Aug. 13, 1963 F. C. GOOD 3,100,626

WINDLASS

Filed Oct. 27, 1960

4 Sheets-Sheet 1

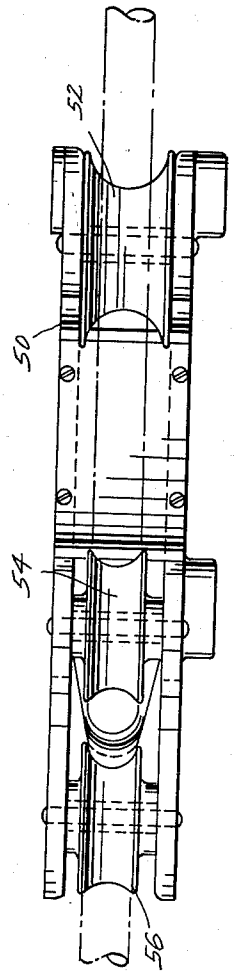


Fig. 6

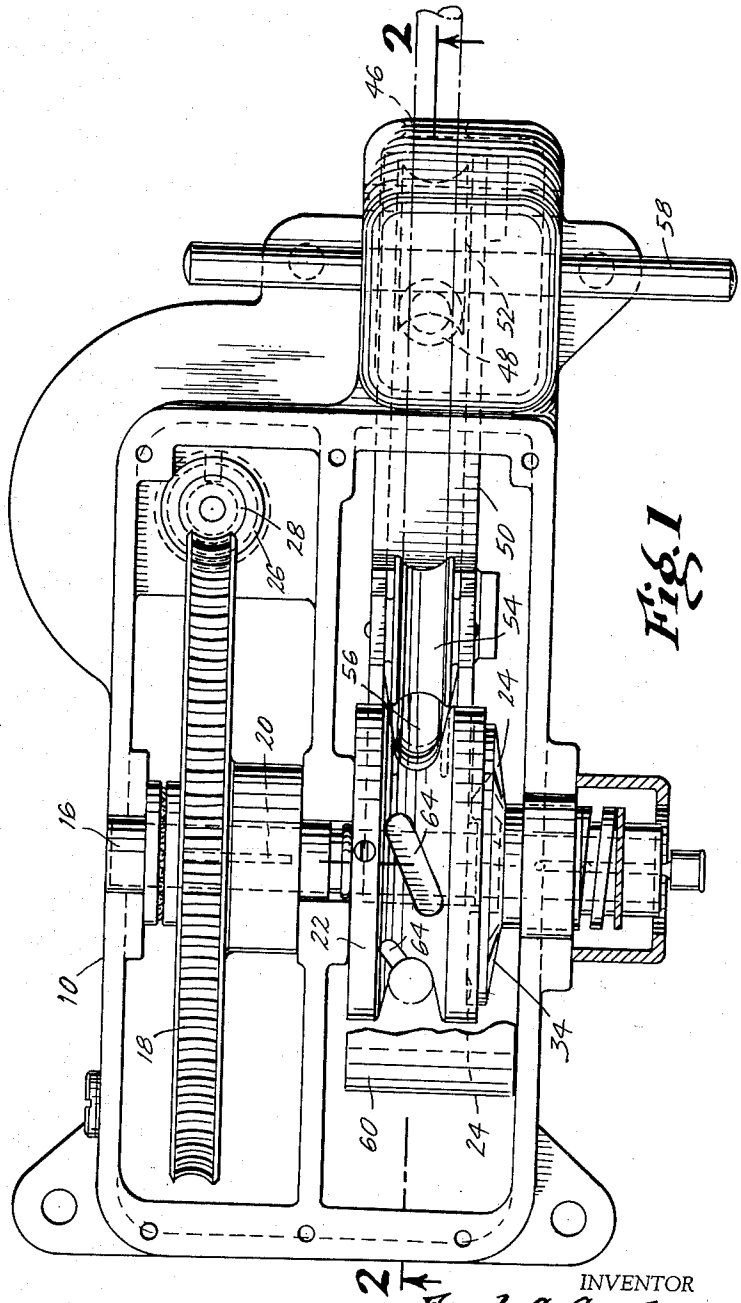


Fig. 1

