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Tillers for marine drives having yaw adjustment device

Abstract

A tiller is for controlling a marine drive. The tiller has a base bracket assembly and a tiller arm which is 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, including a straight upward tilt position and a straight downward tilt position.

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Background/Summary

CROSS-REFERENCE TO RELATED APPLICATION (1) The present application claims the benefit of and priority to U.S. Provisional Patent Application Ser. No. 63/310,369, filed Feb. 15, 2022, which is incorporated herein by reference.

FIELD
(1) The present disclosure relates to marine drives and particularly to tillers for marine drives.
BACKGROUND
(2) The following U.S. Patents are incorporated herein by reference in entirety.
(3) U.S. Pat. No. 11,186,352 discloses a tiller system for steering a marine propulsion device. The tiller system includes a tiller arm rotatably coupled to the marine propulsion device. The tiller arm is rotatable from a down position to an up position through a plurality of lock positions therebetween. A toothed member is coupled to one of the tiller arm and the marine propulsion device. The toothed member defines a plurality of teeth corresponding to the plurality of lock positions for the tiller arm. A pawl is coupled to another of the tiller arm and the marine propulsion device, where the pawl engages with the plurality of teeth to prevent the tiller arm from rotating downwardly through the plurality of lock positions.
(4) U.S. Pat. No. 11,097,826 discloses a tiller for an outboard marine drive including a tiller body that is elongated along a tiller axis between a fixed end connected to an outboard marine drive and a distal end. A lanyard switch on the tiller body is configured to prevent operation of the outboard marine drive when a lanyard clip is not attached to the lanyard switch. A controller is configured to identify that an operator has provided user input to start the outboard marine drive and that the lanyard clip is not connected to the lanyard switch. The controller then generates a lanyard error alert identifying that the lanyard clip is not connected to the lanyard switch.
(5) U.S. Pat. No. 10,787,236 discloses a tiller system for steering an outboard motor. The tiller system includes a tiller arm that is rotatably coupled to the outboard motor. The tiller arm is rotatable from a down position to an up position through a plurality of lock positions therebetween.

A tilt lock system is coupled between the tiller arm and the outboard motor and is configured to be activated and deactivated. When activated, the tilt lock system prevents the tiller arm from rotating downwardly through each of the plurality of lock positions. The tiller arm is further rotatable into an unlock position, whereby rotating the tiller arm into the unlock position automatically deactivates the tilt lock system such that the tiller arm is freely rotatable downwardly through the plurality of lock positions.

(6) U.S. Pat. No. 10,696,367 discloses a tiller for an outboard motor has a throttle grip which is manually rotatable through first and second ranges of motion into and between an idle position in which the outboard motor is controlled at an idle speed, and first and second open-throttle positions, respectively, in which the outboard motor is controlled at an above-idle speed. A throttle shaft is coupled to the throttle grip and is configured so that rotation of the throttle grip causes rotation of the throttle shaft, which changes a throttle position of a throttle of the outboard motor. A rotation direction switching mechanism is manually position-able into a first position in which rotation of the throttle grip through the first range of motion controls the throttle of the outboard motor and alternately manually position-able into a second position in which rotation of the throttle grip through the second range of motion controls the throttle position.

(7) U.S. Pat. No. 10,246,173 discloses a tiller is for an outboard motor and has a manually operable shift mechanism configured to actuate shift changes in a transmission of the outboard motor amongst a forward gear, reverse gear, and neutral gear. The tiller also has a manually operable throttle mechanism configured to position a throttle of an internal combustion engine of the outboard motor into and between the idle position and a wide-open throttle position. An interlock mechanism is configured to prevent a shift change in the transmission out of the neutral gear when the throttle is positioned in a non-idle position. The interlock mechanism is further configured to permit a shift change into the neutral gear regardless of where the throttle is positioned.

SUMMARY

(8) 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.

(9) In non-limiting examples disclosed herein, a tiller is for controlling a marine drive. The tiller comprises a tiller arm, a base bracket assembly comprising a yaw bracket configured for fixed attachment to a marine drive and a steering bracket which pivotably couples the tiller arm to the yaw bracket for movement about a yaw axis, and a yaw lock configured to lock the steering bracket and tiller arm in a plurality of yaw positions relative to the yaw axis, wherein unlocking the yaw lock facilitates movement of the tiller arm into a new yaw position of the plurality of yaw positions.

(10) In non-limiting examples disclosed herein, a hand grip is on an outer end of the tiller arm, the hand grip being rotatable relative to the tiller arm so as to control a speed of the marine drive. A shaft in the tiller arm is coupled to the hand grip such that rotation of the hand grip causes rotation of the shaft. A grip restraining device configured to restrain rotation of the shaft and thus rotation of the hand grip. The grip restraining device is located on a bottom of the tiller arm and is accessible from opposite sides of the tiller arm for ambidextrous operation.

