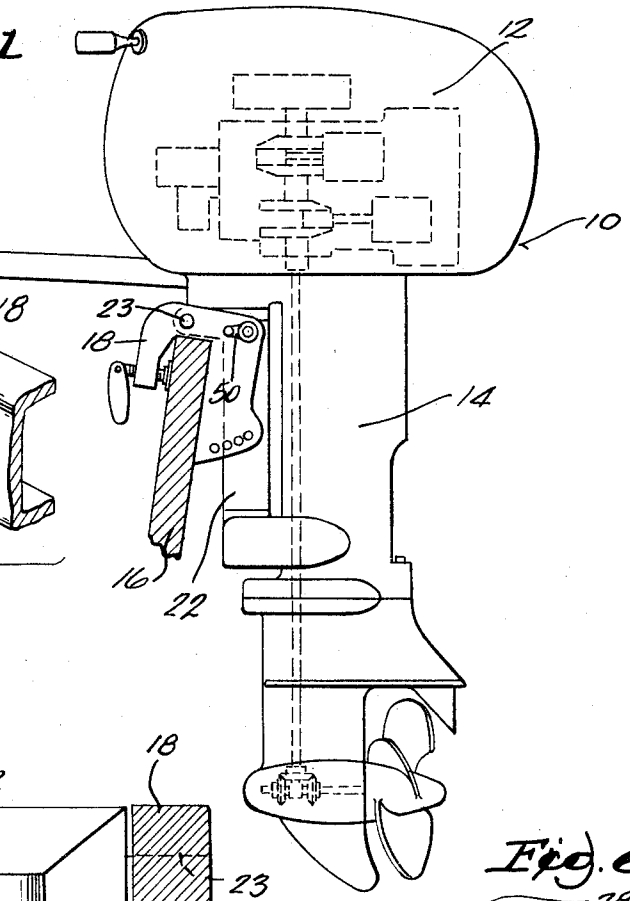
May 12, 1970 W. J. SHIMANCKAS 3,511,460

MANUAL TILTING DEVICE FOR MARINE PROPULSION UNITS

Filed Nov. 22, 1967 2 Sheets-Sheet 1

Fig. 1



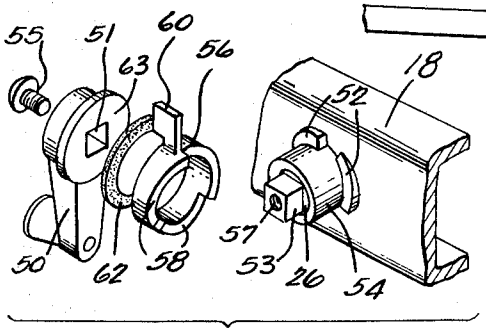


Fig. 5

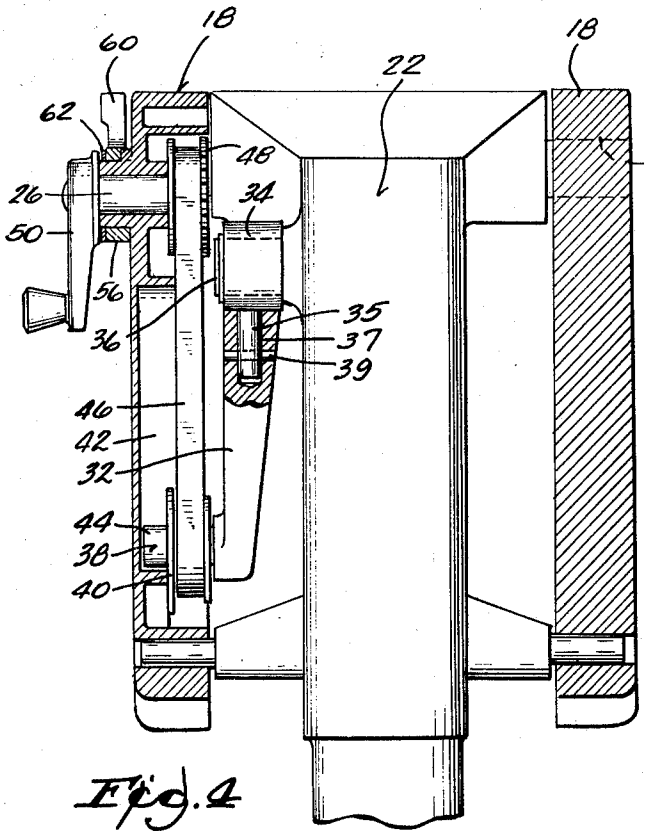
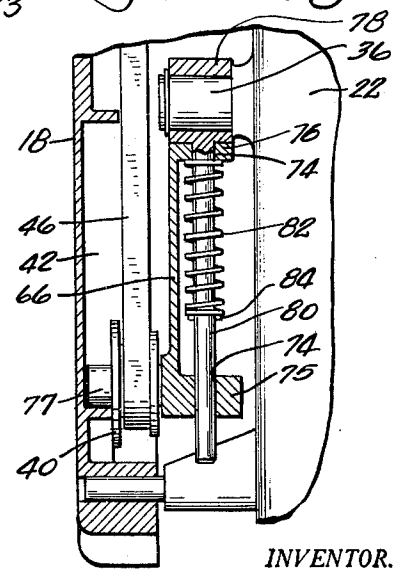