INVENTOR

Fred C. Good,

BY Kemon, Palmer & Stewart

ATTORNEYS

Aug. 13, 1963

F. C. GOOD

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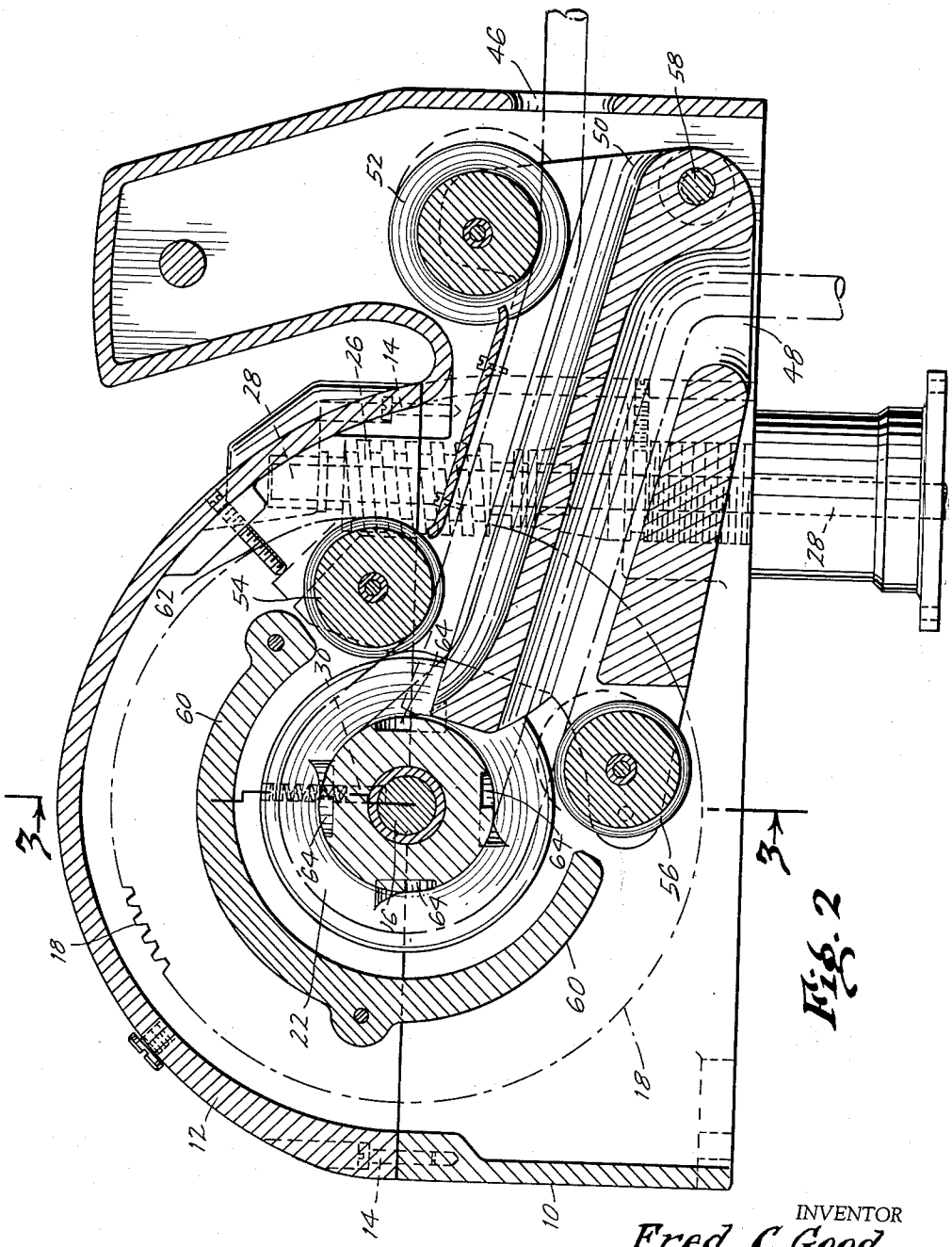