(11) In non-limiting examples disclosed herein, the tiller arm is coupled to the base bracket assembly such that it is pivotable about a tilt axis relative to the base bracket assembly. A tilt mechanism comprises a tilt bracket coupled to one of the base bracket assembly or the tiller arm and a pawl coupled to the other one of the base bracket assembly or tiller arm. The tilt mechanism is movable into an engaged position in which the pawl engages the tilt bracket to retain the tiller arm in a selected one of a range of tilt positions relative to the base bracket assembly, and into a disengaged position in which the pawl is disengaged from the tilt bracket such that the tiller arm is freely pivotable about the tilt axis relative to the base bracket assembly. The range of tilt positions

comprises a downward tilt position in which the tiller arm is angled downwardly relative to horizontal so as to facilitate carrying of the marine drive via the tiller arm.

Description

BRIEF DESCRIPTION OF THE DRAWINGS

(1) Embodiments are described with reference to the following drawing figures. The same numbers are used throughout to reference like features and components.

(2) FIG. **1** is a perspective view looking down at a tiller according to the present disclosure.

(3) FIG. **2** is an exploded view of the tiller, illustrating a tiller arm including a chassis, a cover and a hand grip, spaced apart from a base bracket assembly comprising a yaw bracket and a steering bracket.

(4) FIG. **3** is a section view of the base bracket assembly.

(5) FIG. **4** is an exploded view of the base bracket assembly.

(6) FIGS. **5** and **6** are perspective views, partially in phantom, illustrating a yaw lock.

(7) FIG. **7** is a perspective view looking up at the tiller arm.

(8) FIG. **8** is a side view of the tiller arm along the grip restraining device.

(9) FIG. **9** is an exploded view illustrating the tiller arm.

(10) FIG. **10** is an exploded view illustrating the grip restraining device.

(11) FIG. **11** is a perspective view, partially in phantom, illustrating the grip restraining device.

(12) FIG. **12** is a section side view of the grip restraining device.

(13) FIG. **13** is a perspective view of the grip restraining device.

(14) FIG. **14** is a sectional end view illustrating the grip restraining device.

(15) FIG. **15** is a side view illustrating the base bracket assembly and tiller arm, with the tiller arm shown in phantom line in a vertically straight up tilt position and in a vertically straight down tilt position.

(16) FIG. **16** is a side view illustrating the base bracket assembly and tiller arm, with the tiller arm shown in phantom line in a range of tilt positions.

(17) FIG. **17** is a sectional view of the tiller illustrating portions of a tilt mechanism for the tiller, including a tilt shaft, tilt levers, and a cam device.

(18) FIG. **18** is a view like FIG. **17**, taken from a different perspective.

(19) FIG. **19** is a view of one of the tilt levers shown in phantom and the cam device therein.

(20) FIG. **20** is a side view illustrating the tilt shaft, tilt lever and cam device of the tilt mechanism in an disengaged position.

(21) FIG. **21** is a view like FIG. **20** illustrating the tilt mechanism in an engaged position.

(22) FIG. **22** is a side sectional view illustrating the tilt mechanism in the engaged position with the tiller arm in a tilt position that is slightly downward from horizontal.

(23) FIG. **23** is a side sectional view illustrating the tilt mechanism in the engaged position with the tiller arm in a horizontal tilt position.

(24) FIG. **24** is a side sectional view illustrating the tiller arm as it is pivoted upwardly towards the uppermost, vertically straight up tilt position and illustrating a tilt bracket of the tilt mechanism as it engages a pawl of the tilt mechanism in such a way that moves the tilt mechanism into the disengaged position by overcoming a cam force provided by the cam device.

(25) FIG. **25** is a side sectional view illustrating the tilt mechanism in the disengaged position and the tiller arm in the uppermost, vertically straight up tilt position.

(26) FIG. **26** is a side sectional view illustrating the tilt mechanism in the engaged position and the tiller arm in the uppermost, vertically straight up tilt position.

(27) FIG. **27** is a side sectional view illustrating the tilt mechanism in the disengaged position and the tiller arm in the lowermost, vertically straight down tilt position.

(28) FIG. **28** is a side sectional view illustrating the tilt mechanism in the engaged position with the tiller arm in a vertically straight down tilt position.

DETAILED DESCRIPTION

(29) FIG. **1** illustrates a tiller **100** for controlling a not shown marine drive, such as 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 outwardly from the base bracket assembly **102**. The tiller **100** has several novel attributes which will be further explained herein below. Briefly, the base bracket assembly **102** is specially configured to facilitate yaw adjustment of the tiller arm **104**, in particular into and between a variety of yaw positions relative to the marine drive. In addition, the tiller arm **104** has a novel grip restraining device **106** which is located on the bottom of the middle portion of the tiller arm **104** and is manually accessible from both sides of the tiller arm **104** for ambidextrous use. The grip restraining device **106** is specially configured to selectively restrain rotation of a hand grip **220** on the outer end of the tiller arm **104**. In addition, the tiller arm **104** has a tilt mechanism **300** which facilitates tilting of the tiller arm **104** relative to the base bracket assembly **102** into and between a variety of tilt positions, including a straight upwardly extending tilt position and a straight downwardly extending tilt position (see FIG. **15**) for manual carrying of the marine drive via the tiller arm **104**.

