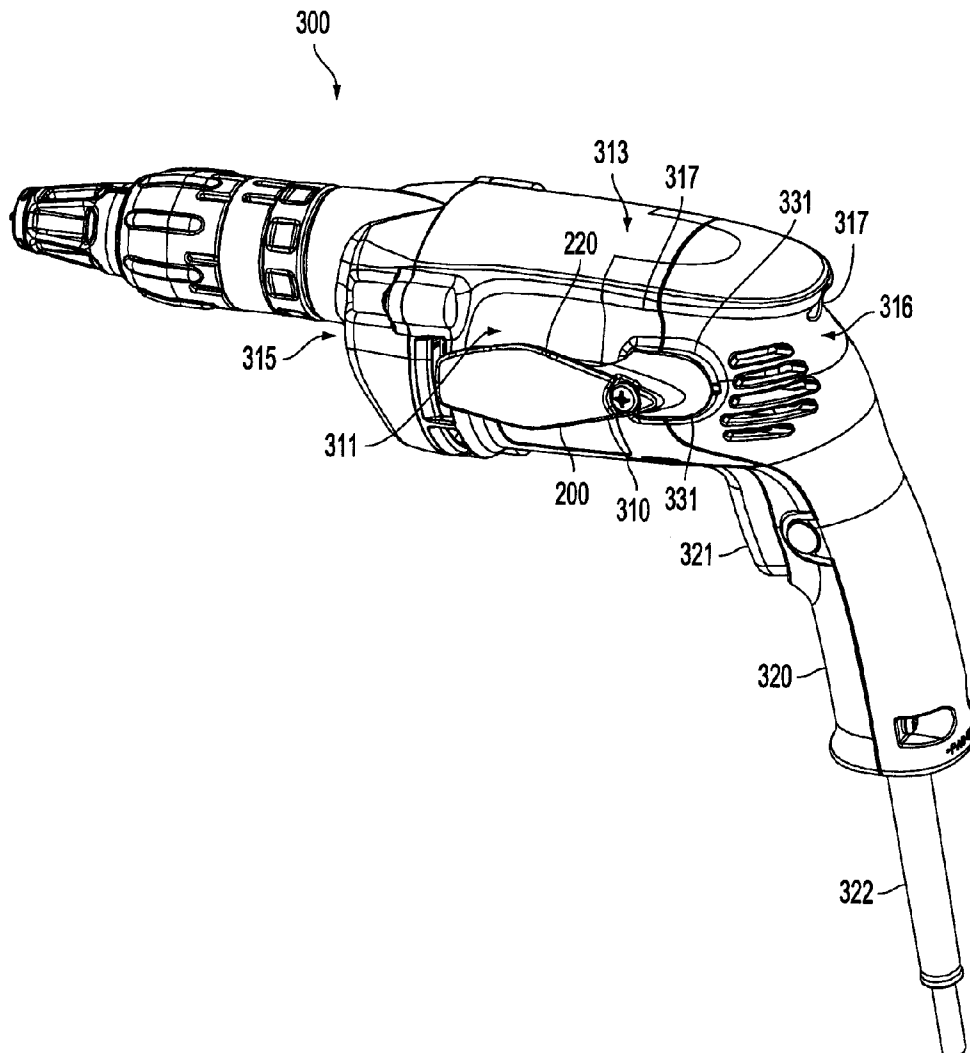


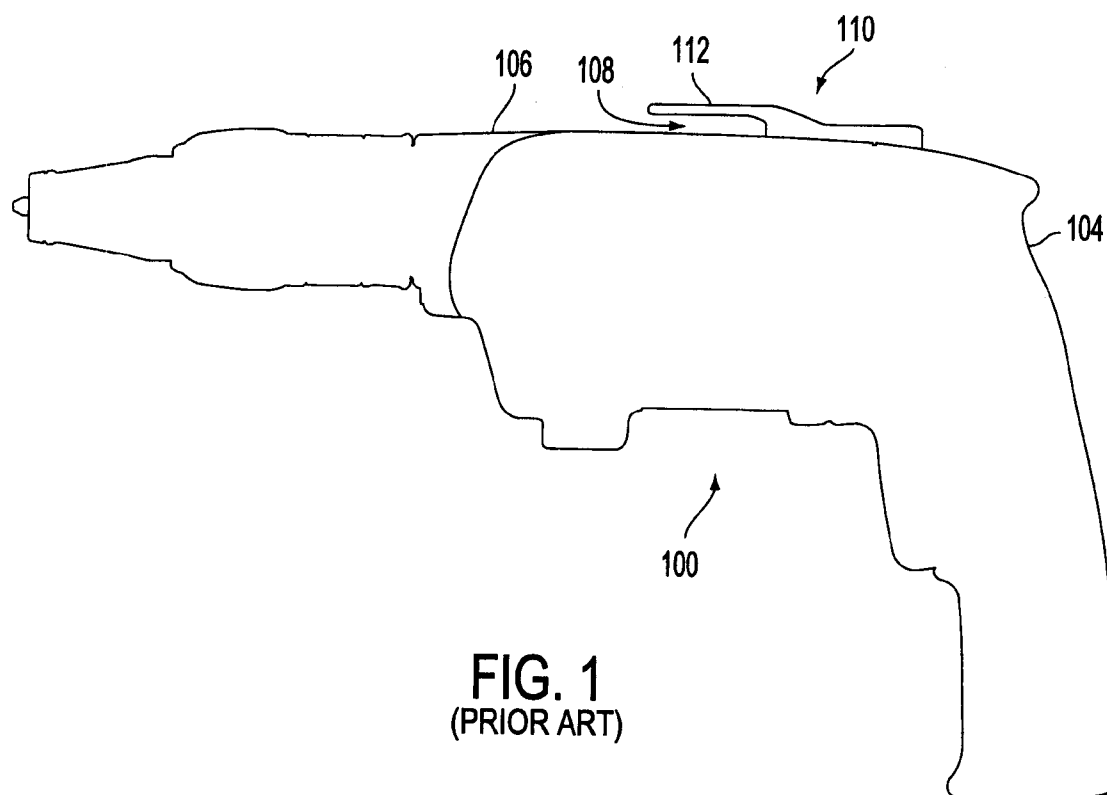


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(19) **United States**(12) **Patent Application Publication****Etter et al.**(10) **Pub. No.: US 2007/0125565 A1**(43) **Pub. Date: Jun. 7, 2007**(54) **BELT CLIP FOR POWER TOOLS**(76) Inventors: **Mark Alan Etter**, Jackson, TN (US);
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WASHINGTON, DC 20006-1109 (US)(21) Appl. No.: **11/673,916**(22) Filed: **Feb. 12, 2007****Related U.S. Application Data**(63) Continuation of application No. 10/849,774, filed on
May 21, 2004, which is a continuation of applicationNo. 10/773,252, filed on Feb. 9, 2004, now Pat. No.
7,143,841, which is a continuation-in-part of appli-
cation No. 09/972,980, filed on Oct. 10, 2001, now
Pat. No. 6,688,407.**Publication Classification**(51) **Int. Cl.**
B23B 45/00 (2006.01)
B25D 17/04 (2006.01)
(52) **U.S. Cl.** **173/170; 173/171**(57) **ABSTRACT**

A power tool, such as a drill/driver or a reciprocating saw, can be provided with a belt clip which attaches to the tool at multiple positions to adapt to the user's preference. The belt clip can be side-mounted to a drill/driver to facilitate holstering of the drill/driver and to reduce the profile of the drill/driver.





