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(54) **A ROLLER POSITIONING DEVICE**

(57) A roller positioning device (250) for a materials processing apparatus (10) such as a roll crusher having at least one roller (40,50) supported on a roller shaft (41,51) between bearings (200,210,220,230), the roller positioning device (250) comprising a worm drive (290) made up of a worm gear (300) and a worm screw (310) engageable with the worm gear (300) and the worm gear (300) being mountable on a roller shaft (41,51), and a worm drive actuator (320) for operating the worm drive

(290) wherein the worm screw (310) is movable by the worm drive actuator (320) between a first roller engaged position in which the worm screw (310) is engaged with the worm gear (300) to rotationally fix the position of the roller (40,50) and optionally effect axial rotation of the roller (40,50) into a desired position and a second roller disengaged position in which the worm screw (310) is disengaged from the worm gear (300).

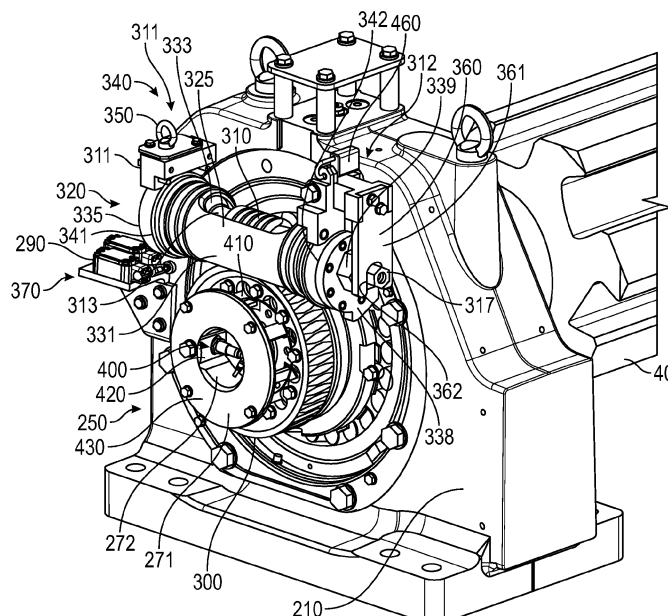


FIG. 3

Description

Field of Invention

[0001] This invention generally relates to a roller positioning device for a materials processing apparatus having a rotor/roller such as crushers including roll crushers, impact crushers and jaw crushers, mills, impactors and the like. The invention also relates to a roll crusher comprising the roller positioning device.

Background to the Invention

[0002] Materials processing apparatus such as crushers, mills, impactors and the like frequently employ rollers/rotors to process the materials and the rollers/rotors must be regularly adjusted by rotating the rollers/rotors and/or secured in position e.g. to facilitate access to the materials processing chambers and the like in which the rollers/rotors are mounted or for apparatus maintenance purposes.

[0003] For example, roll crushers are widely used for crushing bulk materials such as rock, ores and coal and are generally formed from pairs of counter-rotating crusher rollers mounted between bearings at a crushing chamber with the crushing chamber and crusher rollers being mounted on a chassis. The crusher rollers are provided with teeth and/or segments between which bulk material fed into the crushing chamber is crushed. In general, one of the pair of crusher rollers is movable to calibrate the roll crusher and to allow large bulk material to be passed between the crusher rollers. In other examples, roll crushers, sizers and the like can have single, three or other numbers of rollers as required.

[0004] In order to positionally rotate and secure the roll crusher rollers, one of two known roller positioning devices is generally employed. In one method, a gearwheel or a chain is attached to a V-belt pulley of the roll crusher drive and a separate reducer/gearbox is coupled to the gearwheel/chain to rotate the rotor. The position of the roller is then secured by a pin which is inserted into the reducer/gearbox. Alternatively, a separate reducer/gearbox is attached to the non-drive end of the roller and is coupled to a gearwheel which is fixed on the roller.

[0005] However, for the enhanced safety of operatives, a need exists for a roller positioning device that can effect rotation of a roller and more completely lock the roller in place against movement compared with known devices.

[0006] An object of the invention is overcome at least some of the problems of the prior art.

Summary of the Invention

[0007] According to the invention there is provided a roller positioning device for a materials processing apparatus having at least one roller supported on a roller shaft between bearings, the roller positioning device comprising:

a worm drive made up of a worm gear and a worm screw engageable with the worm gear and the worm gear being mountable on a roller shaft, and a worm drive actuator for operating the worm drive wherein the worm screw is movable by the worm drive actuator between a first roller engaged position in which the worm screw is engaged with the worm gear to rotationally fix the position of the roller and optionally effect axial rotation of the roller into a desired position and a second roller disengaged position in which the worm screw is disengaged from the worm gear. The worm drive provides effective fixing or locking in place of the roller to allow safe access to rollers and chambers containing the rollers for maintenance purpose. The worm gear and worm screw also exhibit a self-locking relationship whereby the worm drive does not move without external input thereby preventing undesired movement of the worm drive and roller. The worm drive also exhibits a desirable ratio so that a reduced input torque is required.

[0008] In one embodiment, the worm drive actuator comprises a translationally movable worm drive actuator to effect translational movement of the worm screw between the first roller engaged position and the second roller disengaged position. Translational movement of the worm drive actuator is easily implemented in the roller positioning device.

[0009] In another embodiment, the worm drive actuator comprises an eccentrically movable worm drive actuator to effect eccentric movement of the worm screw between the first roller engaged position and the second roller disengaged position. Eccentric movement of the worm drive actuator can be easily performed with minimal spatial requirements.

[0010] Preferably, the eccentrically movable worm drive actuator comprises an eccentric bush for receiving the worm screw. The eccentric bush allows for ease of movement between the roller engaged and roller disengaged positions.

[0011] In any embodiment, the roller positioning device further comprises a worm drive actuator position sensor to detect the position of the worm drive actuator. The worm drive actuator position sensor indicates the status of the roller positioning device to an operator.

[0012] Suitably, the worm drive actuator position sensor comprises an eccentric bush position switch communicable with a crusher motor. The eccentric bush position switch is movable in response to the rotational position of the eccentric bush.

[0013] In one embodiment, the roller positioning device further comprises an eccentric bush lock to lock the eccentric bush in the first roller engaged position and/or the second roller disengaged position. The eccentric bush lock prevents undesired movement of the eccentric bush.

[0014] Preferably, the eccentric bush lock comprises a locking pin insertable through the eccentric bush in the

first roller engaged position and the second roller disengaged position. The locking pin is a simple device that effectively prevents eccentric bush movement.

[0015] In one embodiment, the roller positioning device further comprises an eccentric bush lock position sensor to detect the eccentric bush lock in the first roller engaged position and/or the second roller disengaged position. The eccentric bush lock position sensor serves to indicate whether the roll crusher is safe to operate.

[0016] Preferably, the eccentric bush lock position sensor comprises a locking pin position switch communicable with a control system to permit access to a materials processing apparatus. The locking pin position switch is movable in response to the position of the locking pin.

[0017] In one embodiment, the roller positioning device further comprises a worm screw lock to lock the worm screw in the first roller engaged position or the second roller disengaged position. The worm screw lock prevents undesired movement of the worm screw.

[0018] Suitably, the worm screw lock comprises a lockable lever. The lockable lever can be easily moved between a locked and unlocked position.

[0019] In any embodiment, the roller positioning device is housed in a bearing mountable housing. The bearing mountable housing allows the roller positioning device to be mounted on the bearings of new materials processing apparatus such as roll crushers or to be retrofitted to existing materials processing apparatus.

[0020] In one embodiment, the roller positioning device further comprises a roller speed sensor assembly recessed in the housing. By recessing the speed sensor assembly in the housing of the roller positioning device at the bearing, the overall dimensions of the materials processing apparatus are not significantly increased by the addition of the roller positioning device to the materials processing apparatus.

[0021] In another embodiment, the invention also extends to a roll crusher comprising a roller positioning device as hereinbefore defined.

Brief Description of the Drawings

[0022] The invention will now be described, by way of example only, with reference to the accompanying drawings in which:

Figure 1 is a perspective view from above of a roll crusher for bulk materials in provided with a roller positioning device on both the fixed roller and movable roller of the roll crusher in accordance with the invention;

Figure 2 is an enlarged perspective view from above and one side of the roller positioning device of Figure 1 on the fixed roller;

Figure 3 is a perspective view from above and one side of the roller positioning device of Figure 2 with

the housing of the roller positioning device removed to show a worm drive and a worm drive actuator for operating the worm drive of the roller positioning device;

Figure 4 is a cross-sectional view through the roller positioning device to show the worm screw of the worm drive eccentrically located within an eccentric bush of the worm drive actuator;

Figure 5 is an enlarged perspective view from above and one side of the eccentric bush, eccentric bush lock (in partial view), worm screw, worm screw lock and associated worm gear of the roller positioning device at a roller with the eccentric bush of the worm drive actuator and the worm screw in the roller disengaged position;

Figure 6 is an enlarged perspective view from above and one side of the worm drive actuator position sensor of the roller positioning device of Figure 5;

Figure 7 is a perspective view of the eccentric bush, worm screw and associated worm gear and roller of Figure 5 with the eccentric bush locking pin being removed from the eccentric bush lock and the lockable lever of the worm screw lock in the open position to allow movement of the worm screw into the roller engaged position;

Figure 8 is a perspective view of the eccentric bush, worm screw and associated worm gear and roller of Figure 7 with the eccentric bush being rotated by 180° with a spanner to engage the worm screw with the worm gear in the roller engaged position;

Figure 9 is an enlarged perspective view from above and one side of an eccentric bush position switch of a worm drive actuator position sensor being activated by contact with the eccentric bush during the rotation;

Figure 10 is a perspective view of the eccentric bush, worm screw and associated worm gear and roller of Figure 7 with the eccentric bush fully rotated by 180° so that the worm screw is fully engaged with the worm gear in the roller engaged position and the eccentric bush locking pin is reinserted in the eccentric bush lock;

Figure 11 is an enlarged perspective view from above and one side of the eccentric bush position switch and an eccentric bush lock position sensor of the roller positioning device of Figure 10;

Figure 12 is a perspective view from above and one side of the roller positioning device of Figure 10 with the worm screw being rotated by a tool in the form

of a cordless screw driver to axially rotate the worm screw and effect rotation of the roller shaft and roller into a desired position, and

Figure 13 is a perspective view of the roller positioning device of Figure 12 with the roller in a desired position and the lockable lever of the worm screw lock in the lockable position.

