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(54) **DRIVE ASSEMBLY**

(57) A tool to bundle a plurality of elongate articles using a weldable tape includes a guide block, a motor assembly, and a drive block. The motor assembly can include a motor and a gear train. The drive block can include a first bracket, a second bracket, a first wheel assembly, a second wheel assembly, and a spring element. The drive block can connect to the gear train of the motor assembly using a slot and tooth arrangement. A rotation of the motor can cause a rotation of the first wheel assembly and the second wheel assembly of the drive block to feed the weldable tape through the tool.

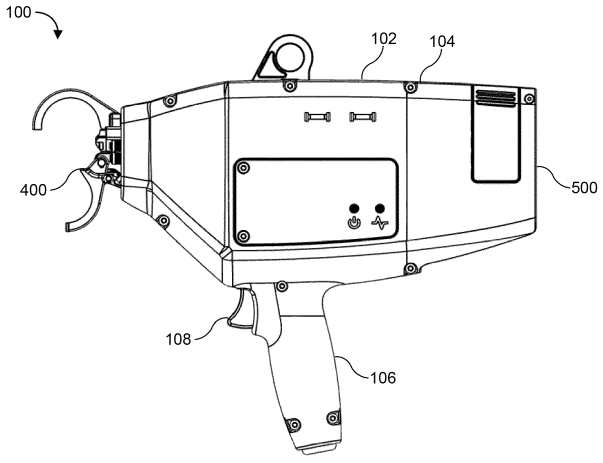

FIG. 1

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Description

FIELD

[0001] The present disclosure relates to a tool for dispensing a weldable material about a bundle of elongate articles. More particularly, the present disclosure relates to a drive assembly for a tool for dispensing the weldable material about the bundle of elongate articles.

BACKGROUND

[0002] Generally, a tool can be used for automatically bundling elongate articles such as wires, cables, or the like. For example, such a tool can feed a weldable tape about the bundled articles until the tape overlaps itself, tensioning the tape about the bundle of articles, and thereafter welding the tape at the location of the overlap to provide a tensioned loop which secures the bundle of articles. The tensioned loop can then be cut free from the remaining stock of tape so that the tool can be removed from the first bundle of articles and moved to a second location to secure a second portion of tape about a second bundle of articles.

SUMMARY

[0003] In some embodiments, a drive apparatus for a tool to bundle a plurality of elongate articles using a weldable tape, the drive apparatus having a first side and a second side and includes a guide block; a motor assembly including: a motor on the guide block at the first side, and a gear train in engagement with the motor and extending through the guide block; and a drive block on the guide block at the second side in engagement with the gear train, the drive block including: a first bracket, a second bracket, a first wheel assembly, a second wheel assembly, a channel extending through the drive block and configured to receive the weldable tape, and a spring element, wherein the spring element provides a compression force onto the first bracket and the second bracket; wherein the drive block engages the weldable tape at the channel based on the compression force to move the weldable tape through the tool.

[0004] In some embodiments, the apparatus further includes a controller, wherein the controller can control a motor torque of the motor to apply a desired tension to the weldable tape by the drive block.

[0005] In some embodiments, the apparatus further includes a motor block disposed on the first side of the guide block about the first worm gear, the second worm gear, the first gear train, and the second gear train.

[0006] In some embodiments, the first wheel assembly includes a first feed axle extending through the first bracket from the first side to the second side, a first wheel element fixedly disposed about the first feed axle in the first bracket, wherein the first wheel element extends into the channel and is configured to engage an upper surface of the weldable tape, and a first tape gear fixedly disposed about the first feed axle on the second side of the first bracket, wherein the first feed axle is configured to engage the drive axle, wherein the first feed axle rotates the first tape gear and the first wheel element in response to the rotation of the motor to feed the weldable tape through the tool.

[0007] In some embodiments, a surface of the first wheel element engaging the weldable tape is substantially smooth.

[0008] In some embodiments, a surface of the first wheel element engaging the weldable tape includes a ridged surface.

[0009] In some embodiments, the second wheel assembly includes a second feed axle extending through the second bracket from the first side to the second side, a second wheel element fixedly disposed about the first feed axle in the second bracket, wherein the second wheel element extends into the channel to engage a bottom surface of the weldable tape, and a second tape gear fixedly disposed about the first feed axle on the on the second side of the second bracket, wherein the second tape gear is configured to engage the first tape gear, wherein the second feed axle rotates the second wheel element in response to the rotation of the first tape gear to feed the weldable tape through the tool.

[0010] In some embodiments, a surface of the second wheel element engaging the weldable tape is substantially smooth.

[0011] In some embodiments, a surface of the second wheel element engaging the weldable tape includes a ridged surface.

[0012] In some embodiments, the drive block includes a gap between the first wheel assembly and the second wheel assembly in the channel.

[0013] In some embodiments, the drive block further includes a pin assembly laterally extending through the first bracket and the second bracket to allow the second bracket to pivotably move about the pin assembly relative to the first bracket, wherein the first wheel bracket and the second wheel bracket engage the weldable tape disposed in the channel of the drive block based on the compression force from the spring element.

[0014] In some embodiments, a tool for bundling a plurality of elongate articles using weldable tape, the tool having a first side and a second side and including a body, a handle, and a trigger, and the tool including a drive assembly in communicable connection with the trigger and including: a guide block, a motor assembly disposed on the guide block, the motor assembly including: a motor, and a gear train in engagement with a drive end of the motor and extending through the guide block; and a drive block opposite from the motor assembly on the guide block, the drive block including: a first bracket, a second bracket, a first wheel assembly configured to engage the drive axle and rotate based on the rotation of the motor, a second wheel assembly configured to engage the first wheel assembly and rotate based on the

rotation of the first wheel assembly, a channel extending through the drive block and configured to receive the weldable tape, and a spring element providing a compression force onto the first bracket and the second bracket, wherein the first wheel assembly and the second wheel assembly engage the weldable tape in the channel, wherein a rotation of the motor causes the first wheel assembly and the second wheel assembly to feed the weldable tape through the tool.

[0015] In some embodiments, the first wheel assembly includes a first feed axle extending through the first bracket from the first side to the second side, a first wheel element fixedly disposed about the first feed axle in the first bracket, wherein the first wheel element extends into the channel and is configured to engage an upper surface of the weldable tape, and a first tape gear fixedly disposed about the first feed axle on the second side of the first bracket, wherein the first feed axle is configured to engage the drive axle, wherein the first feed axle rotates the first tape gear and the first wheel element in response to the rotation of the motor to feed the weldable tape through the tool.

[0016] In some embodiments, a surface of the first wheel element engaging the weldable tape is substantially smooth.

[0017] In some embodiments, a surface of the first wheel element engaging the weldable tape includes a ridged surface.

[0018] In some embodiments, the second wheel assembly includes: a second feed axle extending through the second bracket from the first side to the second side, a second wheel element fixedly disposed about the first feed axle in the second bracket, wherein the second wheel element extends into the channel to engage a bottom surface of the weldable tape, and a second tape gear fixedly disposed about the first feed axle on the on the second side of the second bracket, wherein the second tape gear is configured to engage the first tape gear, wherein the second feed axle rotates the second wheel element in response to the rotation of the first tape gear to feed the weldable tape through the tool.

[0019] In some embodiments, a surface of the second wheel element engaging the weldable tape is substantially smooth.

[0020] In some embodiments, a surface of the second wheel element engaging the weldable tape includes a ridged surface.

[0021] In some embodiments, the drive block includes a gap between the first wheel assembly and the second wheel assembly at the channel.

[0022] In some embodiments, the drive block further includes a controller, wherein the controller can control a motor torque of the motor to apply a desired tension to the weldable tape by the drive block.

DRAWINGS

[0023] Some embodiments of the disclosure are herein described, by way of example only, with reference to the accompanying drawings. With specific reference now to the drawings in detail, it is stressed that the embodiments shown are by way of example and for purposes of illustrative discussion of embodiments of the disclosure. In this regard, the description taken with the drawings makes apparent to those skilled in the art how embodiments of the disclosure may be practiced.

FIG. 1 is a side view of the tool, according to some embodiments.

FIG. 2 is a perspective view of a drive assembly, according to some embodiments.

FIG. 3 is a partially exploded view of the drive assembly, according to some embodiments.

FIG. 4 is a partial perspective view of the drive assembly, according to some embodiments.

FIG. 5 is a top view of the drive assembly, according to some embodiments.

FIG. 6 is a perspective view of a drive block, according to some embodiments.

FIG. 7 is a partially exposed side view of the drive block, according to some embodiments.

FIG. 8 is a partially exploded perspective view of the drive block, according to some embodiments.

FIG. 9 is a partially exposed front view of the drive block, according to some embodiments.

[0024] Like reference numbers represent the same or similar parts throughout.