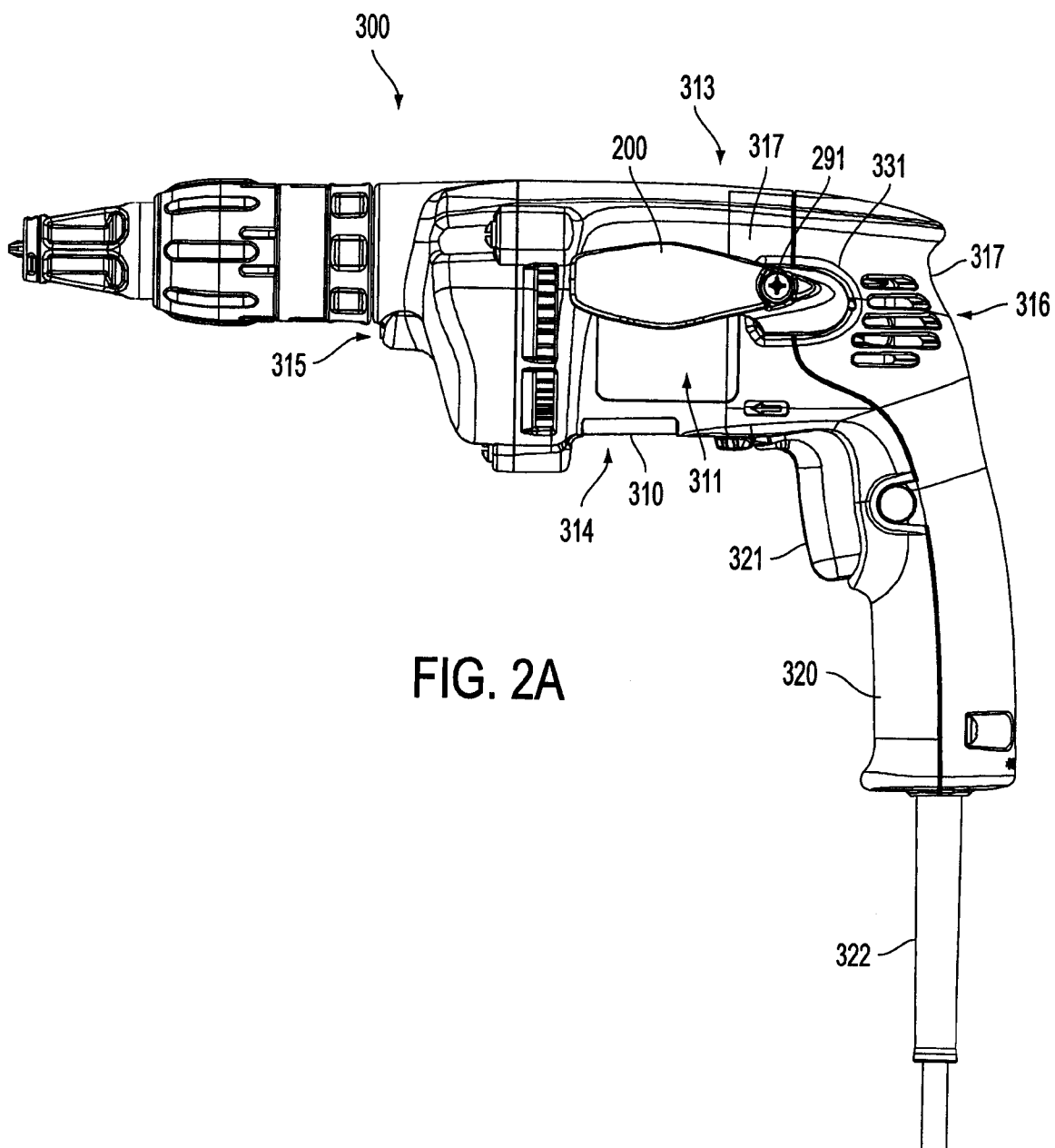


FIG. 2A

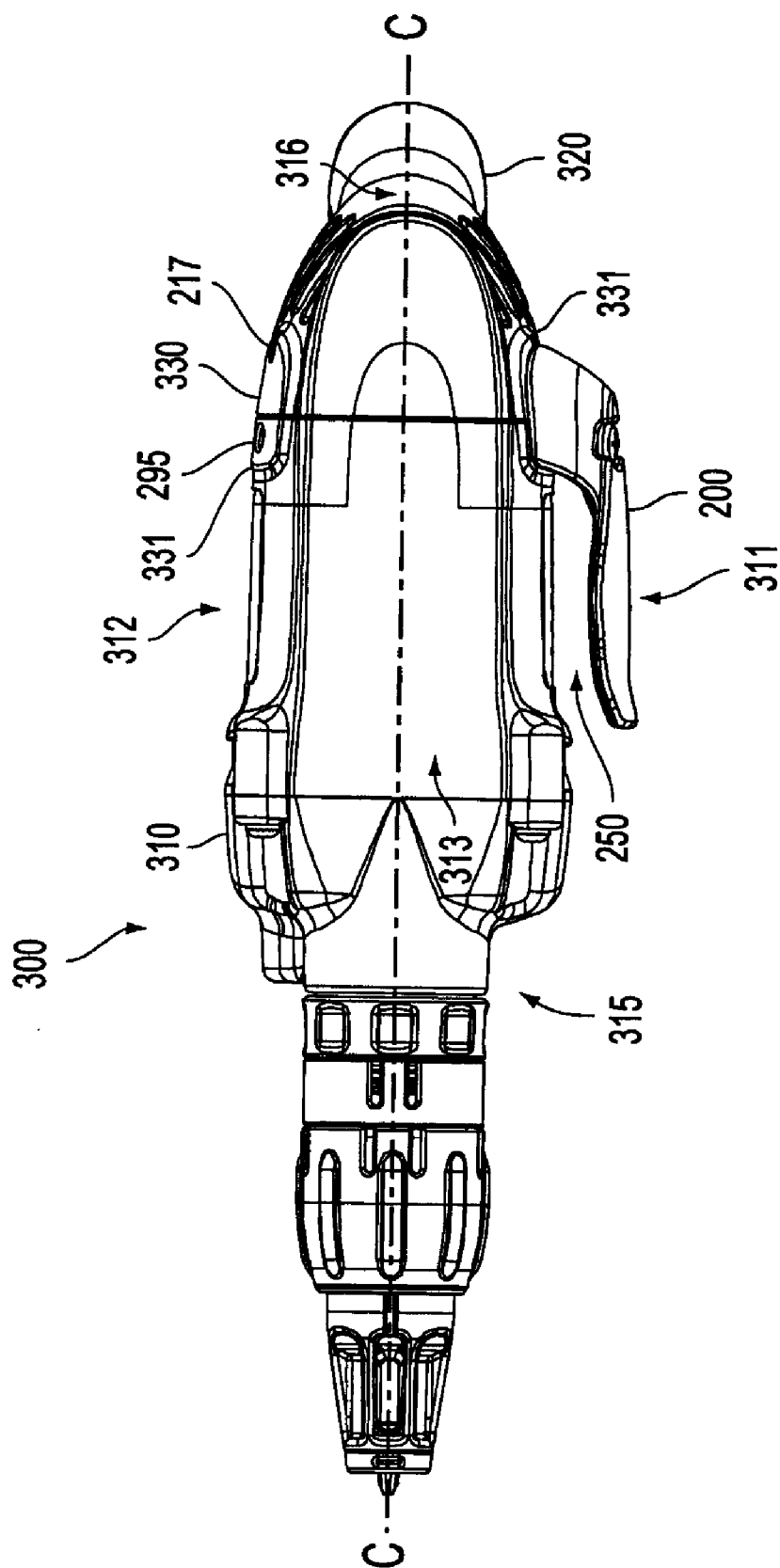
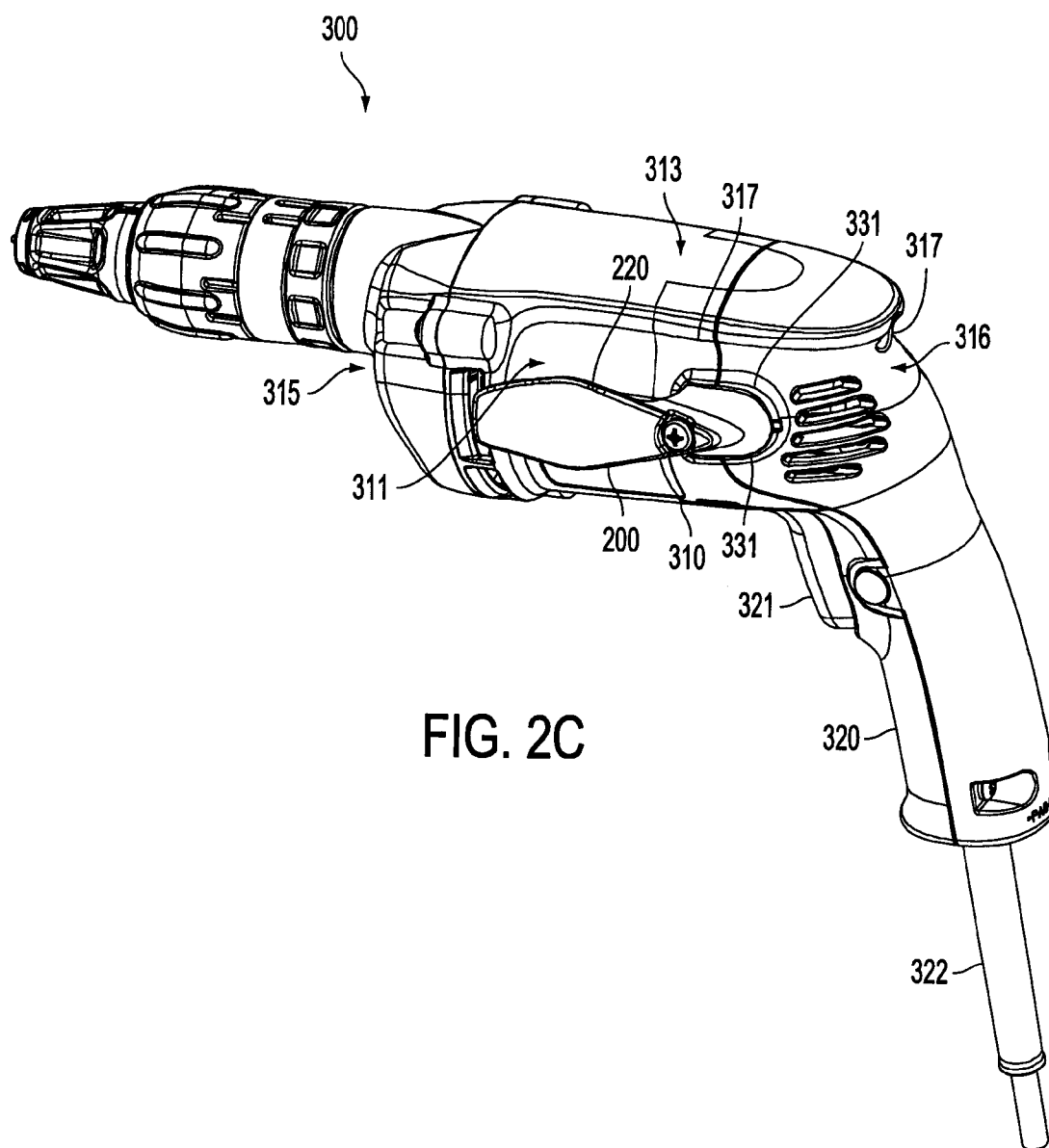