Detailed Description of the Invention

[0023] Figure 1 shows a materials processing apparatus of the invention in the form of a roll crusher 10 having a chassis 20, a crusher chamber 30 mounted on the chassis 20 provided with a fixed roller 40 and a complementary movable roller 50 between which bulk materials can be crushed. The rollers 40,50 are rotated by respective drive trains 60,70 powered by motors 80,90 driven by respective drive belts 100,110. The drive belt 100 extends between a drive wheel 120 and a driven wheel 130 and the drive belt 110 extends between a drive wheel 140 and a driven wheel 150. The crusher chamber 30 is defined by first and second crusher chamber sidewalls 160,170, a front wall 180 and a rear wall 190. The fixed roller 40 is provided with a fixed roller shaft 41 which extends between first and second fixed roller bearings 200,210 at the crusher chamber sidewalls 160,170 and is coupled at a drive end 42 to the driven wheel 130 to effect rotation of the fixed roller shaft 41 and the roller 40. Similarly, the movable roller 50 is provided with a movable roller shaft 51 which extends between first and second movable roller bearings 220,230 at the crusher chamber sidewalls 160,170 and is coupled at a drive end 52 to the driven wheel 150 to effect rotation of the movable roller shaft 51 and the movable roller 50. In the present embodiment, the fixed roller 40 and the movable roller 50 are both provided with a roller positioning device 250 of the invention at the fixed roller bearing 210 and the movable roller bearing 220 respectively. However, in Figures 2 to 13, the roller positioning device 250 will be described in relation to the fixed roller 40 only but, as will be appreciated by those skilled in the art, the movable roller 50 can be positioned by the roller positioning device 250 in an analogous manner to the fixed roller 40. In other embodiments of the invention, if desired, only one of the fixed and movable rollers 40,50 is provided with a roller positioning device 250. As shall be explained more fully below, the roller positioning device 250 is configured to engage with a shaft non-driven end 43 of the fixed roller shaft 41 to rotationally fix the position of the fixed roller 40 and optionally effect axial rotation of the fixed roller 40 into a desired position.

[0024] Figures 2 and 3 show enlarged perspective views from above and one side of the roller positioning device 250 of Figure 1 fitted to the fixed roller 40. As shown in the drawings, the roller positioning device 250 is located at the shaft non-driven end 43 of the shaft 41 of the fixed roller 40 and is provided with a removable

outer housing 260 mounted on the fixed roller bearing 210 with housing fixings 270 such as bolts and the like. The housing 260 is provided with a removable speed sensor front panel 271 to provide access to a recessed speed sensor receiving chamber 272 in the housing 260 via a speed sensor opening 280 defined in the housing 260 (this shall be explained more fully below).

[0025] The roller positioning device 250 is made up of a worm drive 290 having a worm gear 300 mounted on the non-driven shaft end 43 of the fixed roller shaft 41 and a complementary worm screw 310 (see Figure 3) horizontally mounted on the bearing 210 between roller positioning device mountings 311,312. More particularly, the worm screw 310 has a shaft 313 rotatably supported between worm screw openings 315,316 defined in the housing 260. The worm screw shaft 313 has a tooled end 317 for mating with a tool to effect rotation of the worm screw 310 in the roller positioning device mountings 311,312.

[0026] The worm screw 310 is movable by a worm drive actuator 320 into engagement with the complementary worm gear 300 to define the first roller engaged position. The worm drive actuator 320 can also disengage the worm screw 310 from the worm gear 300 into the second roller disengaged position. In the present embodiment, the worm drive actuator 320 is an eccentric worm drive actuator 325. However, in other embodiments of the invention the worm drive actuator 320 can be a translationally movable worm drive actuator 320.

[0027] The eccentric movable worm drive actuator 325 is provided with a worm drive actuator lock 340 for locking the worm drive actuator 325 in the first roller engaged position and/or the second roller disengaged position and a worm screw lock 360 for securing the worm screw 310 in the first roller engaged position or the second roller disengaged position by preventing access to the worm screw 310. Figure 4 shows a cross-sectional view through the roller positioning device 250 to more clearly show the worm screw 310 of the worm drive 290 being eccentrically positioned within the eccentric worm drive actuator 325.

[0028] As shown in the drawings, the eccentric movable worm drive actuator 325 is made up of an eccentric bush 330 having generally open ended cylindrical body 331 defining a passage 332 for receiving the worm screw 310. The cylindrical body 331 has a cutaway portion 333 for exposing the worm screw 310 to the worm gear 300 in the roller engaged position. The eccentric bush 330 is horizontally and rotatably supported in the roller positioning device mountings 311,312 so that the eccentric bush 330 can be rotated through an angle of from about 90° to about 270° and preferably by about 180° in the roller positioning device mountings 311,312.

[0029] The eccentric bush 330 together with the worm screw 310 and in particular the worm screw shaft 313 are supported in the housing 260 so that the housing 260 cannot be removed from the fixed roller bearing 210 without also dismounting the eccentric bush 330 and the

worm screw 310.

[0030] The worm screw 310 is eccentrically positioned off-centre within the passage 332 of the cylindrical body 331 (see also Figure 4) which is also provided with a roller positioning device encoder disc 335 at its first end 341 and an eccentric bush end cap 338 at its opposite second end 342. The end cap 338 is provided with a hexagonal tool engageable head 339 for mating with a tool to effect axial rotation of the eccentric bush 330 in the roller positioning device mountings 311,312. In the present embodiment, the eccentric bush 330 can be rotated through 180° in the roller positioning device mountings 311,312 via the tool engageable head 339. Access to and movement of the tool engageable head 339 is restricted by co-operating faces of an adjacent worm screw lock 360 discussed further below and the housing 260. In particular, a lever 361 of the worm screw lock 360 limits access to the tool engageable head 339. As indicated above, in other embodiments, the eccentric bush 330 can be rotated through an angle of from about 90° to about 270°.

[0031] As indicated above, the roller positioning device 250 is also provided with a worm drive actuator lock 340 for locking the eccentric worm drive actuator 325 in the first roller engaged position and/or the second roller disengaged position. In the present embodiment, the worm drive actuator lock 340 is an eccentric bush lock 340 made up of an eccentric bush locking pin or bolt 350 insertable through either a first substantially vertical bore 351 (see also Figure 7) defined in the roller positioning device mounting 311 corresponding with the first roller engaged position or a second substantially vertical bore 352 (see also Figure 7) corresponding with the second roller disengaged position. The locking pin 350 also serves to prevent undesired movement of the eccentric bush 330 in use. The encoder disc 335 on the cylindrical body 331 of the eccentric bush 330 is provided with a complementary bore (not shown) which is contiguous with the first and second vertical bores 351,352 in first roller engaged and second roller disengaged positions.

[0032] Furthermore, as indicated above, the roller positioning device 250 is provided with a worm screw lock 360 for securing the worm screw 310 as required and for preventing access to the tooled end 317 of the worm screw shaft 313 and the hexagonal tool engageable head 339 for effecting axial rotation of the eccentric bush 330. The worm screw lock 360 is made up of a generally L-shaped lever 361 which can be locked in position over the tooled end 317 of the worm screw shaft 313 to prevent access to and tool engagement with the tooled end 317 and the tool engageable head 339. More particularly, the L-shaped lever 361 is mounted on the bearing 210 so that the lever 361 is pivotable between an open position in which the tooled end 317 of the worm screw shaft 313 and the tool engageable head 339 are both accessible and a locked position in which the tooled end 317 is received in a notch 362 in the lever 361 and access to the tooled end 317 and the tool engageable head 339 is pre-

vented.

[0033] As indicated above, the housing 260 is also provided with a removable speed sensor front panel 271 to provide access to a recessed speed sensor receiving chamber 272 in the housing 260 via the speed sensor opening 280. The speed sensor receiving chamber 272 contains a speed sensor assembly 400 for detecting roller speed made up of a speed sensor encoder ring 410 and a speed sensor 420. By recessing the speed sensor assembly 400 in the housing 260 of the roller positioning device 250 at the bearing 200, the overall width of the roll crusher 10 from bearing 200 to bearing 210 is not significantly increased by the addition of the roller positioning device 250 to the roll crusher 10. Accordingly, the use of the roller positioning device 250 in a crusher 10 does not negatively impact on the size and configuration requirements of the crusher 10. As a result, the roller positioning device 250 is also particularly suitable for retrofitting to existing roll crushers 10.

[0034] The operation of the roller positioning device 250 is described in Figures 5 to 13.

[0035] Figures 5 and 6 show the roller positioning device 250 with the eccentric bush 330 of the worm drive actuator 320 in the second roller disengaged position so that the worm screw 310 is disengaged from the worm gear 300. As a result, the fixed roller 40 can be rotated normally by the motor 80 and is not rotationally fixed by the roller positioning device 250. The eccentric bush 330 is locked in the second roller disengaged position by the eccentric bush locking pin 350 which is inserted through the second substantially vertical bore 352 of the roller positioning device mounting 311 and the complementary bore of the eccentric bush 330 which is aligned and contiguous with the first substantially vertical bore 352 in this position. In addition, access to the tooled end 317 of the worm screw shaft 313 is prevented by the worm screw lock 360.

