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OUTBOARD MOTOR CLUTCH AND INTERLOCK

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Fig. 1

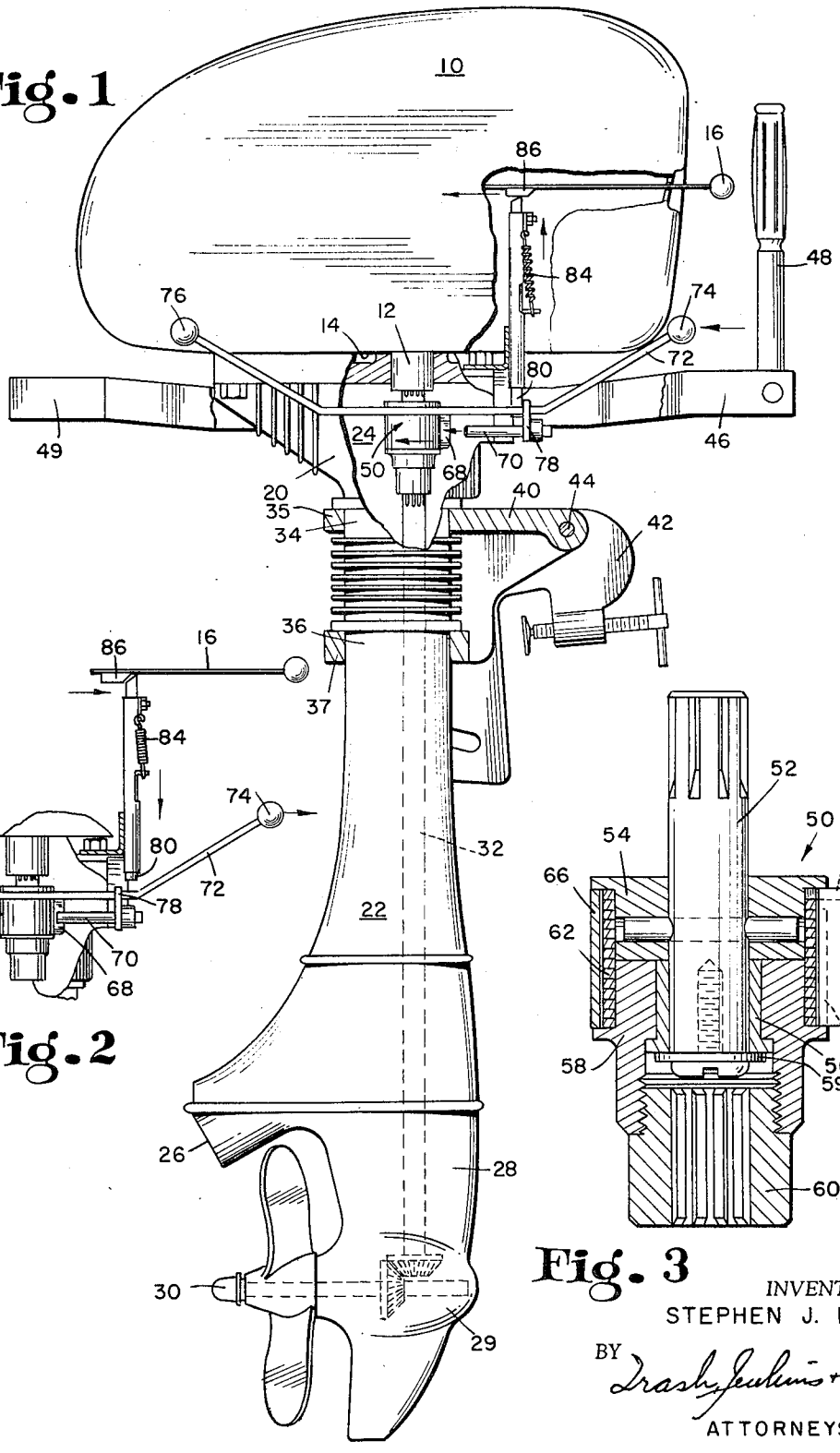


Fig. 2

Fig. 3

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OUTBOARD MOTOR CLUTCH AND INTERLOCK

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ABSTRACT OF THE DISCLOSURE

In an outboard motor, a self-contained clutch assembly of the readily-releasable coil-spring type is mounted immediately below the motor head, as a coupling between the power shaft and the drive shaft, in the enlarged upper end of the exhaust passage through the stem. The clutch is biased to engaged condition and is released by a shift handle operable from front or rear which moves a stop to obstruct rotation of the leading end of the clutch spring. A blocker actuated by the throttle prevents clutch actuation above a selected motor speed.