FIG. 2B



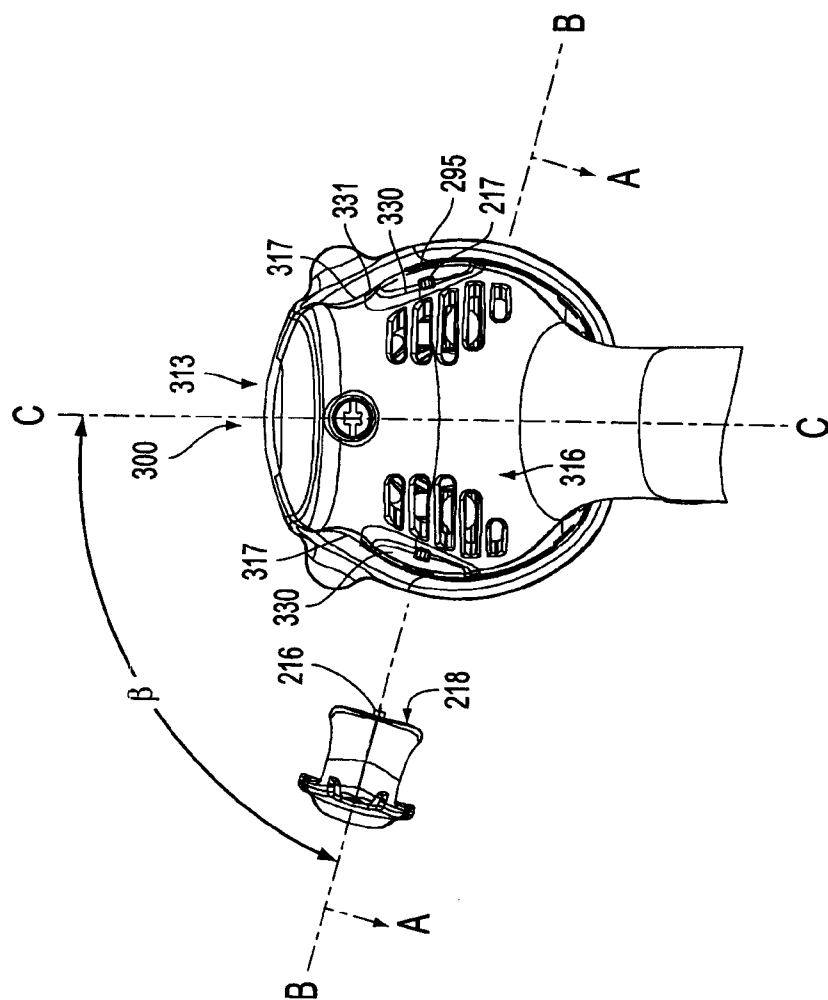


FIG. 2D

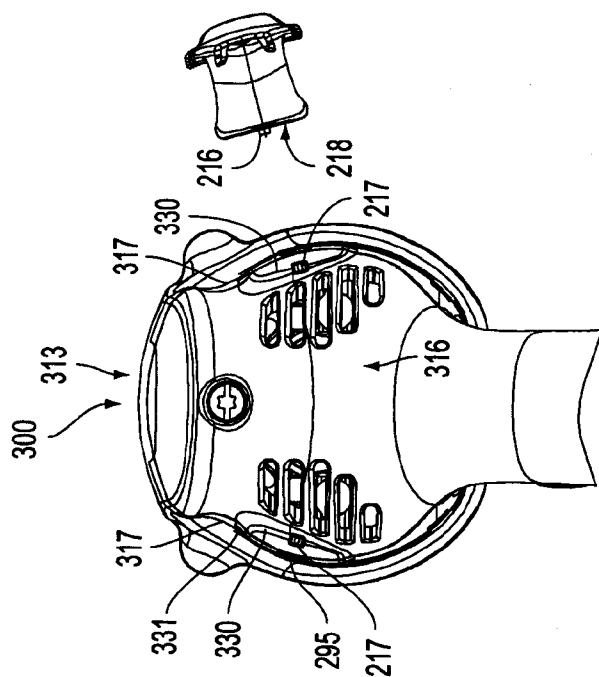


FIG. 2E

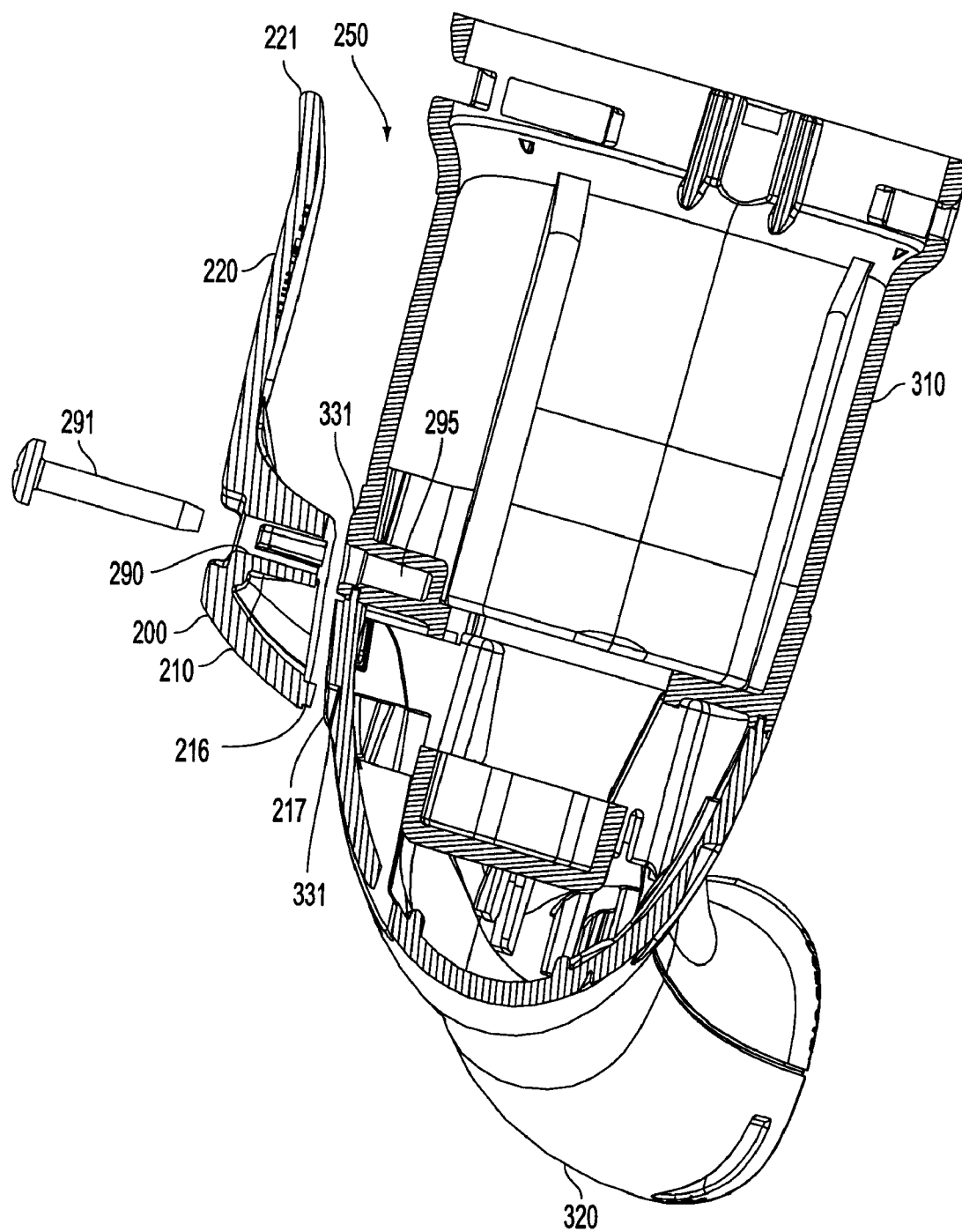


FIG. 2F

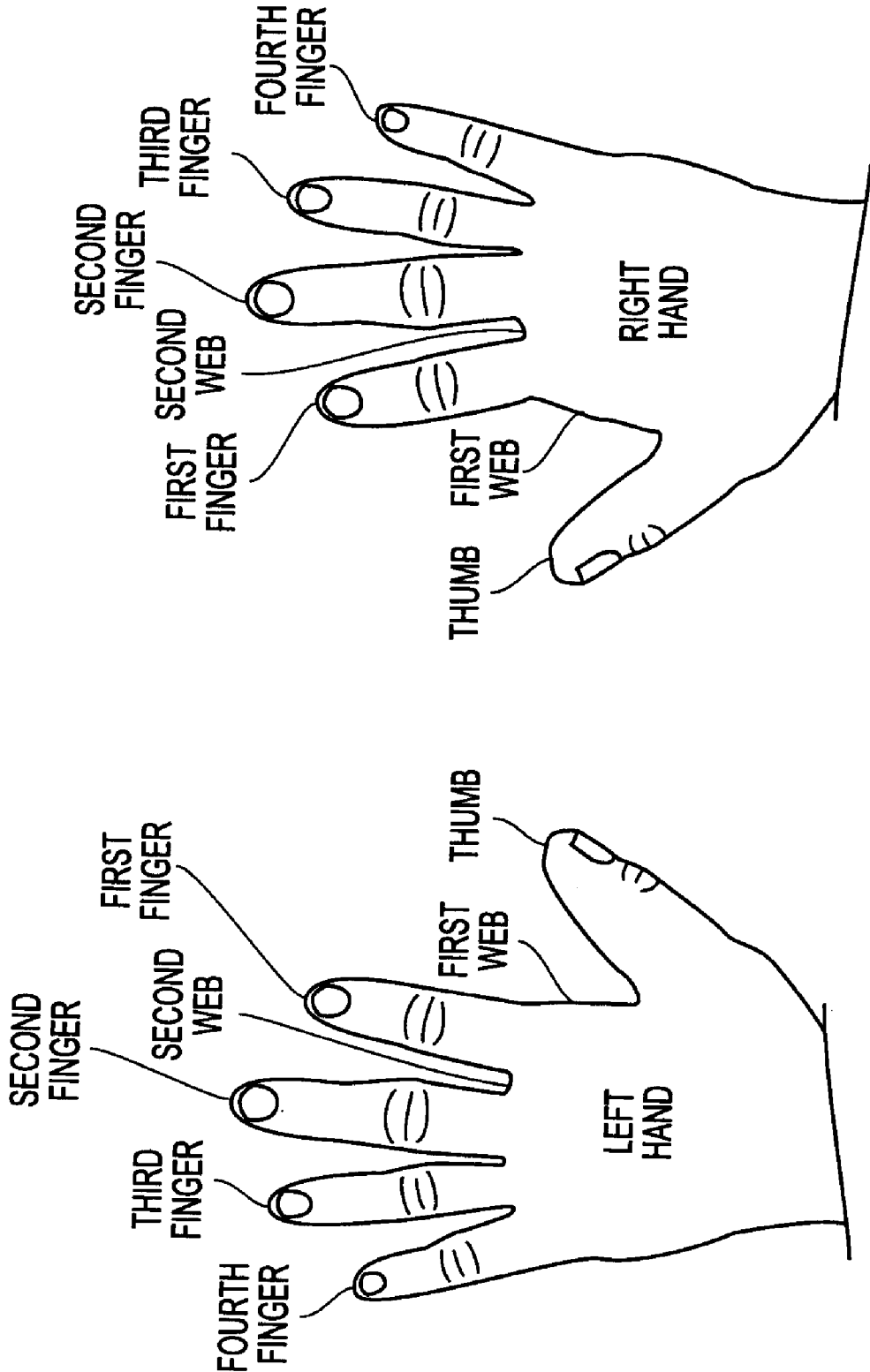


FIG. 3

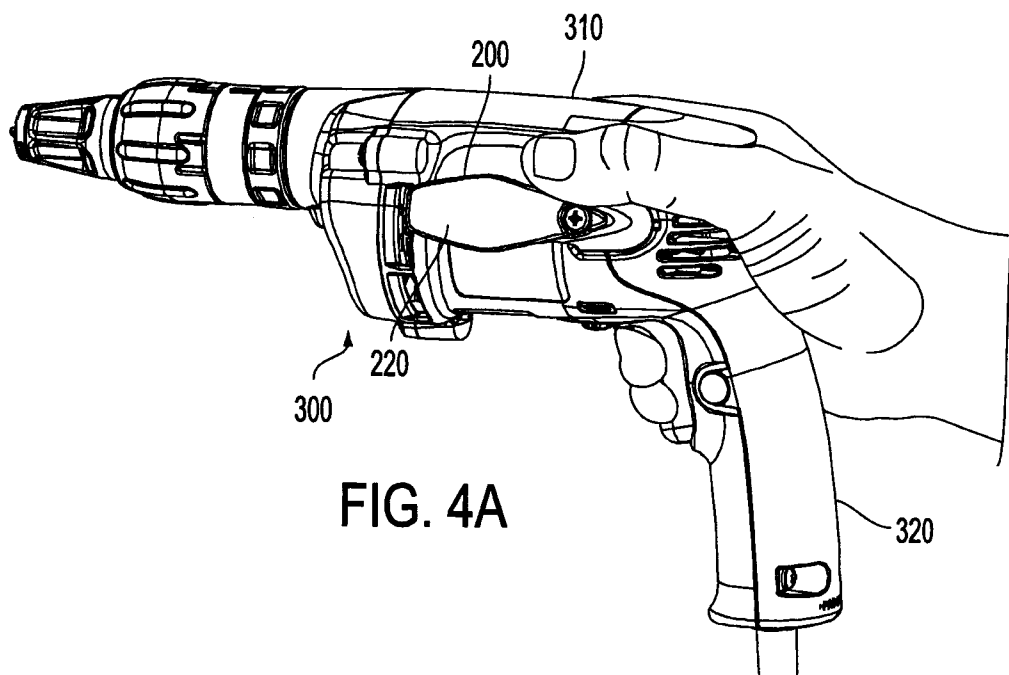


FIG. 4A

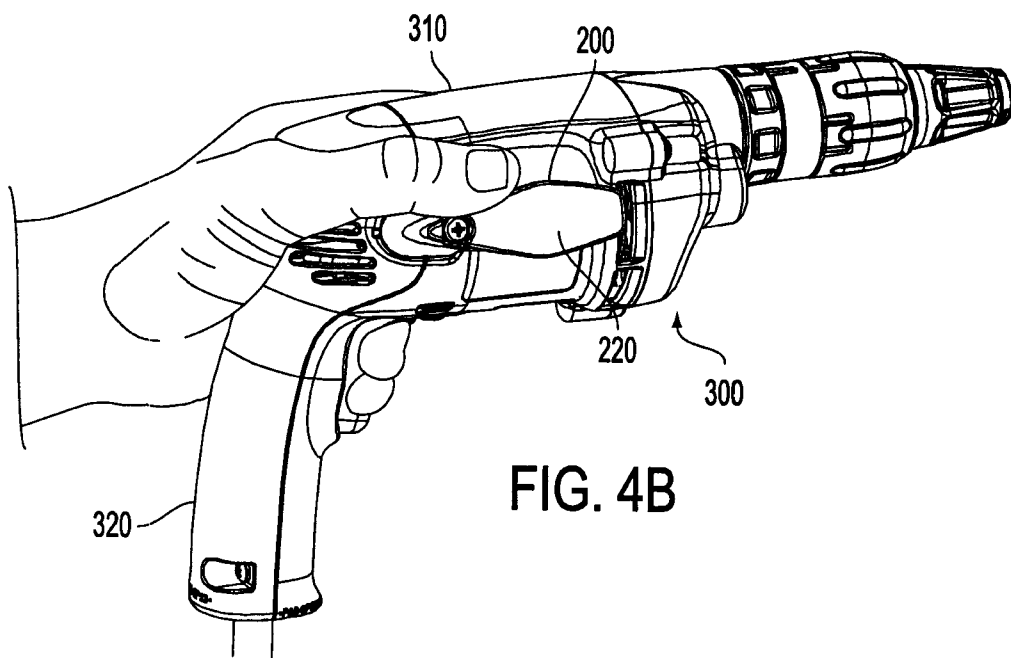


FIG. 4B

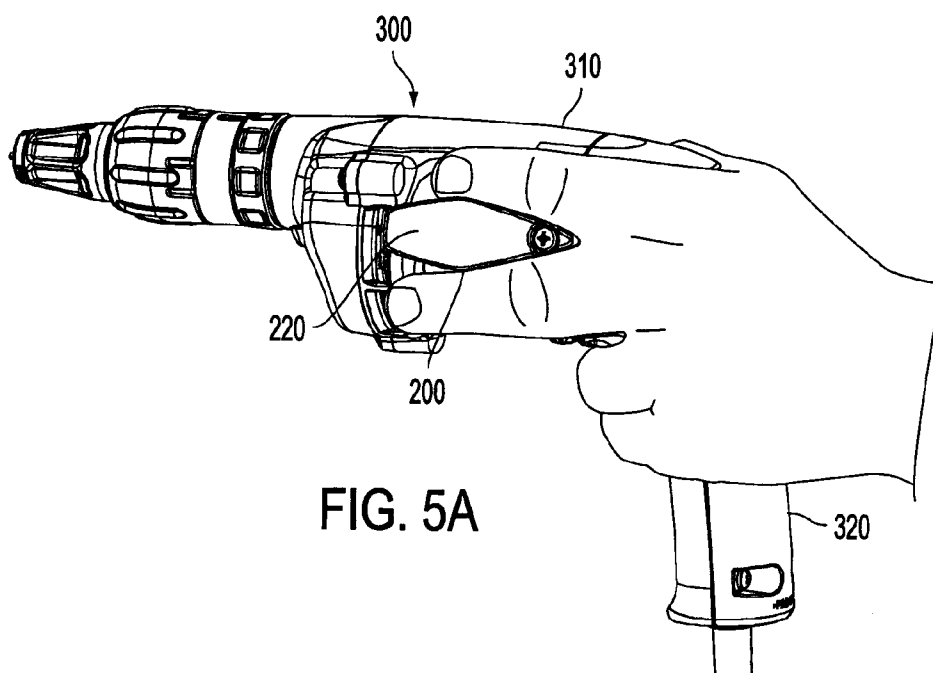


FIG. 5A

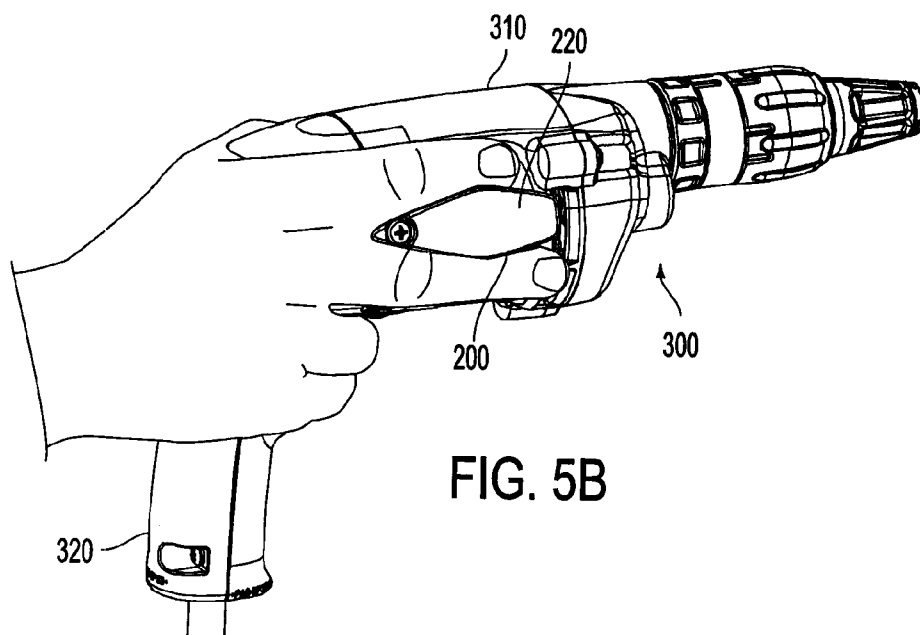


FIG. 5B

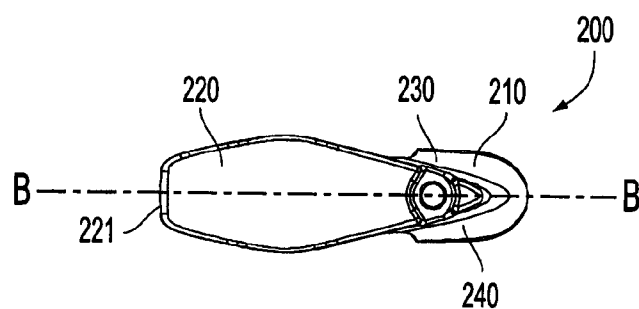


FIG. 6A

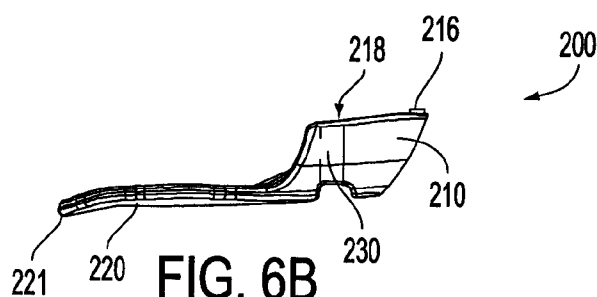


FIG. 6B

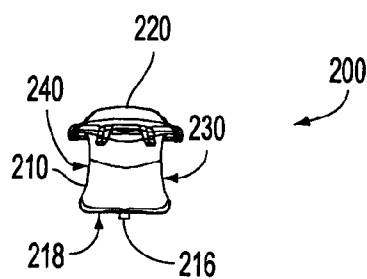


FIG. 6C

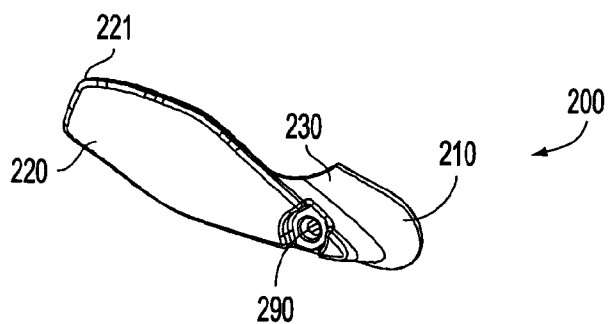


FIG. 6D

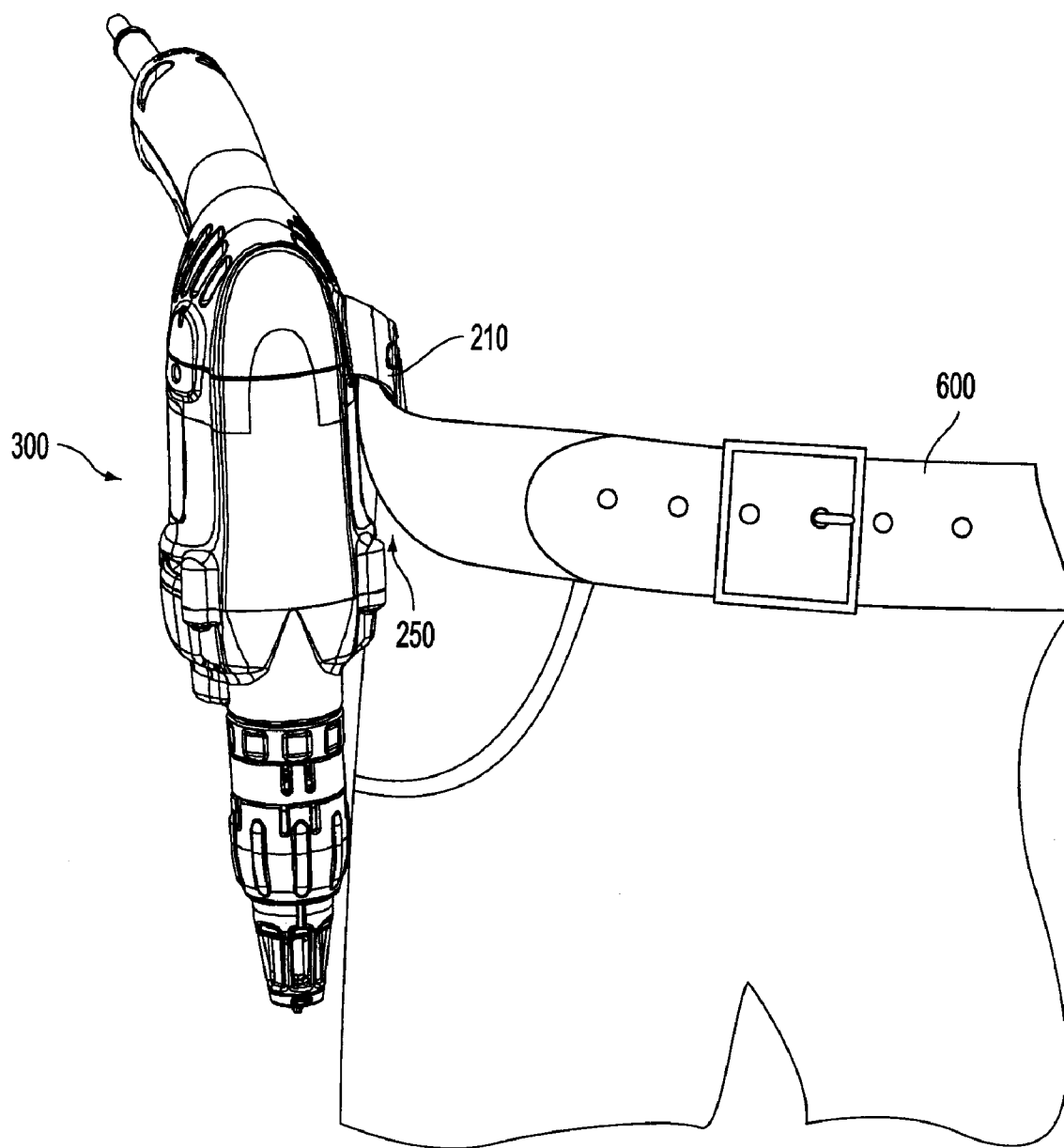


