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2,938,511

REWIND STARTING DEVICE FOR OUTBOARD MOTORS

Filed Dec. 6, 1955

4 Sheets-Sheet 1

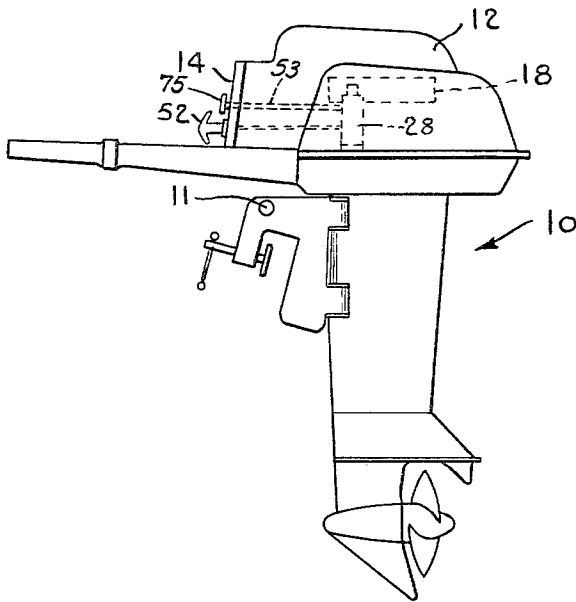


FIG. 1

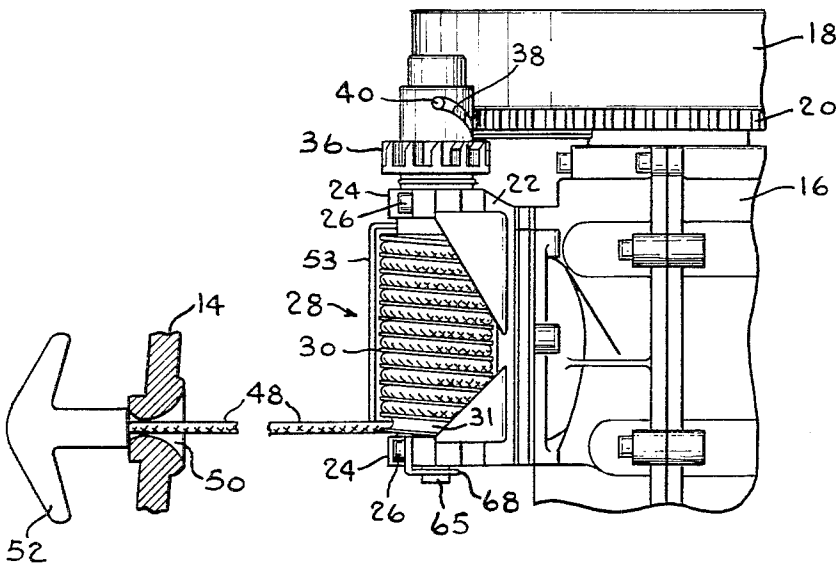


FIG. 2

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4 Sheets-Sheet 2