BACKGROUND OF THE INVENTION

This invention relates to an outboard motor having a self-contained clutch between the power head and drive shaft, which is readily installed on a conventional outboard motor with minimum modification.

In conventional outboard motor construction, a power head containing the motor and its controls is mounted at the top of a hollow stem which forms an exhaust passage and houses a drive shaft leading downward and connected by bevel gears in a bottom gear case to the propeller shaft. Various clutches have been embodied in the bottom gear assembly, for lubrication with the gears, but this requires a modified gear assembly and a remote control mechanism. A coil spring clutch in this bottom location is disclosed in Armstrong Patent No. 2,760,613.

SUMMARY OF THE INVENTION

In accordance with the present invention, a clutch which requires minimum lubrication and can withstand operation in the exhaust gases is mounted immediately below the power head of the outboard motor, as a coupling between the power shaft of the head and a shorter-than-normal drive shaft. The clutch is preferably a self-contained assembly which is internally biased to engaged condition and releasable by obstructing rotation of a control element. The clutch is desirably a coil-spring type, in which aligned cylindrical driving and driven elements are gripped by a coil spring which tends to wind more tightly on the elements by driving torque and to be released by unwinding action. The clutch is released by obstructing rotation of the leading end of the spring with a simple stop movable into the path of a lug carried with such leading end. Clutch actuation above a selected safe speed is prevented by a blocker member, spring pressed to retracted position and moved into blocking position by advance of the throttle of the power head.

BRIEF DESCRIPTION OF THE DRAWING

The accompanying drawing illustrates the invention. In such drawing:

FIG. 1 is a side elevation of a conventional outboard motor which has been modified to embody the invention, and showing the shift member locked in retracted, clutch-engaged position.

FIG. 2 is a fragmental view similar to FIG. 1, showing the clutch shift member in the clutch-releasing position; and

FIG. 3 is an axial sectional view of the self-contained clutch assembly used in the embodiment of FIG. 1.

DESCRIPTION OF THE PREFERRED EMBODIMENT

The outboard motor shown in the drawing comprises a power head **10** containing a motor having a power shaft **12** projecting downward through its lower wall **14**. As shown, this is an internally splined shaft which in the conventional motor receives the upper splined end of the standard drive shaft.

The power head has a throttle control member **16** which as shown is mounted for reciprocation, but may be mounted for other movement, such as swinging movement across the front face of the head **10**.

The head **10** is bolted to the top flange of a transfer case **20** carried at the upper end of the hollow stem **22** by which the motor assembly is supported. The case **20** forms a transfer chamber **24** leading from the exhaust ports of the power head **10** to the exhaust passage in the hollow stem **22**. The lower end of the stem **22** is enlarged rearward to convey the exhaust gases toward an exhaust outlet **26**, and the stem is joined to a lower assembly **28** which defines a gear case **29** in which the propeller shaft **30** is journalled. A drive shaft **32** extends axially through the stem **22** and into the gear case **29**, where it is connected by bevel gears to the propeller shaft **30**.

In the outboard motor shown, the propeller shaft is not reversible and reverse drive is obtained by rotating the drive assembly 180° in its mounting. To this end, the upper portion of the stem **22** is provided with bearing surfaces **34** and **36** which are supported for rotation through 360° in bearing collars **35** and **37** on a swivel bracket **40**. Such bracket is tiltably mounted on a mounting clamp **42** by a transverse pivot bolt **44**. For manual control, the power assembly carries a handle bar having a forward portion **46** to which a control handle **48** is pivoted, and a rear portion **49** which forms a carrying handle and provides a grip when the power assembly is rotated in the supporting bracket **40**.

