



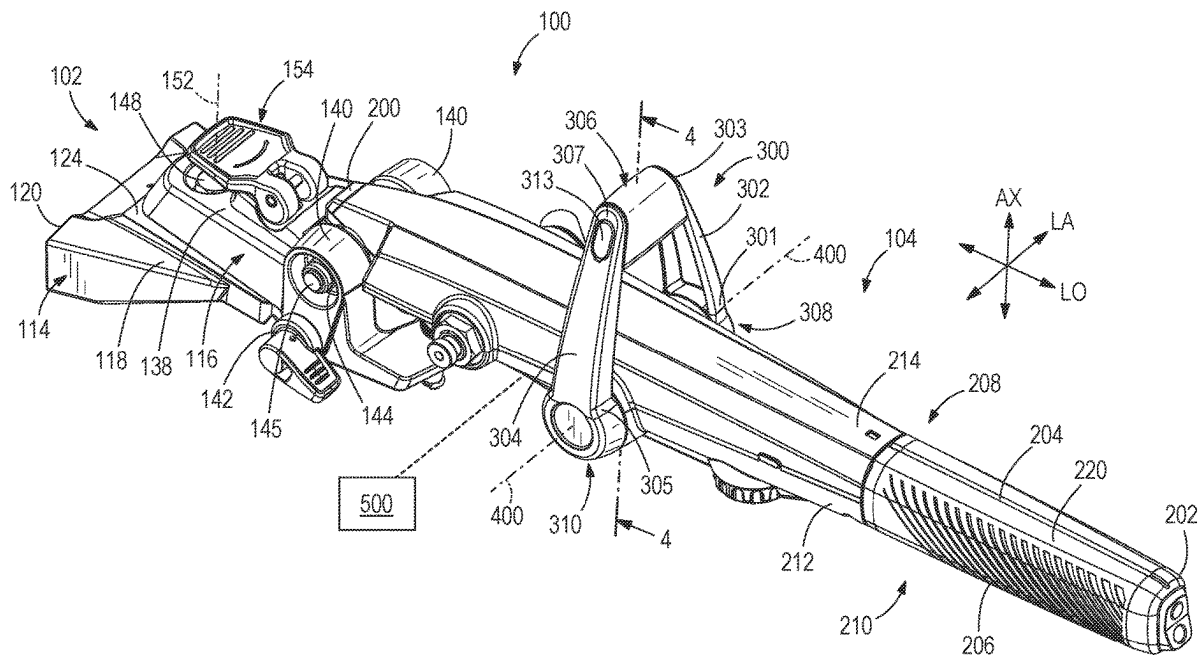
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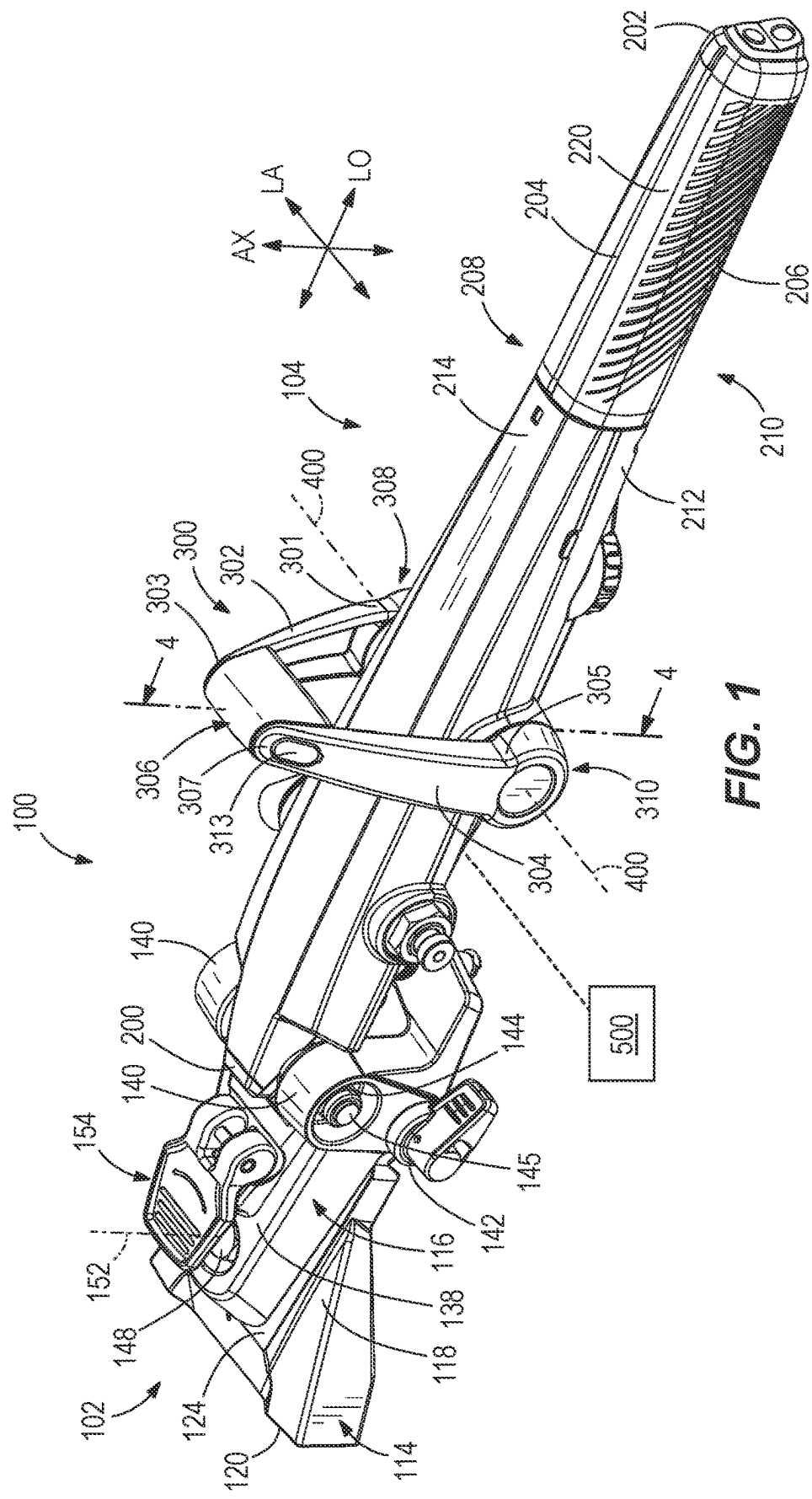
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**Needham et al.**(10) **Pub. No.: US 2025/0256824 A1**(43) **Pub. Date: Aug. 14, 2025**(54) **TILLERS THAT FACILITATE  