DETAILED DESCRIPTION

[0025] FIG. 1 is a side view of the tool 100, according to some embodiments. The tool 100 can be referred to as an ultrasonic tying tool or the like. The tool 100 can bundle a plurality of elongate articles using weldable tape. The tool 100 includes a drive assembly 200 (FIG. 2). The drive assembly 200 (FIG. 2) can be centrally disposed in the tool 100. In some embodiments, the drive assembly 200 can be disposed between a clamping assembly 400 and a cartridge assembly 500 of the tool 100. The weldable tape can be referred to as a strap, tie strap, plastic strap, tie wrap, tape, or the like. The tool 100 includes a housing 102 having a first side, a second side, a forward end, and a rear end. The housing 102 includes a body 104 and a handle 106. The handle 106 can include a trigger 108. In some embodiments, the trigger 108 can be utilized by a user to operate the tool 100. In the illustrated embodiment, the housing 102 is pistol-shaped. It is to be appreciated that other geometries for the housing are possible and that pistol-shaped is an example. Additional geometries are possible in accordance with the remaining disclosure. It is to be appreciated that the tool 100 includes additional features for providing a tape material to the drive assembly 200 and to wrap the tape material around the plurality of elongate articles. However, unless specific reference is made otherwise, these

additional components will not be discussed in additional detail. As will be discussed further hereinbelow, the tool 100 overcomes certain disadvantages associated with prior art tools in that the tool 100 is capable of securing a weldable tape about a bundle of elongate articles and thereafter welding and cutting the tape without loss of tension in the bundled articles and reducing friction forces. It is to be appreciated that the tool 100 includes additional features for bundling the tape material about the plurality of elongate articles. However, unless specific reference is made otherwise, these additional components will not be discussed in additional detail.

[0026] FIG. 2 is a perspective view of a drive assembly 200, according to some embodiments. FIG. 3 shows a partially exploded view of the drive assembly 200, according to some embodiments. FIG. 4 is a partially exposed perspective view of the drive assembly 200, according to some embodiments. FIG. 5 is a top view of the drive assembly 200, according to some embodiments. The tool 100 includes the drive assembly 200. The drive assembly 200 can be referred to as a drive apparatus or the like. The drive assembly 200 can include a guide block 202, a motor housing 208, a first motor assembly 204, and a drive block 206. In some embodiments, the guide block 202 can be configured to mechanically couple to the clamping assembly 400. In some embodiments, the guide block 202 can be configured to mechanically couple to the cartridge assembly 500 (FIG. 1).

[0027] The drive assembly 200 includes the guide block 202. The guide block 202 can be defined by a body and configured to receive the first motor assembly 204 and the drive block 206 onto the body. In some embodiments, the guide block 202 can include any of a plurality of sizes and shapes to connect to the first motor assembly 204, the drive block 206, and other components of the drive assembly 200 and/or the tool 100. In the illustrated embodiments, the geometry of the guide block 202 is shaped to conform to the housing 102 and/or to accommodate other components of the tool 100 including the first motor assembly 204 and the drive block 206. It is to be appreciated that other geometries for the guide block 202 are possible and that the illustrated shape is exemplary. Additional geometries are possible in accordance with the remaining disclosure.

[0028] The drive assembly 200 includes the first motor assembly 204. The first motor assembly 204 can be configured to drive the drive block 206 to move the weldable tape through the drive assembly 200 and the tool 100. In some embodiments, the first motor assembly 204 can cause a rotation of the drive block 206 in response to an operation of the trigger 108 by a user. In some embodiments, the tool 100 can include a controller, the controller providing a control signal to the first motor assembly 204 to drive the drive block 206 and to move the weldable tape through the drive assembly 200 and the tool 100. In some embodiments, the first motor assembly 204 can be detachably mounted to the guide block 202 on the first side 218. In some embodiments, the first motor assembly 204 can be coupled to the guide block 202 with at least one fastener. In some embodiments, the fastener can include, but is not limited to, screws, nuts, bolts, pins, rods, clamps, rivets, other fasteners, and any combination thereof.

[0029] The drive assembly 200 includes the drive block 206 (FIG. 2). The drive block 206 can be disposed in a receptacle 110 (FIG. 4) on the second side of the guide block 202. The drive block 206 can be configured to apply a compression force onto the weldable tape and move the tape through the drive assembly 200 and the tool 100 in response to a rotation of the first motor assembly 204. In some embodiments, the drive block 206 can be disposed on the second side 220 of the guide block 202. In some embodiments, the drive block 206 can be coupled to the first motor assembly 204 through an aperture of the guide block 202. In some embodiments, the first motor assembly 204 and the drive block 206 can be connected by a tab 234 (FIG. 4) and slot 236 (FIG. 8) configuration as will be further discussed below. It is to be appreciated that other connecting means for the first motor assembly 204 and the drive block 206 are possible and that the illustrations are merely exemplary and not intended to be limiting. Additional geometries for the connection between the first motor assembly 204 and the drive block 206 are possible in accordance with the remaining disclosure.

[0030] In some embodiments, the drive assembly 200 can include a second motor assembly 226. In some embodiments, the drive assembly 200 can include a cam 210. In some embodiments, the second motor assembly 226 can be disposed on the first side 218 of the guide block 202 proximal to the first motor assembly 204. In some embodiments, the second motor assembly 226 can extend through an aperture of the guide block 202 and attach to the cam 210 disposed on the second side 220. The second motor assembly 226 can be configured to rotate the cam 210 about an axis.

[0031] The cam 210 includes an eccentric profile and rotates about an axle of the second motor assembly 226. The cam 210 can be configured to be in rolling engagement with the clamping assembly 400 of the tool 100 to cause an operation of the clamping assembly 400. In some embodiments, the cam 210 can be located on the first side 218 of the guide block 202. In some embodiments, the cam 210 can be located on the second side 220 of the guide block 202.

[0032] In some embodiments, the drive assembly 200 can include a trigger 108. In some embodiments, the trigger 108 can be utilized by a user to operate the tool 100. Squeezing of trigger 108 operates a switch (not shown) electrically communicating with a control mechanism (not shown). As will be recognized by those skilled in the art, the control mechanism may, for example, include a programmed microchip contained internally within the tool 100 or external to the tool 100 (e.g., the microchip and power supply can be combined together into one unit). The control mechanism provides power and instructions

to the components of the tool at appropriate points during the bundling operation.

[0033] In some embodiments, the trigger 108 can be mounted to a bottom of the guide block 202 and at the forward end of the handle 106. The trigger 108 can move between a standby position and an actuated position. In some embodiments, the trigger 108 further includes a control linkage movably mounted with respect to the housing 102 and movable between a first position and a second position. In some embodiments, the first position can be a standby position of the tool 100. In some embodiments, the second position can activate the tool 100 and cause the tool 100 to initiate a cycle of bundling the elongate articles with the weldable tape. In some embodiments, the trigger 108 can be located on the first side 218 of the guide block 202. In some embodiments, the trigger 108 can be located on a second side 220 of the guide block 202.

[0034] The drive assembly 200 can include the first motor assembly 204. The first motor assembly 204 can be mounted to the guide block 202 and can be disposed on an opposite side of the guide block 202 from the drive block 206. The first motor assembly 204 cooperates with the drive block 206 for feeding the weldable tape through the drive block 206 and the tool 100. In some embodiments, the drive assembly 200 feeds the weldable tape from the tape cartridge to the clamping assembly 400 of the tool 100.

[0035] In some embodiments, the first motor assembly 204 can include a first motor 212. The first motor 212 rotates a drive end of the motor in a first direction and a second direction based on a control signal. In some embodiments, the first motor 212 can include a DC motor. In some embodiments, a skilled person would appreciate that the motor can include other types of motors suitable to rotatably drive the components of the drive assembly 200. In some embodiments, the first motor assembly 204 can include a gear train 214. The gear train 214 can mechanically couple the first motor 212 to the drive block 206. Consequently, in some embodiments, the rotation of the drive end of the first motor 212 can cause a rotation of the components of the drive block 206 through the gear train 214.

[0036] In some embodiments, the gear train 214 can include a first worm 216. In some embodiments, the first worm 216 can be connected to the drive end of the first motor 212 and rotate in a first direction and a second direction based on a rotation of the first motor 212. In some embodiments, the first worm 216 can be a cylindrical member having a helical thread on an outer surface of the cylindrical member. In some embodiments, the gear train 214 can include a worm gear 228. In some embodiments, an outer circumference of the worm gear 228 can include a plurality of teeth to engage the helical threads of the first worm 216. In some embodiments, the gear train 214 can include a drive axle 232. In some embodiments, the drive axle 232 can extend through the guide block 202 and can include a first end and a second end. The drive axle 232 can be connected to the worm gear 228 at the first end and extend through an aperture of the guide block 202. The drive axle 232 can be configured to rotate about its axis relative to the guide block 202 based on a rotation of the worm gear 228 being driven by the first motor 212. In some embodiments, the drive axle 232 can engage the drive block 206 to cause the drive block 206 to feed the weldable tape through the tool 100 and to tension the weldable tape during the bundling operation. In some embodiments, the drive axle 232 can be a cylindrical member. In some embodiments, the drive axle 232 can include a tab 234 (FIG. 4) disposed at the second end of the drive axle 232. In some embodiments, the drive axle 232 can engage the drive block 206 by a slot and tooth arrangement. In some embodiments, the tab 234 of the drive axle 232 can be configured to engage a slot 236 on the drive block 206 as will be further discussed below. In some embodiments, the guide block 202 can include a worm bearing 230 located in the aperture of the guide block 202. In some embodiments, the drive axle 232 can extend through the worm bearing 230 and allow the drive axle 232 to rotate on its axis. It is to be appreciated that the first motor assembly 204 is exemplary and not intended to be limiting. Consequently, in various embodiments, other gear trains can be used in accordance with the disclosure to convert the rotation of the drive end of the first motor 212 to cause the drive block 206 to feed the weldable tape through the tool 100.