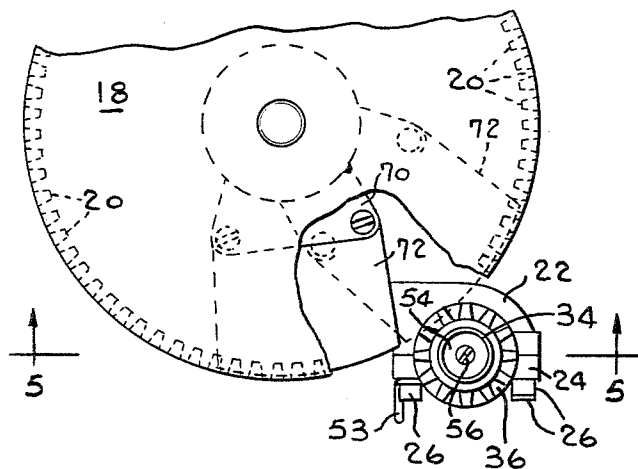


FIG. 3

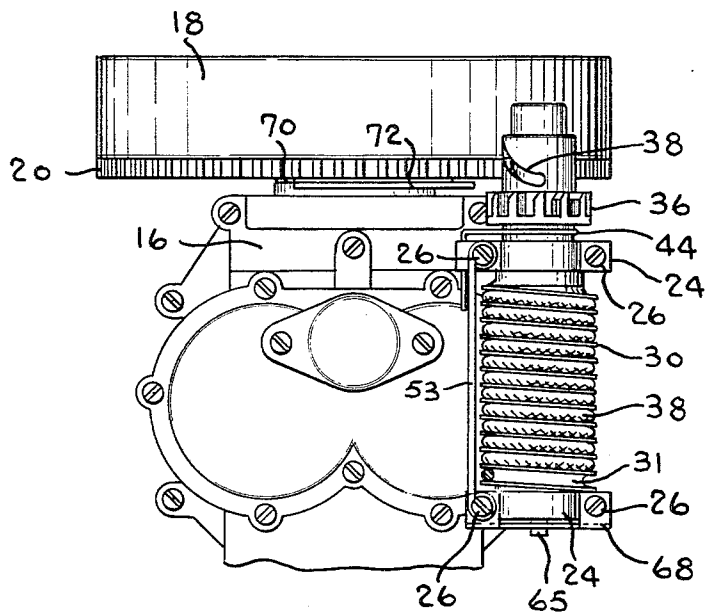


FIG. 4

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4 Sheets-Sheet 3

FIG. 5

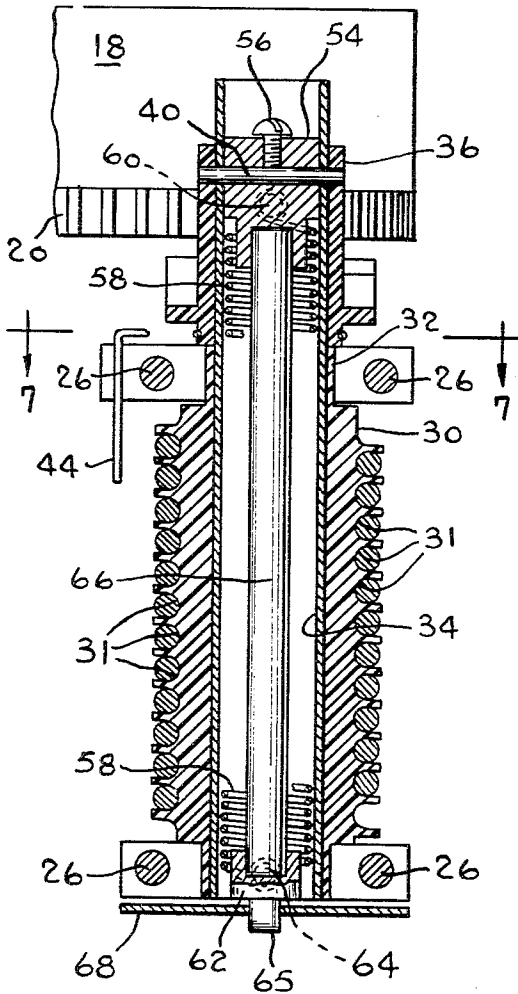
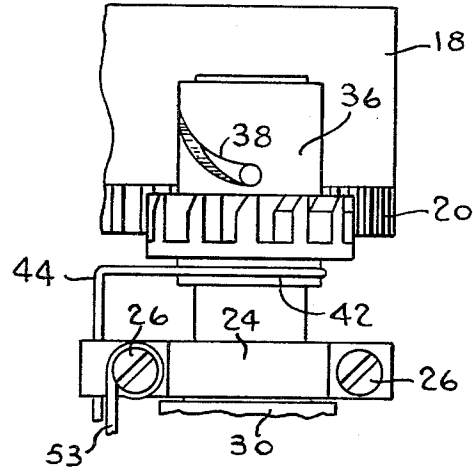