Fig. 4

Fig. 6



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MANUAL TILTING DEVICE FOR MARINE PROPULSION UNITS

Filed Nov. 22, 1967 2 Sheets-Sheet 2

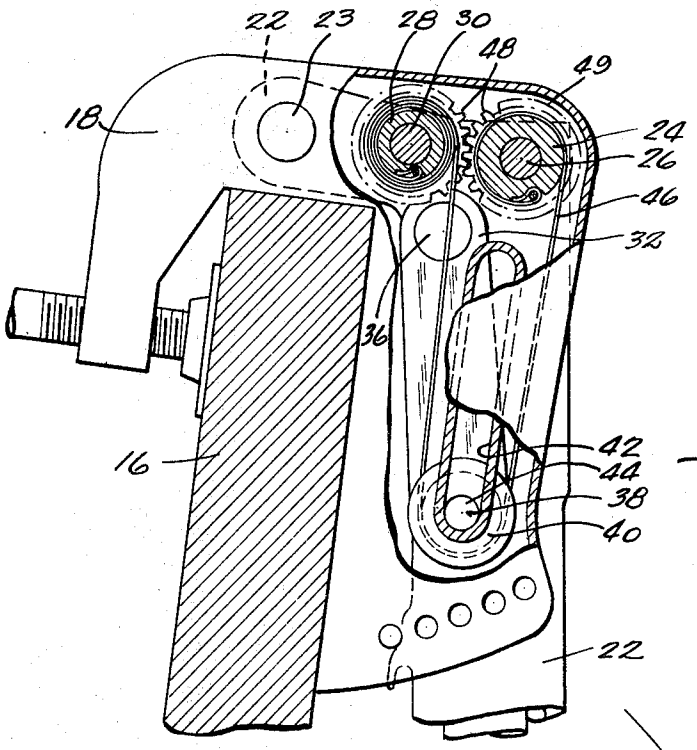


Fig. 2

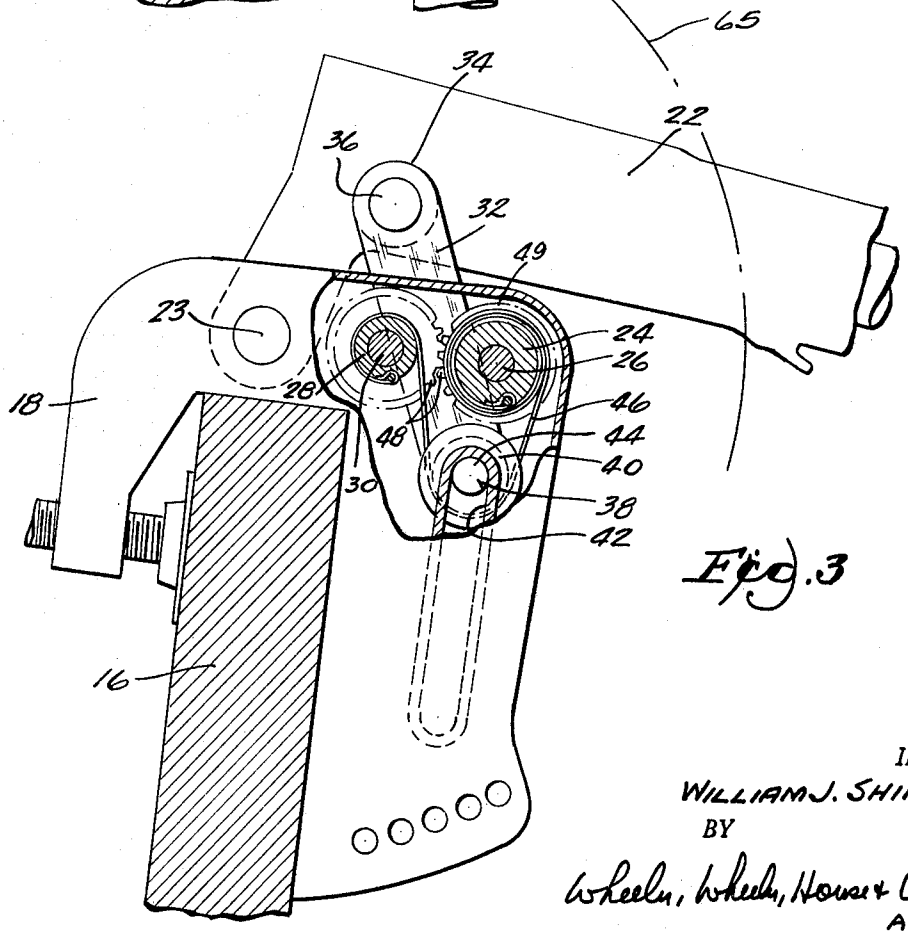


Fig. 3

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3,511,460

MANUAL TILTING DEVICE FOR MARINE PROPULSION UNITS

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U.S. Cl. 248—4 15 Claims

ABSTRACT OF THE DISCLOSURE

Disclosed herein is a manual tilting device for a marine propulsion unit, which device employs a hand crank to tilt the drive shaft housing about a horizontal tilt axis. The hand crank is connected to a band and pulley arrangement with each end of the band secured to separate pulleys rotatably supported by the stern bracket. The band is also reeved around a third idler pulley, mounted on an arm connected to a swivel bracket which is pivotally connected to the stern bracket to provide a horizontal tilt axis. Manual rotation of the crank to wind or unwind the band on the pulleys causes the idler pulley and arm to travel upwardly or downwardly and pivot the swivel bracket about the horizontal tilt axis. A releasable brake secures the crank against rotation to maintain a desired angle of tilt.

BACKGROUND OF INVENTION

In the operation of marine propulsion units it often is necessary to tilt the marine propulsion unit for access to the propeller, for weed removal, or for travel in shallow water. A number of hydraulic and electrical devices have been provided to assist in tilting the drive shaft housing or lower unit of the marine propulsion device. Such hydraulic and electrical devices are expensive and inappropriate for some outboard motors. The present invention provides a tilting device that is particularly appropriate for intermediate size motors.

SUMMARY OF INVENTION