[0036] The second roller disengaged position of the eccentrically movable worm drive actuator 325 can be detected by an optional worm drive actuator position sensor 370 which is communicable with a control system to indicate the status of the roller positioning device 250 to an operator. In the present embodiment, the worm drive actuator position sensor 370 is an eccentric bush position switch 380 disposed beneath the eccentric bush 330. More particularly, the eccentric bush position switch 380 is mounted beneath the encoder disc 335 of the cylindrical body 331 which is shaped and contoured to define a laterally extending ramped or stepped rim 343 in which a ramp 344 abuts and moves the eccentric bush position switch during 180° rotation of the eccentric bush 330. As shown in Figure 6, in the roller disengaged position the ramped rim 343 is not in contact with the eccentric bush position switch 380 and this status is communicated to a control system.

[0037] The location/position of the eccentric bush locking pin 350 can also be sensed by an eccentric bush lock position sensor 390 also disposed beneath the eccentric

bush 330 adjacent the eccentric bush position switch 380. In the present embodiment, the eccentric bush lock position sensor 390 is a locking pin position switch 395 which is not displaced by the eccentric bush locking pin 350 when inserted through the second substantially vertical bore 352 of the roller positioning device mounting 311 and the complementary bore of the eccentric bush 330 as shown in Figure 6. This status is also communicated to the control system to indicate that the roll crusher 10 is safe to operate.

[0038] As shown in Figure 7, in order to move from the roller disengaged position of Figures 5 and 6 to the roller engaged position, the lever 361 of the worm screw lock 360 is pivoted from the locked position of Figures 5 and 6 to the open position to allow access to the tooled end 317 of the worm screw shaft 313 and the hexagonal tool engageable head 339 of the eccentric bush 330. In addition, the eccentric bush locking pin 350 is removed from the second vertical bore 352 in the mounting 311 to allow rotation of the eccentric bush 330.

[0039] As shown in Figure 8, the eccentric bush 330 is then rotated by 180° into the roller engaged position by engaging the tool engageable head 339 of the eccentric bush 330 with a spanner 440 (or other suitable tool). Upon commencement of rotation of the eccentric bush 330, the ramp 344 abuts and moves the eccentric bush position switch 380 (see Figure 9). Movement of the position switch 380 is communicated to the control system to prevent unintentional switch-on of the crusher motors 80,90.

[0040] The locking pin 360 is then reinserted into the mounting 311 through the first vertical bore 351 and the complementary bore of the eccentric bush 330 which is contiguous with the first vertical bore 351 in the roller engaged position (see Figure 10). The eccentric bush 330 is therefore secured against rotation.

[0041] As shown in Figure 11, the reinserted locking pin 360 contacts and displaces the locking pin position switch 395 when inserted through the first substantially vertical bore 351 of the roller positioning device mounting 311 and the complementary bore of the eccentric bush 330. This status is also communicated to the control system which allows access to the crusher chamber 30 e.g. by triggering the release of a transfer key to open inspection/maintenance doors to the crusher chamber 30 i.e. the locking pin position switch 395 gives a signal to the control system which provides a key of a "key-transfer-system", which is needed to open inspection/maintenance doors in the crusher housing for access to the crusher chamber. The worm screw 310 can then be rotated into a desired position by an operative by engaging the tooled end 317 of the worm screw shaft 313 with a suitable tool such as the power tool 450 shown in Figure 12.

[0042] As shown in Figure 13, the lever 361 of the worm screw lock 360 is then pivoted into the locked position to prevent further access to the tooled end 317 of the worm screw shaft 313 and further undesired/unauthorised ro-

tation of the worm screw 310. If desired a padlock (not shown) can be secured to the lever 361 at a padlock mounting 460 to prevent unauthorised access to the roller positioning device 250 (see also Figures 2 and 3). For example, the padlock can be a personal padlock of a service engineer so that only the service engineer can operate the roller positioning device 250 of the invention.

[0043] In the above description, the roller positioning device 250 is described in relation to a materials processing apparatus in the form of a roll crusher 10. However, as will be appreciated by those skilled in the art, the roller positioning device 250 is for use with any materials processing apparatus having a rotor/roller such as crushers including roll crushers, impact crushers and jaw crushers, mills, sizers, impactors and the like.

[0044] The roller positioning device 250 is described as being manually operable. However, as will be appreciated by those skilled in the art, in an alternative embodiment of the invention, operation of the roller positioning device 250 can be automated.

Claims

1. A roller positioning device (250) for a materials processing apparatus (10) having at least one roller (40,50) supported on a roller shaft (41,51) between bearings (200,210,220,230), the roller positioning device (250) comprising:

a worm drive (290) made up of a worm gear (300) and a worm screw (310) engageable with the worm gear (300) and the worm gear (300) being mountable on a roller shaft (41,51), and a worm drive actuator (320) for operating the worm drive (290) wherein the worm screw (310) is movable by the worm drive actuator (320) between a first roller engaged position in which the worm screw (310) is engaged with the worm gear (300) to rotationally fix the position of the roller (40,50) and optionally effect axial rotation of the roller (40,50) into a desired position and a second roller disengaged position in which the worm screw (310) is disengaged from the worm gear (300).

2. A roller positioning device (250) as claimed in Claim 1 wherein the worm drive actuator (320) comprises a translationally movable worm drive actuator (320) to effect translational movement of the worm screw (310) between the first roller engaged position and the second roller disengaged position.

3. A roller positioning device (250) as claimed in Claim 1 wherein the worm drive actuator (320) comprises an eccentrically movable worm drive actuator (325) to effect eccentric movement of the worm screw (310) between the first roller engaged position and

the second roller disengaged position.

4. A roller positioning device (250) as claimed in Claim 3 wherein the eccentrically movable worm drive actuator (320) comprises an eccentric bush (330) for receiving the worm screw (310). 5
5. A roller positioning device (250) as claimed in Claim 4 wherein the roller positioning device (250) further comprises a worm drive actuator position sensor (370) to detect the position of the worm drive actuator (320). 10
6. A roller positioning device (250) as claimed in Claim 5 wherein the worm drive actuator position sensor (370) comprises an eccentric bush position switch (380) communicable with a crusher motor. 15
7. A roller positioning device (250) as claimed in any of Claims 4 to 6 wherein the roller positioning device (250) further comprises an eccentric bush lock (340) to lock the eccentric bush (330) in the first roller engaged position and/or the second roller disengaged position. 20
8. A roller positioning device (250) as claimed in Claim 7 wherein the eccentric bush lock (340) comprises a locking pin (350) insertable through the eccentric bush (330) in the first roller engaged position and the second roller disengaged position. 25
9. A roller positioning device (250) as claimed in Claim 8 wherein the roller positioning device (250) further comprises an eccentric bush lock position sensor (390) to detect the eccentric bush lock (340) in the first roller engaged position and/or the second roller disengaged position. 30
10. A roller positioning device (250) as claimed in Claim 9 wherein the eccentric bush lock position sensor (390) comprises a locking pin position switch (395) communicable with a control system to permit access to a materials processing apparatus (10). 35
11. A roller positioning device (250) as claimed in any of Claims 4 to 10 wherein the roller positioning device (250) further comprises a worm screw lock (360) to lock the worm screw (310) in the first roller engaged position or the second roller disengaged position. 40
12. A roller positioning device (250) as claimed in Claim 11 wherein the worm screw lock (360) comprises a lockable lever (361). 45
13. A roller positioning device (250) as claimed in any of Claims 1 to 12 wherein the roller positioning device (250) is housed in a bearing mountable housing (260). 50
14. A roller positioning device (250) as claimed in Claim 13 further comprising a roller speed sensor assembly (400) recessed in the housing (260). 55
15. A roll crusher (10) comprising a roller positioning device (250) as claimed in any of Claims 1 to 14.