In accordance with the present invention, a self-contained clutch assembly **50** is interposed as a coupling between the power shaft **12** and the upper end of a shortened drive shaft **32**. Such assembly **50** is shown in axial section in FIG. 3. It comprises a stub shaft **52** having a splined upper end for reception in the splined opening of the power shaft **12**. Such shaft **52** carries a fixed collar **54** which forms the driving element of the clutch, and its lower end forms a spindle for a bearing **56** which rotatably supports a driven collar **58**. The driven collar **58** is held onto the spindle portion of the shaft **52** by a washer **59** retained by a screw. The lower end of the driven collar **58** projects beyond the shaft **52** and is threaded onto a drive sleeve **60** which is internally splined to receive the upper end of the drive shaft **32**.

The driving collar **54** and the driven collar **58** are formed with aligned cylindrical outer surfaces, and are drivingly interconnected by a coil-spring **62**. This is wound of wire of rectangular cross section, and is sized to snugly fit and grip the cylindrical surfaces of the two collars. The spring is wound in a direction such that driving torque causes the coil-spring to wind tighter on the cylindrical surfaces, and hence to grip them and transmit drive from the driving collar **54** to the driven collar **58**. Reverse torque tends to unwind the spring and releases the drive connection.

For purposes of releasing the clutch, the upper and leading end of the spring carries an out-turned tang **64** engaged in a notch in a sleeve **66** which surrounds the spring **62** and which is provided with a radially projecting rib **68**. To disengage the clutch, a stop is projected into the

path of the rib **68** to obstruct rotation of the sleeve **66** and the tang **64** at the leading end of the spring. Rotation of the driving collar **54** will then tend to unwind the spring **62** with respect to the stationary tang **64**, and will release the spring from driving engagement with the driving collar **54**. The clutch will be re-engaged by releasing the stop rib **68** for rotation. The spring will then again tighten about the driving collar **54**, and the torque will again tighten the grip and clutch the collars together.

The clutch assembly **50** is mounted as a self-contained coupling between the power shaft **12** and the drive shaft **32**, and is held coaxial therewith by the fit of the shaft **52** in the shaft **12**. The assembly is located in the chamber **24** formed by the transfer case **20**. Its embodiment in a conventional outboard motor structure, therefore, requires no modification of that structure save only for the substitution of a shortened drive shaft **32** in place of the conventional drive shaft. The clutch assembly is made of materials to withstand the effect of exhaust gases, such as a suitable stainless steel, and is found to operate satisfactorily in the relatively unfavorable environment of this convenient location.

The clutch control mechanism requires a minimum of modification of the conventional outboard motor structure. The control mechanism shown comprises a stop pin **70** mounted for sliding movement through a hole bored in the transfer case **20**. The pin is movable to an inward position in which its inner end lies in the path of the stop rib **68** of the clutch assembly **50**, as shown in FIG. 2, to obstruct rotation of the sleeve **66** and disengage the clutch as described above. The pin is also movable to an outer position in which its inner end is withdrawn from the stop rib **68** to allow the clutch to engage.

Movement of the stop pin **70** is controlled by a shift bar **72** which extends forward to a front shift handle **74** and rearward to a shift handle **76** so that the clutch can be operated in all rotative positions of the power assembly.

Desirably, means is provided to prevent engagement, or to prevent both engagement and disengagement, of the clutch when the motor is operating at a speed above a selected safe speed. To this end, the control pin **70** is connected to the shift rod **72** by a bracket **78** which in the shifting operation moves past the position of a blocker pin **80**. This is slidably mounted on a bracket **82** for vertical movement into and out of the path of the bracket **78**. The blocker pin **80** is normally biased to retracted position by a spring **84**, and its upper end lies in the path of a cam **86** mounted on the throttle control member **16**. When the throttle control member **16** is in low speed position, as shown in FIG. 2, the cam **86** allows the blocker pin **80** to rise out of the path of the bracket **78** and permits the clutch shift rod **72** to be freely shifted between clutch engaging and disengaging positions. With the clutch and its control mechanism in disengaged position, as shown in FIG. 2, if the throttle control member **16** is moved to the right to high speed position, the cam **86** will force the stop pin **80** downward into the path of the bracket **78** where it will prevent movement of the clutch shift mechanism **72** from the disengaged position shown in FIG. 2. The clutch can then not be engaged until the throttle has been returned to low speed position.

