

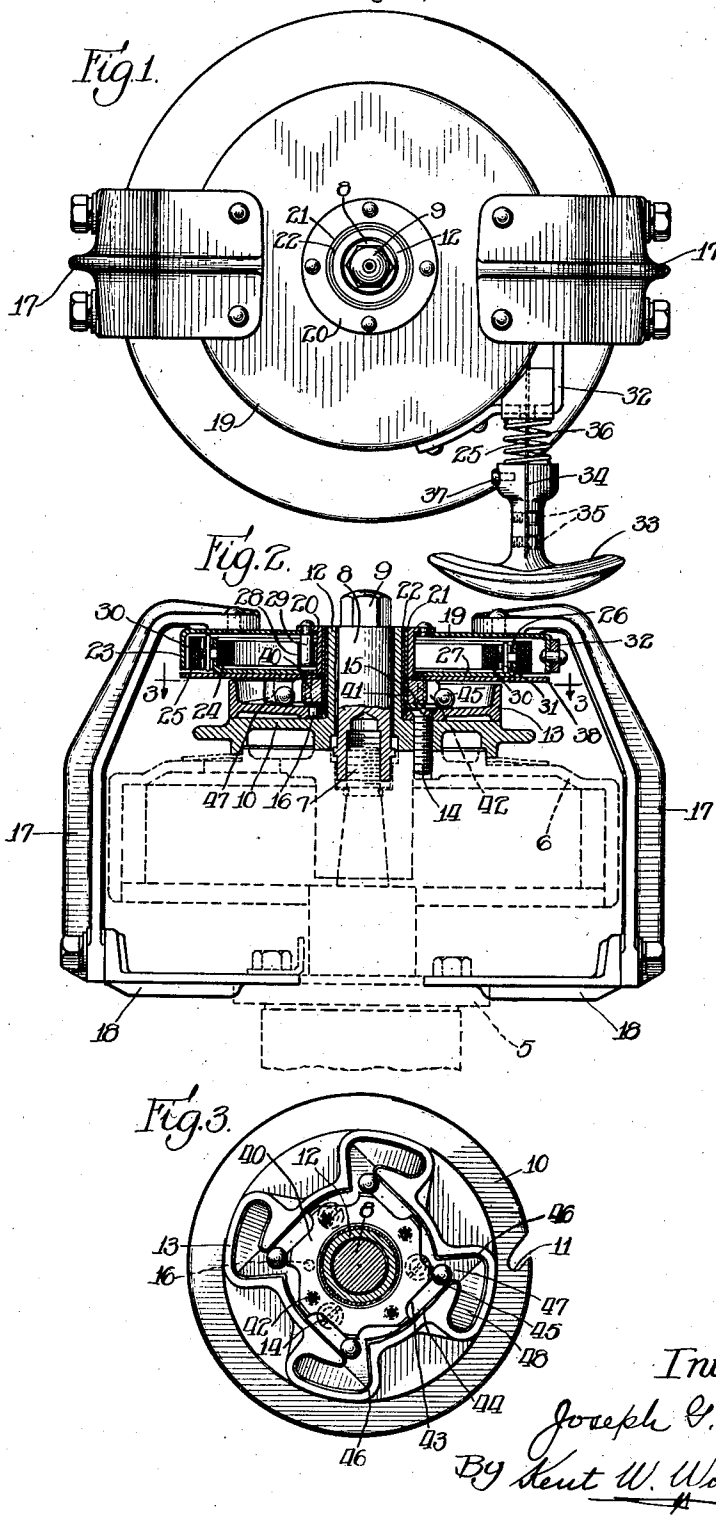
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ENGINE STARTER

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ENGINE STARTER

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This invention relates in general to a mechanical starter for internal combustion engines and more particularly refers to marine motors of the outboard type, although it may be used wherever applicable.

One of the principal objects of the invention is in the provision of a recoiling starter mechanism to simplify and facilitate successive starting operations.

A further object of the invention is in the provision of means for preventing the starter mechanism from engaging during a kick-back or in back-firing.

A further object of the invention is in the provision of ball gripping starter mechanism opposite movable surfaces to grip balls therebetween when they are substantially parallel.

A still further object of the invention is in the provision of a shock absorber upon the return of the starter handle.

A further object of the invention is in the provision of a simple starter mechanism which may be readily applied to outboard motors already in operation.

