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TILLERS THAT FACILITATE AMBIDEXTROUS SHIFTING OF A MARINE DRIVE

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.

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Background/Summary

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.

Description

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 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.

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.