Fig. 2

INVENTOR

Fred C. Good,

BY Kenon, Palmer & Stewart

ATTORNEY

Aug. 13, 1963 F. C. GOOD 3,100,626

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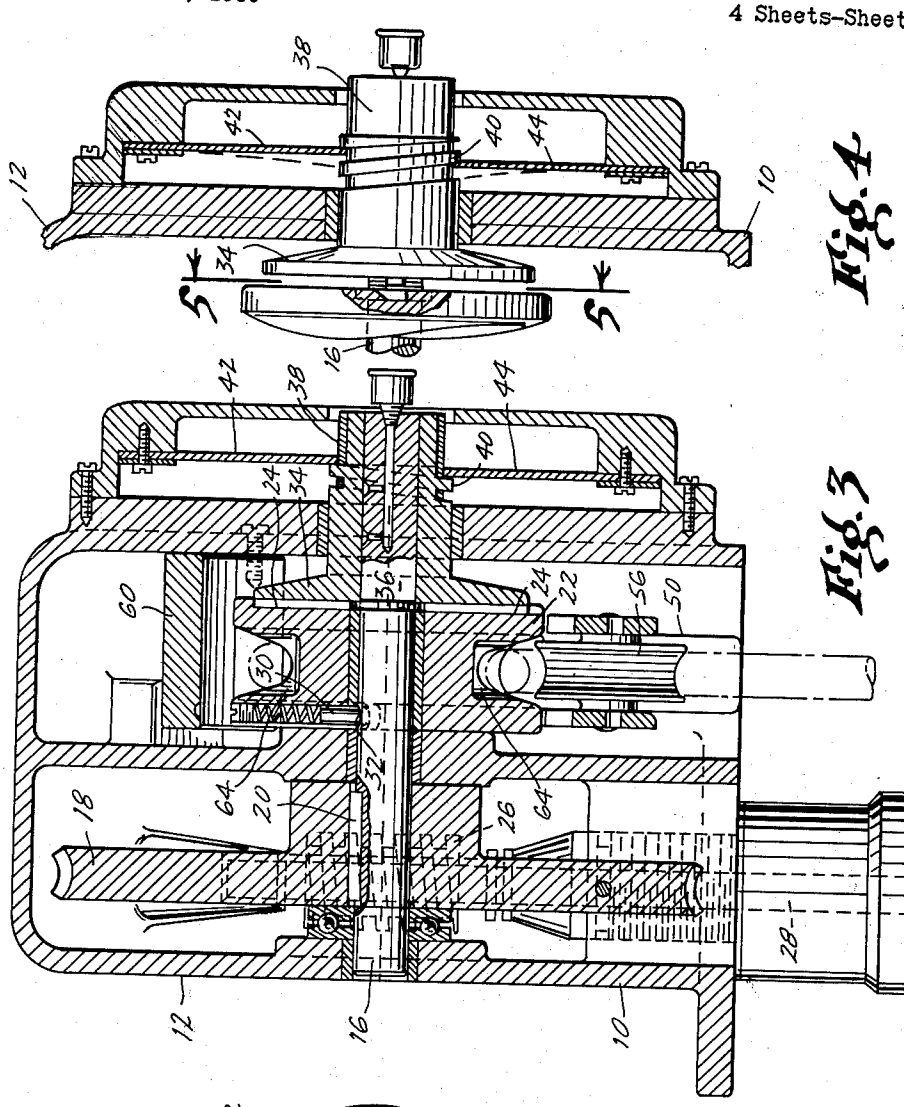


