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OUTBOARD MOTOR OVERDRIVE UNIT

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This invention relates in general to outboard motors, and more particularly to overdrive units for outboard motors.

Heretofore, the operator of an outboard motor had to be satisfied with the range of speed which the particular unit or motor could deliver by varying the throttle setting on the carburetor or by varying the timing of the spark. When the boat to which the motor was attached reached a maximum speed, the engine was unnecessarily driving at a peak R. P. M. This, of course, put a strain on all working parts of the engine, causing faster wear, lessened the life expectancy of the engine and with prolonged running at such speeds sometimes caused unnecessary breakdowns.

Therefore, the primary object of this invention is to provide an overdrive unit for outboard motors adapted to be placed in the vertical drive shaft of an outboard motor for selectively increasing the R. P. M. of the propeller without increasing the R. P. M. of the motor.

A further object of this invention is to provide an outboard motor overdrive unit with the minimum number of parts, thus making it possible to manufacture such a unit at a relatively low price and at the same time allow less wear within such a unit.

A still further object of this invention is to provide an overdrive unit for outboard motors with but one operating rod for selectively driving in straight drive or overdrive.

A still further object of this invention is to provide an outboard motor overdrive unit which is small and compact and can be inserted in the power train of an outboard motor without appreciably increasing the weight or size of the motor to which it is attached.

A still further object of this invention is to provide an overdrive or a speed change unit that may be mounted on the vertical drive shaft of an electric, gasoline or manually operated outboard drive for boats.

These together with other objects and advantages which will become subsequently apparent reside in the details of construction and operation as more fully hereinafter described and claimed, reference being had to the accompanying drawings forming a part hereof, wherein like numerals refer to like parts throughout, and in which:

Figure 1 is a vertical cross-sectional view through the overdrive unit, which is the subject of this invention, having the operating rod broken away and the unit in standard or straight through drive;

Figure 2 is a sectional view similar to Figure 1 but showing the overdrive unit shifted to an overdrive position; and

Figure 3 is a reduced perspective view of the shifting yoke.

Referring now to the drawings in detail, it will be seen that the overdrive unit, referred to in general by the reference numeral 10, consists of a housing, referred to in general by the reference numeral 12, which is horizontally split through the center and has an upper

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section 14 and a lower section 16. The two sections 14 and 16 are securely held together by a plurality of bolts 18 or the like.

The section 14 is generally cup-shaped in configuration and has an upper base 20, with an outer wall 22 depending therefrom which terminates in a surface 24 parallel to the base 20. The lower section 16 is also cup-shaped in configuration, to match section 14, and has a lower base 25 with an outer wall 26 extending upward therefrom which terminates in a surface 28 parallel to the base 24. The surfaces 24 and 28 are held in close face-to-face engagement by the bolts 18 to form the housing 12, with the bases 20 and 25 in spaced parallel relation.

The base 20 is suitably machined at one edge thereof to receive a drive shaft 30 extending through the base 20 and into the housing 12. The shaft 30 extends through a ball bearing 32 which, in turn, is fitted into a recess 34 on the inner surface of the base 20. The bearing 32 is suitably sealed with a grease seal 36 of neoprene or other suitable gasket material. The shaft 30 extends through the bearing 32 and has a reduced portion 38 formed thereon upon which is carried a thrust washer 40. Immediately adjacent the reduced portion 38, the shaft 30 is formed into a still further reduced square portion 42, upon which is carried a drive gear 44. The drive gear 44 is attached to the shaft 30 by means of a pin 46, which extends through the lower portion of the gear 44 and the shaft 30. The shaft 30 extends below the gear 44 in still further reduced form to form a pilot 48, which will be explained in detail hereinafter. Depending from the gear 44 and formed integral therewith, there are provided a plurality of ratchet teeth 50 with engaging faces 52, extending outwardly from the shaft 30 and facing in the direction of rotation.

The lower base 24 is suitably machined, in alignment with the drive shaft 30, to receive a driven shaft 54 which extends through the base 25 into the housing 12 and has formed in the end thereof a pilot hole 56 to receive the pilot 48 of the shaft 30. There is provided between the shaft 30 and the shaft 54 a thrust washer 58 carried by the pilot 48. The driven shaft 54 is also carried by a ball bearing 60, fitted into a recess 62 in the base 24. The bearing 60 is also provided with a suitable seal 64 of neoprene or other suitable material. The shaft 54, above the bearing 60, is suitably splined with splines 66 to receive an internally splined driven gear 68. The splines 66 extend upwardly on the shaft 54 and terminate at the thrust washer 58. The gear 68 is pinned to the shaft 54 by means of a pin 70, which in addition to the splines 66, prevents relative rotation of the gear 68 and the shaft 54. Intermediate the bearing 60 and the gear 68, there is disposed on the shaft 54 a thrust washer 72. Slidably mounted on the splines 66 of the shaft 54, there is mounted a clutch spool 74 having formed on the upper surface thereof a plurality of ratchet teeth 76 having engaging faces 78. The ratchet teeth 76 are of the same conformation and size as the ratchet teeth 50 and are thus engageable therewith with the faces 52 driving against the faces 78 and thus driving the driven shaft 54 upon rotation of the shaft 30. There is provided, in spaced relation from the shafts 30 and 54 and parallel thereto, an intermediate shaft 80. The shaft 80 is suitably journaled in the lower base 25 in pin bearings 82 and in the upper base 20 in pin bearings 84, with the bearings 82 and 84 being provided with suitable grease caps 86 and 88 respectively. The upper portion of the shaft 80, within the housing 12, is suitably splined to receive an internally splined driven pinion 90 which is held in a fixed position on the shaft 80 by means of a pin 92 and is in constant engagement with the drive gear 44. In-

