Nov. 21, 1950 G. W. MARTIN 2,530,623

OUTBOARD MOTOR STARTER

Filed Oct. 1, 1945 3 Sheets-Sheet 1

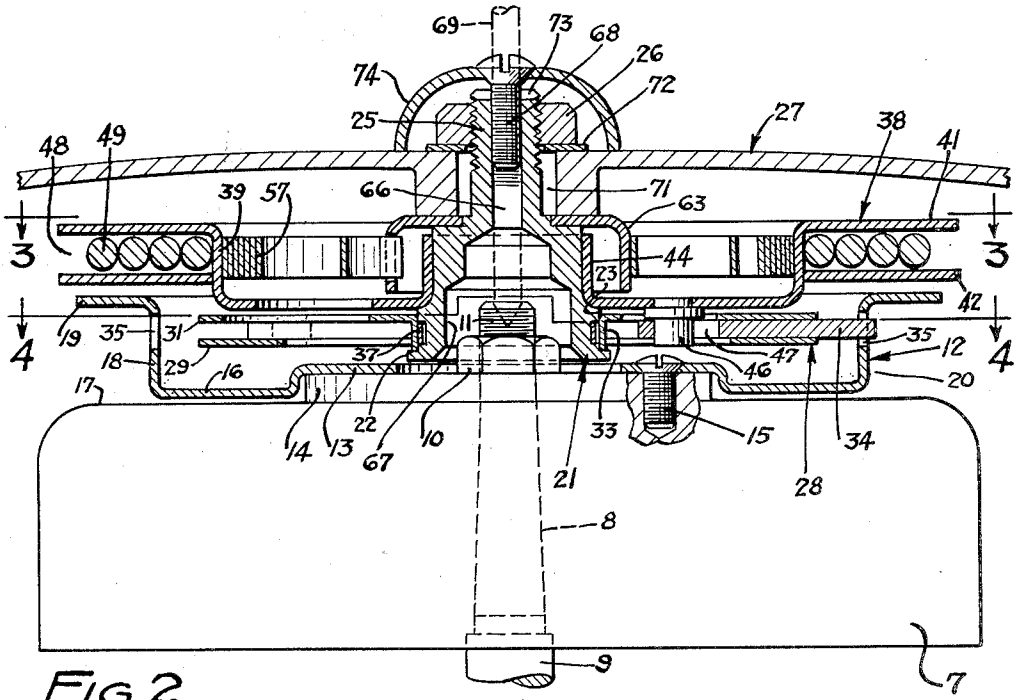

FIG. 2