The invention provides a device for tilting the drive shaft housing and power head of a marine propulsion unit about a horizontal tilt axis. When the drive shaft housing is in a substantially vertical position, the center of gravity of a marine propulsion unit is typically spaced aft of the horizontal tilt axis. As the drive shaft housing is tilted about the horizontal tilt axis, the center of gravity of the swingable part of the marine propulsion unit traverses an arc which extends forwardly and upwardly to a position generally above the horizontal tilt axis. As the center of gravity approaches a position vertically above the horizontal tilt axis, very little effort is required to tilt the marine propulsion unit. The present invention provides a tilting device in which the highest mechanical advantage is afforded when the drive shaft housing is substantially vertical and the greatest amount of effort is required for tilting. The mechanical advantage continuously decreases as the drive shaft housing is tilted upwardly.

The tilting device of the invention comprises a band and pulley arrangement which cooperates with an arm connecting a swivel bracket and stern bracket to afford upward tilting movement of the swivel bracket. More specifically, the stern bracket rotatably supports first and second pulleys, and one end of the band is connected to each of the pulleys. The band is also reeved around an idler pulley rotatably supported on one end of the arm. Upon rotation of the crank, which is connected to one of the pulleys on the stern bracket, the steel band winds around the pulley and draws the idler pulley and arm upwardly, thus tilting the swivel bracket about the horizontal tilt axis. The swivel bracket pulleys are provided with teeth in the outer flanges which mesh to afford counterrotation of one pulley upon rotation of the other pulley. A slot in the swivel bracket provides a guide for movement of the idler pulley.