AMBIDEXTROUS SHIFTING OF A MARINE  
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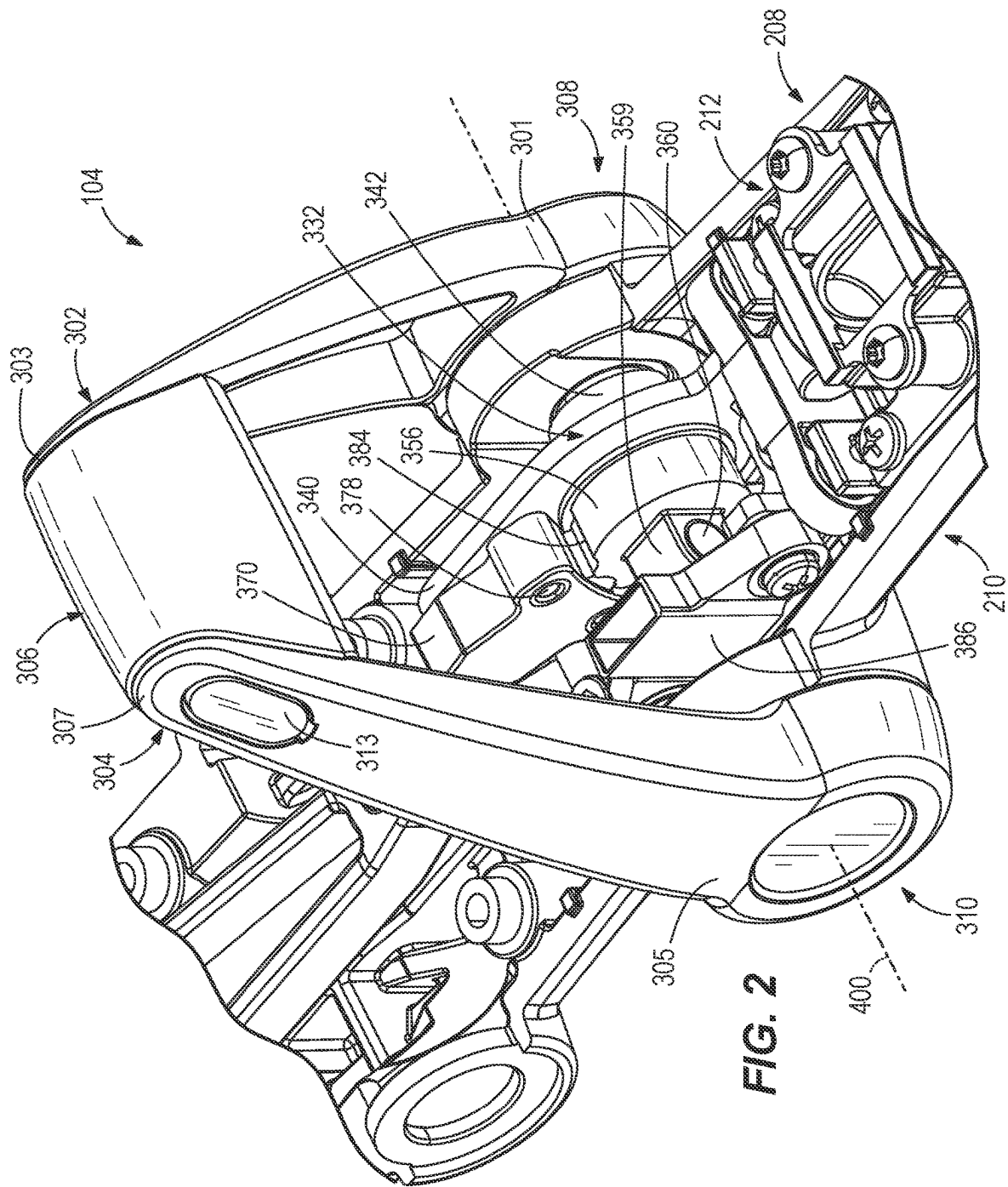
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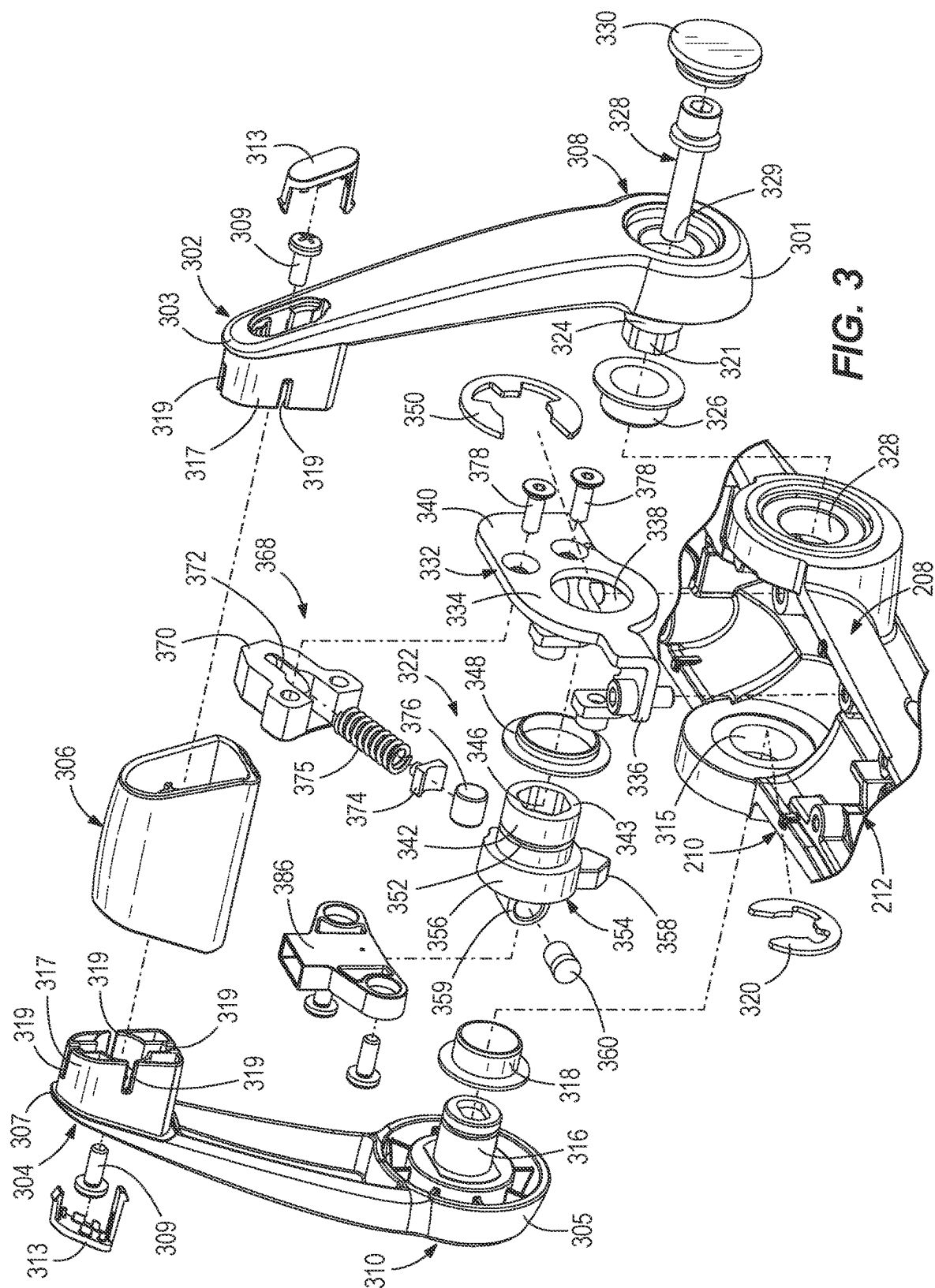
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(2013.01)(57) **ABSTRACT**