Other and further objectives will appear hereinafter, the accompanying drawing illustrating a preferred embodiment of the invention.

In the drawing Fig. 1 is a top view of an engine starter constructed in accordance with the principles of this invention and applied to an outboard type of marine motor; Fig. 2 is a sectional elevation of the starter showing the motor parts in outline; and Fig. 3 is a section taken on the line 3—3 of Fig. 2.

In starting marine motors, particularly of the outboard type, it has been the practice to use a pull rope with a notched starting pulley, but this is objectionable for the reasons that the rope may become lost or broken, it takes time and patience to coil and recoil the rope about the pulley for successive operations, and if many operations are required it becomes very difficult and laborious.

The present invention overcomes these objections by substituting a simple recoil starter of the spring type which actuates a ball clutch by successive pulls on the starter, the pulling tape being immediately recoiled upon release so that it is ready for another pull. Provision is also made for engagement of the clutch balls upon a kick-back or reverse operation of the engine part of the starter mechanism so that there is no danger of engaging the clutch balls in case the engine should operate reversely.

Referring now more particularly to the drawing, this invention is illustrated as applied to an outboard motor of the vertical type having a fixed or casing part 5, above which is a fly wheel 6 mounted at the upper end of the engine or crankshaft 7.

In applying the present invention, a shaft extension 8 is threaded upon the upper end of the crankshaft 7 and has a nut 9 at the top by which it may be attached and removed, the portion below the nut forming a bearing for the starter mechanism. It is customary to provide a notched rope starter plate which is attached to the top of the fly wheel 6, but in applying the present starter the conventional starter plate is removed and a starter plate 10 is substituted therefor which has a rope engaging notch 11 for emergency operation and has a sleeve extension 12 surrounding the bearing portion of the shaft extension 8. Mounted directly on top of the starter plate 10 and surrounding the sleeve extension 15 is a clutch member 13 which is secured directly to the plate 10 and the fly wheel 6 by any suitable means such as screws 14. Also attached to the starter part 13 to rotate therewith is a central washer 15 having a projecting pin 16 which engages with the part 13 for rotating it therewith, these parts all being secured together and to the fly wheel to rotate with it and with the shaft extension 8.

A pair of side supports 17 are secured to the motor casing 5 or any relatively fixed part of the engine by links or brackets 18 and extend around and above the fly wheel where they are attached to a top plate 19 having a downwardly projecting bearing portion 20 which surrounds the sleeve extension 12 but is spaced therefrom by bearing sleeves 21 and 22. The outer rim 23 of the plate 19 is turned downwardly forming a casing for a recoil spring 24 and a pull tape 25, which are attached at the inside and outside respectively of a rim 26 of a lower casing member 27. The inner end of the recoil spring 24 has a looped fastening or end 28 into which a projection 29 is inserted and the outer end of the spring and the inner end of the tape 25 may be attached to the rim 26 by means of a slotted loop at the end adapted to embrace an outwardly or inwardly pressed tongue 30 of the rim 26 through which a holding pin 31 is inserted. The outer end of the pull tape 25 extends through a slot in the rim 23 of the upper casing member and through a bracket 32 attached thereto, and at the outer end of the tape is a pull handle 33 having a slit 34 for receiving the tape and fastening screws 35 for holding it in place. Interposed between the bracket and the handle 32 is a short extended recoil spring 36 attached to the handle by a fastening screw 37 and providing a buffer for cushioning the return of the pull tape due to the action of the recoil spring 24.

To close the bottom of the upper spring casing member is a plate 38 and below this plate and surrounding the extension sleeve 12 is an inner starter member 40 separated from the sleeve 22 by an anti-friction sleeve 41. This

inner starter member 40 rests upon the washer 15 so that it is free from direct engagement with the outer starter member 13 and with the bearing sleeve extension 12. The inner member 40, the plate 38 and the lower casing member 27 are all secured together for joint movement by any suitable fastening means such as a screw 42. Thus it is seen that the casing and the parts enclosed thereby and the inner starter member 40 and the parts attached thereto are relatively fixed with respect to the outer starter member 13, the inner starter member 40 being turned only upon actuation and return of the starter tape 25, and being separated from the rotating parts by anti-friction bearing sleeves and washers.