A releasable brake secures the crank against rotation to maintain the swivel bracket and drive shaft housing at the desired angle of tilt.

Further objects and advantages of the invention will become apparent from the following disclosure.

DRAWINGS

FIG. 1 is a side elevational view of a marine propulsion unit embodying the present invention.

FIG. 2 is an enlarged fragmentary, partially broken away side elevational view of the device shown in FIG. 1.

FIG. 3 is an enlarged fragmentary, partially broken away side elevational view of the device shown in FIG. 1 with the swivel bracket in a tilted position.

FIG. 4 is an enlarged view in fragmentary section of the invention shown in FIG. 2.

FIG. 5 is an exploded perspective view of the hand crank and brake.

FIG. 6 is a vertical elevational view of a modified embodiment of the invention.

DETAILED DESCRIPTION

In the drawings, FIG. 1 shows a marine propulsion unit or device which is generally designated **10** and which includes a power head **12** and a drive shaft housing **14**. Mounting of the marine propulsion unit to a transom **16** of a boat hull is provided by a conventional clamp bracket or stern bracket **18**. The drive shaft housing **14** is rotatably supported on a swivel bracket **22** which is connected to the stern bracket **18** by a horizontal pintle or pin **23** providing a horizontal tilt axis for the power head **12** and drive shaft housing **14**.

The invention contemplates the provision of a manual tilting device in a marine propulsion unit for tilting the drive shaft housing about its horizontal tilt axis through a range of angular positions. In this regard, means are provided for connecting the stern bracket to the swivel bracket to pivot the swivel bracket about its horizontal axis. Such means are adapted for manual rotation and afford initially greater mechanical advantage when the center of gravity of the swingable part of the marine propulsion unit **10** is aft of the horizontal tilt axis and continuously decreasing mechanical advantage as the center of gravity shifts upwardly and forwardly during angular rotation of the marine propulsion unit. In the disclosed construction, the means includes a first pulley or drum **24**, which is secured to a shaft **26** rotatably supported in the stern bracket **18**, and a second pulley or drum **28** secured to or rotatably supported on a shaft **30** which can be fixed or rotatably supported in the stern bracket **18**.

The tilting means connecting the stern bracket **18** to the swivel bracket **22** also includes an arm **32** connected to a collar **34** which is pivotally supported on a laterally extending trunnion **36** which is integral with the swivel bracket **22** and spaced from the horizontal tilt axis **23** as shown in FIG. 3. The lower end of the arm **32** has a laterally projecting shaft **38** which rotatably supports a third pulley **40**.

Means are provided for connecting the arm to the stern bracket **18** for guiding movement of the arm **32** during tilting of the swivel bracket **22** about the horizontal tilt axis as hereinafter described. In the disclosed construction, such means is in the form of an elongated slot **42** in the stern bracket **18** which extends generally

parallel to the transom **16** and which receives the end **44** of the shaft **38**.

To protect the marine propulsion unit against damage caused by impact with an underwater obstruction, the collar has a depending peg **35** which extends into an aperture **37** in the arm **32** and which is connected to the arm **32** by a shear pin **39**.

The pulleys **24**, **28** and **40** are connected by a strand or steel band **46** which is desirably flat and which has one end secured to the pulley **28** and the other end secured to the pulley **24** with a portion reeved around the pulley **40**.

Although in the disclosed construction separate pulleys **24** and **28** are employed, in the alternative, a single drum with two sets of flanges and two different diameters could be utilized.

Means are provided for connecting the pulley **24** to the pulley **28** for rotation of the pulley **28** in a direction counter to the direction of rotation of the pulley **24** during tilting of the marine propulsion unit **10** as hereinafter described. In the construction disclosed in FIGS. 2 and 3, the means includes teeth **48** on adjacent flanges **49** of each of the pulleys **24**, **28**.

A crank **50** is secured to shaft **26** for rotating pulley **24** to wind or release the band **46** for varying the angle of tilt of the drive shaft housing about its horizontal tilt axis **20**. As shown in FIG. 5, the crank **50** has an aperture **51** with angularly related surfaces which interfit with complementary surfaces **53** on the end of the shaft **26**. A bolt **55** threads into the axial aperture **57** in the shaft **26** to secure the crank **50** to the shaft **26**.