(30) Referring to FIGS. **2-6**, the base bracket assembly **102** includes a yaw bracket **114** and a steering bracket **116**. The yaw bracket **114** is a rigid member having a body **118** and a base **120** which extends from the body **118** and is configured for fixed mounting to a not-shown steering arm of the marine drive, by for example fasteners extending through holes **122** (see FIG. **6**) in the end of the base **120**. The body **118** of the yaw bracket **114** provides a pedestal **124**. A through-bore **126** (FIG. **4**) extends through the center portion of the pedestal **124**. Three engagement recesses **128** extend into the pedestal **124**. Each engagement recess **128** has a drain hole **129** (FIG. **3**) which drains fluid that may accumulate in the engagement recess **128** during normal use. The three engagement recesses **128** are spaced apart fifteen degrees relative to the through-bore **126**. Opposing partial recesses **130** (FIG. **4**) are formed in the opposing sidewalls of the body **118** and are located one-hundred-and-eighty degrees apart from each other relative to the center of the through-bore **126**. The center-most of the engagement recesses **128** is located ninety degrees apart from each of the partial recesses **130**, respectively, relative to the center of the through-bore **126**. The engagement recesses **128** and partial recesses **130** together span one-hundred-and-eighty degrees relative to the center of the through-bore **126**. A washer **132** is seated in an annular cavity **136** extending about the through-bore **126**.

(31) 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 arms **140**. A fastener **145** extends through the opposed through-bores **144** and through a corresponding through-bore **147** (FIG. **2**) in the tiller arm **104** so as 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**, as will be further described herein below.

(32) A through-bore **146** (FIG. **4**) extends through the body **138**. A fastener **148** extends through the through-bore **146**, through the washer **132** and through the through-bore **126** in the body **118** and into threaded engagement with a threaded bolt cap **151**. The fastener **148** has a body **150** with a smooth outer surface, which is disposed in the through-bore **146**, the washer **132** and the through-bore **126** when the fastener **148** is in its position of use. As such, the steering bracket **116** is rotatable in either direction relative to the yaw bracket **114** about the fastener **148**. 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** (FIG. **3**) defined by the fastener **148** into and between a variety of yaw positions relative to the yaw bracket **114** and marine drive, as will be further described herein below.

(33) A yaw lock **154** (FIG. **5**) 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, as shown by arrows in FIGS. **5** and **6**. The yaw lock **154** includes a plunger **156** which resides in a through-bore **158** in the steering bracket **116** which defines an internal cavity and relatively smaller top and bottom openings in the body **138** of the steering bracket **116**. Referring to FIGS. **3** and **4**, the plunger **156** is an elongated member with a top end **160** which normally protrudes out of the top opening, a bottom end **168** which in a locked position protrudes out of the bottom opening, and a relatively enlarged annular body **170** which is trapped in the cavity because it is too big to pass through top and bottom openings. A coiled spring **172** is disposed between the top of the annular body **170** and the inside of the cavity adjacent to the top and normally biases the bottom end **168** of the plunger **156** outwardly relative to the bottom opening into the position shown in FIG. **3**.
(34) The yaw lock **154** also includes a release lever **180** located on top of the steering bracket **116** such that it is easily manually accessible from above and from the sides of the tiller **100**. The release lever **180** has a first end which is pivotably coupled to mounting boss **184** protruding up from the top of the steering bracket **116**, a second end which can be manually lifted by the operator's finger(s) to pivot the release lever **180** upwardly about the pivot axis defined through the mounting boss **184**. The top end **160** of the plunger **156** protrudes out of the top opening and is pivotally coupled to the bottom of the middle portion of the release lever **180**, between the first end and second end.
(35) FIGS. **5** and **6** show the yaw lock **154** in a locked position wherein the bottom end **168** of the plunger **156** is biased by the spring **172** into the center-most engagement recess **128**, which retains the steering bracket **116** in a straight-ahead position relative to the yaw bracket **114** and associated marine drive for straight-ahead steering. As shown by arrows in FIGS. **5** and **6**, to change the yaw position of the tiller **100** relative to the marine drive, the user manually pivots the first end of the release lever **180** upwardly relative to the mounting boss **184**, which pulls upwardly on the plunger **156** and causes the annular body **170** to compress the coiled spring **172**. As this occurs, the second end of the plunger **156** is removed from the yaw bracket **114**, which frees the steering bracket **116** and tiller arm **104** for pivoting motion about the yaw axis **152** (FIG. **3**) relative to the yaw bracket **114** and marine drive. As discussed above, in the illustrated embodiment, the steering bracket **116** is pivotable through at least one-hundred-and-eighty degrees relative to the yaw bracket **114** and lockable in each of the yaw positions designated by the engagement recesses **128**, **130**. Particularly, the user can release the release lever **180**, which permits the spring **172** to bias the second end of the plunger **156** outwardly towards and into engagement with the pedestal **124**. Once the plunger **156** becomes aligned with a next of the engagement recesses **128**, **130**, the spring **172** will bias the bottom end **168** of the plunger **156** into the engagement recess **128**, **130**.
(36) As such, it will be understood that unlocking the yaw lock **154** advantageously facilitates movement of the tiller arm **104** into a new yaw position relative to the marine drive. In the non-limiting illustrated embodiment, the tiller arm **104** and steering bracket **116** are pivotable through one-hundred-and-eighty degrees relative to the yaw bracket **114**. It will also be understood that the yaw lock **154** is advantageously configured such that upon movement of the tiller arm **104** and steering bracket **116** into the new yaw position, the yaw lock **154** automatically locks the tiller arm **104** and steering bracket **116** in the new yaw position via engagement of the spring-loaded plunger **156** with another engagement recess **128**, **130** of the plurality of recesses.
(37) 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 first side **208** to a second side **210** which is opposite the first side **208** in a lateral direction LA which is perpendicular to the longitudinal direction LO and perpendicular to the axial direction AX.
(38) Referring to FIG. **1**, 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**. Referring to FIG. **9**, a shaft **216** protrudes from the interior via a passage defined between the front of the chassis **212** and cover **214**. The shaft **216** is rotatable about its own axis and has a front end **218** which is coupled to a hand grip **220**. The hand grip **220** includes a grip member **222** and a grooved grip cover **224**. The shaft **216** is coupled to the hand grip **220** such that manually rotating the hand grip **220** relative to the chassis **212** and cover **214** causes rotation of the shaft **216** relative to the chassis **212** and cover **214**. The shaft **216** has a rear end **226** which includes a shaft extension **228** located within a supporting tray **230**. A magnetic sensor **252** is mounted to the supporting tray **230** and is configured to sense rotation of the shaft **216** (via the shaft extension **228**) and communicate such sensed rotation to a controller for the associated marine drive. Sensing arrangements for sensing rotation of a shaft in a tiller arm are conventional and well known in this art and thus not further herein described. As such, it will be understood that rotation of the hand grip **220** causes rotation of the shaft **216**, including shaft extension **228** within the supporting tray **230** and such rotation in turn causes change in the speed of the marine drive.