FIG. 6

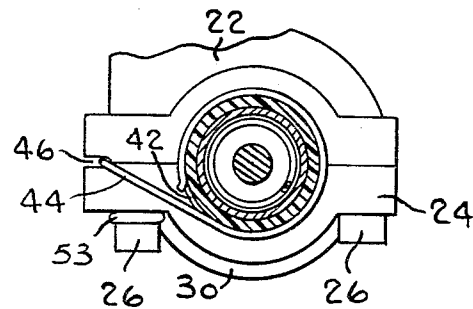


FIG. 7

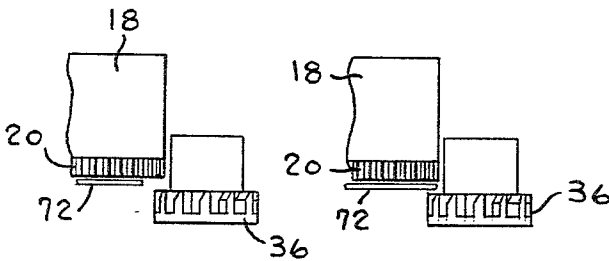


FIG. 8

FIG. 9

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4 Sheets-Sheet 4

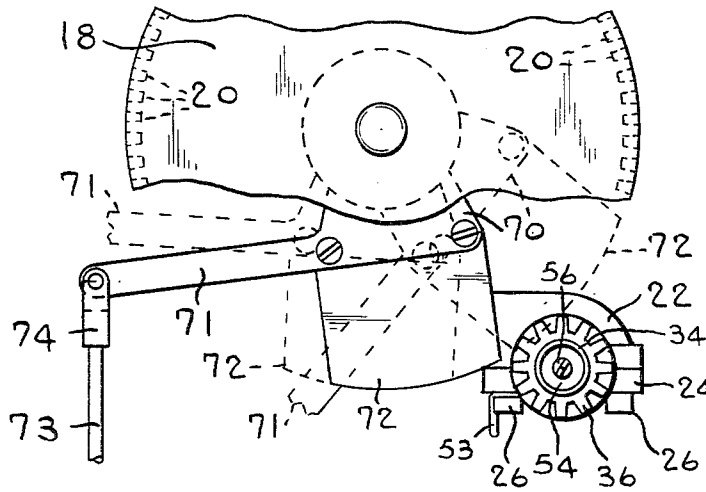


FIG. 10

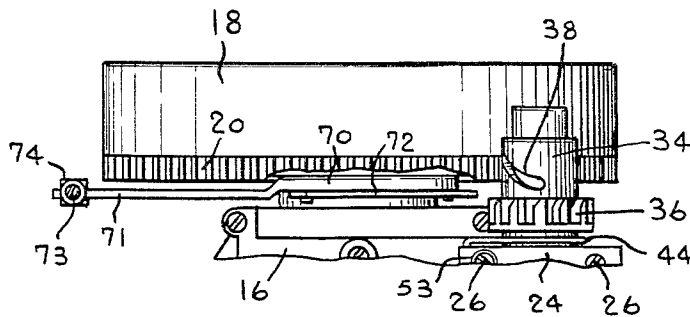


FIG. 11

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REWIND STARTING DEVICE FOR OUTBOARD MOTORS

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12 Claims. (Cl. 123—179)

This invention relates to improvements in starting devices for outboard motors and means for preventing unsafe engagement thereof.

Previous starters for outboard motors have rewind drums on which a starter rope winds mounted coaxially with the crank shaft. Generally these drums are carried above the fly-wheel and the starting pull is thus applied at a maximum height above the horizontal pivotal axis of the motor and tends to swing the motor forward. Furthermore, such drums unduly increase the over-all height of the outboard motor and require cumbersome structural supports. The starter rope winds upon its own coils and thus changes the mechanical advantage during the starting pull. In case of failure such drums must be removed to get at the emergency starter drum.

It is an object of this invention to eliminate these disadvantages and provide a starting device in which the forward tipping component of the starting force is minimized, over-all vertical space is saved, greater and constant mechanical advantage is obtained, and which may be inexpensively manufactured.

Another object of this invention is to provide a starter which will not drivingly engage the fly-wheel when the speed control means is advanced beyond a safe starting position.

These objects are obtained by using a rewind spool having a helix for the starter rope, mounting such spool on the motor below and spaced coaxially from the fly-wheel, providing means to automatically make a driving connection between said spool and the fly-wheel, and using a member motivated by the speed control mechanism of the outboard motor to block such automatic connection when such control is advanced beyond a safe starting range.