[0037] In some embodiments, the tool 100 can include a controller. In some embodiments, the controller can include a motor controller. In some embodiments, the controller can be located in the housing 102 of the tool 100. In some embodiments, the controller can be located external to the tool 100 and connected to the tool 100 by a connector. In some embodiments, the controller can provide, at least in part, control signals to the first motor 212 of the first motor assembly 204 to control the motor torque. In some embodiments, the controller can control the first motor 212 to control the torque applied by the drive block 206 to the weldable tape. In some embodiments, the motor torque can be electronically set to apply a desired tension to the weldable tape by the drive block 206.

[0038] In some embodiments, the drive assembly 200 can include the second motor assembly 226 (FIG. 3). In some embodiments, the second motor assembly 226 can be proximally mounted adjacent the first motor assembly 204 on the same side of the guide block 202 as the first motor assembly 204. In some embodiments, the second motor assembly 226 can cooperate with the clamping assembly 400 to drive the clamping assembly 400 through a sequence of steps to bundle the plurality of elongate articles with the weldable tape being fed through the tool 100 by the drive assembly 200.

[0039] In some embodiments, the second motor assembly 226 includes a second motor 304, a second worm 306, and a second worm gear train 308. The second mo-

tor 304 rotates a drive end of the motor in a first direction and a second direction based on a control signal. In some embodiments, the second motor 304 can include a DC motor. In some embodiments, a skilled person would appreciate that the motor can include other types of motors suitable to drive the rotation of the worm gear. The second worm 306 can be connected to the drive end of the second motor 304 and rotates in the first direction and the second direction based on the rotation of the second motor 304. The second worm 306 can be a cylindrical member having a helical thread on an outer surface of the cylindrical member. The second worm gear train 308 can be in engagement with the threads of the second worm 306 and the second worm gear train 308 rotates on an axis in a corresponding direction in response to the rotation of the second worm 306 in the first direction and the second direction. The second worm gear train 308 extends through the guide block 202 to the opposite side of the guide block 202 through a second aperture.

[0040] In some embodiments, the second worm gear train 308 can include a second worm gear 310 and a second drive axle 314. The second worm gear 310 having an outer surface, the outer surface including a plurality of teeth to engage the helical threads of the second worm 306. The second drive axle 314 includes a first end and a second end. The second drive axle 314 can be connected to the second worm gear 310 at the first end and extends through the guide block 202 through an aperture of the guide block 202. The second drive axle 314 rotatably moves about the axis in relation to the guide block 202 based on a rotation of the second worm gear 310 being driven by the second motor 304. In some embodiments, the guide block 202 can include the second worm bearing 312. The second worm bearing 312 can be disposed in the second aperture of the guide block 202 and allows the second drive axle 314 to rotate on the axis of the second worm gear train 308.

[0041] In some embodiments, the second drive axle 314 can include the cam 210 disposed at an end opposite the second worm gear 310. In some embodiments, the cam 210 can be fixedly connected to the second end of the second worm gear 310 and rotate in response to rotation of the second drive axle 314. In some embodiments, the cam 210 can include an eccentric profile and configured to provide a translational movement to the clamping assembly. In some embodiments, the cam 210 can be mechanically coupled to the clamping assembly. In some embodiments, the cam 210 can be in rolling engagement with the clamping assembly 400 to drive the operation of the clamping assembly.

[0042] In some embodiments, the cam 210 can be mounted to the second end of the second drive axle 314 and rotates on the axis of the second worm gear train 308 based on the rotation of the second drive axle 314. In some embodiments, the second worm gear train 308 can include a plurality of cams fixedly mounted along the second drive axle 314 on the second side of the guide block 202, the plurality of cams rotating in response to a rotation of the second drive axle 314.

[0043] FIG. 6 is a perspective view of a drive block 206, according to some embodiments. FIG. 7 is a partially exposed side view of the drive block 206, according to some embodiments. FIG. 8 is a partial exploded perspective view of the drive block 206, according to some embodiments. FIG. 9 is a partial exposed front view of the drive block 206, according to some embodiments. The drive assembly 200 includes the drive block 206. The drive block 206 includes a first bracket 238, a second bracket 240, a first wheel assembly 242, a second wheel assembly 244, and a spring element 248. The drive block 206 can be configured to engage the first motor assembly 204 to feed the weldable tape through the drive block 206 in response to a rotation of the first motor 212. In some embodiments, the drive block 206 can be configured to feed the weldable tape around the plurality of elongate articles. In some embodiments, the drive block 206 can be further configured to tension the tape around the articles in response to an operation of the first motor assembly 204.

[0044] The first bracket 238 can be defined by a body and can include a guide channel 250, a first wheel slot 280, and a first axle bore 252. In some embodiments, the first bracket 238 can include a first portion 262 and a second portion 264. In some embodiments, the first portion 262 can form the main body of the first bracket 238. In some embodiments, the second portion 264 can protrude from the rear end of the first portion 262. In some embodiments, the first portion 262 and the second portion 264 can integrally form the first bracket 238.

[0045] The first bracket 238 includes the guide channel 250. The guide channel 250 can extend through from the front end to the rear end of the first bracket 238. The guide channel 250 can be sized to accommodate passage of the weldable tape through the first bracket 238. Consequently, the guide channel 250 can include dimensions sufficient to allow passage of the weldable tape through the drive block 206 while preventing buckling of the tape as it advances through the drive block 206. In some embodiments, the guide channel 250 can extend through the first portion 262 and the second portion 264 of the first bracket 238. In some embodiments, the first bracket 238 can include an opening disposed at a bottom of the first bracket 238 to expose at least part of the guide channel 250. In some embodiments, the opening can include dimensions to allow the second wheel assembly 244 to extend, at least in part, into a bottom of the guide channel 250 to engage a bottom surface of the weldable tape disposed in the guide channel 250.

[0046] The first bracket 238 includes the first wheel slot 280. The first wheel slot 280 can extend from a top of the guide channel 250 and at least partly into the first bracket 238. In some embodiments, the first wheel slot 280 can include dimensions adequate to accommodate components of the first wheel assembly 242. In some embodiments, the first wheel slot 280 can include dimensions to allow the components of the first wheel assembly 242

to freely rotate in the first wheel slot 280.

[0047] In some embodiments, the first bracket 238 can include a first axle bore 252. The first axle bore 252 extends through the first bracket 238 from the first side to the second side. In some embodiments, the first axle bore 252 can include dimensions to accommodate components of the first wheel assembly 242. In some embodiments, the first bracket 238 can include a pin bore 260. The pin bore 260 extends from the first side to the second side of the first bracket 238. In some embodiments, the pin bore 266 can be located on the second portion 264. In some embodiments, the pin bore 266 can be configured to receive a pin assembly to rotatably connect the second bracket 240 to the first bracket 238.

[0048] In some embodiments, the first bracket 238 can include a boss. In some embodiments, the boss can protrude from the first bracket 238. In some embodiments, the boss can include a shape to allow a spring element 248 to be positioned around the boss. In some embodiments, the shape of the boss can include a cylindrical shape. In some embodiments, the boss 258 can be configured to retain the spring element 248 disposed about the boss in a centered position relative to the boss on the first bracket 238.

[0049] In some embodiments, the first bracket 238 can include a first member and a second member. The first member and the second member can be configured to form a first side and a second side of the first body, respectively. In some embodiments, each of the first member and the second member can include a plurality of bores, the plurality of bores of the first member can align with the plurality of bores of the second member to receive a plurality of fasteners to couple the first member to the second member. In some embodiments, the plurality of bores can include a threaded inner surface to threadingly engage a threaded fastener. In the illustrated embodiments, the geometry of the first bracket 238 can be shaped to conform to the guide block 202 and to cooperate with the second bracket 240 to engage the weldable tape of the tool 100. It is to be appreciated that other geometries for the first bracket 238 are possible and that the illustrated shape is exemplary. Additional geometries are possible in accordance with the remaining disclosure.