Fig. 4

Fig. 3

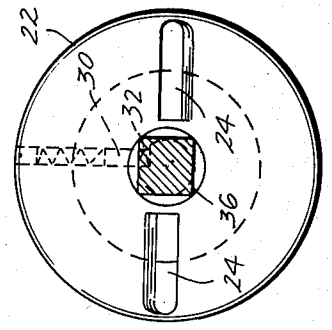


Fig. 5

INVENTOR
Fred C. Good,

BY Kenon, Palmer & Stewart

ATTORNEY

Aug. 13, 1963 F. C. GOOD 3,100,626

WINDLASS

Filed Oct. 27, 1960

4 Sheets-Sheet 4

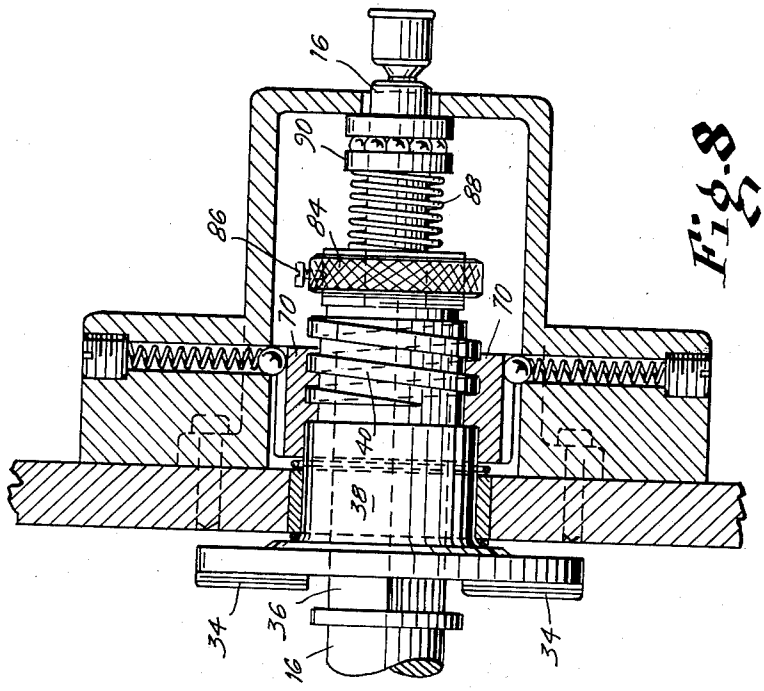


Fig. 8

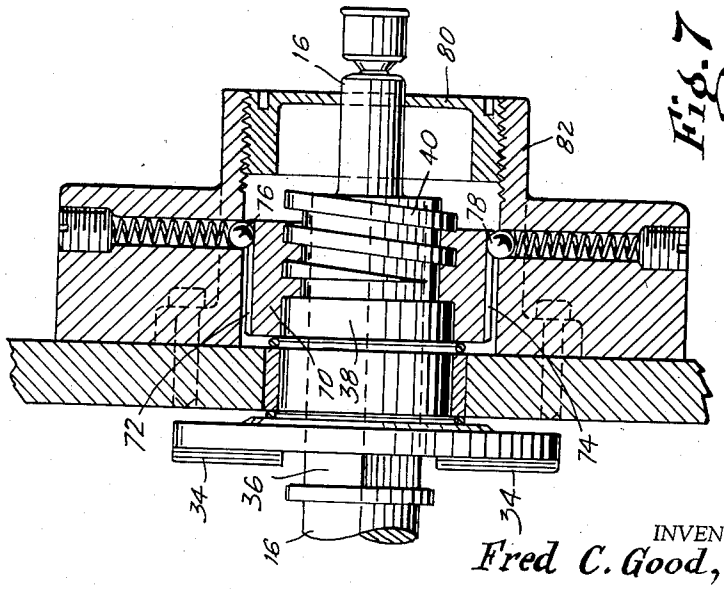


Fig. 7

INVENTOR

Fred C. Good,

BY Kemon, Palmer & Stewart

ATTORNEY

United States Patent Office 3,100,626
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3,100,626

WINDLASS

Fred C. Good, 521 W. Glenwood Ave.,
Philadelphia 40, Pa.

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8 Claims. (Cl. 254—175.5)

This invention relates to windlasses and more particularly to windlasses for use on small boats in the so-called pleasure craft range of sizes for handling the anchor line and anchors thereon.

Prior experience in this particular field has shown the need for a windlass for the above purpose which is capable of complete free-wheeling during anchor lowering operations. In other words, when the anchor is dropped from its deck support, it is desirable that it fall completely free rather than to lower it under power.

Accordingly, it is the principal object of the present invention to provide a free-wheeling windlass for use on boats in the pleasure craft range of sizes for handling the anchor lines and anchors thereon.

A further object of this invention is to provide in a windlass of the foregoing type means for adjusting the maximum tractive effort which can be exerted on an anchor line by the windlass.

Other objects of the invention will be apparent to those skilled in the art from a consideration of the attached sheets of drawings, when read in conjunction with the accompanying specification. In the drawings,

FIG. 1 is a top plan view of a preferred embodiment of the windlass of the present invention with the cover removed;

FIG. 2 is a section on the lines 2—2 of FIG. 1;

FIG. 3 is a section on the lines 3—3 of FIG. 2;

FIG. 4 is a view partially in section showing portions of the right hand side of FIG. 3;

FIG. 5 is a view on the lines 5—5 of FIG. 4;

FIG. 6 is a top plan view of the means for guiding the line through the housing and into engagement with the main winding drum, this portion for purposes of illustration in FIG. 6, being shown as removed from the interior of the housing;

FIG. 7 is a modification of the clutch structure of FIGS. 3, 4 and 5; and

FIG. 8 is a further modification of the same structure.