(39) Referring to FIG. **14**, the hand grip **220** and shaft **216**, including shaft extension **228**, are rotatable in opposite directions away from the center position shown and thus is configured for ambidextrous use. That is, the hand grip **220** can be rotated in the direction of arrow **234** to increase the speed of the marine drive and alternately the hand grip **220** can be rotated in the direction of arrow **236** to increase the speed of the marine drive, a detent mechanism **240** provides tactile feedback to the user grasping the hand grip **220** when the hand grip **220** is rotated into the center position shown, which corresponds to neutral position for the marine drive. The detent mechanism **240** includes a raised groove **242** on the top of the outer diameter of the shaft extension **228** and a roller pin **244** which is coupled to the supporting tray **230** and which becomes aligned with and pops into the raised groove **242** when the hand grip **220** and shaft **216** are rotated into the center position. Seating of the roller pin **244** provides tactile feedback in the form of a click which can be felt by the user grasping the hand grip **220**. Smoothly contoured surfaces **246** provide ramps on opposite sides of the raised groove **242** leading up to the groove and thus provide a gradually increasing resistance to the user rotating the hand grip **220** towards the center position until the roller pin **244** becomes aligned with and seats in the raised groove **242**. Referring to FIGS. **11-13**, in the illustrated example a coiled torsion spring **248** is disposed on the shaft **216** and has a first end attached to the shaft **216** and an opposite, second end attached to the supporting tray **230**. In other examples, the coiled torsion spring **248** can include one of two or more springs having opposite winding. The torsion spring **248** rotationally biases the shaft **216** towards the center position shown in FIG. **14**, however the bias force provided by the torsion spring **248** is not great enough to overcome the engagement force between the roller pin **244** and the ramped surfaces **246**. Instead, it is necessary to apply manual rotational force on the shaft **216** via the hand grip **220** to bring the raised groove **242** into alignment with the roller pin **244**. As such, it will be understood that manually grasping and rotating the hand grip **220** away from the center position in either direction **234**, **236** increases the speed of the marine drive. Manually releasing the hand grip **220** permits the bias of the torsion spring **248** to rotate the shaft **216** and hand grip **220** back towards the center position until the respective ramped surface **246** engages the roller pin **244**. To fully move the hand grip **220** back to the center position, the user must grasp and rotate the hand grip **220** with a force needed to push the ramped surface **246** past the roller pin **244** so that the roller pin **244** will pop into place in the raised groove **242**.

(40) Referring to FIGS. **11-14**, the grip restraining device **106** is specially configured to restrain rotation of the shaft **216** and thus rotation of the hand grip **220**. This is useful when the user wants to maintain a certain speed of the marine drive without having to continuously hold the hand grip **220**. This is also useful when the user wants to vary the amount of resistance which the hand grip **220** provides to rotational force. Some users prefer a hand grip which is more difficult to rotate. Others prefer a hand grip which is easier to rotate. The grip restraining device **106** advantageously

allow the user to selectively vary and set the resistance.