An embodiment of this invention is set forth in the following description and illustrated in the accompanying drawings, in which:

Fig. 1 is a view in side elevation of an outboard motor having a starter embodying the present invention, the location of the starter and fly-wheel being shown in broken lines;

Fig. 2 is an enlarged view in side elevation of such starter with the housing for the outboard motor removed and the instrument panel shown in part;

Fig. 3 is a fragmentary top plan view of such starter with parts of the fly-wheel broken away to illustrate the member for preventing engagement of the starter;

Fig. 4 is an enlarged view in front elevation of such starter with the instrument panel removed;

Fig. 5 is a fragmentary sectional view taken on the line 5—5 of Fig. 3;

Fig. 6 is an enlarged fragmentary view of the drive pinion shown in engagement with the gear on the drive fly-wheel;

Fig. 7 is a fragmentary sectional view taken on the line 7—7 of Fig. 5;

Figs. 8 and 9 are schematic views showing the starter

2

engagement prevention member respectively in non-operative and operative positions;

Fig. 10 is a fragmentary top plan view of such starter with parts of the fly-wheel broken away to illustrate the movable member of the fly-wheel magneto for adjusting the timing to control the speed of the motor to which member is attached the safety lock for preventing engagement of the starter; and

Fig. 11 is a fragmentary view in front elevation of the starter and the speed control means as shown in Fig. 10.

Referring to the drawings by reference numerals, the starter embodying this invention is incorporated in an outboard motor 10 which can be tilted about a horizontal axis 11. The outboard motor 10 has a removable cover 12 which fits against a fixed instrument panel 14 through which the starter rope extends. An engine 16 for the outboard motor has a fly-wheel magneto including the fly-wheel 18 mounted above the axis 11. As is well known to those skilled in this art, the fly-wheel magneto has permanent magnets (not shown) mounted in the fly-wheel and thus it functions as the rotating field of the magneto constituting the ignition system of the engine. This fly-wheel has a gear 20 which is momentarily engaged by the starter mechanism during starting. Such gear may be attached to or formed as a part of the fly-wheel in any of the well-known ways. The engine 16 has starter mountings 22 forming bearing halves which may be an integral part of the manifold secured to the crankcase of the engine. Bearing caps 24 complete the starter mounting and are held by screws 26.

The starter assembly 28 has a moulded plastic (such as nylon) spool 30 provided with grooves 31 formed in a helix around the circumference thereof. The starter rope seats in such grooves to prevent overlapping of its coils when being wound on the spool. The spool 30 has hubs 32 which are rotatably mounted in the starter mountings 22 and 24. A metal tube 34 moulded into the spool 30 extends upwardly of such spool to provide a spindle for mounting and driving a pinion 36. This pinion is preferably made of a moulded plastic such as nylon and its teeth are beveled to make engagement with the teeth of the gear 20 easier. The long hub of the pinion 36 has a helically extending slot 38 which slidably receives a pin 40 carried by the tube 34. The short hub of the pinion 36 is provided with an annular groove 42 (see Fig. 7) for a drag spring 44. The drag spring 44 has an offset leg which freely slides in a slot 46 in the upper starter mounting 22. The spring 44 furnishes enough friction drag to the pinion 36 to prevent its rotation relative to the tube 34 when the pin 40 is spaced from either end of the slot 38. As the spool 30 is rotated counter-clockwise (as viewed in Fig. 3) upon pulling on the starter rope, the pinion 36 will not rotate because of the drag of spring 44 and the pin 40 will ride against the upper edge of the slot 38 forcing the pinion 36 upward into engagement with the gear 20. When the pin reaches the lower end of such slot (as shown in Fig. 6), the torsional force applied to the tube 34 by the pull on the starter rope will cause the pinion 36 to turn the fly-wheel 18. When the fly-wheel starts to overrun the pinion 36, such pinion will be forced in counter-clockwise rotation with respect to the tube 34 (which may be stationary or moving) and the pin 40 will ride on the lower edge of the slot 38 forcing the pinion 36 out of engagement with the gear 20. This same result will occur when the spool 30 is moved in a clockwise direction upon the rewinding thereof hereinafter described. During axial movement of the pinion 36 the offset leg of the drag spring 44 freely slides up and down in the slot 46, thus continuing its drag on the pinion.

A starter rope 48 of proper length is preferably a synthetic rope such as nylon. In the retracted position

3

the starter rope 48 is coiled in the grooves 31 to form a helix. The inner end of the rope is inserted in an opening (not shown) in the top of the spool and secured in a well-known manner. The outer end of such rope extends through a guide hole 50 in the instrument panel 14 and has a handle 52 secured thereto. When the handle 52 is pulled outwardly of the instrument panel 14, the rope 48 will be led out of the panel and the spool 30 will be rotated counter-clockwise (as viewed in Fig. 3) with the resultant turning of the fly-wheel as heretofore described. Upon release of the pulling force the rope 48 will be rewound on the spool 30 as hereafter described. A wire guide 53 adjacent the spool 30 prevents the rope 48 from falling out of the grooves 31 as the spool rotates.