A tiller is for steering a marine drive relative to a marine vessel. The tiller has a tiller arm and a lever for changing an operational characteristic of the marine drive. The lever is pivotably coupled to the tiller arm along a lateral pivot axis and extends along both the port side and the starboard side of the tiller arm and thus is manually operable from both the port side and the starboard side of the tiller arm. A sensor is configured to sense pivoting of the lever and electronically communicate a sensed position of the lever to a controller for controlling an operational characteristic of the marine drive.









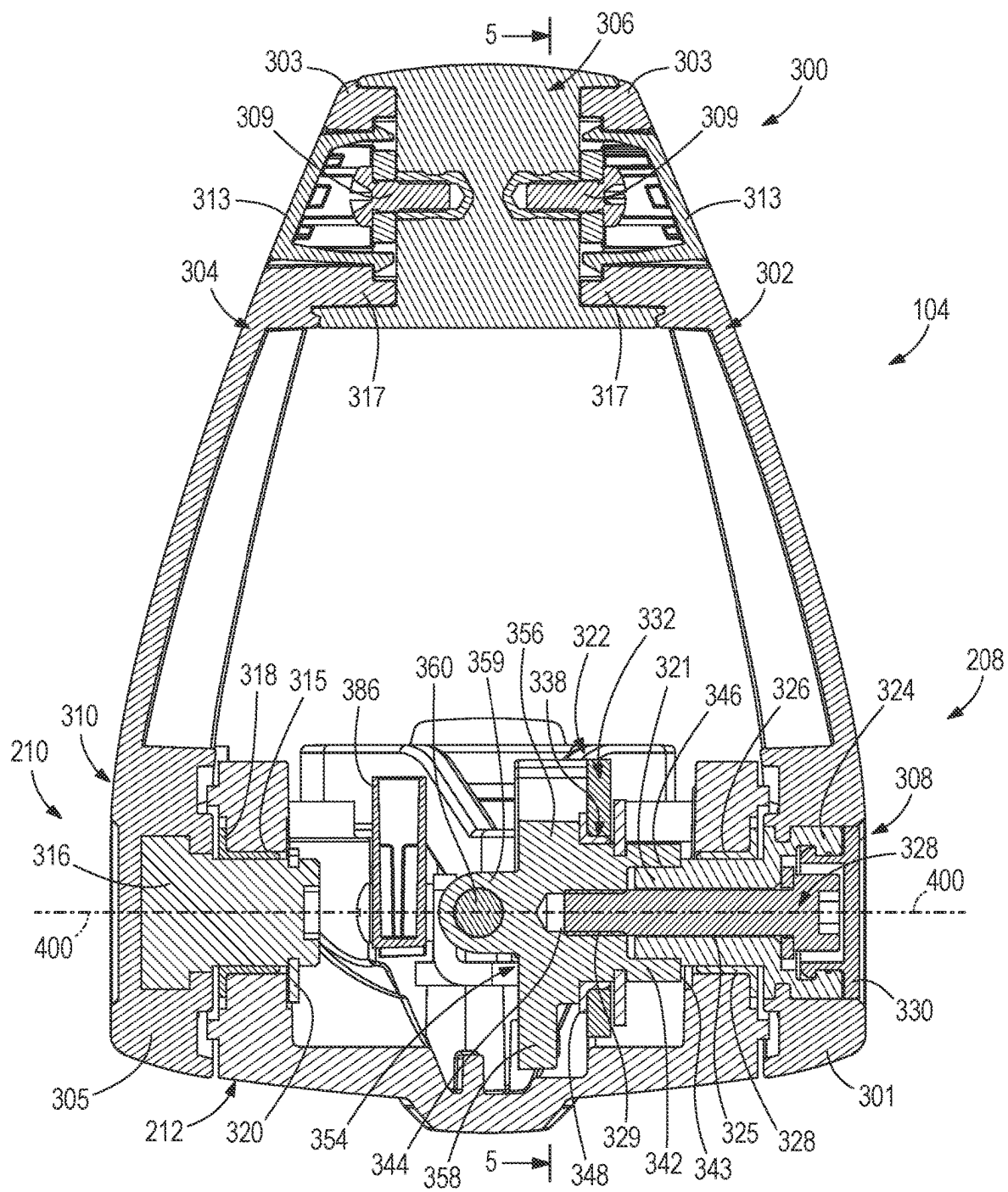
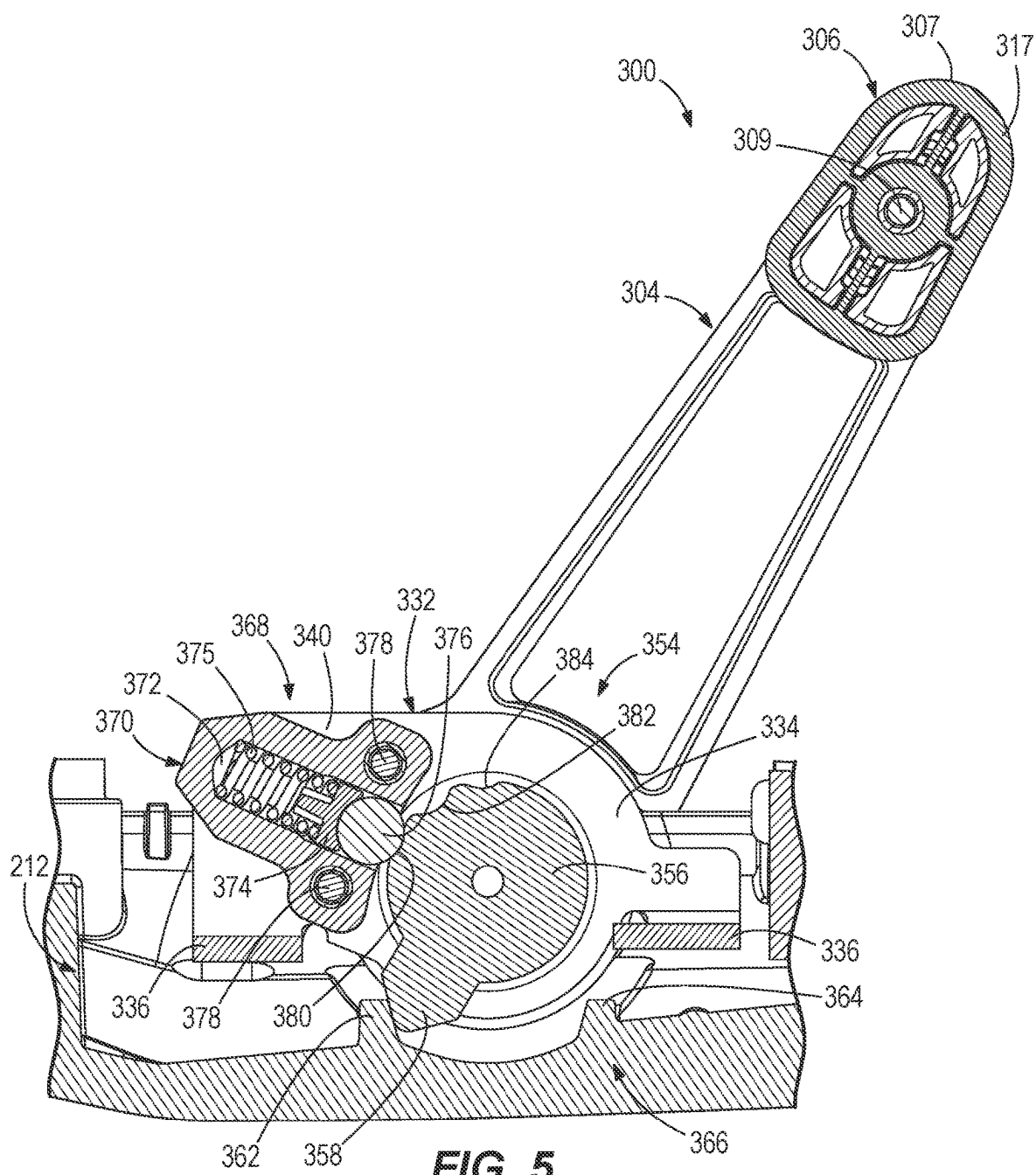
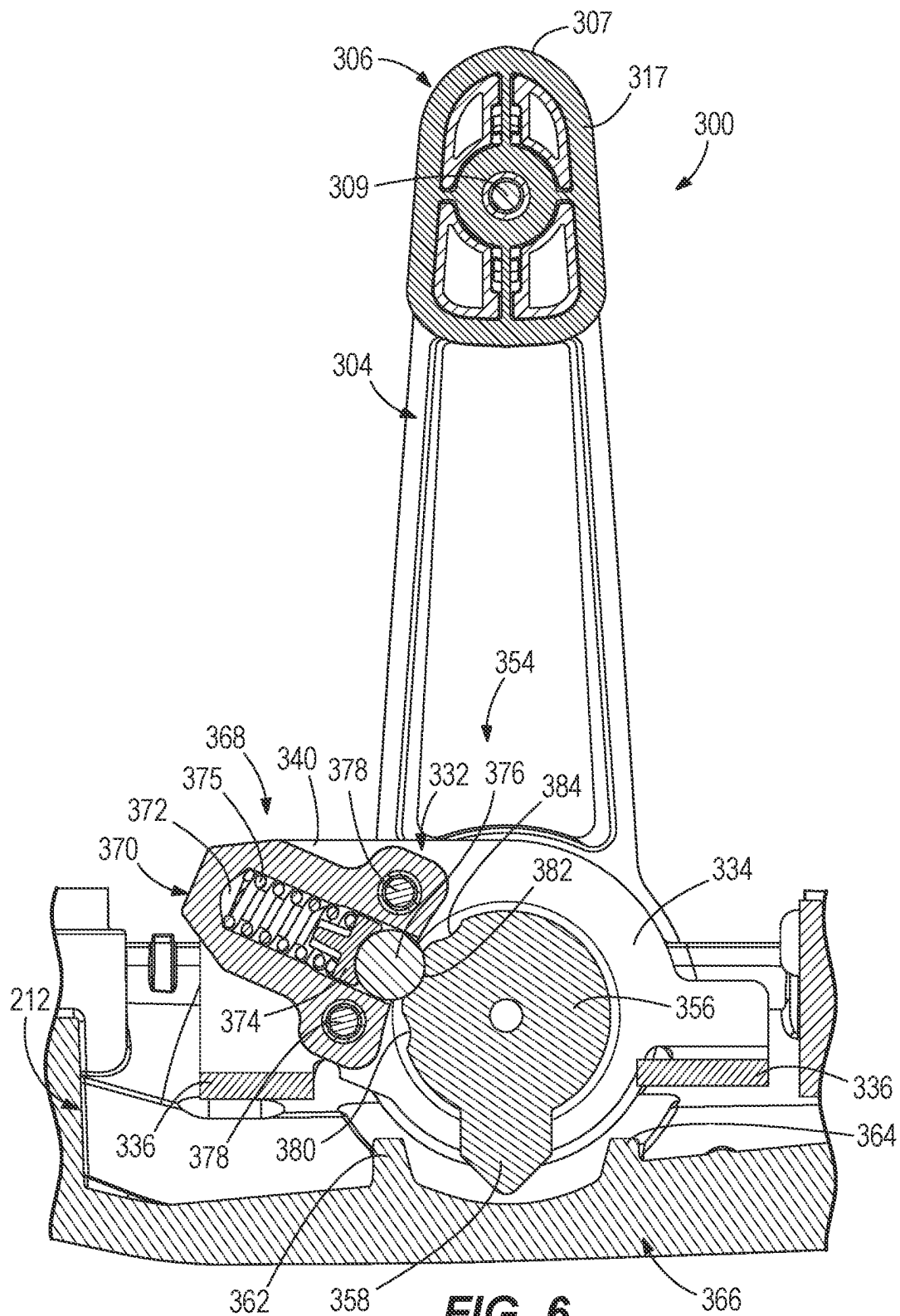
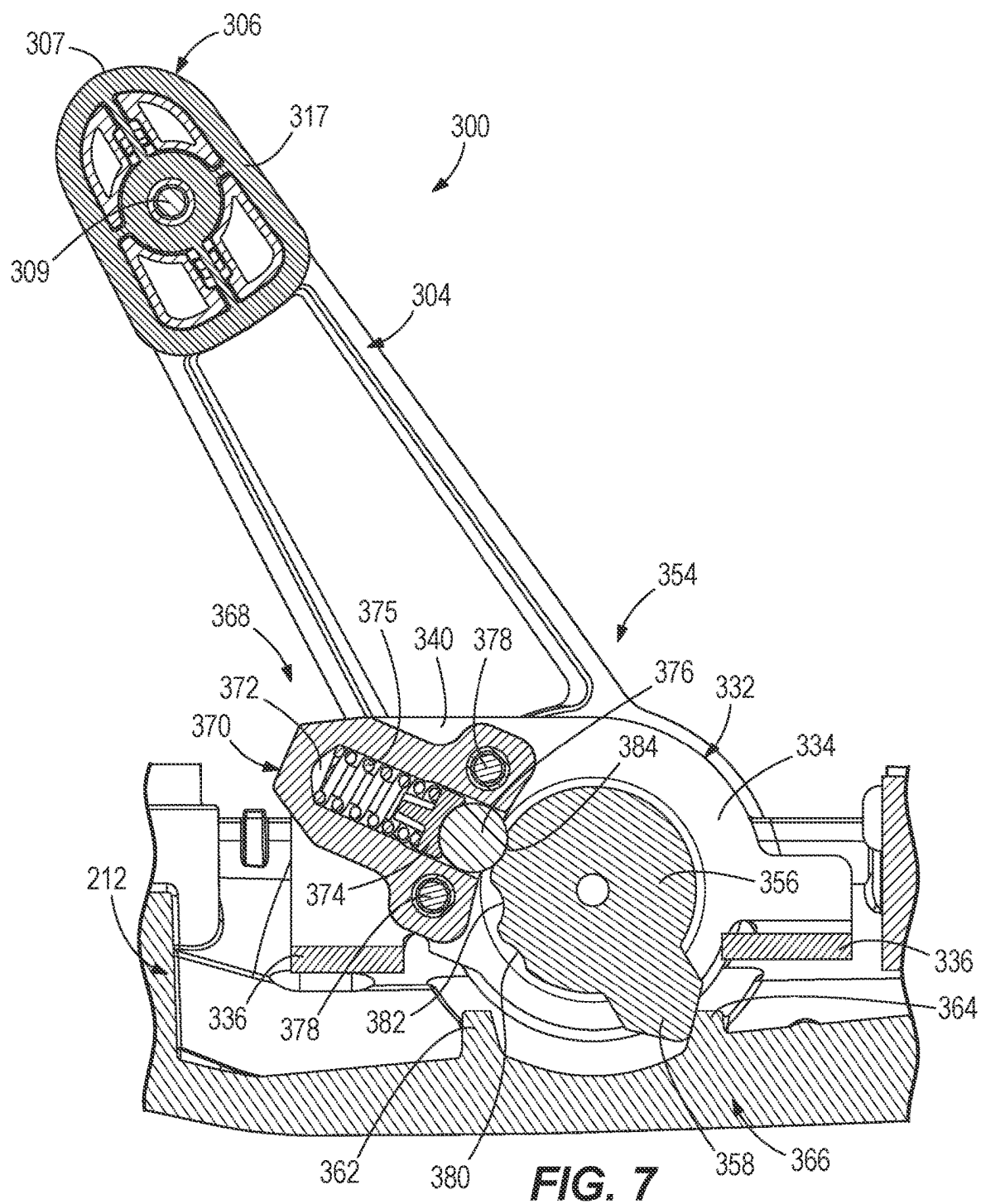