(41) The grip restraining device **106** restrains rotation of the hand grip **220** by frictionally engaging the outer diameter of the shaft extension **228** of the shaft **216**. The shaft extension **228** is a generally cylindrical member having a groove **250** extending around its outer diameter. The groove **250** has flanges **252** which are retained in axial position by supporting surfaces of the supporting tray **230**. The grip restraining device **106** generally includes a dial **254** which is mounted to a hole **256** in the bottom of middle portion of the chassis **212** of the tiller arm **104**. A snap ring **257** mounts the upper portion of the dial **254** to the chassis **212** such that the dial **254** is freely rotatable relative to the chassis **212**. Opposed ramped bottom walls **258** extend from the bottom of the chassis **212** and define a protective recess in which the dial **254** resides. Side cutouts **262** are defined in each of the bottom walls **258** and expose the outer diameter of the dial **254** on both first and second sides **208**, **210** of the tiller arm **104**.

(42) The grip restraining device **106** further includes a shuttle **260** which is disposed in the dial **254**, The shuttle **260** has an end **264** which is coupled to the interior of the dial **254** by flats such that rotation of the dial **254** causes rotation of the shuttle **260**. The shuttle **260** has an opposite narrower end **265** which extends into and is engaged with the inner diameter of a boss **266** protruding downwardly from the supporting tray **230** by a threaded connection. As such, the shuttle **260** is coupled to the dial **254** and to the boss **266** in the supporting tray **230** such that rotation of the dial **254** in a first direction causes rotation of the shuttle **260** in the first direction, which causes the shuttle **260** to travel axially upwardly further into the boss **266** and towards the shaft extension **228**. Rotation of the dial **254** in an opposite, second direction causes rotation of the shuttle **260** in the second direction, which causes the shuttle **260** to travel axially downwardly, outwardly relative to the boss **266**, further away from the shaft extension **228**.

(43) The grip restraining device **106** further includes a friction plunger **270** which resides within the boss **266**. The plunger **270** has an outer friction surface **272** which is curved to match and abut the curved outer diameter of the groove **250** of the shaft extension **228**. A coiled spring **274** has a first end abutting the interior of the shuttle **260** and a second end abutting the inner surface of the friction plunger **270**. The spring **274** tends to bias the friction plunger **270** away from the shuttle **260** and into frictional engagement with the groove **250** of the shaft extension **228**.

(44) As such, it will be understood that rotation of the dial **254** in a first rotational direction causes the shuttle **260** to axially move towards the shaft extension **228**, which compresses the spring **274** and increases the force of which the friction plunger **270** frictionally engages with the shaft extension **228**. This increases the restraining force or resistance to manual rotation of the hand grip **220**. Rotation of the dial **254** in the opposite, second rotational direction causes the shuttle **260** to axially move away from the shaft extension **228**, which allows the spring **274** to relax and decreases the force of which the friction plunger **270** engages with the shaft extension **228**. This decreases the restraining force or resistance to manual rotation of the hand grip **220**. Advantageously, the grip restraining device **106** is manually operable from either side **108**, **110** of the tiller arm **104** and thus is configured for ambidextrous use. This is particularly advantageous in the illustrated embodiment wherein the hand grip **220** is rotatable relative to the tiller arm **104** through at least one-hundred-and-eighty degrees, including 90 degrees away from the center position in the first rotational direction (for right-handed use of the tiller **100**), and 90 degrees away from the center position in the opposite, second direction (for left-handed use of the tiller **100**).

(45) As described herein above with reference to FIGS. **1** and **2**, the tiller **100** is pivotable relative to the base bracket assembly **102** via connection between the fastener **145** which extends through a through-bore **147** in the tiller arm **104**, through the opposed through-bores **144** in the arms **140**. The fastener **145** defines a tilt axis **299** about which the tiller arm **104** is pivotable relative to the base bracket assembly **102**.

(46) Referring to FIGS. **15** and **16**, the tiller **100** also has a tilt mechanism **300**, which advantageously facilitates selective retainment of the tiller arm **104** in any one of a range of user-

selectable tilt positions relative to the tilt axis **299** on the base bracket assembly **102**. FIG. **15** illustrates via arrows a range of selectable tilt positions of the tiller arm **104** facilitated by the tilt mechanism **300**, including in solid line a horizontal tilt position and in phantom lines a vertical straight upward position and in phantom lines a vertical straight downward position, thus spanning a range of selectable positions that extends through 180 degrees relative to the tilt axis **299** on the base bracket assembly **102**. FIG. **16** illustrates the tiller arm **104** in solid lines in the horizontal tilt position and in phantom lines additional upward tilt positions which are in fifteen degree increments relative to each other. As further described herein below, the tilt mechanism **300** advantageously allows the user to move and lock the tiller arm **104** in the illustrated range of tilt positions, including in some examples where the tiller arm **104** is movable at least forty-five degrees downwardly from horizontal, further including in some examples at least seventy-five degrees downwardly from horizontal, and further including in some examples at least ninety degrees downwardly relative to horizontal. As will be further described herein below, the tilt mechanism **300** is engageable to retain the tiller arm **104** in any one of a variety of selected positions. As will be further described herein below, the tilt mechanism **300** is further engageable to lock the tiller arm **104** in the uppermost or lowermost positions.