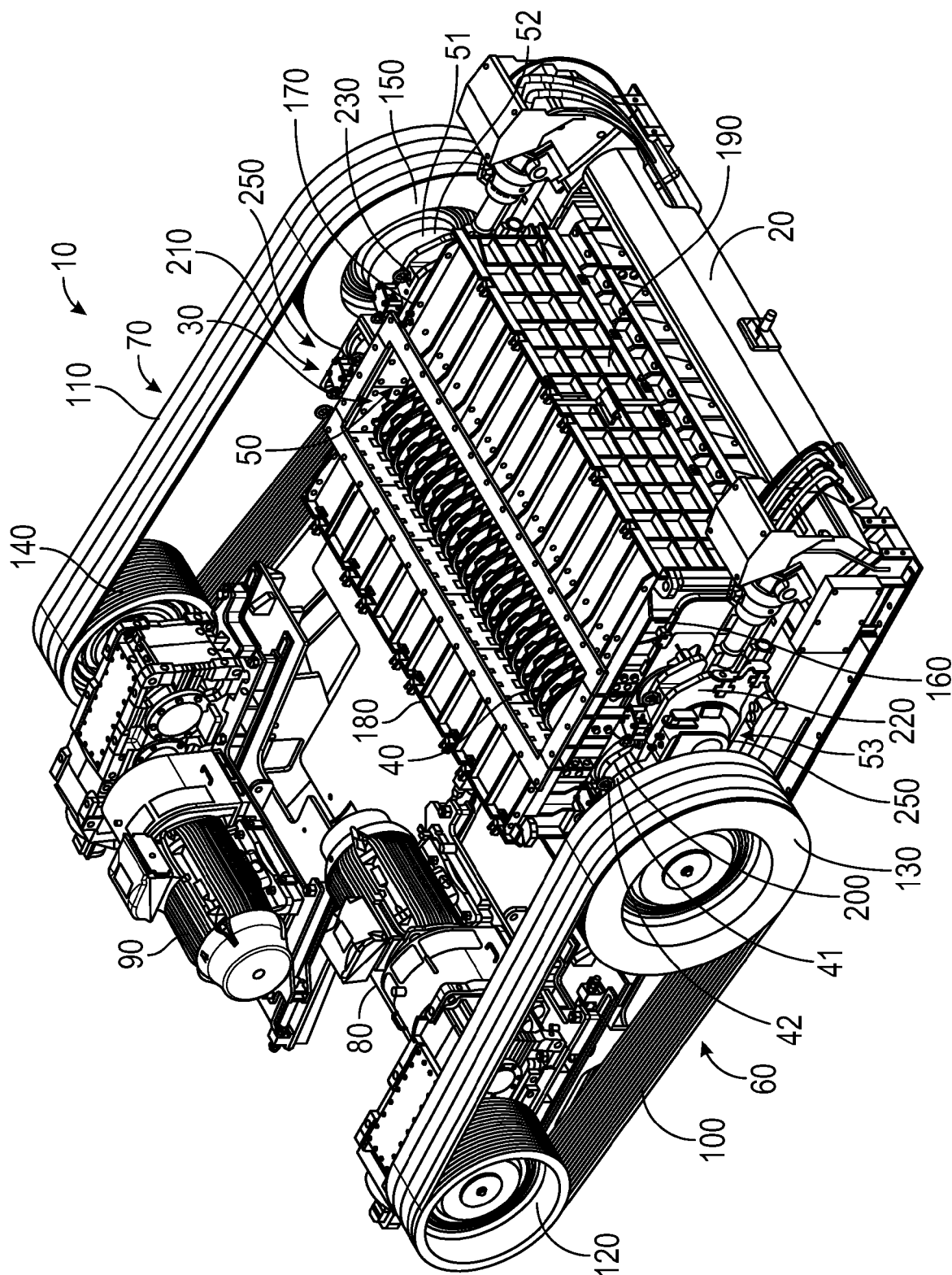


FIG. 1

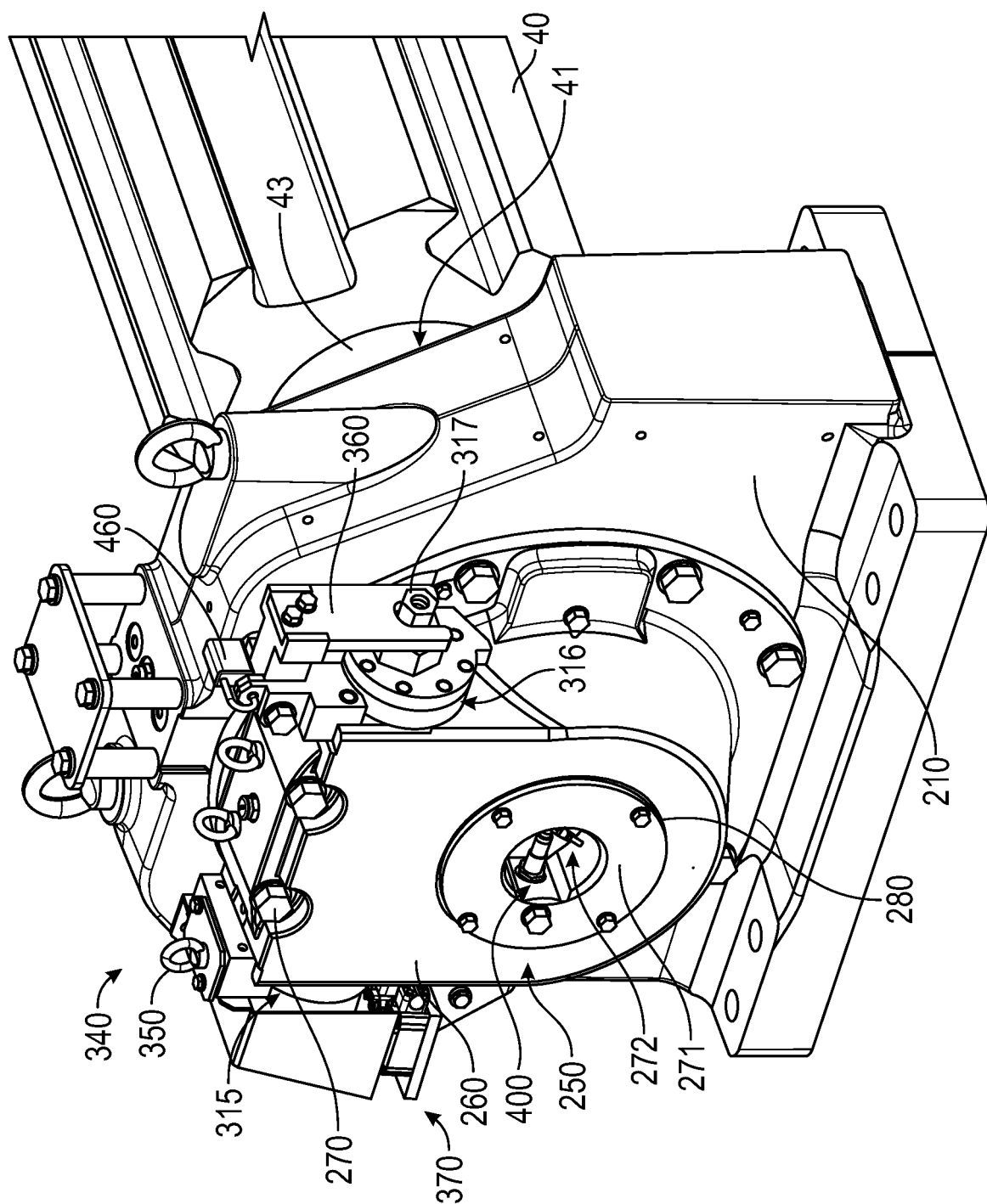


FIG. 2

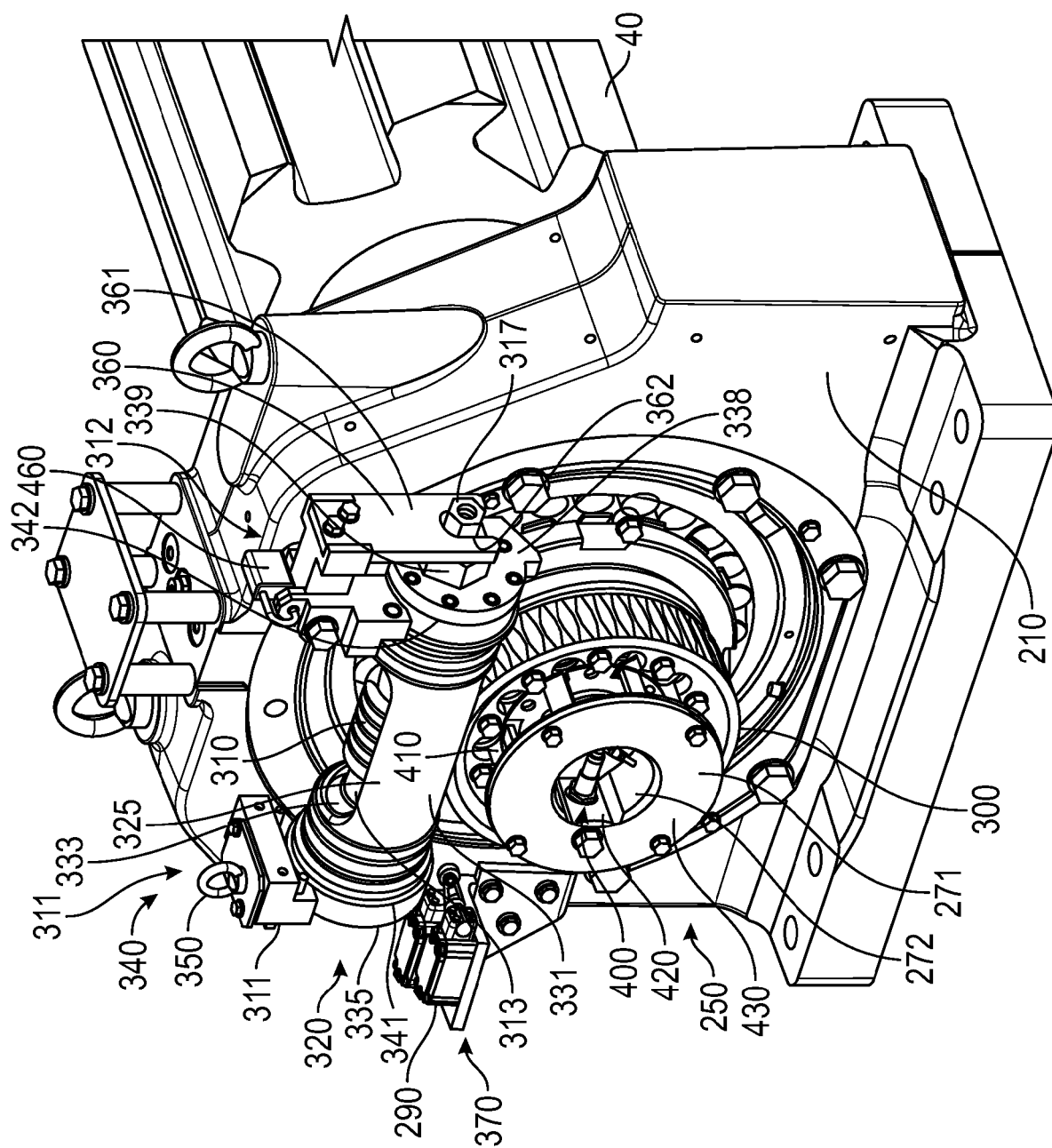


FIG. 3

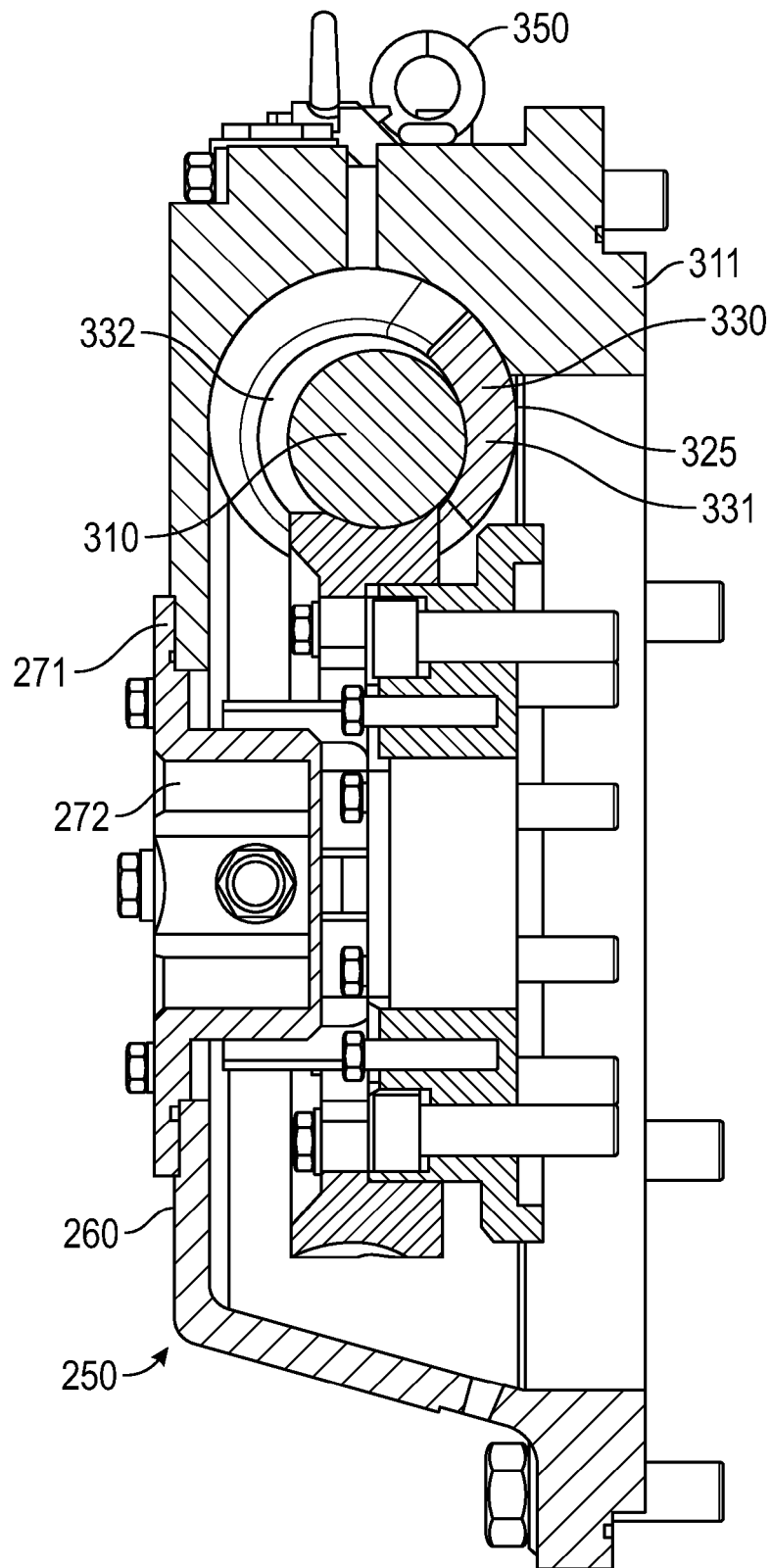


FIG. 4

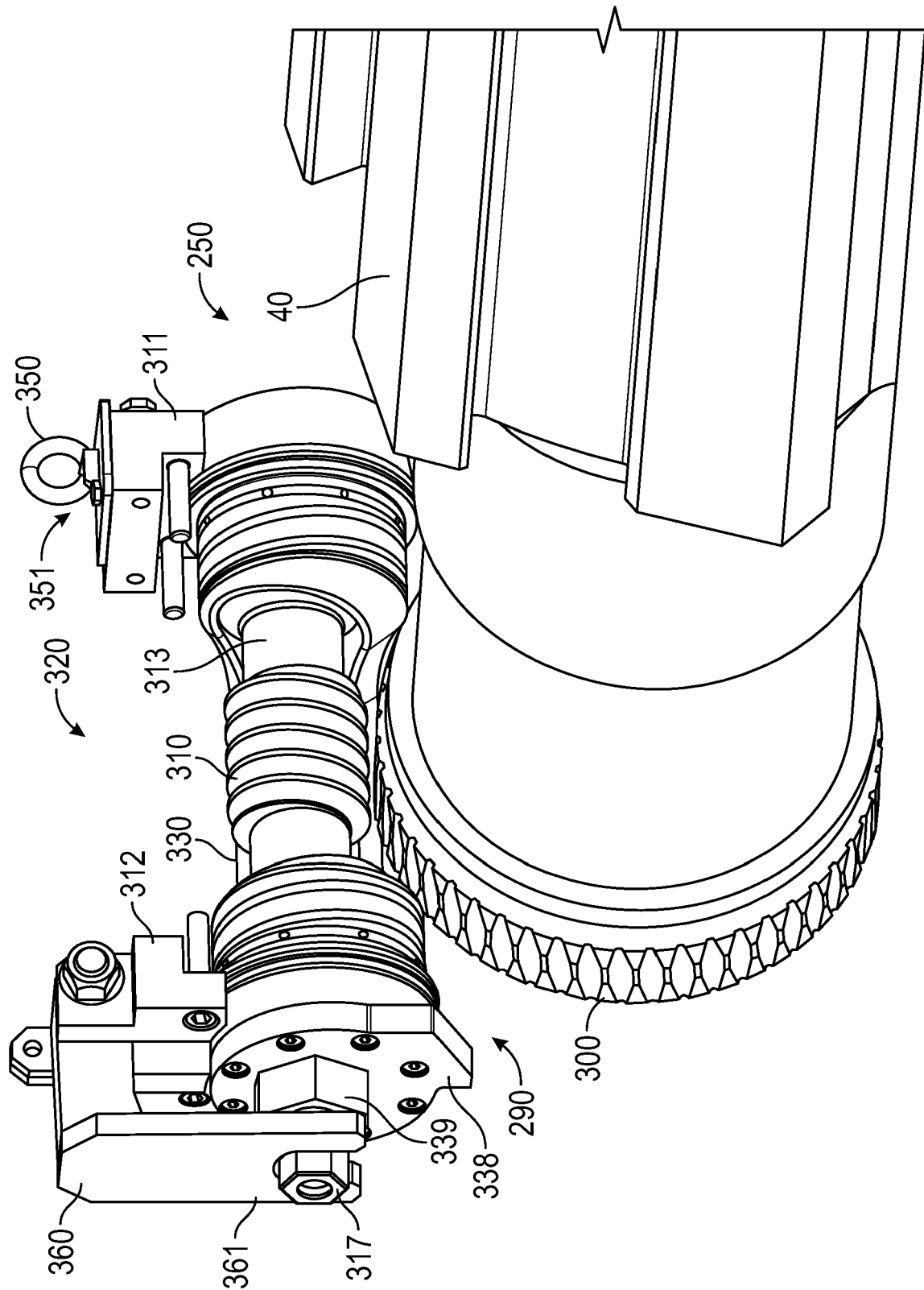


FIG. 5

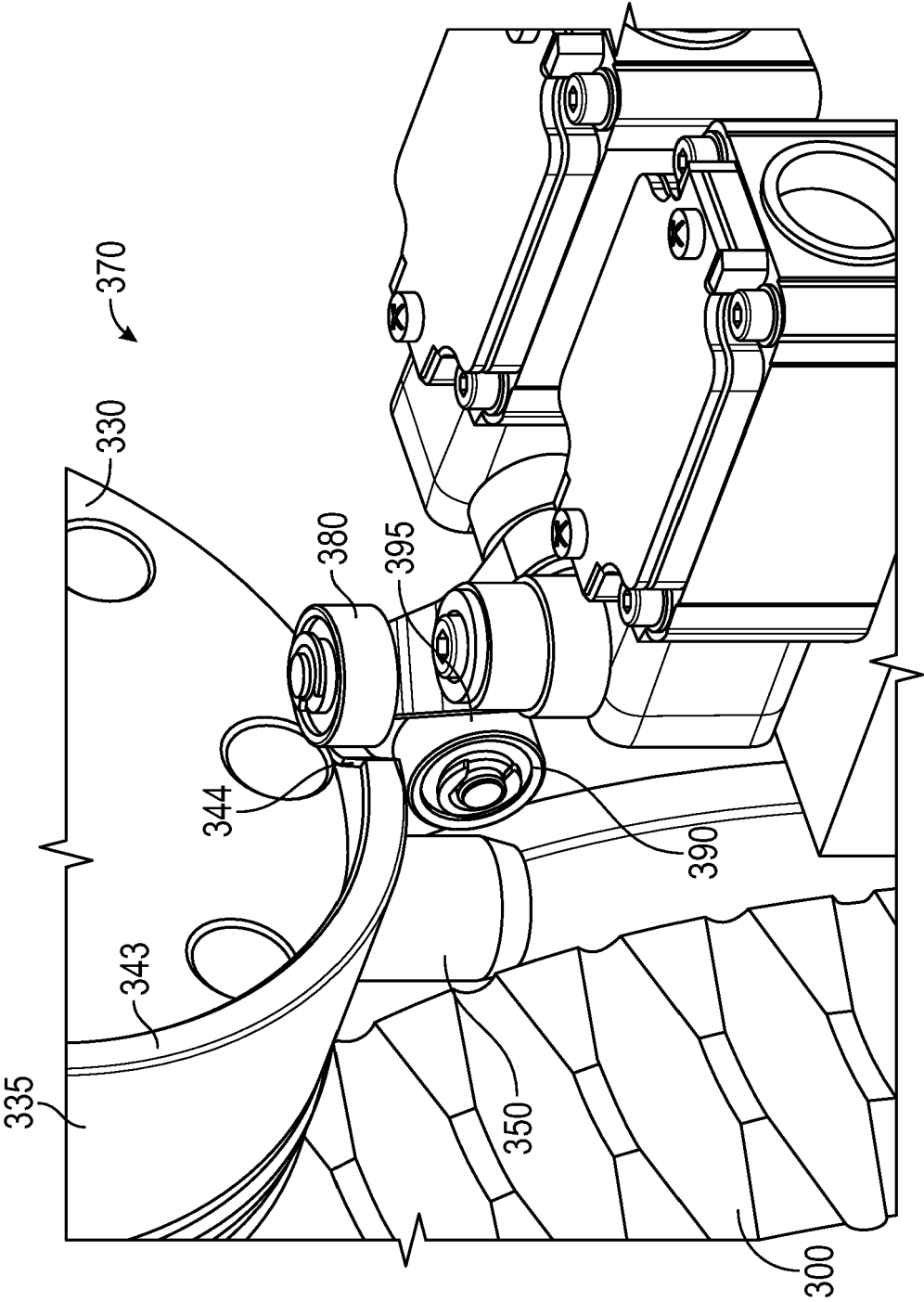