At the periphery of the inner starter member 40 are a number of ball engaging surfaces 43 and at the inside of the outer starter member 13 are a number of ball engaging surfaces 44, normally disposed in substantially vertical relation, between which balls 45 are engaged for gripping action when the surfaces are substantially parallel. For each ball there is provided a retaining groove 46 having a radial portion 47 which is inclined toward the center thereof so that the balls will roll by gravity into position to engage the inner member 40 and an outer curved portion 48 extending from the outer end of the radial portion in the normal direction of movement of the starter members. This portion 48 is also inclined downwardly from its outer end toward the axial portion 47 so that when the starter parts are at rest the balls will tend to roll by gravity from the outermost end of the grooves 46.

In the normal starting operation an outward pull of the handle 33 unwinds the pull tape 25 and winds up the recoil spring 24. This causes the rotation of the inner starter member 40 and the engagement of the balls 45 with the outer starter member 13 when the surfaces 43 and 44 thereof, respectively, are substantially parallel and a continued pull of the tape rotates the crankshaft for starting the engine. As the engine starts or as the inner member 40 is reversely rotated the balls 45 move outwardly in the grooves 46. If it should happen that the engine instead of starting in the proper direction should kick backwardly or start in the reverse direction, the starter balls instead of being moved downwardly into engagement with the starter member 40 will be thrown by centrifugal force into the grooved portion 48 and will not return for engagement with the inner starter member until the engine has stopped, whereupon they will roll down by gravity. Thus there is no danger to an operator even if the engine should by mistake rotate reversely in attempting to start it.

This starter may be built compactly into an engine or it may be applied to a motor already built as an adjunct or attachment thereto. If the starter mechanism becomes damaged or inoperative, the emergency starter plate 18 may be used together with a starter rope either with the brackets 17 and the attached parts in place or removed.

I claim:

1. A horizontally rotatable starter mechanism for an engine having a flywheel comprising a part attachable to a flywheel, a fixed support attachable to the engine and extending about the

flywheel, a starter part rotatable with respect to the support and means including passages inclined to the horizontal and gravity clutch members therein for engaging it in one direction of rotation with said flywheel part, means attached to the starter part for rotating it, and rewinding means attached to the support and the starter part for recoiling the starter rotating means.

2. A starter mechanism for an engine having a fixed casing and a horizontally operating flywheel, comprising a fixed support attachable to the casing and extending adjacent the flywheel, a bearing support forming an extension of the flywheel axis, a starter part secured to and rotatable with the support and the flywheel, a normally stationary starter part rotatable upon the bearing support and connected to the fixed support, and means comprising inclined passages in one of the parts and gravity clutch members thereon connecting the starter parts in one direction of rotation of the stationary part, and means for returning the said stationary part to normal position.

3. In a recoiling engine starter, for horizontally rotatable parts, a fixed support rotatable means, a fixed casing secured to the support, a starter part secured to said rotatable means, an actuating starter part and clutch means to connect it in one direction of rotation with the other starter part, said clutch means including gravity passages and clutch balls movable therein, a lower casing part to which the actuating starter part is connected, a pull tape connected to the actuating starter part, and a recoiling spring connected to the actuating starter part and to the fixed support for rewinding the pull tape.

4. In an engine starter, a starter part having a central crank shaft extension and means to secure it to a flywheel for horizontal operation, a fixed support having a casing part bearing upon the shaft extension, the casing having an outer flange with a slot in it, an inner casing member having a flange within the other one, a pull tape surrounding the inner flange and one end secured thereto, the other end extending through the slot, a coil spring within the casing members attached at one end to the inside of the inner casing flange and at the inner end to the fixed support, another starter part attached to the inner casing member, and means comprising passages inclined to the horizontal and gravity clutch balls to connect the starter parts in one direction of rotation.

5. An engine starter for an outboard motor having a horizontally rotatable flywheel and a stationary casing, comprising a starter part attachable to the flywheel and having a flywheel shaft extension, another starter part rotatable on the extension, means comprising inclined passages having radial portions with outer curved extensions and gravity clutch members therein to connect the starter parts in one direction of rotation, a fixed support attachable to the casing and to extend above a flywheel, a pull tape and a recoil spring and enclosing parts to which they are attached, one end of the spring being attached to the fixed support and the pull tape extending through one of the enclosing parts to which it is returned by the recoil spring.

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