In general, the objects of the present invention are achieved by the use of a novel clutching arrangement between the drive shaft and the main winding drum. The clutching arrangement is such that for anchor raising operations there is positive connection between the drive shaft and the main winding drum, and for anchor lowering operations, the main winding drum is free to revolve on the main drive shaft without the necessity of providing positive rotation of the shaft from the power source. Provision is also made, however, for applying positive power during the anchor lowering operation, in the event that this becomes necessary.

Referring now to the drawings for a detailed description of the present invention, and more particularly to FIGS. 1 and 2, the windlass is enclosed within a housing having a bottom portion 10 and a removable upper portion 12, the two being joined in any convenient manner, as, for example, by studs 14. The main shaft 16, which is journaled in bearings in opposite sides of the housing, carries on it a worm wheel 18 which is rigidly attached, as, for example, by means of a key 20 and also carries the winding drum 22. In one radial face of the winding drum is the female portion 24 of a clutch. Motive power for the main shaft 16 is supplied via a worm 26 rigidly mounted on a drive shaft 28, which shaft is conveniently coupled to an electrical drive motor (not shown) positioned below the deck of the boat. Assuming the motor

to be reversible, therefore, the main shaft 16 may be rotated in either direction by the motor through the worm 26 and worm wheel 18.

Referring now to FIGS. 3, 4 and 5, it will be seen that the winding drum 22 is rotatably carried by the main shaft 16. The drum, however, is permitted to rotate with respect to the shaft in one direction only in view of the spring pressed detent 30, which is engageable with a notch 32 machined into the main shaft 16. With this arrangement, it is possible for the winding drum 22 to be driven positively by applying power to the main shaft, but only in one direction.

In order to provide for positively driving the winding drum in a direction opposite to that which is possible by reason of the spring pressed detent 30, a clutching mechanism is provided. One form of clutch which has been found satisfactory for operation in this structure is shown in FIGS. 3 to 5 inclusive. This is essentially a dental type clutch with the female portion 24 being machined into one radial face of the drum 22. The male half of the clutch member is shown at 34 and has a central bore which is square in cross section as indicated at 36. The clutch member 34, therefore, must always rotate with the main shaft 16 regardless of direction, but the fit between the clutch and the shaft is such that the clutch is permitted to move axially along the shaft. As viewed in FIG. 3, the left hand portion of the main shaft 16 is round up to the point where it enters the square bore of the male clutch member 34, and the remainder may be square. The shaft is preferably machined from square stock as this provides an easy means for holding the clutch member 24 on the round portion.

Referring now particularly to FIG. 4, it will be seen that the clutch 34 includes a hub portion 38, a part of which is threaded as indicated at 40. A pair of leaf spring members 42 and 44 are rigidly attached to the housing at one end and their free ends engage with the threaded portion 40 of the hub 38. Whenever the main shaft 16 is rotated therefore, the clutch will have axial movement within fixed limits in one direction or the other depending on the direction of rotation of the main shaft. The pitch of the threads is such that for anchor raising operations, the male clutch member 34 is moved toward clutch engaging position, which is towards the left as viewed in FIGS. 3 or 4. Conversely, when the main shaft is driven in a direction which would correspond to anchor lowering, the axial movement of the male clutch member 34 s from left to right in FIGS. 3 and 4, or from clutch engaged to disengaged position.

From the foregoing description, it will be apparent that with the anchor in the fully raised position, all that is necessary to lower the anchor is to position the control switch of the motor drive to cause rotation of the main shaft in an anchor lowering direction. Initial application of power is necessary only to insure complete disengagement of the clutch, and this is accomplished in only a few revolutions of the main shaft. The control switch may then be placed in an off position, and the anchor will fall of its own weight, because the winding drum is then in a completely free-wheeling condition. With most types of anchors, and in particularly deep water, the anchor will fall to a certain depth and then begin to "kite." Under these circumstances, it is sometimes useful to again apply power to the main shaft in order to positively drive the winding drum in an anchor lowering direction. It is for this purpose that the spring pressed detent 30 is employed. An examination of FIG. 3 and FIG. 5 will show clearly that this permits applying power to the drum in one direction only, because the notch 32 in the main shaft 16 is of a step shape permitting rotation of the drum with respect to the shaft in one direction and preventing rotation of the drum with respect to the shaft in the other.