[0050] The second bracket 240 can be defined by a body and include a bracket channel 270 and a second axle bore 254. In some embodiments, the second bracket 240 can include a third portion 284 and a fourth portion 286. The third portion 284 can form a bottom portion of the second bracket 240. The fourth portion 286 can vertically extend upwards from the rear end of the third portion 284 to form a tab. In some embodiments, the third portion 284 can include a receptacle disposed near an upper end of the fourth portion 286. In some embodiments, the receptacle can be configured to receive a retaining nut, as will be further discussed below. In some embodiments, the third portion 284 and the fourth portion 286 can be integrally formed to form the second bracket 240.

[0051] The second bracket 240 can include a bracket channel 270. The bracket channel 270 can be sized to allow the second portion 264 of the first bracket 238 to extend at least partly therethrough to the rear end of the drive block 206. The second bracket 240 can include a second wheel slot 288. The second wheel slot 288 can include dimensions adequate to allow components of the second wheel assembly 244 to freely rotate in the second bracket 240 as will be further discussed below.

[0052] The second bracket 240 can include a second axle bore 254. The second axle bore 254 can extend through the second bracket 240 from the first side to the second side of the second bracket 240. The second axle bore 254 can accommodate the second wheel assembly 244 to allow the second wheel assembly 244 to rotate relative to the second bracket 240 and the drive block 206. In some embodiments, the second axle bore 254 can extend through the third portion 284. In some embodiments, the second axle bore 254 can include a first and second bore that extend through the second bracket 240 on opposing sides of the second wheel slot 288.

[0053] In some embodiments, the second bracket 240 can include a pin bore 266. The pin bore 266 extends from the first side to the second side of the second bracket 240. The pin bore 266 can be configured to align with the pin bore 260 of the first bracket 238. The pin bore 260 and the pin bore 266 can receive the pin assembly 272. In some embodiments, the second bracket 240 can pivotably move about the pin assembly 272 relative to the first bracket 238. In some embodiments, the pin bore 266 can be disposed on the third portion 284.

[0054] In some embodiments, the second bracket 240 can include a bore 268. In some embodiments, the bore 268 can be disposed on the fourth portion 286 of the second bracket 240. In some embodiments, the bore 268 can extend through the fourth portion 286 to the receptacle of the fourth portion 286. In some embodiments, the bore 268 can be configured to allow a retaining assembly 246 to extend through the bore 268 when the second bracket 240 can be fixed relative to the first bracket 238 by the pin assembly 272.

[0055] In some embodiments, the second bracket 240 can include a third member and a fourth member. In some embodiments, the third member and the fourth member can be configured to form the first side and the fourth side of the second body, respectively. Further, in some embodiments, the third member and the fourth member can include a plurality of bores. The plurality of bores of the third member aligning with the plurality of bores of the fourth member and configured to receive a plurality of fasteners to couple the third member to the fourth member. In some embodiments, the plurality of bores can include a threaded inner surface to threadingly engage a threaded fastener. In the illustrated embodiments, the geometry of the second bracket 240 can be shaped to conform to the guide block 202 and to cooperate with the first bracket 238 to engage the weldable tape of the tool 100. It is to be appreciated that other geometries for

the second bracket 240 are possible and that the illustrated shape is exemplary. Additional geometries are possible in accordance with the remaining disclosure.

[0056] The drive block 206 includes the first wheel assembly 242. In some embodiments, the first wheel assembly 242 can include a first tape axle 274, a first tape gear 276, and a first tape wheel 278. The first wheel assembly 242 can be configured to rotate relative to the first bracket 238 in the first axle bore 252. In some embodiments, the first wheel assembly 242 can be configured to engage the drive axle 232 using a slot and tooth arrangement and rotate in response to a rotation of the motor 212. In some embodiments, the first wheel assembly 242 can extend through the first axle bore 252. In some embodiments, the first tape axle 274 can include a first end and a second end and extend from the first side to the second side of the first bracket 238. In some embodiments, the first tape axle 274 can be configured to engage the drive axle 232 at the first end of the first tape axle 274. In some embodiments, the first tape axle 274 can rotate the first tape gear 276 and the first tape wheel 278 in response to a rotation of the drive axle 232. In some embodiments, the first tape axle 274 can include the slot 236 disposed at the first end. The slot 236 can engage the tab 234 located on the drive axle 232 and can rotate the first tape axle 274 in response to the rotation of the tab 234 of the drive axle 232. In some embodiments, the first tape axle 274 can be a cylindrical member.

[0057] The first tape gear 276 can be fixedly mounted onto the first tape axle 274 at the second end. The first tape gear 276 can be configured to rotate relative to the first bracket 238 in response to a rotation of the first tape axle 274. In some embodiments, an outer circumference of the first tape gear 276 can include a plurality of teeth for engaging a face of the second wheel assembly 244 as will be further discussed below. In some embodiments, the first tape gear 276 can be configured to receive a fastener to connect the first tape gear 276 to the first tape axle 274. In some embodiments, the fastener can include a set screw, screw, clip, bolt, nut, other fasteners, and combinations thereof. In some embodiments, the circumference of the first tape axle 274 can include an eccentric shape. In some embodiments, the second end of the first tape axle 274 can include the eccentric shape. In some embodiments, the first tape gear 276 can include an inner bore having a profile corresponding to the eccentric shape of the second end of the first tape axle 274 to retain the position of the first tape gear 276 as the first tape axle 274 rotates about its axis.

[0058] The first tape wheel 278 can be fixedly mounted to the first tape axle 274 at the first wheel slot 280 of the first bracket 238. The first tape wheel 278 can be configured to rotate relative to the first bracket 238 in response to a rotation of the first tape axle 274. In some embodiments, the first tape wheel 278 can include a diameter sized to extend a portion of the first tape wheel 278 into the guide channel 250 to engage an upper surface of the weldable tape located in the guide channel 250. The first tape wheel 278 includes an outer circumference having a surface that can contact the weldable tape located in the guide channel 250. In some embodiments, the outer surface of the first tape wheel 278 can be substantially smooth and can feed the tape through the guide channel 250 based on friction and the compression force. In some embodiments, the outer surface of the first tape wheel 278 can include a plurality of ridges to engage a surface of the weldable tape and feed the tape through the guide channel 250.

[0059] The drive block 206 includes the second wheel assembly 244. The second wheel assembly 244 can be configured to rotate relative to the second bracket 240 in the second axle bore 254. In some embodiments, the second wheel assembly 244 can extend through the second axle bore 254. In some embodiments, the second wheel assembly 244 can include a second tape axle 290, a second tape gear 292, and a second tape wheel 294. In some embodiments, the second tape axle 290 can include a first end and a second end and extend from the first side to the second side of the second bracket 240. In some embodiments, the second tape axle 290 can rotate the second tape wheel 294 in response to a rotation of the second tape gear 292. In some embodiments, the second tape axle 290 can include the slot 236 disposed at the first end. In some embodiments, the slot 236 can engage the tab 234 located on the drive axle 232 and can rotate the first tape axle 274 in response to the rotation of the tab 234 of the drive axle 232. In some embodiments, the second tape axle 290 can be a cylindrical member.

[0060] The second tape gear 292 can be fixedly mounted onto the second tape axle 290 at the second end. In some embodiments, an outer circumference of the second tape gear 292 can include a plurality of teeth for engaging a face of the first tape gear 276. Consequently, in some embodiments, the first tape gear 276 can be configured to rotate relative to the first bracket 238 in response to a rotation of the first tape gear 276. In some embodiments, the second tape gear 292 can be configured to receive a fastener to connect the second tape gear 292 to the second tape axle 290. In some embodiments, the fastener can include a set screw, screw, clip, bolt, nut, other fasteners, and combinations thereof. In some embodiments, the circumference of the second tape axle 290 can include an eccentric shape. In some embodiments, the second end of the second tape axle 290 can include the eccentric shape. In some embodiments, the second tape gear 292 can include an inner bore having a profile corresponding to the eccentric shape of the second end of the second tape axle 290 to retain the second tape gear 292 in a fixed position relative to the second tape axle 290 as the second tape axle 290 rotates about its axis.

[0061] The second tape wheel 294 can be fixedly mounted to the first tape axle 274 at the second wheel slot 288 of the second bracket 240. The second tape

wheel 294 can be configured to rotate relative to the second bracket 240 in response to a rotation of the first tape axle 274. In some embodiments, the second tape wheel 294 can include a diameter sized to extend a portion of the second tape wheel 294 into the guide channel 250 to engage a bottom surface of the weldable tape located in the guide channel 250. The second tape wheel 294 can include an outer circumference having a surface that can contact the weldable tape located in the guide channel 250. In some embodiments, an outer surface of the second tape wheel 294 can be substantially smooth and can feed the tape through the guide channel 250 based on friction and compression forces. In some embodiments, the outer surface of the second tape wheel 294 can include a plurality of ridges to engage a surface of the weldable tape and feed the tape through the guide channel 250.