The invention also provides means for securing the swivel bracket against rotation to maintain the drive shaft housing **14** at a desired angle of tilt. As shown in FIGS. 4 and 5, the means comprises cam surfaces or segments **52** circumferentially arranged around a hollow boss or extension **54** which projects from the stern bracket **18** and which rotatably supports the shaft **26**. The means also includes a collar **56** having cam surfaces or segments **58** and a radially extending lever **60** adapted to be manipulated by the operator. A friction washer or brake band **62** is located on the boss **54** between the face **63** of the crank or handle **50** and the collar **56**. To secure the shaft **26** against rotation and fix the angle of tilt, the lever **60** is moved to rotate the collar until the cam surfaces **58** and **52** coopearte to move the collar **56** axially and urge the washer **62** against the face **63** of the hand crank **50**.

To operate the manual tilt of the invention, and to tilt the swivel bracket from the substantially vertical position shown in FIGS. 1 and 2 to the angular position shown in FIG. 3, the crank handle **50** is turned to rotate the pulley **24** and wind thereon the band **46**, thereby increasing the diameter of the pulley **24**, and decreasing the diameter of the pulley **28** and thereby also causing upward travel of the pulley **40** and the shaft **38** in the slot **42**. The upward travel of the pulley **40** causes upward movement of the arm **32** and thus pivots the swivel bracket **22** about the horizontal tilt axis **20**.

When the swivel bracket is in the substantially vertical position shown in FIG. 2, the diameters of the pulleys **24** and **28** are desirably equal to provide maximum mechanical advantage. In this position, the center of gravity of the swingable part of the marine propulsion unit i.e., the drive shaft housing **14**, is aft of the stern bracket, and the lifting force required for pivotal movement is the maximum. Upon rotation of the crank **50**, the band **46** will wind on the pulley **24** and increase the diameter of the pulley **24**, and unwind on the pulley **28**, decreasing the diameter of the pulley **28**. The mechanical advantage thus continually decreases as the swivel bracket is tilted upwardly about the horizontal tilt axis **20**, carrying the drive shaft housing **14** upwardly from its normal operating position. As the center of gravity of the swingable part of the marine propulsion unit traverses an elongated arcurate path **65** upwardly and toward the horizontal tilt axis **20**, the lifting force required to afford angular rotation of the swivel bracket decreases, and less mechanical advantage is required to produce the same lifting force. As the diameter of the pulley **24** increases, each turn of the crank **50** will cause greater angular movement of the drive shaft housing **14**. When the marine propulsion unit has attained the desired angle of tilt, the lever **60** can be moved to secure the shaft **26** against rotation.

In the modified embodiment of the invention illustrated in FIG. 6, means are provided to yieldably restrain upward pivotal movement of the drive housing **14** and the sewivel bracket **22**.

In the disclosed construction, the means comprises an arm **66** which has co-axial apertures **74** in inturned flanges **75**, **76** at each end of the arm **66**. The arm **66** has an outturned shaft portion **77** which extends into the elongated slot **42** and rotatably carries the pulley **40**. The arm **66** is connected to the trunnion **36** by a collar **78** rotatably supported on the trunnion **36**. The collar has a stem **80** secured thereto, which extends through apertures **74**. A spring **82** is arranged over the stem **80** and located against the flange **76**. A cross pin **84** secures the other end of the spring **82**.

During upward movement of the swivel bracket **22** upon tilting the drive shaft housing, as the shaft **77** engages the upper end of the slot **42**, further angular movement of the swivel bracket beyond the limit imposed by the slot **42** will cause the arm **66** to telescope over the stem **80**, i.e. move downwardly in FIG. 6 and pull away from engagement with the collar **78**, against the biasing of spring **82**, which yieldably restrains further travel of the swivel bracket **22** to minimize any possibility of damage to the stern bracket **18**.

Various of the features of the invention are set forth in the following claims.

What is claimed is:

1. A marine propulsion unit comprising a stern bracket, a swivel bracket pivotally mounted to said stern bracket for movement about a horizontal axis, a manually operable handle rotatably mounted on said stern bracket about an axis parallel to and spaced from said horizontal axis and means connecting said handle to said swivel bracket for pivoting said swivel bracket about said horizontal tilt axis in response to rotary handle movement relative to said stern bracket.