FIG. 7

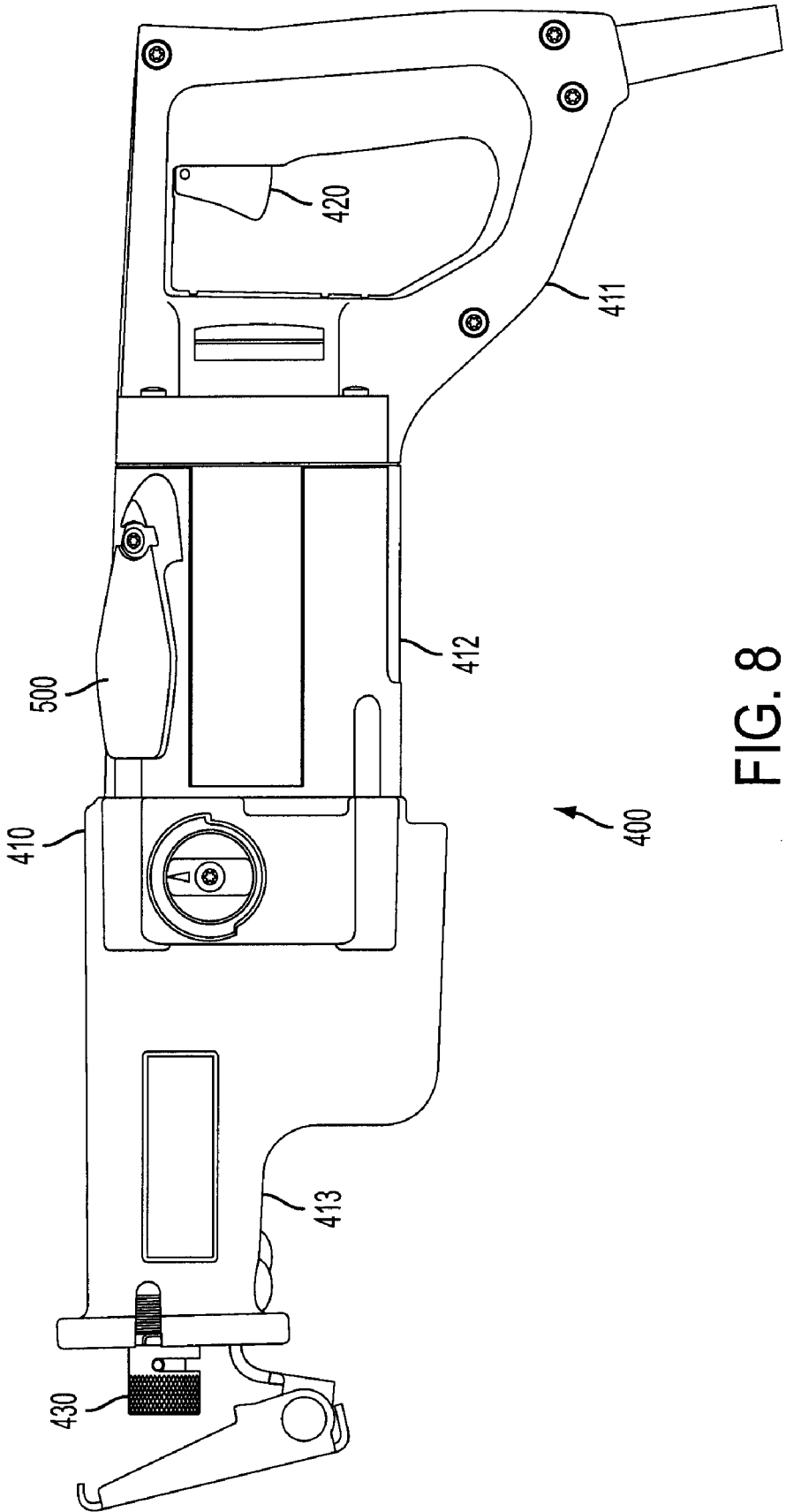


FIG. 8

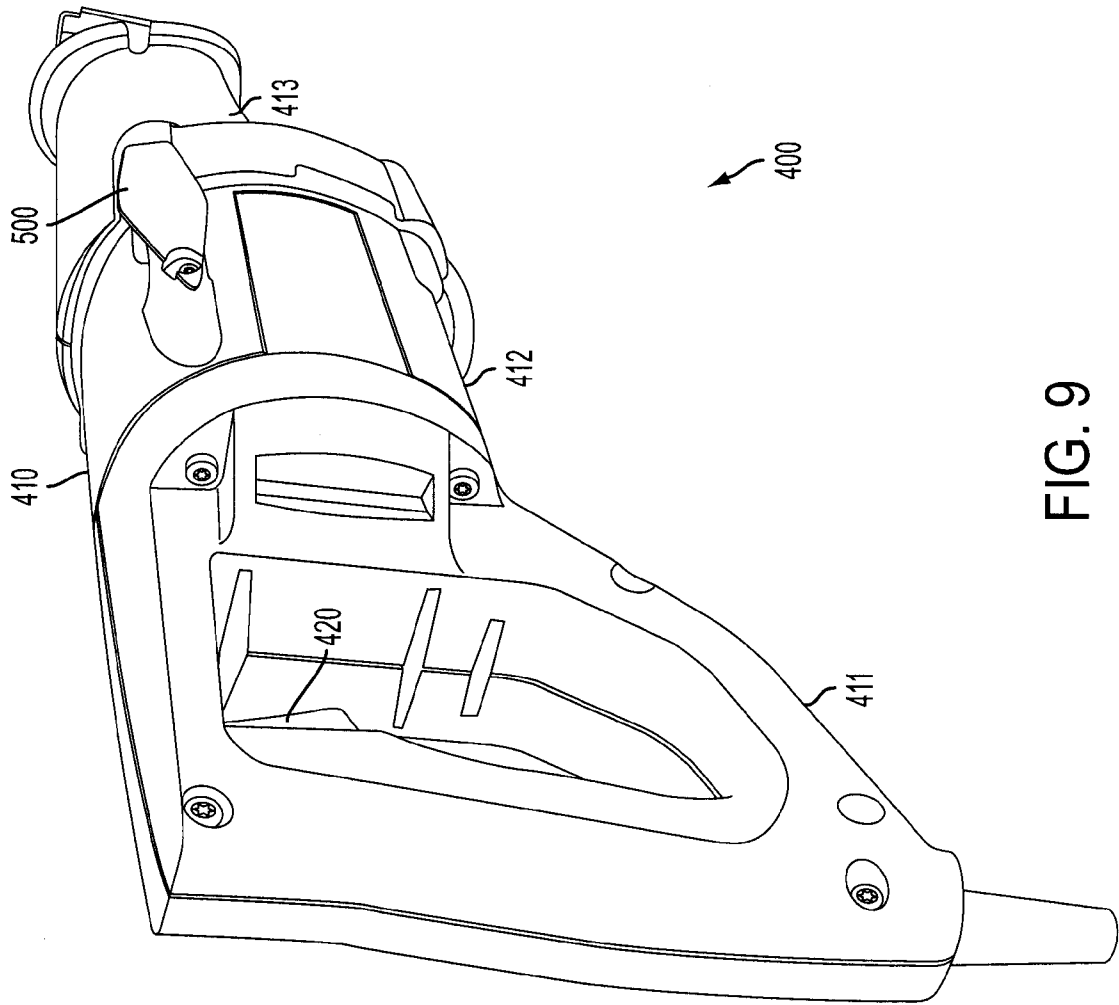


FIG. 9

BELT CLIP FOR POWER TOOLS

[0001] This application is a continuation of U.S. patent application Ser. No. 10/849,774, filed May 21, 2004, which application is a continuation of U.S. patent application Ser. No. 10/773,252, filed Feb. 9, 2004 (now U.S. Pat. No. 7,143,841, issued Dec. 5, 2006), which application is a continuation-in-part of U.S. patent application Ser. No. 09/972,980 filed Oct. 10, 2001 (now U.S. Pat. No. 6,688,407, issued Feb. 10, 2004). Each of these applications is hereby incorporated by reference in its entirety.

BACKGROUND OF THE INVENTION

[0002] This invention relates generally to belt clips for hand-held power tools.

[0003] Belt clips mounted on the top surface of a drill/driver housing are known in the art and are substantially flat, elongated members that extend substantially parallel to the top surface of the tool housing, at a height just slightly elevated from the top surface of the housing. In U.S. Pat. No. 5,372,206, for example, a hand-held, motor-driven tightening tool is illustrated having a belt clip. The belt clip is integrally formed with the top surface of the tool housing. Belt clips on other hand-held power tools are also known.