[0062] In some embodiments, the drive block 206 can include a retaining assembly 246. The retaining assembly 246 can be configured to be disposed opposite the spring element 248 from the boss on the first bracket 238. In some embodiments, the retaining assembly 246 can be disposed at the receptable of the second bracket 240 and configured retain a position of the spring element 248 relative to an axis of the boss based on the position of the first bracket 238 and the second bracket 240. In some embodiments, the retaining assembly 246 can include a retaining member having a retaining nut and a boss member. In some embodiments, the boss member and the retaining nut can be integrally formed, the boss member protruding from an end of the retaining nut. In some embodiments, the retaining nut can be configured to be disposed in the receptacle of the second bracket 240. In some embodiments, the retaining nut can include a threaded bore opposite the boss member. In some embodiments, the threaded bore extends at least partly through the retaining member. In some embodiments, the retaining assembly 246 can include a screw element configured to threadingly engage the threaded bore. In some embodiments, the screw element can extend through the bore 268 of the second bracket 240. In some embodiments, the screw element can include a screw, set screw, bolt, nut, clip, rivet, clamp, other elements, and combinations thereof.

[0063] In some embodiments, the screw element can be configured to extend through the bore 268 when the second bracket 240 is fixed relative to the first bracket 238 by the pin assembly 272. In some embodiments, the distance the screw element protrudes from the retaining assembly 246 can be adjusted to adjust the compression force of the spring element 248. Consequently, in some embodiments, the compression force of the spring element 248 can be adjusted by screwing the screw element in or out of the threaded bore. For example, unscrewing the screw element further out from the retaining nut can decrease the compression force. In some embodiments, the retaining nut can include any of a plurality of shapes to be disposed in a receptacle and to prevent a rotation of the retaining assembly 246. In some embodiments, the retaining nut can include a square nut. In some embodiments, the retaining nut can include at least three sides.

[0064] The drive block 206 includes the spring element 248. The spring element 248 can be configured to allow the force from a driving of the first motor assembly 204 to move the weldable tape in the drive block 206 with minimal slippage to control a tension of the weldable tape around the plurality of elongate articles during the bundling operation. The spring element 248 can be located between the first bracket 238 and the second bracket 240. In some embodiments, the spring element 248 can be disposed between the first portion 262 and the fourth portion 286. In some embodiments, the retaining assembly 246 can extend from the first bracket 238 to the second bracket 240 and through an interior of the spring element 248. In some embodiments, the spring element 248 provides a compression force against the first bracket 238 and the second bracket 240, the first bracket 238 being fixed relative to the guide block 202 and the second bracket 240 pivotably rotating about the pin assembly 272. In some embodiments, the compression force from the spring element 248 can be translated to the first tape wheel 278 and the second tape wheel 294 to engage a surface of the weldable tape disposed in the guide channel 250 to allow the tape to be fed through the drive block 206. In some embodiments, the compression force of the spring element 248 can be adjusted by adjusting the retaining assembly 246. In some embodiments, the compression force can be adjusted by replacing the spring element 248. In some embodiments, the spring element 248 can include a spring. In some embodiments, the spring element 248 can include a compression spring. In some embodiments, the spring element 248 can include any of a plurality of members including, but not limited to, a leaf spring, a coil spring, a torsion spring, a clip, other spring elements, and combinations thereof.

[0065] The terminology used herein is intended to describe embodiments and is not intended to be limiting. The terms "a," "an," and "the" include the plural forms as well, unless clearly indicated otherwise. The terms "comprises" and/or "comprising," when used in this Specification, specify the presence of the stated features, integers, steps, operations, elements, and/or components, but do not preclude the presence or addition of one or more other features, integers, steps, operations, elements, and/or components.

[0066] It is to be understood that changes may be made in detail, especially in matters of the construction materials employed and the shape, size, and arrangement of parts without departing from the scope of the present disclosure. This Specification and the embodiments described are examples, with the true scope and spirit of the disclosure being indicated by the claims that follow.

Claims

1. A drive apparatus for a tool to bundle a plurality of elongate articles using a weldable tape, the drive apparatus having a first side and a second side and comprising:

    a guide block;
    a motor assembly including:

        a motor on the guide block at the first side,
        a gear train connected to a drive end of the motor and extending through the guide block; and

    a drive block on the guide block at the second side in engagement with the gear train, the drive block including:

        a first bracket,
        a second bracket,
        a first wheel assembly,
        a second wheel assembly,
        a channel extending through the drive block and configured to receive the weldable tape, and
        a spring element,
        wherein the spring element provides a compression force onto the first bracket and the second bracket;

    wherein the drive block engages the weldable tape at the channel based on the compression force to move the weldable tape through the tool.

2. The apparatus of claim 1, further comprising:
    a controller,
    wherein the controller can control a motor torque of the motor to apply a desired tension to the weldable tape by the drive block.

3. The apparatus of claim 2, further comprising:
    a motor block disposed on the first side of the guide block about the first worm gear, the second worm gear, the first gear train, and the second gear train.

4. The apparatus of one of the preceding claims, wherein the first wheel assembly comprises:

    a first feed axle extending through the first bracket from the first side to the second side,
    a first wheel element fixedly disposed about the first feed axle in the first bracket, wherein the first wheel element extends into the channel and is configured to engage an upper surface of the weldable tape, and
    a first tape gear fixedly disposed about the first feed axle on the second side of the first bracket,
    wherein the first feed axle is configured to engage the drive axle,
    wherein the first feed axle rotates the first tape gear and the first wheel element in response to the rotation of the motor to feed the weldable tape through the tool.

5. The apparatus of claim 4, wherein a surface of the first wheel element engaging the weldable tape is substantially smooth.

6. The apparatus of claim 4 or 5, wherein a surface of the first wheel element engaging the weldable tape includes a ridged surface.

7. The apparatus of one of the preceding claims, wherein the second wheel assembly comprises:

    a second feed axle extending through the second bracket from the first side to the second side,
    a second wheel element fixedly disposed about the first feed axle in the second bracket,
    wherein the second wheel element extends into the channel to engage a bottom surface of the weldable tape, and
    a second tape gear fixedly disposed about the first feed axle on the on the second side of the second bracket,
    wherein the second tape gear is configured to engage the first tape gear,
    wherein the second feed axle rotates the second wheel element in response to the rotation of the first tape gear to feed the weldable tape through the tool.

8. The apparatus of claim 7, wherein a surface of the second wheel element engaging the weldable tape is substantially smooth.

9. The apparatus of claim 7 or 8, wherein a surface of the second wheel element engaging the weldable tape includes a ridged surface.

10. The apparatus of one of the preceding claims, wherein the drive block includes a gap between the first wheel assembly and the second wheel assembly in the channel.

11. The apparatus of one of the preceding claims, wherein the drive block further includes:

    a pin assembly laterally extending through the first bracket and the second bracket to allow the second bracket to pivotably move about the pin assembly relative to the first bracket,
    wherein the first wheel bracket and the second wheel bracket engage the weldable tape disposed in the channel of the drive block based

on the compression force from the spring element.

12. A tool for bundling a plurality of elongate articles using weldable tape, the tool having a first side and a second side and including a body, a handle, and a trigger, the tool comprising:
a drive assembly in communicable connection with the trigger and including:

a guide block,
a motor assembly disposed on the guide block, the motor assembly including:

a motor, and
a gear train in engagement with a drive end of the motor and
extending through the guide block, and

a drive block opposite from the motor assembly on the guide block, the drive block including:

a first bracket,
a second bracket,
a first wheel assembly configured to engage the drive axle and rotate based on a rotation of the motor,
a second wheel assembly configured to engage the first wheel assembly and rotate based on the rotation of the first wheel assembly,
a channel extending through the drive block and configured to receive the weldable tape, and
a spring element providing a compression force onto the first bracket and the second bracket,

wherein the first wheel assembly and the second wheel assembly engage the weldable tape in the channel,
wherein a rotation of the motor causes the first wheel assembly and the second wheel assembly to feed the weldable tape through the tool.

13. The tool of claim 12, wherein the first wheel assembly comprises:

a first feed axle extending through the first bracket from the first side to the second side,
a first wheel element fixedly disposed about the first feed axle in the first bracket, wherein the first wheel element extends into the channel and is configured to engage an upper surface of the weldable tape, and
a first tape gear fixedly disposed about the first feed axle on the second side of the first bracket, wherein the first feed axle is configured to engage the drive axle,
wherein the first feed axle rotates the first tape gear and the first wheel element in response to the rotation of the motor to feed the weldable tape through the tool.

14. The tool of claim 13, wherein a surface of the first wheel element engaging the weldable tape is substantially smooth.

15. The tool of claim 13 or 14, wherein a surface of the first wheel element engaging the weldable tape includes a ridged surface.

16. The tool of one of claim 12 to 15, wherein the second wheel assembly comprises:

a second feed axle extending through the second bracket from the first side to the second side,
a second wheel element fixedly disposed about the first feed axle in the second bracket,
wherein the second wheel element extends into the channel to engage a bottom surface of the weldable tape, and
a second tape gear fixedly disposed about the first feed axle on the on the second side of the second bracket,
wherein the second tape gear is configured to engage the first tape gear,
wherein the second feed axle rotates the second wheel element in response to the rotation of the first tape gear to feed the weldable tape through the tool.