(47) Referring to FIGS. **9** and **22-28**, the tilt mechanism **300** includes a tilt bracket **302** which is fastened to the inner end **200** of the tiller arm **104**. The tilt bracket **302** has an inner arm **304** which extends into the interior of the tiller arm **104** defined by the chassis **212** and cover **214**. The inner arm **304** is fixed via fasteners **307** extending through the chassis **212** and into engagement with the inner arm **304**. The tilt bracket **302** extends from the inner end **200** of the tiller arm **104** and has a body **308**. A through-bore **311** extending laterally through the body **308**. Ratchet wheels **310** are located on laterally opposite sides of the body **308**, each having a series of two-sided angular ratchet recesses **312** located along the outer radius of the rear side of the respective ratchet wheel **310**. Upper and lower pairs of locking arms **314**, **315** are located axially between the ratchet wheels **306** and radially extend from the body **308** on opposite sides of the series of ratchet recesses **312**, respectively. Each of the upper and lower pairs of locking arms **314**, **315** provide sidewalls for a respective rectangular-shaped locking recess **316**, **317** having a bottom wall and opposing side walls extending upwardly from the bottom wall.

(48) Referring to FIGS. **1** and **4**, the tilt mechanism **300** also includes a tilt shaft **320** which extends along a tilt shaft axis **322** and is rotatably supported within the opposed through-bores **142** in the arms **140**. A pawl **324** is pinned to the middle of the tilt shaft **320**, axially between the arms **140**. The pawl **324** is rotatable along with the tilt shaft **320** about the tilt shaft axis **322** and relative to the base bracket assembly **102**. The pawl **324** has opposing ratchet surfaces **326** having a series of pointed ratchet protrusions for mating in a meshed engagement with the ratchet recesses **312** on the ratchet wheels **306**, as will be further described herein below. The pawl **324** also has a locking bar **328** located axially between the ratchet surfaces **326**.

(49) Referring to FIG. **4** and FIGS. **17-19**, the tilt mechanism **300** further includes tilt levers **330** fastened to each end of the tilt shaft **320**. The tilt levers **330** are manually rotatable, which causes rotation of the tilt shaft **320** and pawl **324** about the tilt shaft axis **322** and with respect to the arms **140**. A novel cam device **332** is located on one end of the tilt shaft **320**. The cam device **332** includes a coil spring **334** disposed on the tilt shaft **320**, a cam body **336** on the tilt shaft **320** and a cam receiver **338** formed on the inside surface of the respective tilt lever **330**. The spring **334** and cam body **336** are located in a bore **337** in the respective arm **140** such that the cam body **336** remains rotatably fixed relative to the arm **140** but can axially travel with respect to the tilt shaft **320**. The coil spring **334** provides a spring bias force that biases the cam body **336** axially outwardly towards the cam receiver **338** in the tilt lever **330**. The cam body **336** has axially outwardly facing rounded ridges **340** which are configured to alternately nest in correspondingly contoured surfaces **342** in the cam receiver **338** depending on a rotational position of the tilt lever **330**, as will be further described herein below. Generally speaking the contoured surfaces **342** in

the cam receiver **338** provide a first elongated pocket for nesting the rounded ridges **340** of the cam body **336** when the tilt mechanism **300** is in the disengaged position (see FIG. **20**), and a second elongated pocket for nesting the rounded ridges **340** when the tilt mechanism **300** is in the disengaged position (see FIG. **21**). As further described herein below, moving the cam device **332** from one of the disengaged position and engaged position to the other of the disengaged position and engaged position requires application of a rotational force on the cam device **332** that is greater than a cam force provided by the spring **334** plus camming engagement between the rounded ridges **340** and contoured surfaces **342** in the nested orientation of the cam body **336** in the cam receiver **338**. The rotational force can be applied by manually rotating the tilt levers **330** or by rotating the tiller arm **104** upwardly into the vertical straight upward position shown in FIG. **15**. This causes the contoured surfaces **342** to cammingly engage the rounded ridges **340**, which in turn causes the cam body **336** to axially travel inwardly away from the cam receiver **338** along the tilt shaft **320** in the bore **337**, against the bias of the spring **334**, until the contoured surfaces **342** are removed from the existing pocket in which it resides, which permits further rotation of the tilt levers **330** and corresponding rotation of the tilt shaft **320** and pawl **324** to the other of the disengaged and engaged position, whereafter the spring **334** biases the cam receiver **338** back axially outwardly into engagement with the new pocket. In the illustrated example, the cam device **332** is located on one end of the tilt shaft **320**, however in other examples, the tilt mechanism **300** includes cam devices **332** on both ends of the tilt shaft **320**. Also, in other examples the orientation of the levers **330** can be flipped 180 degrees to better avoid interference of components.

(50) FIG. **22** is a side sectional view illustrating the tilt mechanism **300** in an engaged position with the tiller arm **104** in a tilt position that is angled slightly downward from horizontal. The tilt mechanism **300** is illustrated in the engaged position, wherein the spring **334** is biasing the pawl **324** in the counter-clockwise direction in the side perspective of FIG. **22**, and such that the opposing ratchet surfaces **326** on the pawl **324** are mated with the first few ratchet recesses **312** on the ratchet wheels **306**, respectively. As such, the tiller arm **104** is retained in the illustrated tilt position via engagement between the pawl **324** and the body **308** of the tilt bracket **302**.