The spool-rewind mechanism, shown in Fig. 5, includes a plug 54 secured within the upper end of the tube 34 by the pin 40. A set screw 56 threaded in the plug 54 locks the pin 40 in place. A coiled rewind spring 58 has a loop at its upper end fitted over a small stud 60 on the plug 54 to lock such end to the spool. The lower end of the spring 58 is secured to a spring retainer 62 by having a loop on its lower end fitted on a stud 64 on such retainer. The retainer 62 fits within the bottom of tube 34 and has a flat 65 extending below such tube by which tension may be placed on such spring and maintained. A retainer bracket 68 held in place by the screws 26 of the lower cap 24 holds such flat in place. A guide rod 66 for the spring 58 seats in sockets in the plug 54 and the retainer 62. This rod also maintains the retainer 62 in its proper position at the bottom of such tube. In order to place initial tension on the spring 58, the retainer 62 is rotated clockwise as viewed in Fig. 3 with the rope fully wound on the spool (see Fig. 4). With the retainer 62 secured with such tension by the bracket 68, the spring will be wound tighter as the plug 54 is rotated counter-clockwise by the pulling out of the starter rope during starting operations. The residual tension in the spring 58 is sufficient to complete the rewinding of the rope on the spool 30 when the pulling force is released.

The spool 30 is easily assembled to the motor by the readily accessible mountings 22 and bearing caps 24 below the fly-wheel and spaced to one side thereof. Hence the starting pull is applied below the fly-wheel and nearer to the horizontal axis 11 thus minimizing the tendency to tilt the motor forward. This placing and mounting of the spool 30 further eliminates the rewind drum customarily mounted coaxial with the crank shaft by structural spiders and the like and thus the over-all height of the outboard motor is lessened and the installation costs of the starter cheapened. The spool 30 has a constant diameter for the helix of the grooves 31, hence the mechanical advantage remains constant throughout each starting pull. Without any sacrifice of space requirements, the diameter of the spool 30 and the number of teeth on the pinion 36 may be varied to provide a wide selection of the mechanical advantage in ranges greater than can be obtained by the customary rewind drum starter. An emergency rope starting drum (not shown) fixed on top of the fly-wheel is accessible upon removal of the cover 12 without necessitating removal of rewind drum of customary design.

Another feature of this invention is the prevention of engagement of the starting device with the fly-wheel when the speed control of the engine is advanced beyond a safe starting point. This lessens the possibility of damage from back-fire and also prevents such engagement during operation at speeds great enough to cause dangerous rotation of the starting device.

While the embodiment shown herein has a manual starter which is engaged by axial movement of a pinion on such starter, the following described safety lock will also function in the same way with an electric motor

4

starter with an axially engageable pinion or with an electrical or manual starter with a pinion engageable with the fly-wheel upon radial movement of such pinion. The lock herein described will prevent either axial or radial movement of the pinion by a mere change in dimension.

As heretofore explained, the fly-wheel 18 constitutes the rotor of the fly-wheel magneto. As is shown in Patents No. 2,487,095 and No. 2,528,700, there is mounted on a stator plate so as to project upwardly within a recess in the fly-wheel the stationary magnetic coils and breaker mechanism constituting the fixed stator of the magneto. In this embodiment these parts (not shown) are mounted on a stator plate 70. As shown in Figs. 10 and 11, this plate is mounted on the engine and has limited angular movement for the purpose of retarding and advancing the timing of the ignition system to control the speed of the engine. The movement of the stator plate 70 may be manually accomplished by a variety linkage mechanism connected with an operating handle. One example is shown in Patent No. 2,487,095. For illustrative purposes such manually operated mechanism is shown diagrammatically and includes an arm 71, secured to or made as an integral part of the stator plate 70, which extends radially beyond the periphery of the fly-wheel 18. A forwardly extending rod 73 is pivotally secured to the end of the arm 71 by a clevis and pin arrangement 4. The rod 73 may extend through the panel 14 and terminate in a handle 75. Sliding the handle toward the panel rotates the stator plate 70 clockwise from the "start" position shown in the full lines of Fig. 3 through the "slow" position to the "stop" position shown in broken lines in Fig. 10. Sliding the handle away from the panel rotates the stator counter-clockwise from such "start" position toward "fast" and "full" speed positions. Thus the stator plate 72 is in essence the adjustable means to control the speed of the engine and is sometimes referred to herein as speed control mechanism.