17. The tool of claim 16, wherein a surface of the second wheel element engaging the weldable tape is substantially smooth.

18. The tool of claim 16 or 17, wherein a surface of the second wheel element engaging the weldable tape includes a ridged surface.

19. The tool of one of claim 12 to 18, wherein the drive block includes a gap between the first wheel assembly and the second wheel assembly at the channel.

20. The tool of one of claim 12 to 19, wherein the tool further includes:
a controller,
wherein the controller can control a motor torque of the motor to apply a desired tension to the weldable tape by the drive block.

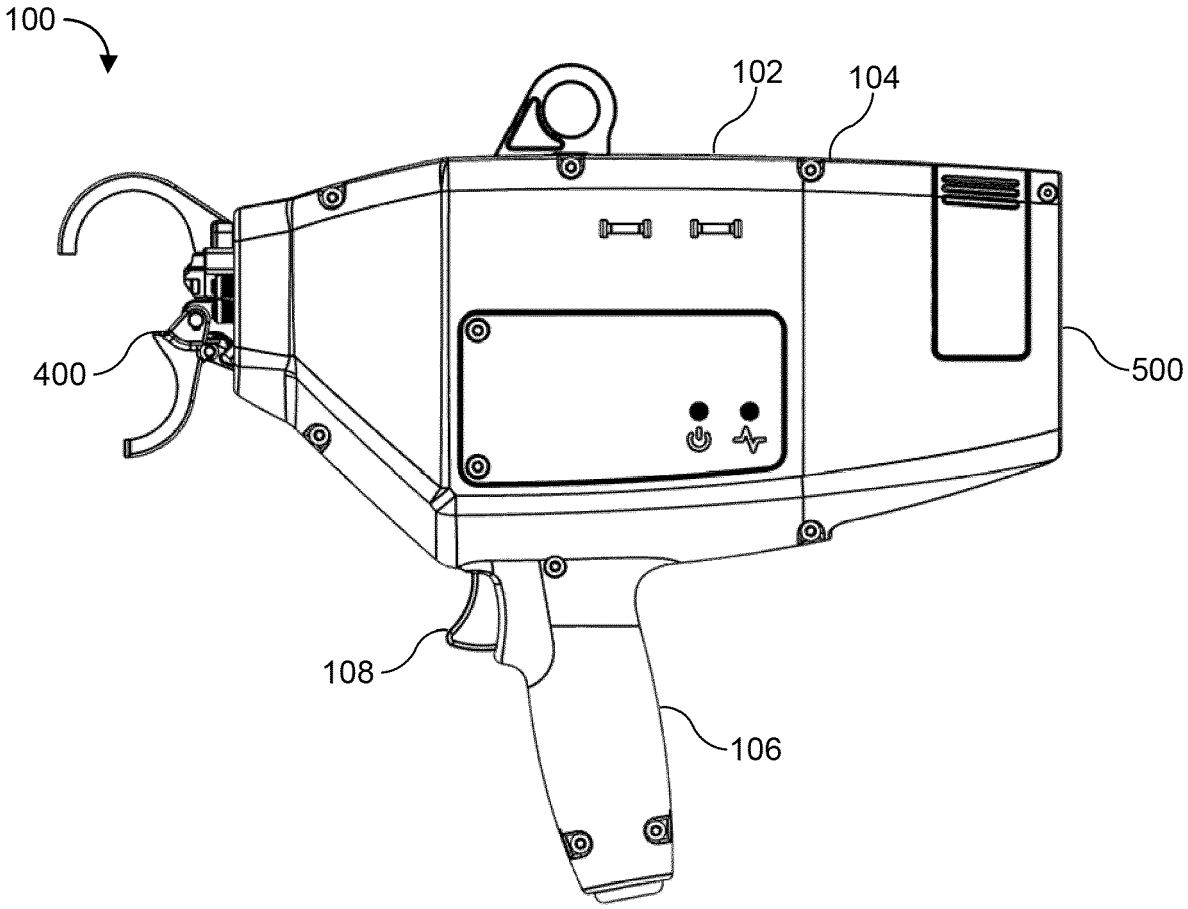

FIG. 1

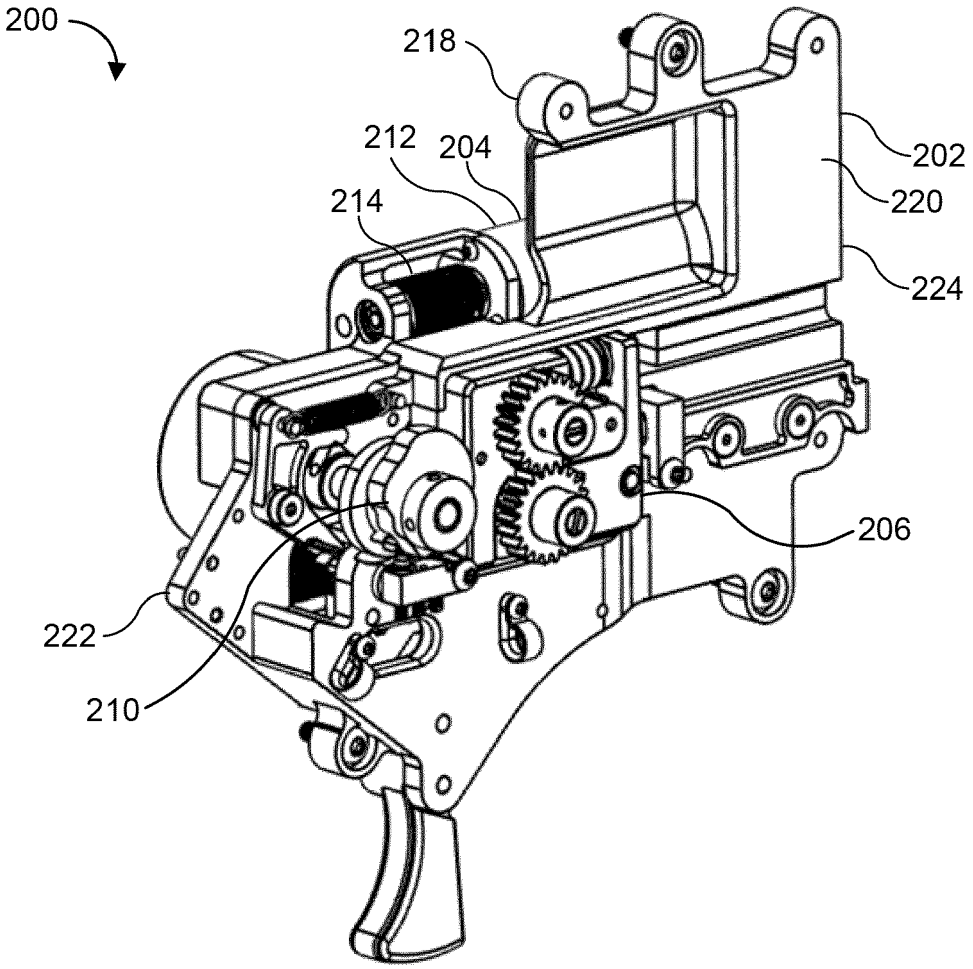

FIG. 2

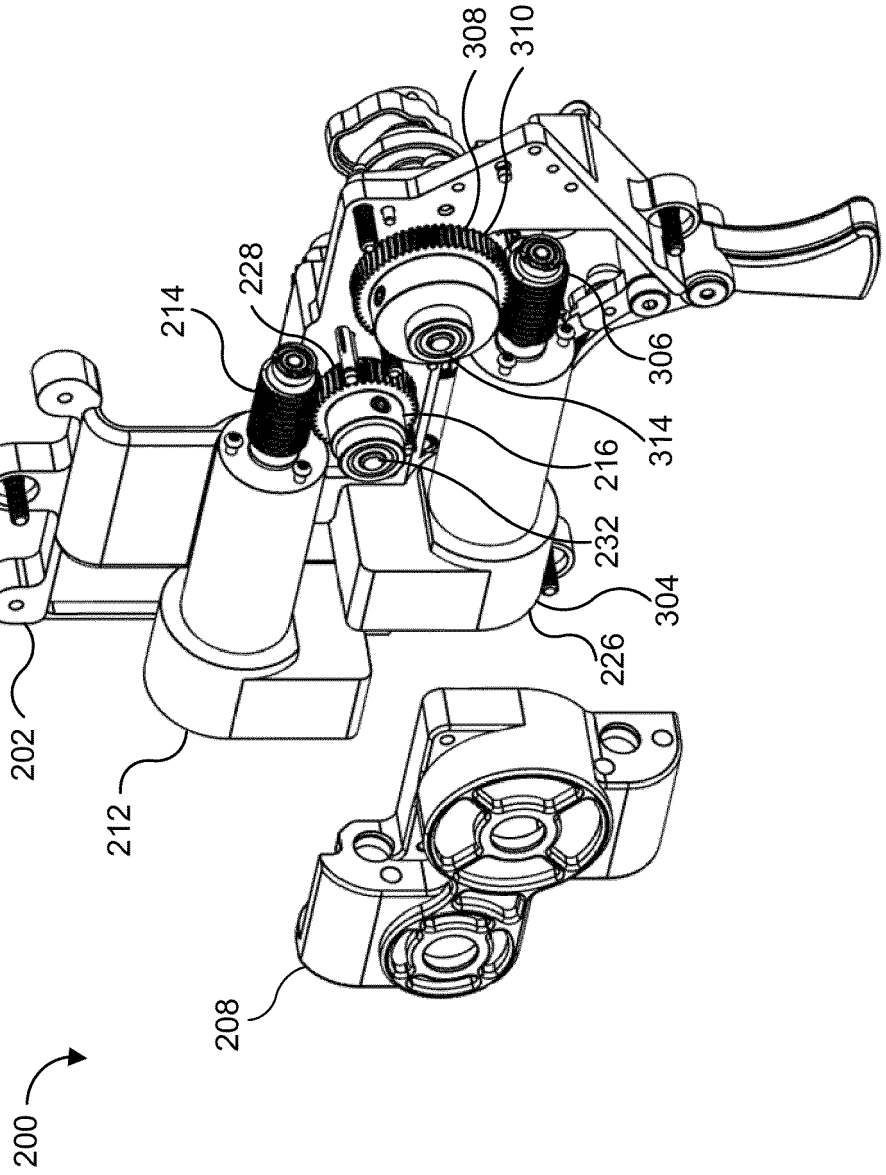

FIG. 3

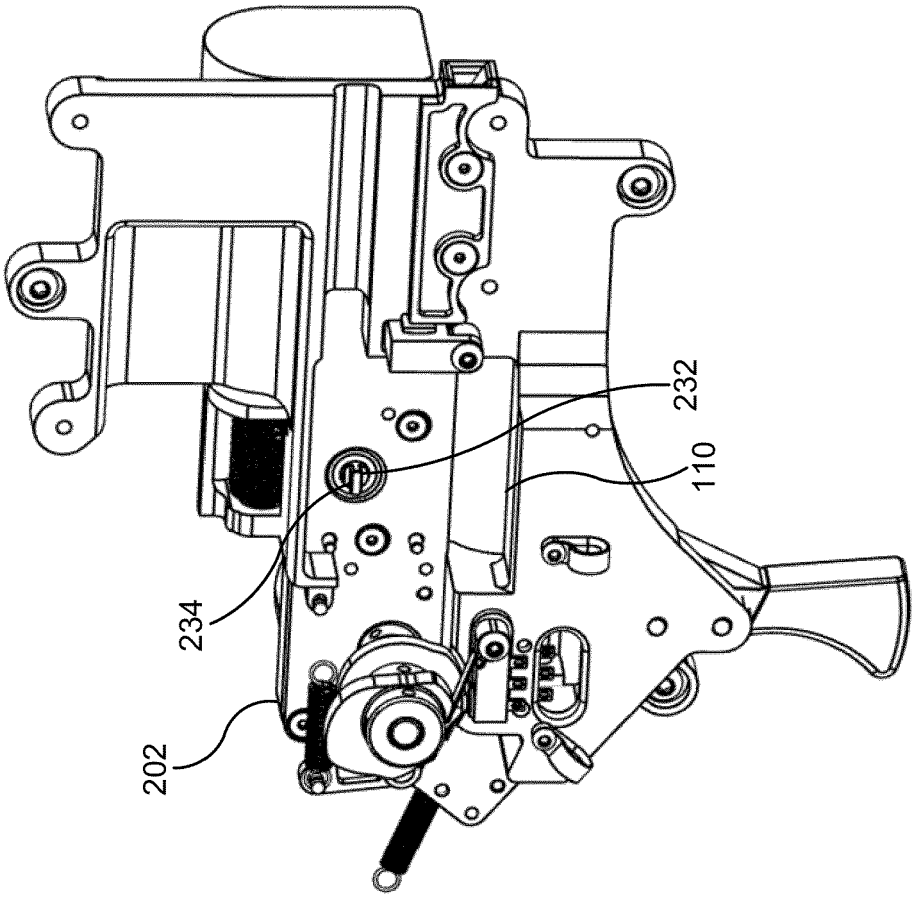

FIG. 4

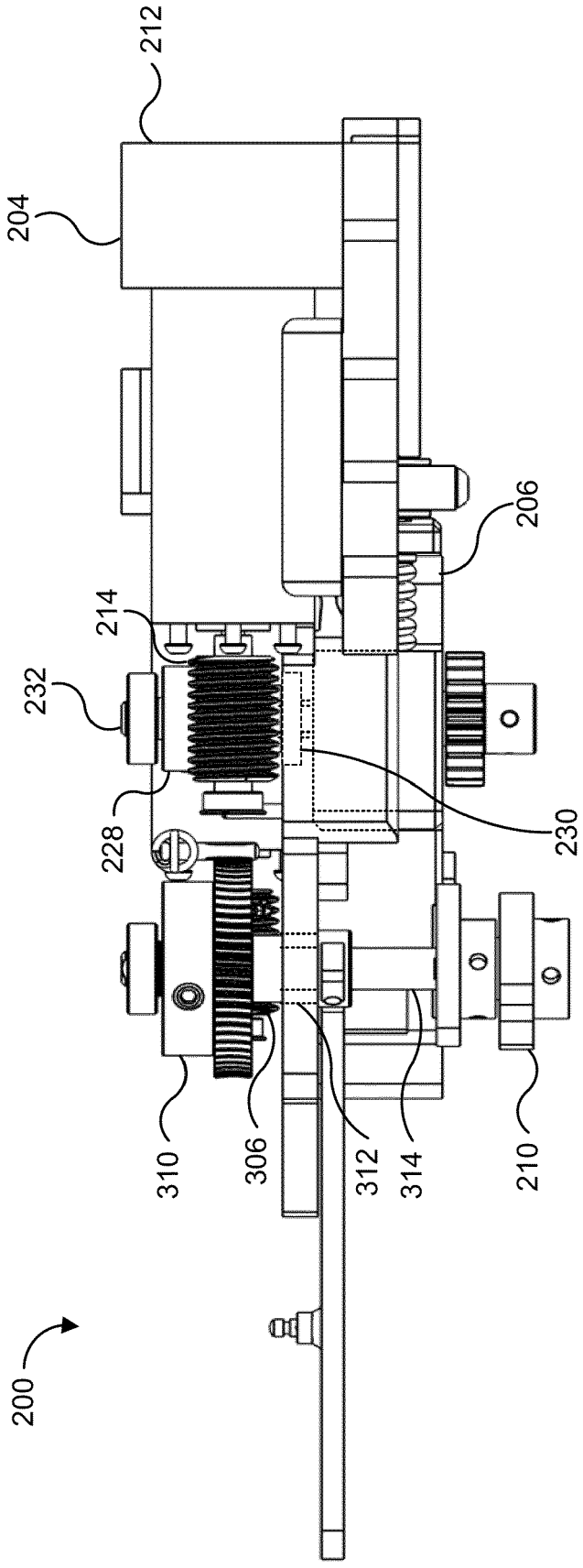

FIG. 5

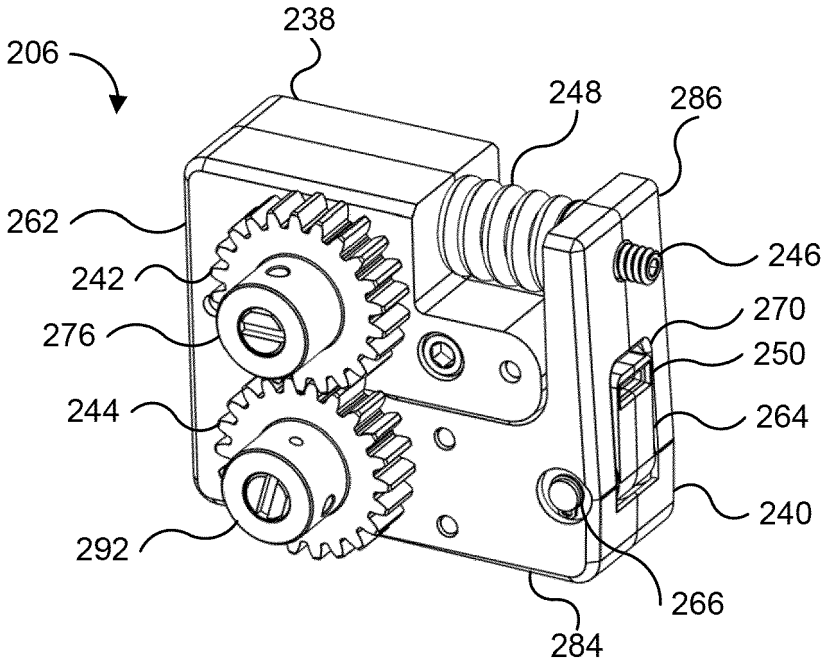
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FIG. 6