[0004] A prior art hand-held drill/driver **100** having a belt clip **110** is schematically illustrated in FIG. 1. The belt clip **110** is formed as an integral part of the housing **104** of the drill/driver **100**. Like many belt clips known in the art, belt clip **110** has a substantially flat elongated portion **112** extending parallel to the top surface **106** of the tool housing **104**. The flat, elongated portion **112** is slightly elevated from top surface **106** so as to form a receiving space **108** therebetween.

[0005] Belt clip **110** enables the user to secure the drill/driver **100** or other tool to a tool belt, pants pocket, or other suitable receiving means. As a result, a user can temporarily store the tool in a convenient location to allow the user to use both hands for a task, or to rapidly switch to another tool. A user on a ladder, for example, does not have to interrupt work in order to climb down the ladder to replace or retrieve a tool.

[0006] Despite providing a convenient means to carry hand-held power tools, conventional belt clips on the top surface of a tool housing do not enhance the performance of the tool while it is being operated by the user. Conventional belt clips do not do anything to facilitate wielding or holding the drill/driver. In fact, conventional belt clips are typically positioned on hand-held power tools so that the user does not contact or interact in any other way with the belt clip while the tool is in use.

[0007] Furthermore, when the belt clip is positioned on the top surface of the housing of a drill/driver, as in U.S. Pat. No. 5,372,206, attaching the belt clip to a tool belt or receiving means causes the pistol grip portion of the drill/driver to extend substantially perpendicular with respect to the receiving surface. For example, if the power tool in U.S. Pat. No. 5,372,206 is attached to a tool belt at a position corresponding with the user's hip, the profile of the tool extending from the tool belt is at a maximum. The user's hand and forearm may inconveniently contact the pistol grip as the user searches for and retrieves other tools and implements from the tool belt.

[0008] Having the belt clip positioned on the top surface of a drill/driver causes the drill/driver to be holstered to the user's tool belt or other receiving means in a configuration which is not ergonomically desirable. For example, in order for the user to holster the drill/driver to a tool belt or other receiving means on the front portion of a user's pants, the user must rotate their arm and wrist into an uncomfortable and unconventional position.

[0009] These and other drawbacks of the prior art are overcome by the belt clip and drill/driver of the preferred embodiments of the invention.

[0010] In addition to their use with a drill/driver, the belt clip, attaching means, and other features are also useful with a reciprocating saw.

BRIEF DESCRIPTION OF THE DRAWINGS

[0011] FIG. 1 is a schematic illustration of a prior art hand-held drill/driver having a top-mounted belt clip.

[0012] FIGS. 2A, 2B, and 2C are side, top, and isometric views, respectively, of the belt clip mounted to the side of a drill/driver according to a first preferred embodiment.

[0013] FIGS. 2D and 2E are rear views of the drill/driver in FIGS. 2A, 2B, and 2C showing the attachment of the belt clip to either side of the drill/driver.

[0014] FIG. 2F is a sectional view of the drill/driver taken along line A-A of FIG. 2D showing the attachment of the belt clip to the side of the drill/driver.

[0015] FIG. 3 is an illustration of a user's hands showing the nomenclature of the fingers and other parts of the hand as used herein.

[0016] FIGS. 4A and 4B are isometric views of the drill/driver with the side-mounted belt clip grasped in the thumb-rest hold.

[0017] FIGS. 5A and 5B are isometric views of the drill/driver with the side-mounted belt clip grasped in the power-grip hold.

[0018] FIGS. 6A, 6B, 6C, and 6D illustrate side, top, rear, and isometric views, respectively, of a first preferred embodiment of the belt clip.

[0019] FIG. 7 is an illustration of a drill/driver conveniently fastened to a tool belt via the side-mounted belt clip.

[0020] FIG. 8 is a side view of a reciprocating saw with a belt clip mounted thereto.

[0021] FIG. 9 is an isometric view of the reciprocating saw of FIG. 8 with the belt clip mounted on the opposite side thereof.

DETAILED DESCRIPTION

[0022] For convenience in describing the preferred embodiments, the belt clip will first be described as a belt clip on a drill/driver. It will be understood, however, that the belt clip is not limited to use with a drill/driver, as it can be advantageously incorporated into other hand-held power tools in a similar manner. For example, the belt clip and features of the belt clip can be incorporated on and used with a reciprocating saw, as shown in FIGS. 8 and 9.

[0023] Also, the term drill/driver shall be construed herein to encompass the entire range of hand-held drills and power screwdrivers and other similar tools which have the same basic shape as the drill/driver illustrated in the figures.

[0024] FIGS. 2A-2F illustrate the belt clip mounted on a drill/driver 300. Drill/driver 300 has a housing with a barrel portion 310 and a pistol grip portion 320. The barrel portion 310 at least partially encloses the rotary motor (not shown) which powers the drill/driver 300. The barrel portion 310 further comprises a first side portion 311, a second side portion 312, a top side portion 313, a bottom side portion 314, a front side portion 315, and a back side portion 316. The first and second side portions 311, 312 generally oppose one another on the housing, as do the top side portion 313 and bottom side portion 314, and the front side portion 315 and back side portion 316. A drill chuck or screwdriver clutch and nosepiece assembly, if provided, extend from the front side portion 315. The pistol grip portion 320 extends away from the barrel portion 310 at the bottom side portion 314. The pistol grip portion 320 is typically angled with respect to the barrel portion 310 for comfort. The pistol grip portion 320 mounts a trigger switch 321. The pistol grip portion 320 also typically has a battery or power cord 322 extending from the distal end thereof.

[0025] As seen in FIGS. 2A-2C, the belt clip 200 may be mounted to the first side portion 311 of the drill/driver 300. As seen in FIG. 2B, a receiving space 250 is formed between the belt clip 200 and the first side portion 311. A tool belt, belt loop, pants pocket, or other accommodating surface can be received in receiving space 250 to secure the drill/driver 300 to the user's belt, clothing or the like. The belt clip 200 may also likewise be mounted to the second side portion 312 of the drill/driver 300. A belt clip 200 mounted to either the first side portion 311 or the second side portion 312 of the drill/driver 300 will be referred to hereinafter as a side-mounted belt clip.

[0026] With a side-mounted belt clip, the profile of the drill/driver 300 is significantly reduced when it is holstered to a receiving surface. This is due to the fact that the longitudinal plane of the receiving space 250 is generally parallel to the plane through which the pistol grip portion 320 extends away from the barrel portion 310. Thus, the pistol grip portion 320 extends generally tangentially from the user's waist or other receiving surface, instead of radially as occurs with a top-mounted belt clip. As a result of this reduced profile when holstered, the user's wrist or arm will be less likely to inadvertently bump into the drill/driver 300, and the drill/driver 300 will be less likely to inadvertently bump into obstacles. When a power cord 322 extends from the distal end of the pistol grip portion 320, it is likewise more advantageous to have a side-mounted belt clip than a top-mounted belt clip. When a drill/driver with a side-mounted belt clip is holstered, the power cord 322 will extend generally tangentially to the user's waist instead of radially.

[0027] A side-mounted belt clip also facilitates holstering and un-holstering the drill/driver 300 from the user's tool belt or the like. With a side-mounted belt clip, the user is not required to rotate his or her hand and arm excessively when holstering the drill/driver 300, as the case may be with a top-mounted belt clip.

[0028] Also, a side-mounted belt clip 200 on the drill/driver 300 allows the drill/driver 300 to be operated in

tighter locations where obstacles obstruct access to the workpiece. As shown in FIGS. 2A and 2B, the rotational axis of the screwdriver bit is closer to the top portion 313 of the barrel portion 310 than either of the two side portions 311 or 312. Thus the effective profile of the drill/driver 300 is minimized when the top portion 313 abuts the obstacle. For example, when driving a screw into drywall where two walls meet in the corner of a room, the top of the drill can be placed against one wall while driving the screw into the edge of the other wall near the corner. This will allow the screw to be driven into the other wall as near as possible to the corner. However, when a belt clip is top-mounted in the manner shown in FIG. 1, this minimum profile is increased because the top-mounted belt clip is interposed between the top portion 313 and the obstacle. When a belt clip is side-mounted, the minimum profile from the rotational axis of the screwdriver bit to the top portion 313 is retained.

[0029] Besides the advantages of a smaller profile when holstered and facilitated holstering and un-holstering of the drill/driver 300, the side-mounted belt clip can also provide very significant ergonomic advantages in the wielding of the drill/driver 300. With reference to FIG. 3, a user's left and right hand are illustrated and the nomenclature used to describe each of the user's fingers and other parts of the hand is illustrated. Each hand is labeled with a thumb and first, second, third, and fourth fingers. Also, the flesh between each thumb and first finger is labeled a first web, while the flesh between each first finger and second finger is labeled a second web. This nomenclature of FIG. 3 will be used hereinafter to make reference to the position of the user's fingers and other parts of the hand while wielding the drill/driver 300.

[0030] If desired, the side-mounted belt clip may be positioned to enable a thumb-rest hold illustrated in FIGS. 4A and 4B. In FIG. 4A, the belt clip 200 is side-mounted to the first side portion 311 of the drill/driver 300. In FIG. 4B, the belt clip 200 is side-mounted to the second side portion 312 of the drill/driver 300. In either configuration illustrated in FIG. 4A or 4B, the user is able to grasp the drill/driver 300 with a single hand in the thumb-rest hold. In the thumb-rest hold, the user's thumb of the hand that is grasping the drill/driver 300 is positioned in contact with both the belt clip 200 and one of the side portions 311 or 312. The remaining fingers are positioned in contact with either the other of the side portions 311 or 312 or the pistol grip portion 320. At least one of the remaining fingers is in contact with the pistol grip portion 320 and can actuate the trigger switch 321. Specifically, in FIGS. 4A and 4B, the first and second fingers are in contact with the first or second side portions 311 or 312, and the third and fourth fingers are in contact with the pistol grip portion 320 and can actuate the trigger switch 321.

[0031] As can be seen in FIGS. 4A and 4B, in the thumb-rest hold the belt clip 200 and the side portions 311 or 312 cradle the user's thumb. Cradling of the thumb means that there is substantial surface contact along the sides of the thumb in addition to the surface contact on the bottom of the thumb. The cradling of the thumb in this manner is an important ergonomic advantage.

[0032] In order to wield the drill/driver 300, the user must transfer forces from his fingers and hand to the surfaces of the housing. In order to transfer certain forces to the drill/

driver 300, the user must first squeeze with the fingers in order to develop friction between the fingers and the housing. The friction is then used to transfer forces laterally from the fingers to the housing. With fingers positioned on both sides of the barrel portion 310 of the housing, the lateral forces form a couple which creates a torque. For example, in order for a thumb positioned as illustrated in FIG. 4B to counterbalance a counter-clockwise reaction torque from driving a screw, the user must first squeeze the thumb into the second side portion 312. This squeezing must result in enough friction to permit the thumb to apply a lateral force to the housing which will form part of a couple which in turn creates a clockwise torque to counterbalance the counter-clockwise reaction torque.