The engagement between the pinion 36 and the ring gear 20 is prevented by a safety lock (see Figs. 3, 4, 8, 9, 10 and 11) consisting of a plate 72 secured to the adjustable stator plate or speed control mechanism 70 which has an arcuate outer end which projects over the teeth of the pinion 36, as illustrated in Fig. 9, when such pinion is in the lower position shown in Fig. 4 and such plate has been moved counter-clockwise from the Start position, shown in full lines of Fig. 3, far enough toward the fully advanced position, shown in the broken lines, to cause its counter-clockwise end to be over such pinion. This prevents the pinion 36 from engaging the gear 20. The angular position of the counter-clockwise edge of the arcuate end of plate 72 is adjusted to the angular range of movement of the stator plate 70 so that when such stator plate is moved counter-clockwise from Off into the Start position such leading edge will be positioned substantially as shown in the full lines of Fig. 3 and the starter will be operative. When the stator plate 70 is further advanced counter-clockwise from the Start position, such leading edge will at once overlie the pinion 36 and thereafter the plate 72 will prevent engagement during further advance of the stator plate or speed control mechanism 70 by the manual operation of the rod 73. The arcuate end of the plate 72 has sufficient angular length to continue to so overlie the pinion 36 until such fully advanced position is reached. Thus the pinion will be prevented from engagement with the gear 20 during the operation of the speed control mechanism from slightly above starting speed to high speed. When the speed control mechanism is moved to Start position, the plate 72 will be removed from over the pinion 36 as shown in the positions shown in Figs. 3 and 8 and the starter will again be operative.

5

We claim:

1. In a motor having a fly-wheel, a starting device comprising a gear fixed to said fly-wheel, a spool rotatably mounted adjacent said fly-wheel, a starter rope wound on said spool and having an end secured to said spool and a free end which is pulled to rotate said spool, a pinion on said spool having limited relative rotative movement with respect thereto, and driving means between said pinion and spool for moving said pinion axially into engagement with said gear upon rotation of said spool relative to said pinion.

2. The combination claimed in claim 1 in which said driving means consists of a helically extending slot in said pinion and a pin carried by said spool slidable in said slot.

3. The combination claimed in claim 1 in which there is a spring to provide a frictional drag on said pinion to cause relative rotation between said pinion and spool upon rotation of said spool.

4. The combination claimed in claim 1 in which said spool has grooves in a helix about the circumference thereof to guide said rope.

5. The combination claimed in claim 1 in which there is a rewind spring mounted within said spool for rewinding said rope upon release of pulling force.

6. The combination claimed in claim 5 in which there is a plug for the upper end of said rewind spring held in place by said driving means.

7. The combination claimed in claim 5 in which there is a retainer for the lower end of said rewind spring adjustably held in place by a bracket.

8. The combination claimed in claim 7 in which a spring guide rod is mounted in said plug and retainer, such rod also acting to properly space said retainer.

9. In a starter for an engine with a fly-wheel and adjustable means to control the speed of such engine, starting means for applying starting force to said fly-wheel, and locking means operated by said adjustable means to prevent a driving interconnection between said starting means and said fly-wheel when said adjustable means is set for speed above a safe starting speed.

6

10. In a starter for an engine with a fly-wheel, starting means for supplying a starting torque, driving means providing a driving interconnection between starting means and said fly-wheel, speed control mechanism for said engine, and a locking member movable by said speed control mechanism into position to prevent a driving interconnection between said starting means and said fly-wheel.

11. The combination claimed in claim 10 in which said starting means comprises a pull rope and rewind spool assembly, and said driving means comprises a pinion movable into temporary engagement with a gear on said fly-wheel, and said locking member prevents the movement of said pinion into engagement with said fly-wheel.

12. A manual starter for an outboard motor with a fly-wheel positioned above a horizontal axis of pivotal movement of said outboard motor including a pull rope and rotatable rewind spool assembly fixedly carried by said motor between said fly-wheel and said horizontal axis with its axis of rotation offset from the axis of rotation of said fly-wheel, and means providing a driving interconnection between said spool and said fly-wheel.

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