Referring now to FIGS. 1, 2 and 6, these FIGURES show the line handling and guiding portions of the apparatus. The lower housing member **10** includes line entry and exit ports shown most clearly in FIG. 2 and designated by the reference numerals **46** and **48** respectively. The exit port is conveniently arranged when mounting the apparatus on board ship so that the line as it is taken in passes through the deck of the boat and into a line storage receptacle or area below the deck on which the windlass is mounted.

Pivotally mounted within the housing is a rocker arm **50** which carries three idler pulleys **52**, **54** and **56**. The rocker arm is pivotally mounted within the housing on a shaft **58**. The path of the anchor line therefore from the anchor to the windlass is through the entry port **46**, under the pulley **52**, under the pulley **54**, around the winding drum **22**, over the pulley **56** and through the exit port **48**. In order to guard against the line piling up and/or slipping over the edges of the main drum, a guide shield is placed around the greater portion of the circumference of the drum and secured to the outer housing. This member is identified by the reference numeral **60** and appears most clearly in FIGS. 1 and 2. The entire rocker arm and pulley assembly is shown in FIG. 6 in a top plan view as it would appear if it were lifted bodily from the windlass housing.

The purpose of the pivotally mounted rocker arm and pulley structure is to automatically change the tractive effort of the windlass. Looking, for example, at the showing in FIG. 2, it will be seen that with a load on the anchor side of the line, that the tendency is to rotate the rocker arm clockwise about its pivot axis. Clockwise rotation of the rocker arm is therefore effective to cause the pulley **56** to pinch or squeeze the line against the periphery of the main winding drum. In order to adjustably limit the amount of this pinch and hence the tractive effort of the windlass, an adjustable stop is provided for limiting clockwise rotation of the rocker arm and pulley assembly. Such adjustment as shown in the drawings includes simply a threaded stud **62** which forms an adjustable stop for the rocker arm.

Still a further feature of the apparatus is the particular configuration of the surface of the main winding drum. The periphery of the drum is of course grooved, as shown most clearly in FIG. 1, and the groove is to a depth to fully receive a line of the diameter for which the apparatus is designed to operate. In addition to the groove, however, there are a plurality of milled-out portions shown at **64**. These portions are so spaced and angularly positioned, that they correspond to the pitch of those portions of the twisted line being handled, and therefore provide a more positive grip of the drum on the line.

Referring now to FIGS. 7 and 8 of the drawing, there is therein shown a modification of the clutch structure which can be substituted for the clutch structure described previously. The clutch shown in FIG. 7 may be termed a nut-operated automatic clutch, while that in FIG. 8 may be termed a spring-operated automatic clutch.

Referring now particularly to FIG. 7, the elements **34**, **36**, **38** and **40** are identical to those in FIGS. 1 to 6 inclusive. In lieu of the spring fingers engaging with the threaded portion **40** of the hub, this figure shows a nut member **70** having a pair of grooves **72** and **74** which extend longitudinally of the nut at portions on the periphery thereof which are 180° apart from each other. A pair of spring-pressed balls **76** and **78** tend to hold the nut stationary in a radial sense. The nut is therefore free to travel a limited distance axially along the threaded hub as the shaft **16** is turned. A second nut **80** threadedly engages the internal bore of the casing **82** which surrounds the clutch operating assembly. This nut is adjustable therefore to vary the permissive extent of travel of the nut **70**.

In operation, therefore, the nut **70** will move axially in one direction or the other whenever the shaft **16** is rotated.

Such axial movement will continue until the nut abuts the nut **80** in one direction on the main housing in the opposite axial direction. As shown in FIG. 7, the clutch is in its disengaged position. If the winch is then operated in a direction to raise the anchor line, initial rotation of the shaft **16** is effective to move the nut **70** to the right in this figure until it abuts against the nut **80**. Since it can then travel no further, it will then be effective to feed the clutch member **34** to the left to cause it to engage with the female clutch member **24** on the winding drum **22**. Further rotation of the shaft **16** during the anchor raising operation causes the nut **70** to rotate with the clutch and the balls **76** and **78** simply slide in and out of the grooves **72**, **74** as the nut rotates.