FIG. 4









## TILLERS THAT FACILITATE AMBIDEXTROUS SHIFTING OF A MARINE DRIVE

### CROSS-REFERENCE TO RELATED APPLICATION

[0001] The present application claims priority to Chinese Application No. 202420294525X, filed Feb. 8, 2024, the content of which is incorporated herein by reference.

### FIELD

[0002] The present disclosure relates to tillers for controlling marine drives.

### BACKGROUND

[0003] U.S. Pat. Pub. No. 2023/0257092 is incorporated herein by reference and discloses a tiller for controlling a marine drive. The tiller has a base bracket assembly and a tiller arm which extends outwardly from the base bracket assembly. The base bracket assembly is configured to facilitate yaw adjustment of the tiller arm, in particular into and between a variety of yaw positions relative to the base bracket assembly. The tiller arm has a grip restraining device which is located on the bottom of the middle portion of the tiller arm and is manually accessible from both sides of the tiller arm. The grip restraining device is specially configured to selectively restrain rotation of a hand grip on the outer end of the tiller arm. The tiller arm also has a tilt mechanism which facilitates tilting of the tiller arm relative to the base bracket assembly into and between a variety of tilt positions.

### SUMMARY

[0004] This Summary is provided to introduce a selection of concepts which are further described herein below in the Detailed Description. This Summary is not intended to identify key or essential features of the claimed subject matter, nor is it intended to be used as an aid in limiting scope of the claimed subject matter.

[0005] In non-limiting examples disclosed herein, a tiller is for steering a marine drive relative to a marine vessel. The tiller includes a tiller arm which extends from an inner end to an outer end in a longitudinal direction, from a top side to a bottom side in an axial direction that is perpendicular to the longitudinal direction, and from a port side to a starboard side in a lateral direction that is perpendicular to the lateral direction and perpendicular to the axial direction. A lever is for changing an operational characteristic of the marine drive. The lever is pivotably coupled to the tiller arm along a lateral pivot axis, the lever extending along both the port side and the starboard side of the tiller arm and thus being manually operable from both the port side and the starboard side of the tiller arm.

[0006] In independent examples disclosed herein, a port arm and a starboard arm are pivotably coupled to the port side and the starboard side of the tiller arm, respectively.

[0007] In independent examples, a handle extends between the port arm and the starboard arm.

[0008] In independent examples, the tiller comprises a port pivot joint coupling the port arm to the port side and a starboard pivot joint coupling the starboard arm to the starboard side.

[0009] In independent examples, the tiller arm comprises a chassis, the port pivot joint comprises a port pivot boss

extending from the port arm into the chassis, and the starboard pivot joint comprises a starboard pivot boss extending from the starboard arm into the chassis, the port pivot pin and the starboard pivot boss being pivotable relative to the chassis along the lateral pivot axis.

[0010] In independent examples, a detent mechanism retains the lever relative to the tiller arm in a forward position, a reverse position, and a neutral position.

[0011] In independent examples, the detent mechanism comprises a spring-loaded piston which is biased into engagement with the lever and thus retains the lever relative to the tiller arm in the forward position, the neutral position, and the reverse position.

[0012] In independent examples, the detent mechanism comprises grooves which seat the spring-loaded piston in the forward position, the neutral position, and the reverse position, respectively.

[0013] In independent examples, a stop mechanism prevents over-pivoting of the lever relative to the tiller arm.