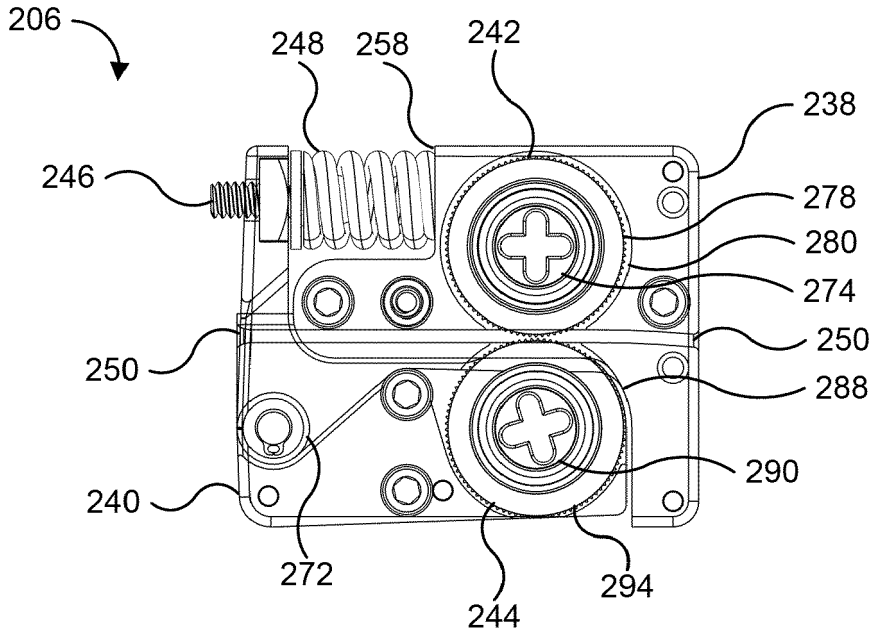
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FIG. 7

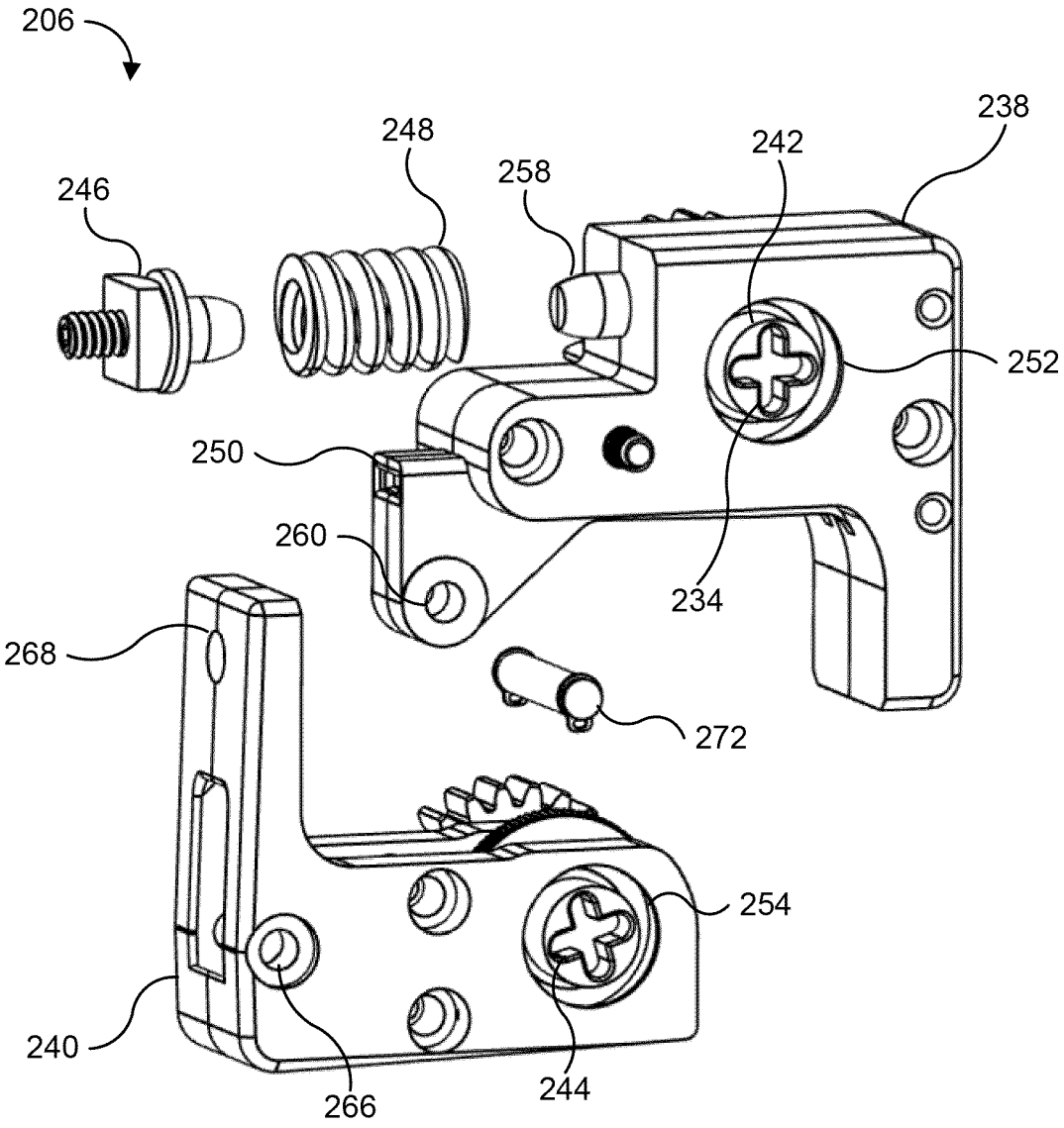

FIG. 8

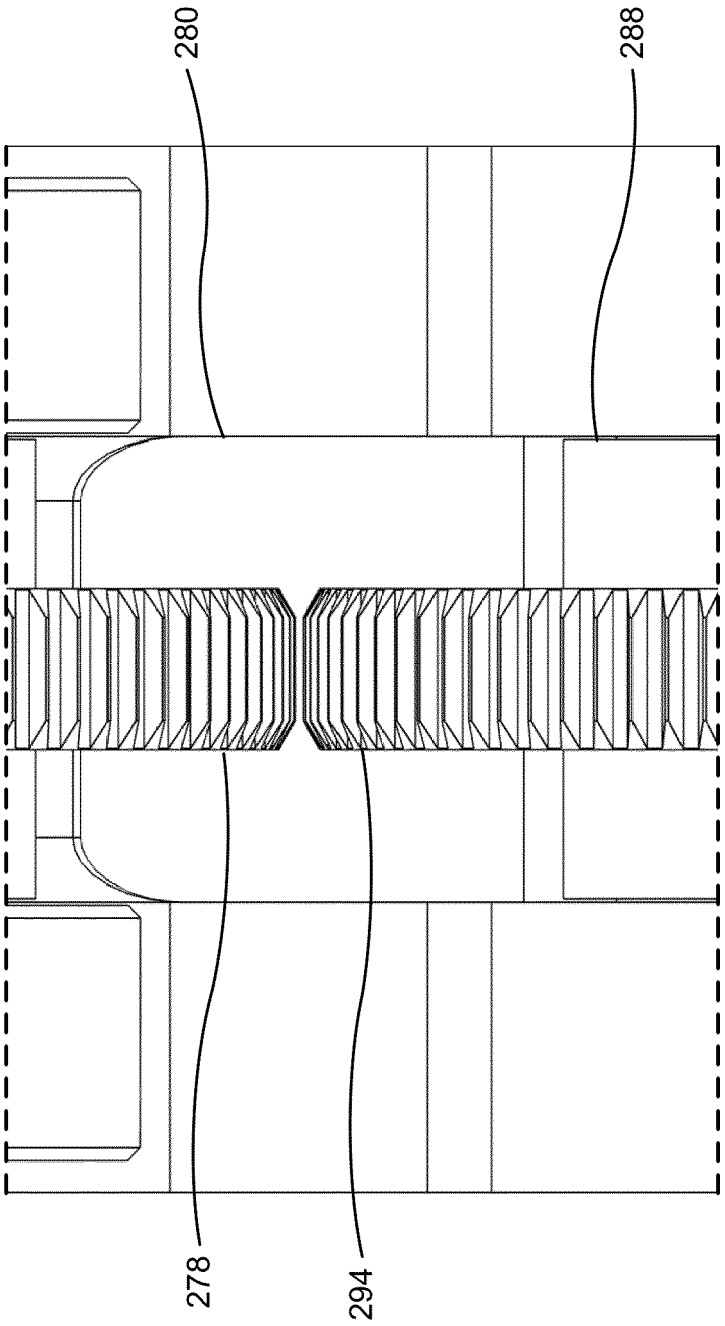

FIG. 9

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EUROPEAN SEARCH REPORT

Application Number
EP 23 18 5764

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B65B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	26 January 2024	Klinger, Thierry

CATEGORY OF CITED DOCUMENTS

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