** (see FIG. **2**). However, because the handle portion axis **256** is offset from the large portion central axis **148**, the handle portion axis **256** does not extend within the dividing plane **182**. Instead, the dividing plane **182** extends parallel to the handle portion axis **256** in the illustrated embodiment.

[0059] Although the disclosure has been described in detail with reference to certain preferred embodiments, variations and modifications exist within the scope and spirit of one or more independent aspects of the disclosure as described.

[0060] Various features of the disclosure are set forth in the following claims.

1. A fastener driver comprising:

an inner cylinder centrally defining an inner cylinder axis;

a piston positioned within the inner cylinder;

a driver blade coupled to the piston and movable therewith between a ready position and a driven position;

a storage tank including a large portion centrally defining a large portion axis, the large portion surrounding at least a portion of the inner cylinder;

a housing supporting the storage tank and including a handle portion, the handle portion defining a handle portion axis extending transverse to the inner cylinder axis;

wherein the inner cylinder axis extends within a dividing plane that centrally and longitudinally divides the inner cylinder into a first half and a second half;

wherein one of:

a) the dividing plane is parallel to the handle portion axis; or

b) the handle portion axis extends within the dividing plane; and

wherein the large portion axis is offset from the dividing plane by a distance D that is greater than or equal to 1.0 mm.

2. The fastener driver of claim **1**, wherein the distance D is greater than or equal to 5.0 mm.

3. The fastener driver of claim **2**, further comprising a lifter operable to move the driver blade from the driven position to the ready position, wherein the lifter is positioned on a first side of the driver blade, and wherein the distance D is measured in a direction from the inner cylinder axis toward the first side.

4. The fastener driver of claim **3**, wherein the large portion is generally cylindrical.

5. The fastener driver of claim **1**, wherein the distance D is measured along an offset axis which extends transverse to the inner cylinder axis and transverse to the handle portion axis.

6. The fastener driver of claim **5**, wherein the handle portion axis is centrally defined by the handle portion and extends along a length of the handle portion, and wherein the handle portion axis intersects the large portion axis.

7. The fastener driver of claim **5**, further comprising:

a lifter operable to move the driver blade from the driven position to the ready position;

wherein the lifter is positioned on a first side of the driver blade;

wherein the handle portion axis is centrally defined by the handle portion and extends along a length of the handle portion; and

wherein the handle portion axis passes beside the large portion axis on the first side of the driver blade.

8. A fastener driver comprising:

an inner cylinder centrally defining an inner cylinder axis;

a piston positioned within the inner cylinder;

a driver blade coupled to the piston and movable therewith between a ready position and a driven position;

a storage tank fluidly communicating with the inner cylinder; and

a housing supporting the storage tank and including a handle portion, the handle portion defining a handle portion axis extending transverse to the inner cylinder axis;

wherein the handle portion axis is offset from the inner cylinder axis.

9. The fastener driver of claim **8**, wherein the storage tank includes a large portion surrounding at least a portion of the inner cylinder, the large portion centrally defining a large portion axis, and wherein the large portion axis is offset from the inner cylinder axis by a distance D measured along an offset axis which extends transverse to the inner cylinder

axis and transverse to the handle portion axis, and wherein the distance D is greater than or equal to 1.0 mm and less than or equal to 40.0 mm.

10. The fastener driver of claim **9**, further comprising a lifter operable to move the driver blade from the driven position to the ready position, wherein the lifter is positioned on a first side of the driver blade, and wherein the distance D is measured in a direction from the inner cylinder axis toward the first side.

11. The fastener driver of claim **8**, wherein the housing further includes a battery connection portion connected to the handle portion, the battery connection portion defining a battery portion centerline that extends parallel to the handle portion axis and offset from the handle portion axis, and wherein the handle portion axis extends between the inner cylinder axis and the battery portion centerline.

12. The fastener driver of claim **8**, further comprising:

a lifter operable to move the driver blade from the driven position to the ready position;

wherein the lifter is positioned on a first side of the driver blade;

wherein the handle portion axis is centrally defined by the handle portion and extends along a length of the handle portion; and

wherein the storage tank includes a large portion surrounding at least a portion of the inner cylinder, the large portion centrally defining a large portion axis, and

wherein the handle portion axis passes beside the large portion axis on the first side of the driver blade.

13. The fastener driver of claim **8**, wherein:

the inner cylinder axis extends within a dividing plane that centrally divides the inner cylinder into a first half and a second half;

the handle portion axis extends parallel to the dividing plane;

a storage tank volume is defined between an inner surface of the storage tank and an outer surface of the inner cylinder;

the dividing plane divides the storage tank volume into a first volume and a second volume; and

the first volume is at least 5 percent greater than the second volume.

14. The fastener driver of claim **8**, further comprising:

a cap dividing an open end of the inner cylinder from an open end of the storage tank;

a first seal positioned between the cap and the inner cylinder; and

a nut coupled to the open end of the storage tank and securing the cap to the storage tank.

15. A fastener driver comprising:

an inner cylinder centrally defining an inner cylinder axis, the inner cylinder axis extending within a dividing plane which centrally divides the inner cylinder into a first half and a second half;

a piston positioned within the inner cylinder;

a driver blade coupled to the piston and movable therewith between a ready position and a driven position;

a storage tank surrounding at least a portion of the inner cylinder;

a housing supporting the storage tank and including a handle portion, the handle portion defining a handle portion axis extending transverse to the inner cylinder axis and one of: (a) within the dividing plane, and (b) parallel to the dividing plane;

wherein a storage tank volume is defined between an inner surface of the storage tank and an outer surface of the inner cylinder;

wherein the dividing plane divides the storage tank volume into a first volume and a second volume; and

wherein the first volume differs from the second volume by at least 5 percent.

16. The fastener driver of claim **15**, wherein the first volume is at least 20 percent greater than the second volume.

17. The fastener driver of claim **15**, wherein the storage tank includes a large diameter portion surrounding at least the portion of the inner cylinder, the large diameter portion centrally defining a large diameter portion axis, and wherein the large diameter portion axis is offset from the inner cylinder axis by a distance D that is greater than or equal to 1.0 mm.

18. The fastener driver of claim **15**, wherein:

the storage tank includes a large diameter portion surrounding at least the portion of the inner cylinder, the large diameter portion centrally defining a large diameter portion axis;

the handle portion axis is centrally defined by the handle portion and extends along a length of the handle portion; and

the handle portion axis intersects the large diameter portion axis.

19. The fastener driver of claim **15**, further comprising:

a lifter operable to move the driver blade from the driven position to the ready position;

wherein the lifter is positioned on a first side of the driver blade;

wherein the storage tank includes a large diameter portion surrounding at least the portion of the inner cylinder, the large diameter portion centrally defining a large diameter portion axis;

wherein the handle portion axis is centrally defined by the handle portion and extends along a length of the handle portion; and

wherein the handle portion axis passes beside the large diameter portion axis on the first side of the driver blade.

20. The fastener driver of claim **15**, further comprising:

a cap dividing an open end of the inner cylinder from an open end of the storage tank;

a first seal positioned between the cap and the inner cylinder; and

a nut coupled to the open end of the storage tank and securing the cap to the storage tank.

* * * * *