[0014] In independent examples, the stop mechanism comprises a leg which is pivoted with the lever and opposing stop surfaces which are engaged by the leg to prevent said over-pivoting.

[0015] In independent examples, a sensor is configured to sense pivoting of the lever and communicate a sensed position of the lever to the marine drive.

[0016] In independent examples, a magnet is rotated when the lever is pivoted, and the sensor is a magnetic sensor which senses pivoting of the magnet.

[0017] In independent examples, a magnet carrier couples the magnet to the lever, the magnet carrier further comprising a leg configured to prevent over-pivoting of the lever relative to the tiller arm.

[0018] In independent examples, the operational characteristic of the marine drive comprises a shift state including a reverse state, a neutral state, and a forward state.

[0019] In non-limiting examples disclosed herein, a tiller is for steering a marine drive relative to a marine vessel. The tiller comprises a tiller arm, a shift lever which is pivotably coupled to the tiller arm, and a sensor which is configured to sense pivoting of the shift lever and electronically communicate a sensed position of the shift lever to a controller for controlling shifting of the marine drive.

[0020] In independent examples, a magnet is coupled to the shift lever such that pivoting of the shift lever rotates the magnet, the sensor being a magnetic sensor which is configured to sense rotation of the magnet.

[0021] In independent examples, a magnet carrier couples the magnet to the shift lever, the magnet carrier further comprising a leg configured to prevent over-pivoting of the shift lever relative to the tiller arm.

[0022] In independent examples, a system is for propelling a marine vessel which includes a marine drive, a control configured to control shifting of the marine drive, and a tiller for steering the marine drive relative to the marine vessel. The tiller comprises a shift lever which is pivotably coupled to the tiller, and a sensor which is configured to sense pivoting of the shift lever and electronically communicate a sensed position of the shift lever to the controller for controlling shifting of the marine drive.

[0023] In independent examples disclosed herein, a magnet is coupled to the shift lever such that pivoting of the shift lever rotates the magnet, the sensor being a magnetic sensor which is configured to sense rotation of the magnet

[0024] In independent examples disclosed herein, a magnet carrier couples the magnet to the shift lever, the magnet carrier further comprising a leg configured to prevent over-pivoting of the shift lever relative to the tiller.

#### BRIEF DESCRIPTION OF THE DRAWINGS

[0025] Embodiments are described with reference to the following drawing figures. The same numbers are used throughout to reference like features and components.

[0026] FIG. 1 is a perspective view looking down at a tiller according to the present disclosure.

[0027] FIG. 2 is a perspective view of a chassis of the tiller, illustrating a shift lever according to the present disclosure.

[0028] FIG. 3 is an exploded view of the shift lever.

[0029] FIG. 4 is a section view of the shift lever along a longitudinal axis of the tiller.

[0030] FIG. 5 is a view of section 5-5, taken in FIG. 4, showing the shift lever in a forward position.

[0031] FIG. 6 is a view like FIG. 6, showing shift lever in a neutral position.

[0032] FIG. 7 is a view like FIG. 6, showing shift lever in a reverse position.

#### DETAILED DESCRIPTION

[0033] FIG. 1 illustrates a tiller 100 for controlling a not-shown marine drive, such as but not limited to an outboard motor. In general, the tiller 100 has a base bracket assembly 102 and a tiller arm 104 which is coupled to and extends from the base bracket assembly 102. As further described herein below, the tiller arm 104 is specially configured for ambidextrous use.

[0034] Referring to FIG. 1, the base bracket assembly 102 includes a yaw bracket 114 which is pivotably coupled to a steering bracket 116 of the tiller arm 104. The yaw bracket 114 is a rigid member having a body 118 providing a base 120 configured for fixed mounting to the not-shown steering arm of the marine drive. The body 118 has an upper face providing a pedestal 124 upon which the steering bracket 116 is mounted. A through-bore (not shown) extends through a center portion of the pedestal 124, defining a yaw axis 152 about which the tiller arm 104 is pivotable.

[0035] The steering bracket 116 is a rigid member having a body 138 and a pair of upwardly angled arms 140 having opposed lower through-bores 142 through the lower ends of the arms 140 and opposed through-bores 144 through the upper ends of the arms 140. A fastener 145 extends through the opposed through-bores 144 and through a corresponding through-bore (not shown) in the tiller arm 104 to couple the tiller arm 104 to the steering bracket 116 in a way that the tiller arm 104 is tiltable up and down relative to the steering bracket 116. The fastener 145 defines a tilt axis about which the tiller arm 104 is pivotable relative to the base bracket assembly 102. Further description of one example of a suitable tilt mechanism such as what is shown in the drawings is presented in U.S. Patent Application No. 2023/0257092, which is incorporated by reference herein.

[0036] A fastener 148 extends through the body 138 and through the through-bore 126 of the yaw bracket 114 along the yaw axis 152. As explained above, the yaw bracket 114 is fixed to the steering arm of the marine drive and the steering bracket 116 is attached to the tiller arm 104. Thus, the tiller arm 104 and steering bracket 116 are pivotable

together about the yaw axis 152 into and between a variety of yaw positions relative to the yaw bracket 114 and marine drive, as will be further described herein below. A yaw lock 154 is specially configured to lock the tiller arm 104 and steering bracket 116 in a variety of yaw positions relative to the yaw bracket 114 and marine drive. Further description of one example of a suitable yaw mechanism like what is shown in the drawings is presented in U.S. Patent Application No. 2023/0257092, which is incorporated by reference herein. Referring to FIG. 1, the tiller arm 104 extends from an inner end 200 to an outer end 202 in a longitudinal direction LO, from top 204 to bottom 206 in an axial direction AX which is perpendicular to the longitudinal direction LO, and from a port side 208 to a starboard side 210 which is opposite the port side 208 in a lateral direction LA which is perpendicular to the longitudinal direction LO and perpendicular to the axial direction AX.

[0037] Current tiller designs include a shift lever positioned on one of the port and starboard sides and require a user to disassemble and reconfigure the tiller arm in order to change the side on which the lever is positioned. During research and development in this field, the present inventors determined it would be advantageous to improve upon existing tiller designs by incorporating a handle configuration which is ambidextrous such that it can be ergonomically operated from a user positioned on either side of the tiller arm. During research and development in this field, the present inventors further determined it would be advantageous to provide tiller designs having a steer-by-wire control system for shifting gear position of the marine drive associated with the tiller. The present disclosure is a result of the present inventor's realization of the above-described areas for improvement on known configurations and particularly their resulting efforts to provide ambidextrous shift levers in accordance with the above.