2. A marine propulsion unit comprising a stern bracket, a swivel bracket pivotally mounted to said stern bracket for movement about a horizontal axis, a drive shaft housing connected to said swivel bracket, means connecting said stern bracket to said swivel bracket and adapted for manual rotation for pivoting said swivel bracket about said horizontal tilting axis, said means connecting said stern bracket to said swivel bracket including means for initially providing greater mechanical advantage when said drive shaft housing is in its normal operating position and continually decreasing mechanical advantage as said drive shaft housing is pivoted upwardly from the normal operating position.

3. The combination, in a marine propulsion unit, of a stern bracket, a swivel bracket pivotally mounted to said stern bracket for movement about a horizontal axis, a first pulley rotatably supported by said stern bracket, a second pulley rotatatably supported by said stern bracket, a crank connected to said first pulley, and arm having one end pivotally connected to said swivel bracket at a point spaced from said horizontal tilt axis, a third pulley rotatably supported on the other end of said arm, and a band connected to said first pulley and said second pulley and reeved around said third pulley to afford movement of said swivel bracket about said horizontal axis upon rotation of said first pulley.

4. The device of claim **3** including means for connecting the arm to the stern bracket for guiding movement of said arm during tilting of said swivel bracket.

5. The improvement of claim 4 wherein said means for guiding movement of said arm comprises an elongated slot in said stern bracket, and a shaft projecting from the end of said arm into said slot.

6. The improvement of claim 3 including means connecting said first pulley to said second pulley to counterrotate said second pulley upon rotation of said first pulley.

7. The improvement of claim 6 wherein said means connecting said first pulley to said second pulley to counterrotate said second pulley comprises flanges on each of said pulleys, each of said flanges having teeth in meshing engagement.

8. The device of claim 1 including a releasable brake means for securing said swivel bracket against rotation to maintain said swivel bracket at a desired angle relative to said stern bracket.

9. The improvement of claim 3 including means for yieldably restraining upward tilting movement of said swivel bracket.

10. The improvement of claim 9 wherein said means for yieldably restraining upward tilting movement of said swivel bracket comprises an arm having upper and lower inturned flanges, said flanges having co-axial apertures, a stem extending through said apertures, said stem having an upper end rotatably mounted on said swivel bracket, a cross pin extending through said stem, and a spring located between said cross pin and said upper flange of said arm.

11. A marine propulsion device comprising a stern bracket, a drive shaft housing pivotally mounted to said stern bracket for vertical swinging movement about a horizontal tilt axis, a manually operable handle rotatably mounted on said stern bracket about an axis parallel to and spaced from said horizontal axis, and means connecting said handle to said drive shaft housing for tilting of said drive shaft housing about said horizontal tilt axis in response to rotary handle movement relative to said stern bracket.

12. The combination, in a marine propulsion unit, of a stern bracket, a swivel bracket pivotally mounted to said stern bracket for movement about a horizontal axis, an arm having one end pivotally mounted on said swivel bracket at a point spaced from said horizontal tilt axis, and means on said stern bracket and connected to the other end of said arm for elevating said other end of said arm relative to said stern bracket to rock said swivel bracket upwardly about said horizontal axis.

13. The combination, in an outboard motor, of a stern bracket, a swivel bracket pivotally mounted to said stern bracket for movement about a horizontal axis, a first pulley rotatably supported by said stern bracket, a second pulley on said swivel bracket, a crank connected to said first pulley, and a band connected to said first pulley and reeved around said second pulley to afford movement of said swivel bracket about said horizontal axis upon rotation of said first pulley.

14. The combination in a marine propulsion unit of a stern bracket, a swivel bracket pivotally mounted to said steering bracket for movement about a horizontal axis, a rotatable member on said stern bracket, means connecting said rotatable member to said swivel bracket for effecting movement of said swivel bracket about said horizontal axis upon rotation of said rotatable member, and a brake band mounted for movement into engagement with said rotatable member to prevent rotation thereof and thereby prevent swivel bracket movement about said horizontal axis.

15. The device of claim 8 wherein said releaseable brake means comprises a brake band engageable with said handle to prevent rotation thereof, and means for selectively engaging said band with said handle.

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74—89.22; 115—17; 248—291