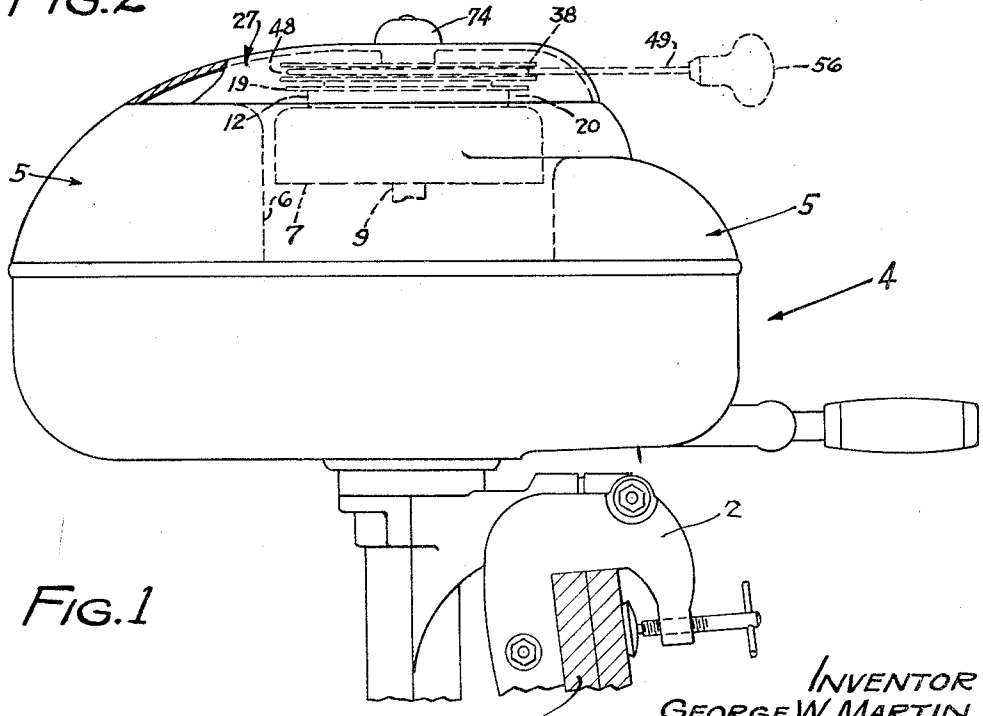

FIG. 1

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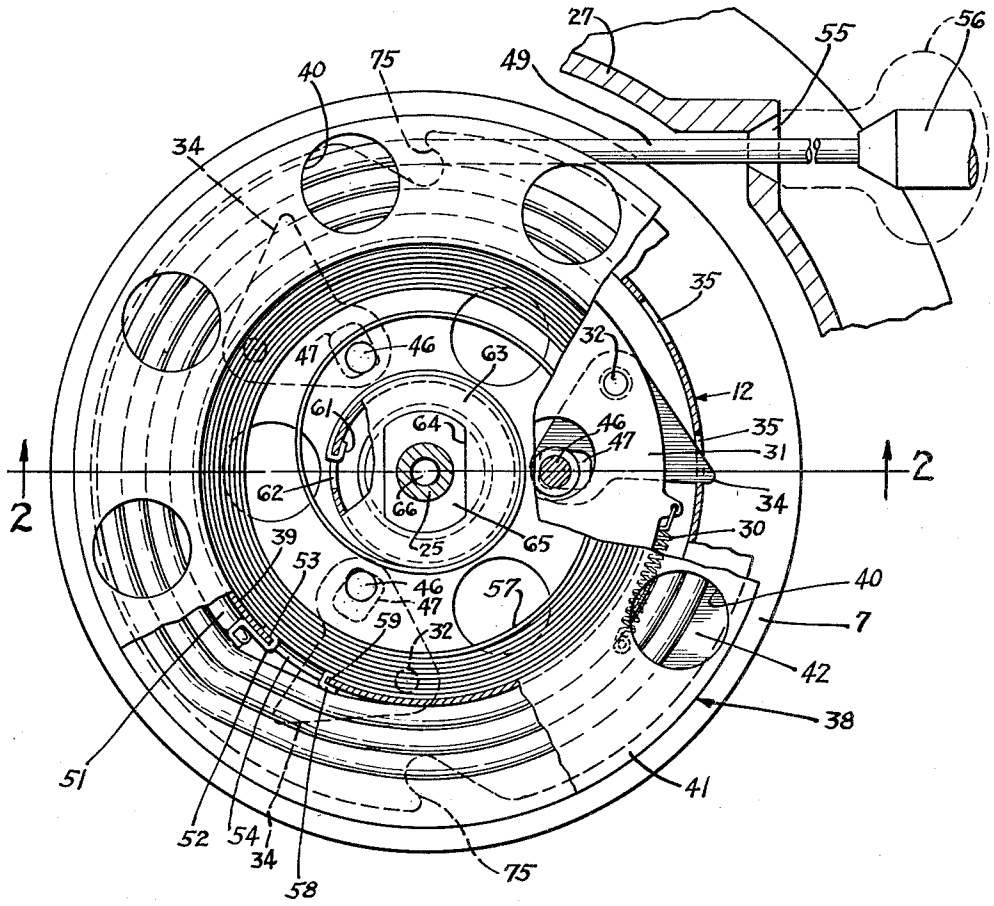