[0033] The necessary squeezing force is reduced due to the cradling of the thumb. With a substantial amount of contact surface on the side of the thumb, more of the lateral force can be directly transferred from the thumb to the housing, requiring less friction. Less squeezing force is necessary because less friction is necessary. As a result of the smaller squeezing force, hand fatigue that can accompany use of the drill/driver 300 is reduced. Because of the cradling of the thumb, the drill/driver will also feel more “responsive” to the user, i.e., the user will feel tactilely more able to make quick and precise movements with the drill/driver 300.

[0034] If desired, the side-mounted belt clip may be positioned to enable a power-grip hold illustrated in FIGS. 5A and 5B. In FIG. 5A, the belt clip 200 is mounted to the first side portion 311 of the drill/driver 300. In FIG. 5B, the belt clip 200 is mounted to the second side portion 312 of the drill/driver 300. In either configuration illustrated in FIGS. 5A and 5B, the user is able to grasp the drill/driver 300 with a single hand in the power-grip hold. In the power-grip hold, the thumb is positioned in contact with the side portion 311 or 312 which is opposite the belt clip 200. The first and second fingers are each positioned in contact with the other of the side surfaces 311 or 312 and the belt clip 200, with the first finger positioned on top of the belt clip 200 and the second finger positioned below the belt clip 200. The second web between the first and second fingers may also contact the belt clip 200. The remaining fingers are positioned in contact with either the side surface or the pistol grip portion 320. At least one of the remaining fingers can actuate the trigger switch 321 positioned on the barrel portion 320. Specifically, in FIGS. 5A and 5B the third and fourth fingers are in contact with the pistol grip portion 320 and can actuate the trigger switch 321.

[0035] The power-grip hold enables cradling of the first and second fingers in a manner similar to the cradling of the thumb in the thumb-rest hold. Fatigue associated with squeezing the drill/driver 300 will also be reduced in a similar manner, and the “responsiveness” will also similarly be improved. This hold especially gives the user a greater feeling of stability for the drill/driver 300.

[0036] As can be seen in FIGS. 4A, 4B, 5A, and 5B, the belt clip 200 can be positioned on the drill/driver 300 to enable both the thumb-rest and the power-grip holds. With the belt clip 200 mounted on the first side portion 311, the user can grasp the drill/driver 300 with the right hand in the thumb-rest hold (FIG. 4A) or with the left hand in the power-grip hold (FIG. 5A). With the belt clip 200 mounted on the second side portion 312, the user can grasp the

drill/driver 300 with the right hand in the power-grip hold (FIG. 5B) or with the left hand in the thumb-rest hold (FIG. 4B). Thus, the belt clip 200 can be positioned on the drill/driver 300 for ambidextrous use.

[0037] With either the thumb-rest or the power-grip hold, the cradling of the fingers may be further enhanced through the inclusion of a finger groove 317. As shown in FIGS. 2A, 2C, 2D, and 2E, finger groove 317 may extend from first side portion 311 around to back side portion 313 and continue to second side portion 312. Alternatively, finger groove 317 may be formed discontinuously on the first and second side portions 311, 312 without extending across the back side portion 313. Finger groove 317 provides a depression in the housing which can help cradle the user’s thumb and first finger when grasping the drill/driver 300. For either hold, it may also be advantageous to position the belt clip 200 on the drill/driver 300 so that while being grasped in the thumb-rest or the power-grip hold, the first web of the user’s hand grasping the tool contacts the back side portion 316 at the finger groove 317.

[0038] When the finger groove 317 is included on the drill/driver 300, the belt clip 200 may be positioned so that the belt clip’s surfaces effectively continue the shape of the finger groove 317, enlarging and enhancing the finger groove’s effect of cradling the user’s thumb and first finger.

[0039] The angular position of the belt clip 200 on the first and second side portions 311 and 312 is illustrated in FIGS. 2D and 2E. An axis of symmetry of the drill/driver 300 is represented with a broken line C-C in FIG. 2D and also in FIG. 2B. The term axis of symmetry as used herein means that the features of the object are generally symmetrical on either side of the axis. Perfect symmetry is not necessary. An axis of symmetry of the belt clip is represented with a broken line B-B in FIG. 2D and also in FIG. 6A. The angular position β of the belt clip 200 is defined as the interior angle formed by the intersection of the axis of symmetry of the drill/driver 300 represented by line C-C and the axis of symmetry of the belt clip 200 represented by line B-B, as shown in FIG. 2D. In a preferred embodiment, β is preferably approximately 60° to 90°, or more preferably approximately 70° to 80°, or even more preferably approximately 75°.

[0040] The angular position β is partly dictated by the natural grasping position of the user’s hand when grasping the drill/driver 300. As used herein, the term natural grasping position means a position in which a user’s hand may grasp a tool so that the tool can be operated for its intended use, and a position of a user’s hand for grasping the tool which an operator of ordinary skill in the art would naturally choose even if the operator was unfamiliar with the operation of the tool. The angular position β may be selected so that the user’s first and second fingers will fit comfortably around the belt clip 200 in the power-grip hold. The angular position β may also be selected so that the user’s thumb will rest comfortably on the top-facing surface of the belt clip 200 in the thumb-rest hold. Or, the angular position β may be selected for facilitation of both the power-grip and thumb-rest holds, as in the illustrated embodiment.

[0041] The angular position β may also be affected by the position of the finger groove 317, if included on drill/driver 300. If desired, the angular position β may be selected so that the surfaces of the belt clip 200 can effectively continue

the shape of the finger groove 317, enlarging and enhancing the finger groove's effect of cradling the user's thumb and first finger.

[0042] It is also possible to mount belt clip 200 to other portions of drill/driver 300. Likewise, when belt clip 200 is mounted to other tools, its position may be selected as desired.

[0043] Belt clip 200 may be selectively detachably mounted to a tool, if desired, so that the belt clip 200 can be removed when it is not needed or hampers the operation to be performed by the tool. In the illustrated embodiment, belt clip 200 is detachably mounted to drill/driver 300 by an attaching means. The attaching means can be any of a number of systems for selectively releasably securing the belt clip 200 to the surface of the tool. Examples of attaching means include a threaded recess formed in the housing for receiving a screw extending from the belt clip, a recess for receiving a biased snap attachment extension on the belt clip, a latch, a sliding joint, etc. Other appropriate attaching means may also be used, as will be recognized by those of skill in the art. Of course, if it is not desirable to have a detachable belt clip 200, the belt clip 200 may be permanently bonded to the housing by glue or the like. Or the belt clip 200 may be integrally formed as part of the housing. The term "mounted" as used herein includes items which are formed as separate pieces and permanently or selectively releasably held together, and items which are integrally formed together.

[0044] In the case of belt clip 200 used with drill/driver 300, it is especially advantageous to have the belt clip 200 detachably mounted. Drill/driver 300 is often used in tight positions where the protruding belt clip 200, even though its profile on the drill/driver 300 has been minimized, can encumber the operation. Thus, it may be necessary to remove the belt clip 200 in order to perform certain operations in very tight spaces.

[0045] In the illustrated embodiment, the attaching means comprises a fastener receiving recess 295 (FIG. 2F) formed in the housing of the drill/driver 300. A fastener 291 extends from a fastener hole 290 formed in the belt clip 200 and is received in the fastener receiving recess 295. To further prevent relative movement between the belt clip 200 and the drill/driver 300, an indexing tab 216 and an indexing tab receiving recess 217 may be formed on one or the other of the belt clip 200 and the drill/driver 300. Again, it should be emphasized that the attaching means is not limited to the means shown in the illustrated embodiment, but can be any of the other systems described above, or any other appropriate attaching means that will be recognized by those of skill in the art.

[0046] FIGS. 2D and 2E demonstrate how the belt clip 200 can be selectively detachably mounted by the user to the first or second side portion 311 or 312 of drill/driver 300. This may be accomplished by providing matching, symmetrical attaching means on both the first and second side portion 311, 312 of the drill/driver 300. Of course, more than two attaching means may be provided on drill/driver 300. Likewise, when belt clip 200 is used with other tools it may also be advantageous to provide multiple attaching means so that the belt clip 200 can be selectively attached to the tool in the location most convenient for the user. For example, right-handed and left-handed users may prefer different positions of belt clip 200 on a tool.

[0047] A raised pad 330 may be associated with the attaching means, if desired. Raised pad 330 may be formed integrally as part of the tool's housing and fastener receiving recess 295 may be formed on the raised pad 330. A tool mating surface 218 formed on the belt clip 200 may abut the raised pad 330 when the belt clip 200 is attached to the attaching means. The raised pad 330 is elevated above at least part of the housing of the tool immediately surrounding the raised pad 330, forming a lip 331 extending at least part way around the raised pad 330. The lip 331 can be contoured to match curves on the belt clip 200 and the tool housing for comfort. The lip 331 aids in the cradling of the user's thumb and fingers in the thumb-rest hold and power-grip hold.

[0048] The raised pad 330 provides a tactilely and visually recognizable identification of the attaching means to facilitate attachment of the belt clip 200 by the user.

[0049] When belt clip 200 is not attached to the tool, raised pad 330 still has utility as an aid in cradling the user's thumb or fingers. The lip 331 which extends at least partly around the raised pad 330 can aid in cradling the user's thumb or fingers because it extends away from the surface of the housing and provides an additional surface for the sides of the fingers or thumb to push on when wielding the tool.

[0050] When two attaching means and two associated raised pads 330 are provided on the first and second sides 311, 312 of a drill/driver 300, and a belt clip 200 is mounted to one of the attaching means, the other raised pad can be advantageously positioned to cradle the user's thumb or fingers on the side of the drill/driver 300 opposite the belt clip 200.

[0051] FIGS. 6A-6D illustrate a preferred embodiment of belt clip 200 for a hand-held power tool. Belt clip 200 may be fabricated as a single piece using conventional injection molding techniques. It may be comprised of any suitable plastic, such as polypropylene, high density polyethylene (HDPE), or the like. Other materials and manufacturing methods may also be used as will be recognized by those of skill in the art.

[0052] Belt clip 200 comprises a first projection 210 and a second projection 220. The first projection 210 forms a tool mating surface 218 at a first end whose profile may match the profile of the tool housing to which it will be mounted. If the belt clip 200 will be detachably mounted to the tool, the tool mating surface 218 may advantageously match the profile of the attaching means.