Similarly, when the clutch control pin **70** is in retracted, clutch-engaged position as shown in FIG. 1, movement of the throttle member **16** to the right to high speed position will force the blocker pin **80** downward behind the bracket **78**, where it will prevent the clutch shift mechanism **72** from moving to its clutch-disengaging position. This locked-out condition is shown in FIG. 1.

By the simple replacement of the standard drive shaft with a shorter drive shaft **32**, the insertion of a clutch assembly **50**, and addition of a simple control, a conventional outboard motor having no clutch is provided with a highly satisfactory and effective clutch; and at small additional expense such clutch can readily be interlocked with the throttle to prevent clutch actuation above a selected safe speed.

I claim as my invention:

1. An outboard motor having a power head including a power shaft, positioned at the upper end of a stem which forms an exhaust passage and houses a drive-shaft for connecting the power shaft of the head to a propeller at the lower end of the stem, wherein the improvement comprises,

a clutch assembly interposed between the power shaft and the drive shaft at the upper end of the stem, said clutch assembly having relatively rotatable driving and driven parts and clutch means therebetween biased to clutched position, a de-clutching element rotatable with the clutch assembly and operable when stopped to de-clutch the clutching means,

said clutch driving member being releasably inter-fitted with said power shaft and supported thereby in coaxial relation, and said driven member being supported in coaxial relation from said driving member, the clutch assembly being telescopically engaged with said power shaft and held against separation by said drive shaft, whereby said clutch assembly is removable by axially separating the power head and the drive shaft,

a clutch control element mounted on the outboard motor structure for actuation into and out of the path of said de-clutching element to disengage and engage the clutch, and

manually operable means for actuating said control element.

2. An outboard motor having a power head including a power shaft, positioned at the upper end of a stem which forms an exhaust passage and houses a drive-shaft for connecting the power shaft of the head to a propeller at the lower end of the stem, wherein the improvement comprises,

a clutch assembly interposed between the power shaft and the drive shaft at the upper end of the stem, said clutch assembly having relatively rotatable driving and driven parts and clutch means therebetween biased to clutched position, a de-clutching element rotatable with the clutch assembly and operable when stopped to de-clutch the clutching means,

a clutch control element mounted on the outboard motor structure for actuation into and out of the path of said de-clutching element to disengage and engage the clutch, and

manual operable means for actuating said control element,

said stem being mounted in a supporting bracket for 360° rotation, to reverse the drive direction of the motor, and said manually operable means including an extension accessible at the rear of the motor for actuating said control element when the motor is in reversed position.

3. A self-contained clutch assembly for use in an outboard motor having a power head containing a power shaft, the power head being positioned at the upper end of a stem which forms an exhaust passage and houses a drive shaft for connecting the power shaft of the head to a propeller at the lower end of the stem,

said clutch assembly being adapted to be interposed between the power shaft and the drive shaft at the upper end of the stem, and said clutch assembly comprising

a clutch driving element including a shaft portion and means for mount ing the same in coaxial engagement with the lower end of said power shaft to be driven thereby,

a collar fixed to said shaft portion and having a cylindrical outer surface for engagement by a clutch drive spring,

a clutch driven element including a sleeve mounted for rotation on said driving element coaxial with said shaft portion below said fixed collar and having a cylindrical outer surface aligned with said fixed-collar surface for engagement by the same clutch drive

spring, means to retain said sleeve against axial displacement from said shaft portion,

and a drive sleeve carried by said driven clutch element sleeve and having a splined element coaxial with and beyond said shaft portion for axially-separable drive engagement with said drive shaft, and a helical clutch drive spring in engagement with said cylindrical surfaces to clutch the driving and driven elements together,

and means to arrest rotation of the leading end of the spring, said last named means comprising a de-clutching element rotatable with the clutch assembly and operable when stopped to disengage the clutch, said de-clutching element being stoppable by a clutch control element mounted on the outboard motor structure and movable in response to manual actuation into and out of the path of said de-clutching element.

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