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intermediate the gear 90 and the bearing 84, there is provided a thrust washer 94 carried by the shaft 80. The lower end of the shaft 80 is provided with a reduced portion 96 which carries a tubular bearing 98 which, in turn, carries a drive pinion 100. The drive pinion 100 is thereby free to rotate on the shaft 80 and in constant engagement with the driven gear 68. There is disposed between the pinion 100 and the bearing 82 a thrust washer 102 and between the pinion 100 and the splined portion, a thrust washer 104. There is provided a plurality of ratchet teeth 106 on the upper surface of the gear 100 with engaging faces 108, disposed 90° to the face of the gear 100, and facing opposite the direction of rotation. Disposed intermediate the pinion 100 and the pinion 90 on the shaft 80, and slidably engaging the splined portion, there is disposed a shifting collar 110. The lower face of the collar 110 is formed into a plurality of ratchet teeth 112 with engaging faces 114. The ratchet teeth 112 are similar in number, conformation and size to the ratchet teeth 106 and are thus selectively engageable therewith, thereby, upon rotation of the shaft 80 and engagement of the faces 114 with the faces 108 rotating the pinion 100 through the ratchet teeth 112 and 106.

In line with the shaft 30 and the shaft 80 on the upper surface 20, there is provided an operating rod 116 extending through the base 20 and terminating within the housing 12. The portion of the operating rod 116 extending through the base 20 is fitted with a packing gland 118 and a packing material 120. The rod 116 is suitably threaded, as at 122, to receive a threaded journal 124 of a shifting yoke, referred to in general by the reference numeral 126. The shifting yoke 126 consists of two arm portions 128 extending horizontally outward from the boss 124 in spaced parallel relation and engaging a circumferential groove 130 provided in the clutch reel 110. The arms 128 continue outward in a horizontal plane and on the latter half thereof are formed into a reduced size 132, thus forming a step 134 on the upper surface thereof. The reduced portion 132 engages a circumferential groove 138 provided in the shifting spool 74.

It should be noted that the drive gear 44 is larger than the driven pinion 90, therefore having a larger number of teeth and the drive pinion 100 is larger than the driven gear 68. As a result, when the shaft 30, which is secured to the drive gear 44, is rotating at a given speed, there is an increase in R. P. M., when the pinion clutch 110 is engaged with the drive pinion 100, of the driven shaft 54.

In operation, the outboard motor is assumed to be running and driving the drive shaft in a clockwise direction, a clockwise rotation is imparted to the drive gear 44. The operating rod is shifted to its uppermost position, as at Figure 1, thus raising the shifting yoke 126, and engaging the ratchet teeth 50 with the ratchet teeth 76 and the faces 52 in close face-to-face relation to the faces 78, thus imparting through the splines 66 of the driven shaft 54 a clockwise rotation to the driven shaft 54 at the same R. P. M. of the drive shaft 30. When an increase of the driven shaft 54 is desired, without increasing the R. P. M. of the motor, the operating rod 116 is shifted downward, as at Figure 2, thus moving the shifting yoke 126 downward, disengaging the ratchet teeth 50 and 76 and engaging the ratchet teeth 112 and 106 with the faces 114 and 108 being in close face-to-face relation and the drive train being

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through the drive gear 44, the driven pinion 90, the clutch spool 110, the drive pinion 100 and the driven gear 68. Due to the gear ratios previously described, an increase in the driven shaft 54 is thus obtained.

The foregoing is considered as illustrative only of the principles of the invention. Further, since numerous modifications and changes will readily occur to those skilled in the art, it is not desired to limit the invention to the exact construction and operation shown and described, and accordingly, all suitable modifications and equivalents may be resorted to, falling within the scope of the invention as claimed.

What is claimed as new is as follows:

1. An outboard motor overdrive unit having a drive shaft, with a reduced pilot on one end thereof a driven shaft, with a pilot hole in one end thereof, said pilot engaging said pilot hole and retaining said driven shaft in alignment with said drive shaft, an intermediate shaft, said intermediate shaft being spaced from and parallel to said drive and said driven shafts, said drive shaft having a drive gear attached thereto, said driven shaft having a driven gear attached thereto, a driven pinion carried by said intermediate shaft, said driven pinion being in constant mesh with said drive gear, a drive pinion carried by said intermediate shaft, said drive pinion being in constant mesh with said driven gear, a first one way dog clutch between said drive gear and said driven gear, a second one way dog clutch between said driven pinion and said drive pinion, said first clutch and said second clutch being positionable to selectively drive said driven shaft through said gears and through said gears and pinions, said clutches being interconnected and having a single operator.

2. An outboard motor overdrive unit having a drive shaft with a reduced pilot on one end thereof, a driven shaft with a pilot hole in one end thereof, said pilot engaging said pilot hole and retaining said driven shaft in alignment with said drive shaft, an intermediate shaft, said intermediate shaft being spaced from and parallel to said drive and said driven shafts, said drive shaft having a drive gear attached thereto, said driven shaft having a driven gear attached thereto, a driven pinion carried by said intermediate shaft, said driven pinion being in constant mesh with said drive gear, a drive pinion carried by said intermediate shaft, said drive pinion being in constant mesh with said driven gear, a first one way dog clutch between said drive gear and said driven gear, a second one way dog clutch between said driven pinion and said drive pinion, said first clutch being splined and slidable on said driven shaft and engageable with said drive gear for selectively driving said driven shaft, said driven pinion being connected to said intermediate shaft, said second clutch being splined and slidable on said intermediate shaft and engageable with said drive pinion for selectively driving said driven shaft through said drive gear, driven pinion, drive pinion and driven gear, said clutches being interconnected and having a single operator.

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