[0053] First projection 210 tapers outward from tool mating surface 218 to form first and second curved surfaces 230 and 240. First projection 210 has a second end for attaching the second projection 220. First projection 210 helps to space the second projection 220 away from the tool housing. Second projection 220 extends generally parallel to the tool housing to form the receiving recess 250 (see FIG. 2B). First and second projections 210, 220 can be formed as separate parts and can be permanently or semi-permanently fastened together. Or they may be formed as one unitary component, as illustrated in the figures. First and second projections 210, 220 can appear as generally distinctly curved, non-continuous formations, as illustrated in the figures, or each can be part of one mostly continuously curved formation. Preferably they are each mostly rigid, but could be made somewhat flexible as well.

[0054] A fastener hole 290 may be formed in the belt clip 200 as part of the attaching means to facilitate screw attachment of the belt clip 200 to the tool. Fastener hole 290 is recessed so that when attached to the tool, the fastener will not protrude from the surface of the belt clip 200.

[0055] The second projection 220 may include a lead-in 221 formed on the end thereof opposite the first projection 210. Lead-in 221 is a portion of the end of second projection 220 which is angled outwardly from the tool surface to facilitate holstering of the tool.

[0056] The first and second curved surfaces 230, 240 are ergonomically contoured to generally match the profile of the user's thumb and finger in order to comfortably cradle a thumb, a finger, or the webs of the user's hands which may contact the first or second curved surfaces 230, 240 and the corresponding surrounding tool housing. The curves of the first and second curved surfaces 230, 240 enhance the cradling which occurs during the thumb-rest hold and the power-grip hold. When used with the finger groove 317, at least one of the first and second curved surfaces 230, 240 can also be curved to continue, and enlarge and enhance the effect of, the finger groove 317. In addition, the intersection of the first and second curved surfaces 230, 240 adjacent to the back side portion 316 may be contoured to receive the second web of the user's hand.

[0057] In addition to the belt clip's ability to provide an enhanced grip and greater feeling of stability when operating the tool, it also advantageously functions as an attachment means. Receiving space 250 is easily accessible to facilitate holstering of the tool by the belt clip 200. As seen in FIG. 7, the belt clip 200 can secure the tool to a tool belt 600. When the belt clip is side-mounted on a drill/driver 300, the user is not required to rotate his or her hand and arm excessively when holstering the drill/driver 300.

[0058] According to another aspect of the invention, a belt clip may be incorporated on a hand-held reciprocating saw. FIGS. 8 and 9 illustrate a reciprocating saw 400 with a belt clip 500. The clip 500 can be the same as the belt clip 200 illustrated in FIGS. 6A-6D, or can be chosen to better suit particular circumstances and needs or user preferences. The clip 500 permits the user of the reciprocating saw 400 to suspend the saw, when not in use, from a belt, belt loop, pants pocket, or any other accommodating surface or suitable receiving means.

[0059] The reciprocating saw 400 has a housing 410 including a handle portion 411, a motor portion 412, and a neck portion 413. The user typically grasps the reciprocating saw 400 by the handle portion 411 and the neck portion 413. The handle portion 411 includes a switch 420 for controlling a rotary motor (not shown). The rotary motor is generally mounted within the motor portion 412 of the housing. A reciprocating shaft extends out from the neck portion of the housing and mounts a blade holder 430. The reciprocating saw 400 has an axis of symmetry defined by a plane that approximately divides in half the handle portion 411, the motor portion 412, and the neck portion 413, the plane typically being parallel to the reciprocating shaft. The reciprocating saw 400 need not be perfectly symmetrical about the axis of symmetry. The axis of symmetry reflects a general symmetry on each side of the saw.

[0060] The clip 500 may be integrally formed with the housing 410 of the reciprocating saw 400, or the clip may be

formed as a separate component and attached to the housing. If desired, the clip 500 can be attached to the housing in a manner that the user can detach and reattach the belt clip as desired.

[0061] As with the drill/driver 300, provision can be made for selective attachment of the clip 500 by the user at more than one location on the reciprocating saw 400. Two opposite mounting positions can be provided on either side of the reciprocating saw 400 for selective attachment of the clip 500 according to the preference of a right-handed or left-handed user or other circumstances. FIG. 8 illustrates the clip 500 mounted to the left side of the reciprocating saw 400, or the side of the reciprocating saw left of the axis of symmetry. FIG. 9 illustrates the clip 500 mounted to the right side of the reciprocating saw 400, or the side of the reciprocating saw right of the axis of symmetry. The two mounting positions can be selected so that they are approximately symmetrical about the axis of symmetry.

[0062] The clip 500 can be mounted anywhere on the reciprocating saw 400, as desired. FIGS. 8 and 9 illustrate the belt clip attached to the motor portion 412 of the housing 410. The belt clip could also be attached to the handle portion 411 or the neck portion 413.

[0063] The clip 500 can be attached to the reciprocating saw 400 with the same means as have been described with respect to the attachment of the belt clip 200 to a drill/driver 300. For example, the clip 500 could be attached to the reciprocating saw 400 with a threaded fastener 510 passing through the clip and attaching to the housing 410, and a projection or recess formed on the belt clip with a mating recess or projection formed on the housing for laterally holding the belt clip (see, e.g., FIG. 2F for a similar illustration of this structure included on the belt clip 200 and drill/driver 300).

[0064] Other embodiments, uses and advantages of the invention will be apparent to those skilled in the art from consideration of the specification and practice of the invention disclosed herein. The specification should be considered exemplary only, and the scope of the invention is accordingly intended to be defined by the following claims.

We claim:

1. A drill/driver comprising:

a housing with a barrel portion, the barrel portion at least partially enclosing a rotary motor, the housing having a switch which controls the rotary motor;

the housing having a central axis defined by a plane that approximately divides in half the barrel portion of the housing with a first side of the housing on one side of the central axis and a second side of the housing on the other opposite side of the central axis;

a clip assembly capable of suspending the drill/driver from a surface, the clip assembly comprising a tool mating surface and being selectively mountable by a user to the housing in at least two separate positions: a first position where the clip assembly is on the first side of the housing and a second position where the clip assembly is on the second side of the housing;

a pad formed on the housing at the first position and comprising a bore formed in the pad and a projection

receiving recess formed in the pad, the shape of the pad generally conforming with the shape of the clip assembly tool mating surface.

2. The drill/driver of claim 1, the barrel portion further comprising:

- a top side;
- a bottom side generally opposite the top side;
- a front side;
- a back side portion generally opposite the front side;
- a chuck for holding a drill or screwdriver bit extending from the front side; and
- a grip attached to the bottom side.

3. The drill/driver of claim 1 wherein the second position is approximately symmetrical about the central axis with respect to the first position.

4. The drill/driver of claim 1 wherein the clip assembly has a bore for receiving a fastener that holds the clip on the housing.

5. The drill/driver of claim 4 wherein the fastener passes through the bore in the clip assembly and attaches to the bore formed in the pad.

6. The drill/driver of claim 5 wherein the clip assembly comprises a projection extending from the clip assembly and engaging the projection receiving recess formed in the pad.

7. The drill/driver of claim 6 wherein the projection is an indexing projection and the projection engaging recess is an indexing projection engaging recess such that when the projection engages the recess, the clip assembly tool mating surface cannot rotate relative to the housing.

8. The drill/driver of claim 6, the drill/driver further comprising a second pad formed on the housing at the second position and comprising a second bore formed in the second pad and a second projection receiving recess formed in the second pad, the shape of the second pad generally conforming with the shape of the clip assembly tool mating surface.

9. The drill/driver of claim 8, wherein the clip assembly may be positioned on the first pad and secured to the housing by the fastener attaching to the first bore and alternatively may be positioned on the second pad and secured to the housing by the fastener attaching to the second bore.

10. The drill/driver of claim 1 wherein the pad is a raised pad.

11. The drill/driver of claim 1 wherein the clip assembly is generally rigid and unitary in construction.

12. A drill/driver comprising:

- a housing with a barrel portion and a grip portion, the barrel portion at least partially enclosing a rotary motor, the grip portion having a switch which controls the rotary motor;

the housing being generally symmetrical about a central plane with a first side of the housing on one side of the central plane and a second side of the housing on the other opposite side of the central plain;

a belt clip being selectively mountable by a user to the housing in at least two separate positions: a first position where the belt clip is on the first side of the housing and a second position where the belt clip is on the second side of the housing;

a bore formed in the first side of the housing;

a projection receiving recess formed in the first side of the housing; and

a pad formed on the first side of housing for attaching the belt clip, the pad having a perimeter that corresponds generally to the shape of the belt clip when the belt clip is attached to the housing;

wherein the bore and the projection receiving recess are each formed on the pad.

13. The drill/driver of claim 12 wherein the second position is approximately symmetrical about the central plane with respect to the first position.

14. The drill/driver of claim 12 wherein the barrel portion comprises:

- a top side portion;
- a bottom side portion generally opposite the top side portion;
- a first side portion;
- a second side portion generally opposite the first side portion;
- a front portion, a chuck for holding a drill or screwdriver bit extending from the front side portion; and
- a back side portion generally opposite the front side portion, the grip portion being attached to the bottom side portion;

wherein, the first pad is positioned on the first side portion, and a second pad is positioned on the second side portion.

15. The drill/driver of claim 14 wherein when the belt clip is mounted in either of the first position or the second position, the belt clip is positioned closer to the back side portion of the barrel portion of the housing than to the front side portion.

16. The drill/driver of claim 12 wherein belt clip comprises a fastener that extends into the bore formed in the pad.

17. The drill/driver of claim 16 wherein the belt clip further comprises a bore, the fastener extending through the clip bore and into the housing bore.

18. The drill/driver of claim 12 wherein belt clip comprises a projection extending therefrom, the projection engaging the projection receiving recess.

19. The drill/driver of claim 12 wherein the belt clip comprises:

- a tool mating surface;
- a first projection having a first end generally adjacent the tool mating surface and a second end spaced some distance from the first end; and
- a second projection extending generally perpendicularly to the first projection.

20. A drill/driver comprising:

- a housing with a barrel portion and a grip portion, the barrel portion at least partially enclosing a rotary motor, the grip portion having a switch which controls the rotary motor;

the housing having a central axis defined by a plane that approximately divides in half the barrel portion of the housing and the grip portion of the housing with a first

side of the housing on one side of the central axis and a second side of the housing on the other opposite side of the central axis;

a means for holding the drill/driver from a surface when the drill/drive is not in use, the means for holding selectively detachably mountable by a user to the housing in at least two separate positions: a first position where the means for holding is on the first side of the housing and a second position where the means for holding is on the second side of the housing;

a first bore formed in the first side of the housing;

a first indexing projection receiving recess formed in the first side of the housing; and

a pad formed on the housing with a perimeter that corresponds generally to a profile of the means for holding that is adjacent to the housing when the means for holding is attached to the housing, wherein the first bore and the first indexing projection receiving recess are each formed on the pad.

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