(51) FIG. **23** illustrates the tilt mechanism after a user manually pivots the tiller arm **104** upwardly about the tilt axis **299** defined by the fastener **145**, counter-clockwise in the side perspective of FIG. **22**. The tilt mechanism **300** remains in the engaged position and the tiller arm **104** is shown in a generally horizontal position relative to the tilt axis **299** and the base bracket assembly **102**. Upward pivoting of the tiller arm **104** is permitted by the tilt mechanism **300** via spring-biased ratcheting movement of the pawl **324** along the ratchet wheels **306**, particularly as the ratchet surfaces **326** on the pawl **324** ratchet along the ratchet recesses **312** of the ratchet wheels **310**, respectively, until the tiller arm **104** is brought to a rest position, which permits the spring **334** to rotate the pawl **324** towards the tilt bracket **302**, causing meshed engagement between the ratchet surfaces **326** and ratchet recesses **312**. The spring bias is provided by the axial bias of spring **334**, pushing the cam body **336** axially into engagement with the cam receiver **338** such that the rounded ridges **340** tend to remain nested in the pocket corresponding to the locked position. As the tiller arm **104** is rotated upwardly, the ratchet surfaces **326** move along the ratchet surfaces **326**, which causes slight counter-clockwise and clockwise movements of the pawl **324** and tilt shaft **320** about the tilt shaft axis **322**. Such movements of the pawl **324** and tilt shaft **320** is facilitated by the counter-acting forces provided by the cam device **332**. In particular, slight clockwise rotation of the pawl **324** and tilt shaft **320** is facilitated by camming engagement of the rounded ridges **340** upwardly along the contoured surfaces **342** of the respective pocket. Slight clockwise (return) rotation is cause by the bias of the spring **334**, pushing the cam body **336** axially towards the cam receiver **338**, which causes the rounded ridges **340** to cam back down along the contoured surfaces **342** into a fully nested position. Compared to the downwardly angled position shown in FIG. **22**, more of the ratchet surfaces **326** are engaged with ratchet recesses **312** on the ratchet wheels **310**.

(52) FIG. **24** illustrates the tiller arm **104** as it is manually pivoted further upwardly relative to the

tilt axis **299**, further counter-clockwise in the side perspective of FIG. **24**. Such upward pivoting of the tiller arm **104** relative to the tilt axis **299** brings the outside edge of the upper locking arms **314** into engagement with the upper surface of the locking bar **328** on the pawl **324**, as shown. When the tiller arm **104** is further rotated upwardly from the position shown in FIG. **24**, with a rotational force that is greater than the above-noted cam force provided by the cam device **332**, the outside edge of the upper locking arms **314** forces the pawl **324** to rotate downwardly, clockwise in the side perspective of FIG. **24**. More specifically, the rotational force applied on the pawl **324** and tilt shaft **320** rotates the cam receiver **338** relative to the cam body **336**, which causes the rounded ridges **340** of the cam body **336** to travel upwardly along the contoured surfaces **342** of the cam receiver **338**, against the bias of the spring **334**, until the rounded ridges **340** fully leave the noted pocket corresponding to the engaged position and become aligned with and nested in the noted pocket corresponding to the disengaged position. This simultaneously causes the tilt shaft **320** and tilt levers **330** to also rotate downwardly until the pawl **324** is rotated out of the way of the tilt bracket **302**, as shown in FIG. **25**. Thus manually pivoting of the tiller arm **104** upwardly into the position shown in FIG. **25** automatically frees the tiller arm **104** to be pivoted back downwardly to any angle.
(53) As shown in FIG. **26**, if the user wants to lock the tiller arm **104** in the vertical upward position, the user manually rotates one or both of the tilt levers **330** with a force that is greater than the cam force provided by the cam device **332**. This overcomes the bias of the spring **334** and the nested surfaces of the cam body **336** and cam receiver **338** and rotates the locking bar **328** of the pawl **324** into locking engagement with the recess **316** provided by the upper locking arms **314**, effectively locking the tiller arm **104** in place.
(54) As shown in FIGS. **27-28**, if the user wants to unlock the tiller arm **104** and move it downwardly, for example to the vertically straight downward position shown, the user manually rotates one or both of the tilt levers **330** with a force that is greater than the noted cam force. This rotates the locking bar **328** of the pawl **324** downwardly, clockwise in the side view of FIGS. **27-28**. This removes the locking bar **328** from the recess **316** and frees the tilt bracket **302** from the pawl **324** and permits the user to manually lower the tiller arm **104** about the tilt axis **299** into the vertically straight downward position shown. Thereafter the user can again rotate the tilt levers **330** counter-clockwise, which brings the locking bar **328** of the pawl **324** into locking engagement with the recess **317** defined by the lower locking arms **315**. This effectively locks the tiller arm **104** in place with a robust tilt mechanism which can be made strong enough to permit a user to carry the associated marine drive via the tiller arm **104** in the position shown in FIG. **28**.
(55) 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 a marine drive, the tiller comprising: a tiller arm, a yaw bracket configured for fixed attachment to a marine drive and a steering bracket that pivotably couples a tiller arm to the yaw bracket for movement about a yaw axis, and a yaw lock configured to lock the steering bracket and the tiller arm in a plurality of yaw positions relative to the yaw axis, wherein unlocking the yaw lock facilitates movement of the steering bracket and the tiller arm into a new yaw position in the plurality of yaw positions, wherein the yaw lock includes a lever located on top of the steering bracket and a plunger that is extendable from the steering bracket into operative engagement with the yaw bracket, wherein pivoting the lever relative to the steering bracket unlocks the yaw lock by