FIG. 6

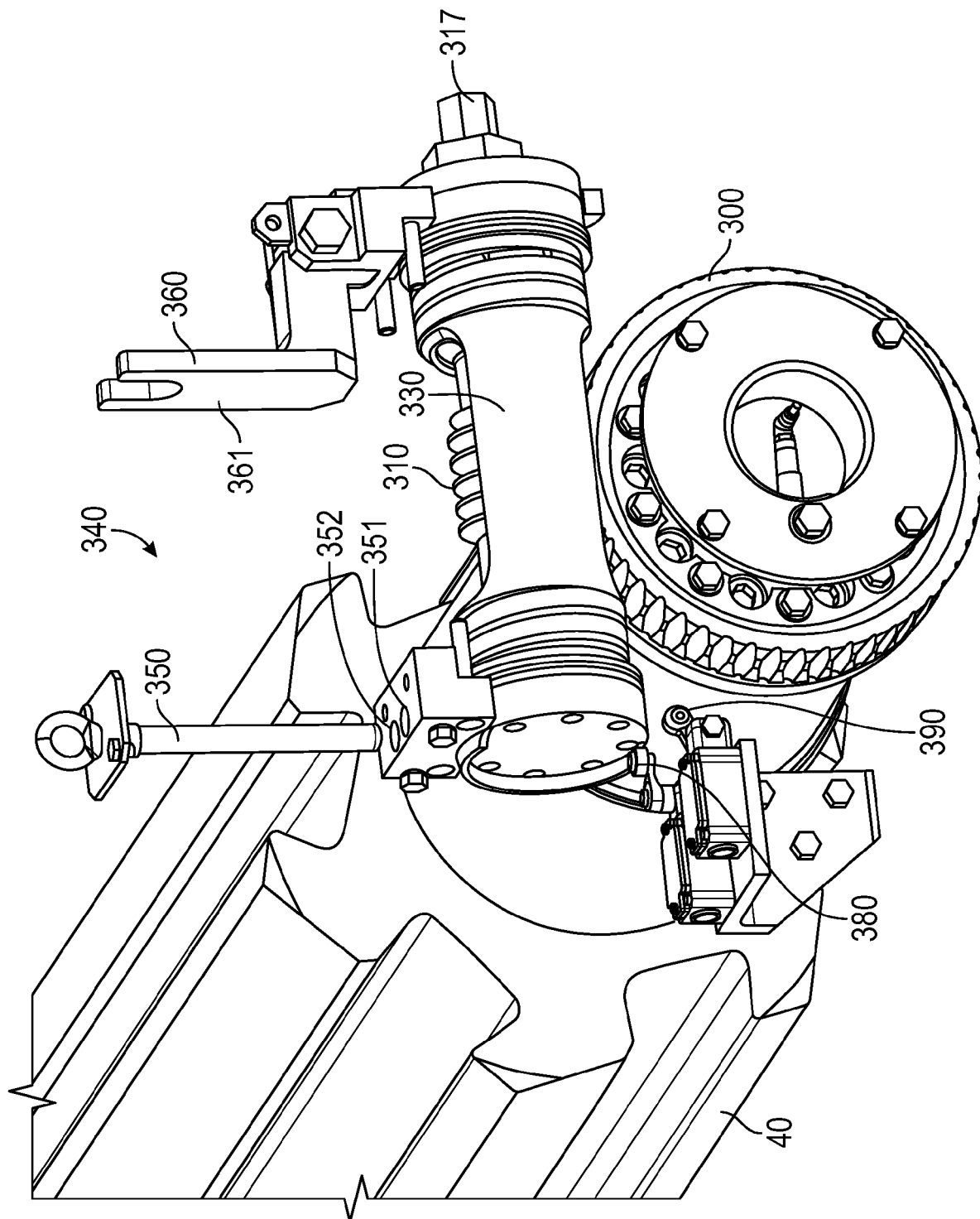


FIG. 7

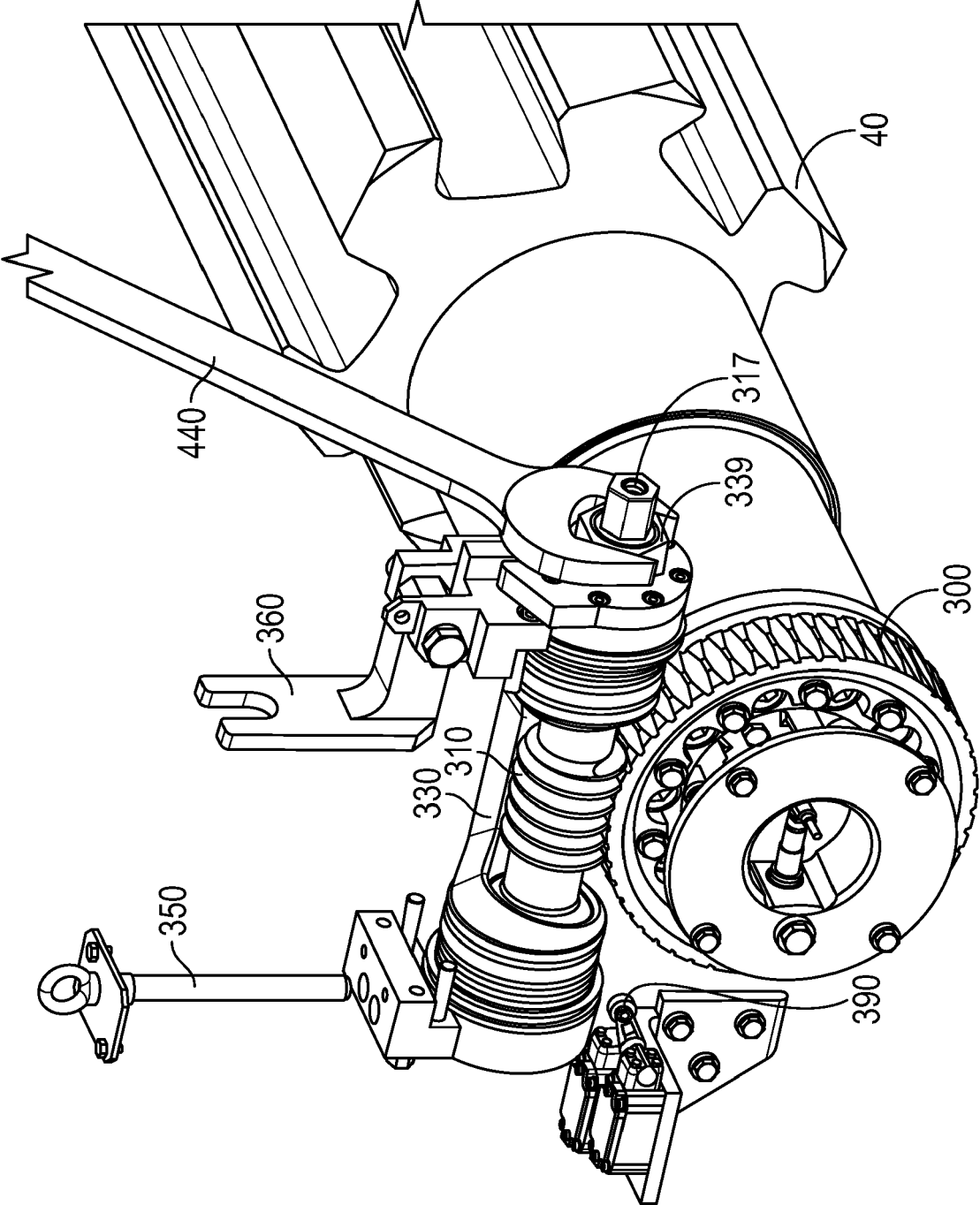


FIG. 8

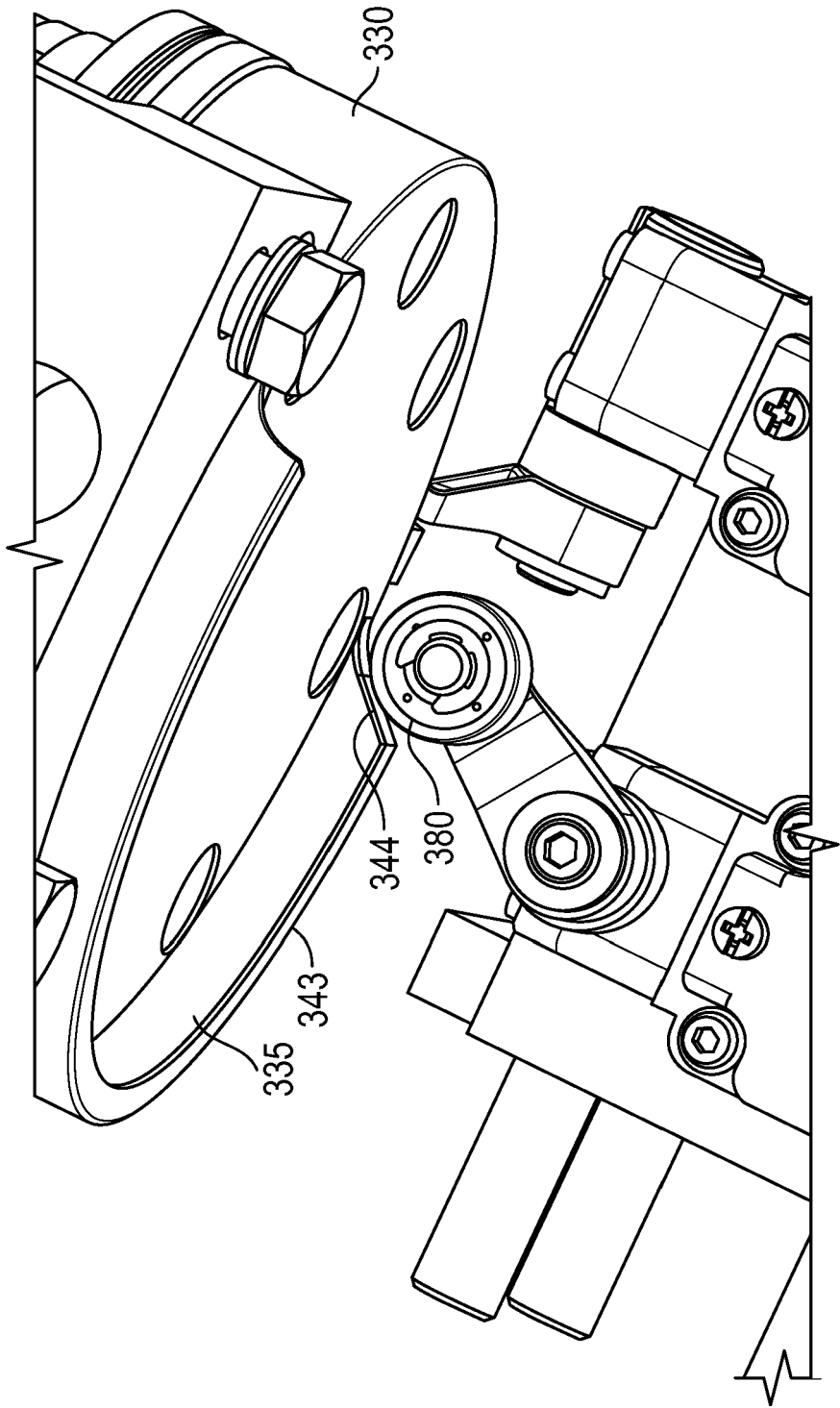


FIG. 9

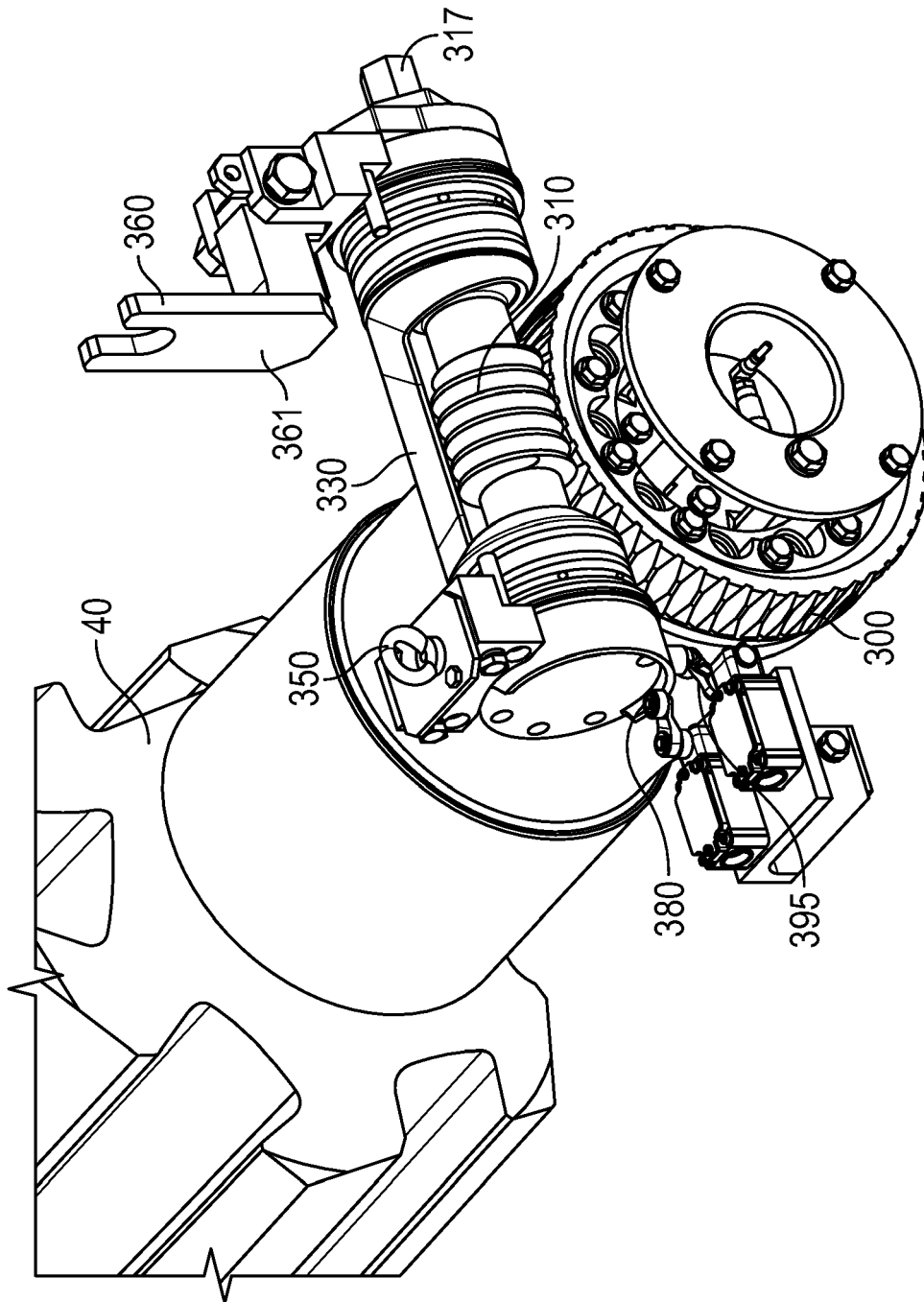


FIG. 10

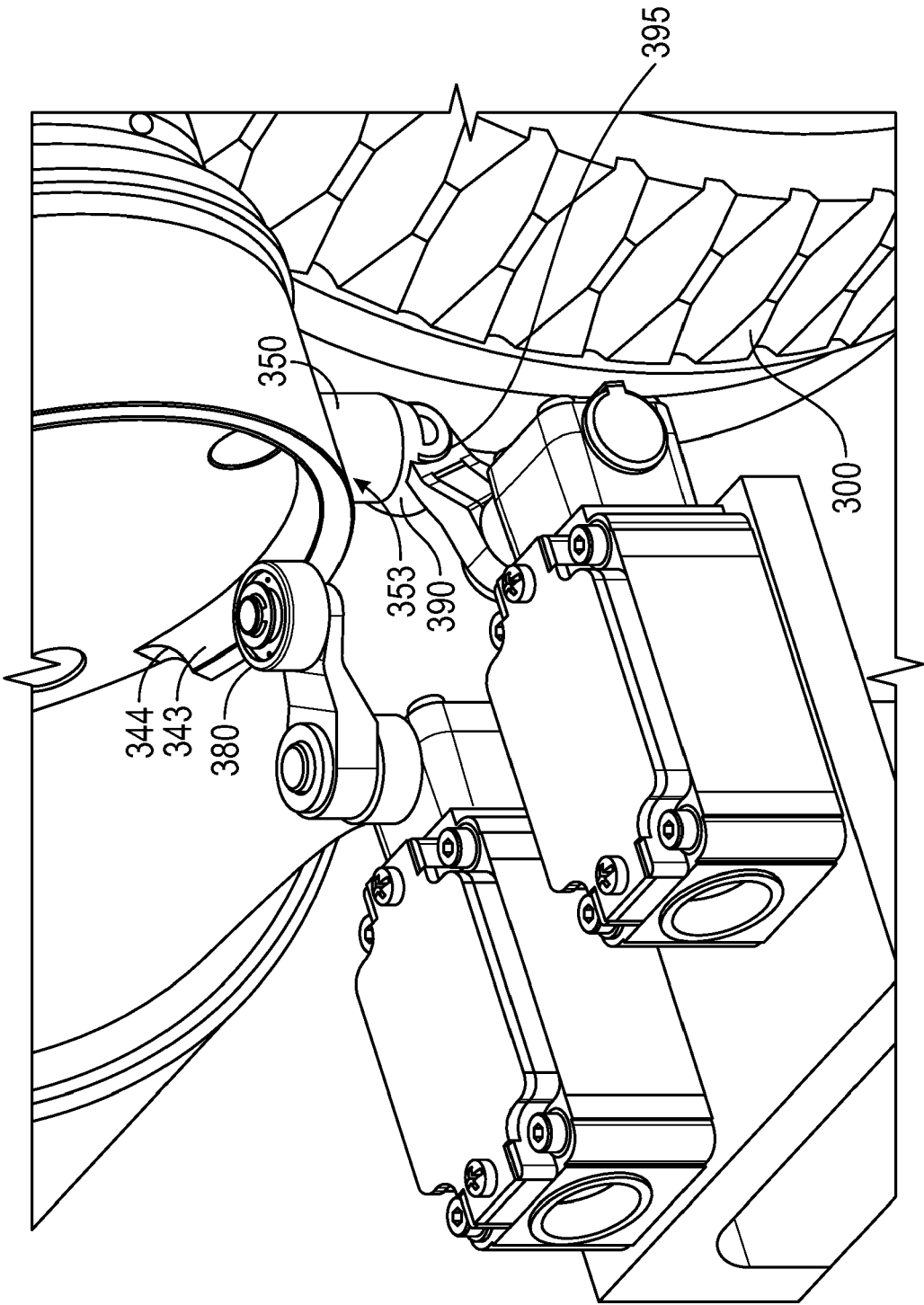


FIG. 11