[0038] Referring to FIGS. 1-4, the tiller arm 104 has a chassis 212 which is elongated in the longitudinal direction LO and underlies and supports various components associated with the tiller arm 104. A cover 214 is mounted on top of chassis 212 and encloses the various components in an interior of the tiller arm 104. A hand grip 220 is positioned at the outer end 202 of the tiller arm and is configured such that manually rotating the hand grip 220 relative to the chassis 212 causes change in the speed of the marine drive. One example of the relationship between the tiller arm and propulsion speed is presented in U.S. Patent Application No. 2023/0257092, which is incorporated by reference herein.

[0039] Referring to FIGS. 1-3, an ambidextrous shift lever 300 of the present disclosure is positioned at a middle portion of the chassis 212 and pivotably coupled to the tiller arm 104 along a lateral pivot axis 400 for changing an operational characteristic of the marine drive. In a non-limiting example, the shift lever 300 is specially configured to permit a user to shift between a forward (FIG. 5), a neutral (FIG. 6), and a reverse state (FIG. 7) of operation of the marine drive from either the port side 208 or the starboard side 210 of the tiller arm 104. As will be understood by one having ordinary skill in the art, the forward state causes the marine drive to generate a forward thrust force in the body of water, the neutral state causes the marine drive to not generate a substantial thrust force in the body of water, and the reverse state causes the marine drive to generate a reverse thrust force in the body of water.

[0040] Referring to FIGS. 2-3, the shift lever 300 includes a port arm 302 and a starboard arm 304 which extend along the port side 208 and the starboard side 210, respectively, and are joined together above the tiller arm 104 by a handle 306 extending therebetween. As such, the shift lever 300 is conveniently manually operable by a user situated on either the port side 208 or the starboard side 210 of the tiller arm 104.

[0041] The port arm 302 is coupled to the chassis 212 of the tiller arm 104 at a first end 301 by a port pivot joint 308 and is coupled to the handle 306 at a second end 303 opposite the first end 301. The starboard arm 304 is coupled to the chassis 212 of the tiller arm 104 at a first end 305 by a starboard pivot joint 310 and coupled to the handle 306 laterally opposite the port arm 302 at a second end 307 opposite the first end 305. The port pivot joint 308 and the starboard pivot joint 310 are pivotable relative to the chassis 212 along the lateral pivot axis 400. Referring to FIG. 3, the second ends 303, 307 each include standoffs 317 extending laterally inwardly. The standoffs 317 are oblong in shape and include sidewalls having slots 319 for sliding engaging the handle 306. Best shown in FIG. 4, the handle 306 forms a sleeve into which the standoffs 317 are nested. The handle 306 is secured to the second ends 303, 307 by fasteners 309 extending laterally inward from each side toward a center of the handle 306. In the illustrated embodiment, decorative end caps 313 are press fit onto the second ends 303, 307 to conceal the fasteners 309.

[0042] Referring to FIGS. 3-4, the starboard pivot joint 310 includes a boss 316 which is molded into the first end 305 and laterally extends from outside of the tiller arm 104 through a bearing 318 which is fitted within a passage 315 into the chassis 212. In the illustrated embodiment, an E-clip 320 is secured around an inner end of the boss 316 within the chassis 212. In certain examples, the boss 316 is formed of brass and permanently welded within the first end 305 of the starboard arm 304, although this configuration is not limiting.

[0043] The port pivot joint 308 extends within the chassis 212 and fixedly couples a magnet carrier 322 to the port arm 302 such that pivoting of the shift lever 300 about the lateral pivot axis 400 causes rotation of the magnet carrier 322. The port pivot joint 308 includes a boss 324 which is molded into the first end 301 and extends from outside of the tiller arm 104 through a bearing 326 which is fitted within a passage 327 into the chassis 212. An inner end 321 of the boss 324 is hex-shaped and configured for frictional engagement with the magnet carrier 322. A pivot pin 328 extends through a washer 323 and a through-bore 325 in the boss 324 and into the chassis 212. The pivot pin 328 has a threaded inner end 329 which fixedly couples the port pivot joint 308 to the magnet carrier 322. In the illustrated embodiment, a decorative cap 330 is press-fit onto an outer end of the boss 324 to conceal the pivot pin 328 and provide a continuous exterior of the tiller arm 104.

[0044] The magnet carrier 322 is pivotably supported within the tiller arm 104 via a stamped metal brace 332 which is bolted within the chassis 212. The brace 332 has a support wall 334 and mounting flanges 336 having fasteners fixedly securing the brace 332 to the chassis 212. The support wall 334 extends longitudinally and axially within the chassis 212 and includes an opening 338 within which the magnet carrier 322 extends and rotates. The support wall

334 further includes a lug 340 which supports a detent mechanism 368 which will be further described herein.

[0045] Referring now to FIGS. 3-4, the magnet carrier 322 has a cylindrical boss 342 and a shift mechanism 354. The boss 342 extends through a bearing 348 which is seated within the opening 338 of the brace 332. When seated within the opening 338, an outer end 343 of the boss 342 extends laterally outward from the brace 332 toward the port pivot joint 308. An E-clip 350 is secured within an annular groove 352 near the outer end 343 and retains the magnet carrier 322 on the brace 332. The outer end 343 includes hex-shaped cavity 346 which is configured to receive the inner end 321 of the boss 324 of the port pivot joint 308. A threaded bore 344 extends inwardly from the hex-shaped cavity 346 for engagement with the inner end 329 of the pivot pin 328.

[0046] The shift mechanism 354 is positioned inwardly from the boss 342 and is seated near a lateral center of the chassis 212. The shift mechanism 354 includes a wheel 356 which is positioned at an inner end of the boss 342. The wheel 356 is substantially circular and centered about the lateral pivot axis 400. The wheel 356 includes a leg 358 protruding radially outward therefrom for engagement with the chassis 212, as will be described further herein. A magnet housing 359 protrudes laterally from the wheel 356 along the lateral pivot axis 400 opposite the boss 342. The housing 359 is cylindrical and configured for receiving a magnet 360, best shown in FIG. 3. The chassis 212 includes a magnetic sensor 386 positioned laterally outward from the magnet housing 359 for sensing an orientation of the magnet 360.

[0047] Referring now to FIGS. 5-7, the chassis 212 further includes a pair of axially offset stop surfaces 362, 364 which straddle the magnet carrier 322. The stop surfaces 362, 364 form a cradle within which the leg 358 pivot about the lateral pivot axis 400. The stop surfaces 362, 364 and the leg 358 constitute a stop mechanism 366 for preventing over pivoting of the shift lever 300. The stop mechanism 366 is configured such that pivoting the shift lever 300 about the lateral pivot axis 400 in either one of a first and a second direction rotates the wheel 356, which engages the leg 358 with one of the stop surfaces 362, 364 to prevent further pivoting in the current direction.