retracting the plunger from the yaw bracket.
2. The tiller according to claim 1, wherein the tiller arm and the steering bracket are movable through at least 180 degrees relative to the yaw axis, and wherein the plurality of yaw positions spans at least 180 degrees relative to the yaw axis.
3. The tiller according to claim 1, wherein the yaw lock is configured such so that upon said movement of the tiller arm and steering bracket into the new yaw position, the yaw lock automatically locks the tiller arm and steering bracket in the new yaw position.
4. The tiller according to claim 3, wherein the plunger is spring biased to automatically lock the tiller arm in the new yaw position.
5. The tiller according to claim 1, wherein the plunger is configured to engage a plurality of recesses in the yaw bracket which corresponds to the plurality of yaw positions.
6. The tiller according to claim 5, wherein each recess in the plurality of recesses comprises a drain.
7. The tiller according to claim 1, wherein the yaw lock is manually operable to unlock the tiller arm and steering bracket from each of the plurality of yaw positions.
8. The tiller according to claim 1, wherein the plunger is spring-biased into operative engagement with the yaw bracket, and wherein the lever is pivotable against the spring bias to unlock the steering bracket.
9. The tiller according to claim 1, wherein the lever has a first end that is pivotably coupled to the steering bracket, and a second end that is pivotable upwardly relative to the steering bracket to move the plunger out of operative engagement with the yaw bracket.
10. A tiller for a marine drive, the tiller comprising: a tiller arm, a yaw bracket configured for fixed attachment to a marine drive and a steering bracket pivotably coupling the tiller arm to the yaw bracket for movement about a yaw axis, and a yaw lock configured to automatically lock the steering bracket and tiller arm in a plurality of yaw positions relative to the yaw axis, wherein manually unlocking the yaw lock facilitates movement of the tiller arm into a new yaw position of the plurality of yaw positions, wherein the yaw lock includes a lever on top of the steering bracket and a plunger that is extendable from the steering bracket into operative engagement with the yaw bracket, wherein the lever is pivotably coupled to the plunger and the plunger is spring biased towards operative engagement with the yaw bracket, and wherein pivoting the lever relative to the top of the steering bracket moves the plunger out of operative engagement with the yaw bracket and releasing the lever permits the spring bias to move the plunger towards operative engagement with the yaw bracket.
11. The tiller according to claim 10, wherein the steering bracket includes an internal cavity and relatively smaller top and bottom openings in the steering bracket, and wherein the plunger has a top end, a bottom end, and body between the top end and the bottom end, wherein the body remains trapped in the internal cavity between the relatively smaller top and bottom openings as the plunger is moved into and out of operative engagement with the yaw bracket.
12. The tiller according to claim 4, further comprising a spring providing the spring bias.
13. The tiller according to claim 10, wherein the yaw lock is configured so that upon said movement of the tiller arm and steering bracket into the new yaw position, the yaw lock automatically locks the tiller arm and steering bracket in the new yaw position.
14. The tiller according to claim 10, wherein the lever has a first end that is pivotably coupled to the steering bracket, a second end that is pivotable upwardly relative to the steering bracket to move the plunger out of operative engagement with the yaw bracket.
15. A tiller for a marine drive, the tiller comprising: a tiller arm, a yaw bracket configured for fixed attachment to a marine drive, the yaw bracket having a pedestal surface, a steering bracket coupled to the tiller arm, the steering bracket being supported on the pedestal surface and pivotable relative to the pedestal surface about a yaw axis, and a yaw lock configured to lock the steering bracket and the tiller arm in a plurality of yaw positions relative to the yaw axis, wherein unlocking the yaw lock facilitates movement of the steering bracket and the tiller arm into a new yaw position in the

plurality of yaw positions, wherein the yaw lock is movable into a locked position in which the yaw lock protrudes from the steering bracket into operative engagement with the pedestal surface to lock the steering bracket and the tiller arm in the new yaw position and an unlocked position in which the yaw lock is retracted from operative engagement with the pedestal surface.

16. The tiller according to claim 15, wherein the yaw lock includes a lever located on top of the steering bracket and configured to move the yaw lock out of the locked position.

17. The tiller according to claim 15, wherein the yaw lock is spring-loaded into the locked position.

18. The tiller according to claim 15, wherein the yaw lock includes a plunger that protrudes from the steering bracket into operative engagement with the pedestal surface when the yaw lock is in the locked position.

19. The tiller according to claim 18, wherein the yaw lock includes a lever configured to move the plunger out of operative engagement with the pedestal surface.

20. The tiller according to claim 19, wherein the plunger is spring-loaded into operative engagement with the pedestal surface.