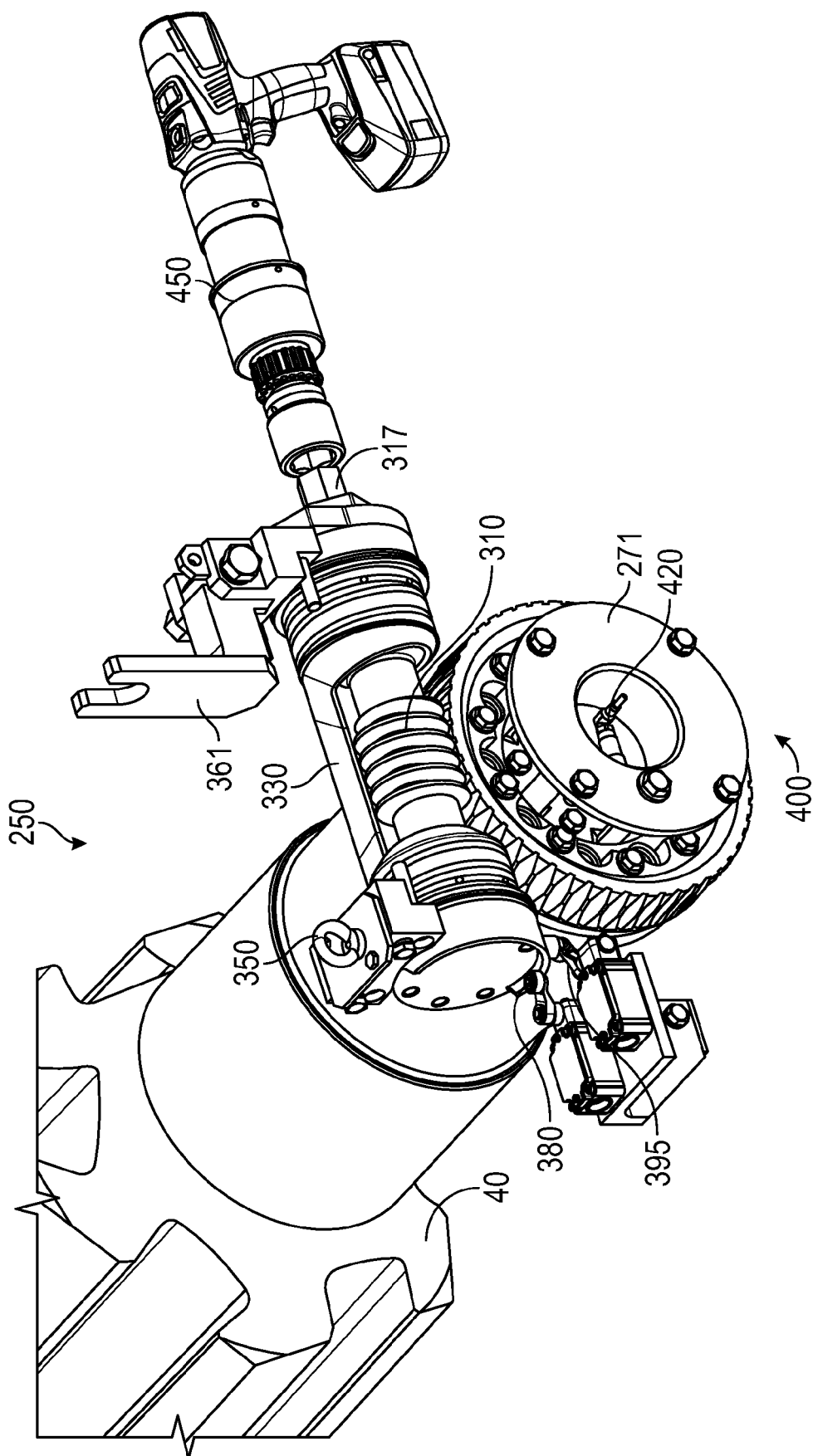


FIG. 12

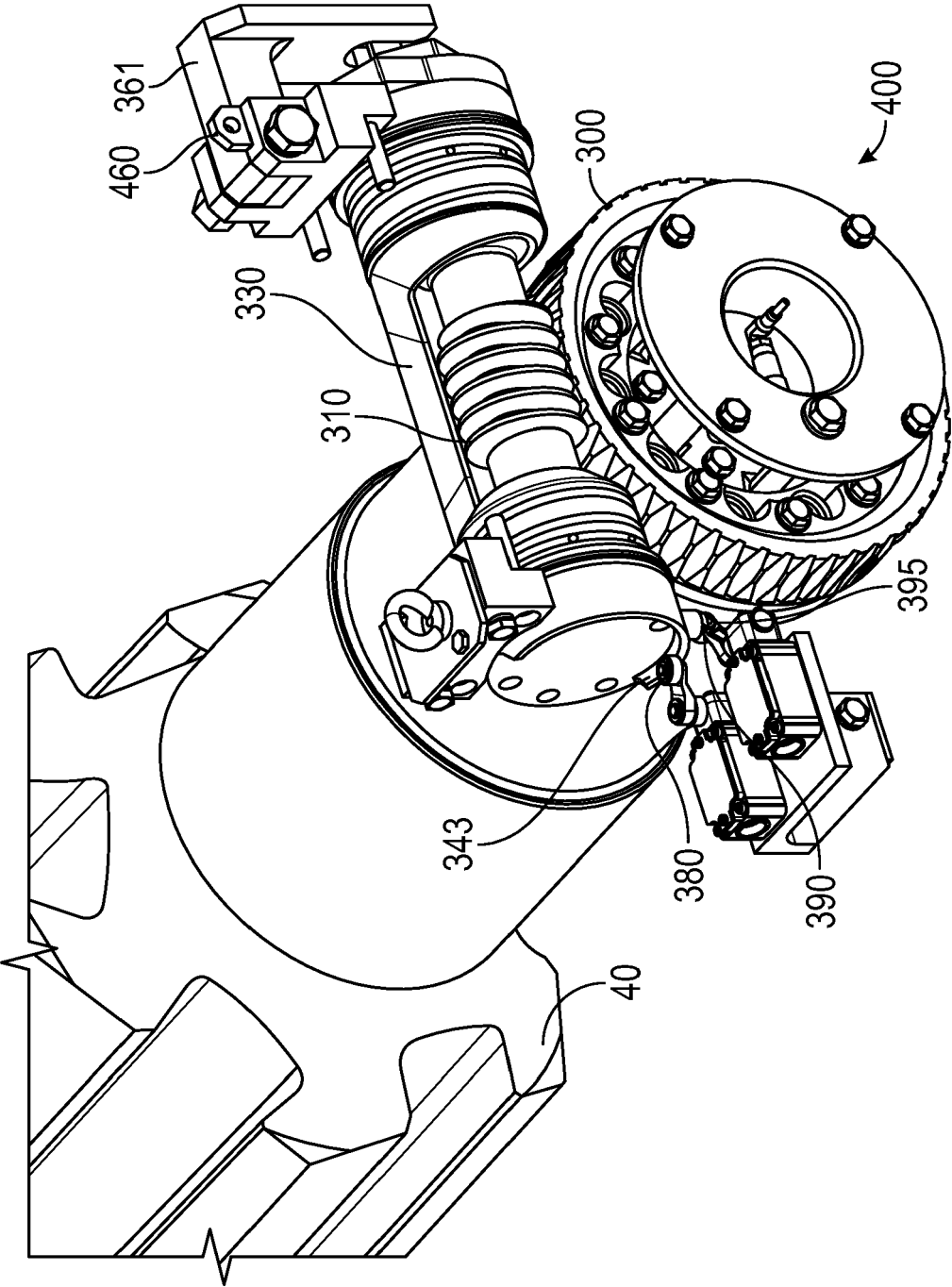


FIG. 13



EUROPEAN SEARCH REPORT

Application Number

EP 22 16 5942

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	DE 12 11 869 B (ALPINE AG MASCHINENFABRIK; EISENGIESSEREI) 3 March 1966 (1966-03-03)	1-3, 13, 15	INV. B02C23/00
A	* column 3, line 22 - column 4, line 15; claims 1,2; figure 1 *	4-12, 14	B02C4/28
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EPO FORM 1503 03.82 (P04C01)

Place of search Munich	Date of completion of the search 27 September 2022	Examiner Laurim, Jana
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document		

**ANNEX TO THE EUROPEAN SEARCH REPORT
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5 This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
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