[0048] The shift mechanism 354 further includes the detent mechanism 368 which is configured to retain the shift lever 300 relative to the tiller arm in a forward position (FIG. 5), a neutral position (FIG. 6), and a reverse position (FIG. 7). As previously mentioned, the detent mechanism 368 is fixedly secured to the lug 340 of the brace 332 via fasteners 378. The detent mechanism 368 includes a housing 370 with a bore 372 for retaining a spring-loaded piston 374 and a detent ball 376. The detent ball 376 is biased outwardly from the bore 372 by a compression spring 375 forcing the piston 374 outwardly. The housing 370 is positioned such that the bore 372 opens toward the wheel 356 and the detent ball 376 is held in engagement between the piston 374 and the wheel 356. The wheel 356 includes three grooves 380, 382, 384 which correspond to the forward, neutral, and reverse position and are configured for receiving the detent ball 376.

[0049] Referring to FIG. 1, a controller 500 is provided on the tiller 100 or remotely from the tiller 100, for example on the noted marine drive. The controller 500 has a processor and memory. The processor is configured to operate according to stored programming and in particular is configured to communicate with various external devices including the

magnetic sensor **386**, to access data within the memory, and to control operational characteristics of the marine drive based upon how the position of the magnet **360** compares to data within the memory.

**[0050]** In use, to shift between a forward, neutral, and reverse state, a user moves the shift lever **300** between a forward position (FIG. 5), an upright position (FIG. 6), and a reverse position (FIG. 7). Pivoting of the shift lever **300** rotates the magnet carrier **322** and thus the magnet **360** about the lateral pivot axis **400**. When the shift lever **300** is in the desired position, the detent mechanism **368** engages the detent ball **376** with one of the grooves **380**, **382**, **384** corresponding to the desired state, giving the user a tactical response such as a click or pop, indicating that the lever **300** is in the appropriate position. The magnetic sensor **386** senses and communicates the orientation of the magnet **360** to the controller **500**, which is programmed to compare the orientation of the magnet **360** sensed by the magnetic sensor **386** to values stored in the memory and based upon the comparison control the marine drive to enact forward, neutral, or reverse operational states of the marine drive. In the event that the user continues to pivot the lever **300** past the forward position or the neutral position indicated by the detent mechanism **368**, the leg **358** of the stop mechanism **366** comes into engagement with one of the stop surfaces **362**, **364** and further pivoting is prevented.

**[0051]** In the present description, certain terms have been used for brevity, clarity, and understanding. No unnecessary limitations are to be implied therefrom beyond the requirement of the prior art because such terms are used for descriptive purposes only and are intended to be broadly construed. The different apparatuses described herein may be used alone or in combination with other apparatuses. Various equivalents, alternatives and modifications are possible within the scope of the appended claims.

1. A tiller for steering a marine drive relative to a marine vessel, the tiller comprising:

a tiller arm that extends from an inner end to an outer end in a longitudinal direction, from a top side to a bottom side in an axial direction that is perpendicular to the longitudinal direction, and from a port side to a starboard side in a lateral direction that is perpendicular to the lateral direction and perpendicular to the axial direction, and

a lever for changing an operational characteristic of the marine drive, the lever being pivotably coupled to the tiller arm along a lateral pivot axis, the lever extending along both the port side and the starboard side of the tiller arm and thus being manually operable from both the port side and the starboard side of the tiller arm.

2. The tiller according to claim 1, the lever comprising a port arm and a starboard arm which are pivotably coupled to the port side and the starboard side of the tiller arm, respectively.

3. The tiller according to claim 2, further comprising a handle extending between the port arm and the starboard arm.

4. The tiller according to claim 2, further comprising a port pivot joint coupling the port arm to the port side and a starboard pivot joint coupling the starboard arm to the starboard side.

5. The tiller according to claim 4, the tiller arm comprising a chassis, the port pivot joint comprising a port pivot boss extending from the port arm into the chassis, and the

starboard pivot joint comprising a starboard pivot boss extending from the starboard arm into the chassis, the port pivot pin and the starboard pivot boss being pivotable relative to the chassis along the lateral pivot axis.

6. The tiller according to claim 1, further comprising a detent mechanism which retains the lever relative to the tiller arm in a forward position, a reverse position, and a neutral position.

7. The tiller according to claim 6, the detent mechanism comprising a spring-loaded piston which is biased into engagement with the lever and thus retains the lever relative to the tiller arm in the forward position, the neutral position, and the reverse position.

8. The tiller according to claim 7, the detent mechanism comprising grooves which seat the spring-loaded piston in the forward position, the neutral position, and the reverse position, respectively.

9. The tiller according to claim 1, further comprising a stop mechanism which prevents over-pivoting of the lever relative to the tiller arm.

10. The tiller according to claim 9, the stop mechanism comprising a leg which is pivoted with the lever and opposing stop surfaces which are engaged by the leg to prevent said over-pivoting.

11. The tiller according to claim 1, further comprising a sensor configured to sense pivoting of the lever and communicate a sensed position of the lever to the marine drive.

12. The tiller according to claim 11, further comprising a magnet which is rotated when the lever is pivoted, and the sensor comprising a magnetic sensor which senses pivoting of the magnet.

13. The tiller according to claim 12, further comprising a magnet carrier which couples the magnet to the lever, the magnet carrier further comprising a leg configured to prevent over-pivoting of the lever relative to the tiller arm.

14. The tiller according to claim 1, the operational characteristic of the marine drive comprises a shift state including a reverse state, a neutral state, and a forward state.

15. A tiller for steering a marine drive relative to a marine vessel, the tiller comprising:

a tiller arm,

a shift lever which is pivotably coupled to the tiller arm, and

a sensor configured to sense pivoting of the shift lever and electronically communicate a sensed position of the shift lever to a controller for controlling shifting of the marine drive.

16. The tiller according to claim 15, further comprising a magnet coupled to the shift lever such that pivoting of the shift lever rotates the magnet, the sensor being a magnetic sensor which is configured to sense rotation of the magnet.

17. The tiller according to claim 16, further comprising a magnet carrier which couples the magnet to the shift lever, the magnet carrier further comprising a leg configured to prevent over-pivoting of the shift lever relative to the tiller arm.

18. A system for propelling a marine vessel, the system comprising:

a marine drive,

a controller configured to control shifting of the marine drive,

a tiller for steering the marine drive relative to the marine vessel, the tiller comprising a shift lever which is pivotably coupled to the tiller, and a sensor configured

to sense pivoting of the shift lever and electronically communicate a sensed position of the shift lever to the controller for controlling shifting of the marine drive.

**19.** The system according to claim **18**, further comprising a magnet coupled to the shift lever such that pivoting of the shift lever rotates the magnet, the sensor being a magnetic sensor which is configured to sense rotation of the magnet.

**20.** The system according to claim **19**, further comprising a magnet carrier which couples the magnet to the shift lever, the magnet carrier further comprising a leg configured to prevent over-pivoting of the shift lever relative to the tiller.

\* \* \* \* \*