Referring now to that form of clutch operator which is shown in FIG. 8 of the drawings, here again the parts numbered **34** to **40** inclusive are identical to those in the previous figures. The nut **70** is also the same as the one shown in FIG. 7 and its operation is substantially identical. In place of the adjustable nut **80** shown in FIG. 7, however, there is provided in this embodiment an adjustable collar **84** which may be moved along the hub portion **38** beyond the threaded area **40** and may be fixed in any desired location by means of a set screw **86**. The purpose of the nut **84**, however, is the same as that of the nut **80** because it limits the travel of nut **70** in the right hand direction as the apparatus is shown in this figure. In addition, this embodiment includes a compression spring **88** which surrounds the shaft **16**. At its outer end, the spring **88** abuts a thrust bearing **90**, and at its inner end it abuts the outer end of the hub portion of the clutch. The spring is therefore effective to exert a biasing force on the male clutch member **34**, always tending to urge it toward engaging position. As is the case in FIG. 7, the clutch is shown in full disengaged position.

From the foregoing, it will be apparent to those skilled in the art that there is herein shown and described a new and useful automatic windlass for anchor line handling. While preferred embodiments have been shown and described, applicant claims the benefit of a full range of equivalents within the scope of the appended claims.

I claim:

1. An anchor line windlass, comprising in combination: a housing; means defining line entry and exit ports in said housing; a shaft within said housing; a winding drum; means mounting said drum on said shaft, permitting rotation on said shaft in a first direction only; a clutch member mounted on said shaft for positive rotation therewith and for axial movement with respect thereto between predetermined limits; clutch means on said drum for engagement by said clutch member only when said member is at one end of its axial movement; means carried by said clutch and housing members causing said clutch member to move to clutch engaging position when said shaft is rotated counter to said first direction and for disengaging said clutch when said shaft is rotated in said first direction; and means affording connection of a positive drive to said shaft.

2. A windlass as defined by claim 1 in which the means for engaging and disengaging the clutch comprises an externally threaded hub carried by said clutch member and spring fingers carried by said housing and engaging with said threads.

3. Apparatus as defined by claim 1 in which the said means mounting said drum on said shaft comprise a shoulder formed out of the periphery of said shaft and a spring biased detent mounted in said drum for engagement with said shoulder only when said shaft is rotated in said first direction.

4. Apparatus as defined by claim 1 in which said windlass drum is peripherally grooved to receive the line being handled and in which guard means are mounted within said housing in closely spaced concentric relation to said

drum to prevent the line being handled from bulging into the remaining interior of the housing.

5. Apparatus as defined by claim 1 and including: a line guiding and tensioning member pivotally mounted adjacent one end of and within said housing in the same plane as said winding drum; a pair of idler pulleys mounted on the other end of said member immediately adjacent the periphery of said winding drum and in the same plane therewith so that the line being handled passes through said member, under one pulley, around the drum, and over the other pulley; whereby tension on either side of the line causes said member to pivot and force engagement between one of said idler pulleys and the line on the drum.

6. Apparatus as defined in claim 1 in which the means for operating said clutch comprise: an externally threaded hub carried by said clutch member; a nut threadedly engaged with said hub; means engaging with said nut and tending to prevent rotation thereof; and means for limiting the axial extent of travel of said nut with respect to said hub.

7. Apparatus as defined by claim 6 and including spring means biasing said clutch member to clutch engaging position.

8. An anchor line windlass comprising in combination: a housing including line entry and exit ports therethrough;

a shaft rotatably journaled in said housing; a winding drum rotatably mounted on said shaft; means preventing rotation of said drum on said shaft in one direction of rotation of said shaft; a first clutch member carried by a radial face of said drum; a second clutch member for engagement with said first clutch member, mounted on said shaft for rotation therewith and axial movement with respect thereto between predetermined limits corresponding to fully engaged or fully disengaged position of said clutch members; means for automatically causing said clutch members to engage when said shaft is rotated in said one direction and to disengage when said shaft is rotated in said opposite direction; and means affording connection of a positive drive to said shaft.

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