FIG. 3

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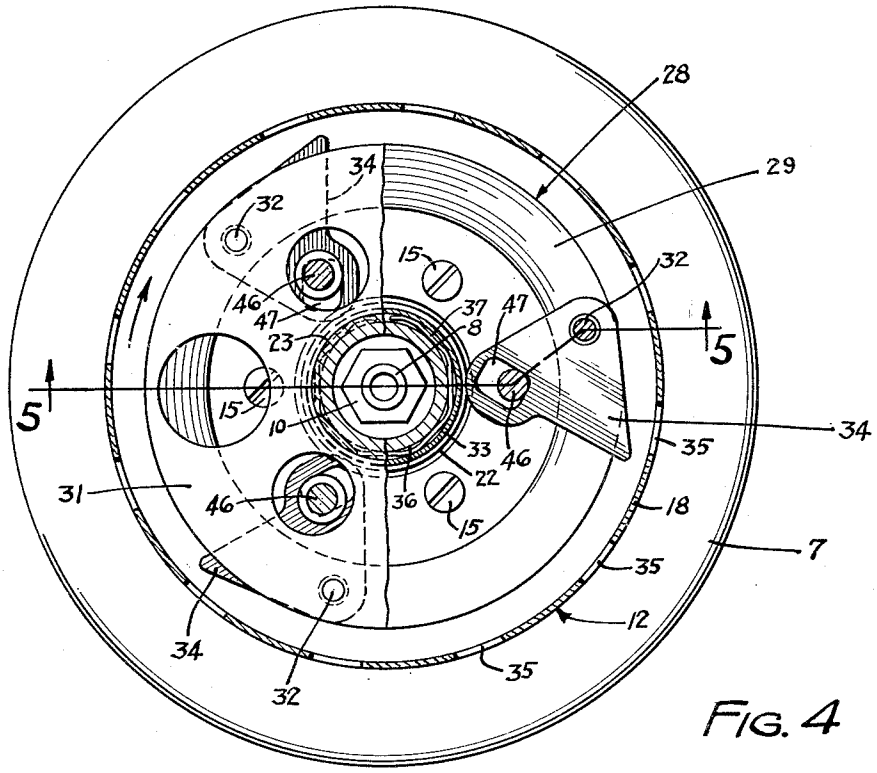

FIG. 4

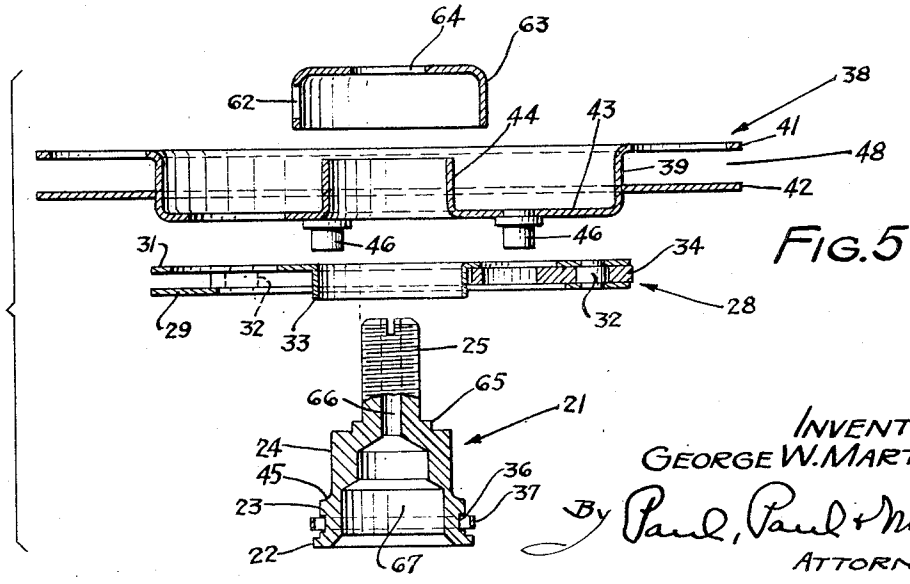

FIG. 5

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UNITED STATES PATENT OFFICE

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OUTBOARD MOTOR STARTER

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Application October 1, 1945, Serial No. 619,638

11 Claims. (Cl. 123—179)

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This invention relates to new and useful improvements in starters for outboard motors, and more particularly to such motors of the type commonly known as mechanical, wherein the usual starter rope is not separated from the starter mechanism or motor when pulled to start the motor.

There are now in commercial use two types of outboard motor starters. One consists simply of a short length of rope which must be manually wound about a drum fastened to the flywheel each time the motor is to be started. A pull is then exerted on the rope to rotate the flywheel and start the engine, and each time the rope is so pulled it is completely detached from the drum and engine. Some engines, if not in proper adjustment or condition, may require the rope be applied thereto several times before the engine will start, resulting in delayed starting, which, in some cases, may be serious. Then, too, because the rope is usually detached from the engine it may readily become mislaid or lost and when this occurs, the engine cannot be started until another piece of rope has been obtained.

The other type of starter comprises, usually, a drum and a ratchet mechanism which is associated with the engine flywheel and is made operable to rotate the flywheel, when a pull is exerted on a rope normally having one end inseparably secured to the drum of the ratchet mechanism. When a pull is exerted on the rope, the drum is rotated and winds up a spring, which, when the rope is released following an attempt to start the motor, immediately restores the rope to its normal or original starting position upon the drum, ready for the next starting operation.

With this type of starter a motor may be quickly cranked or started at any time by merely exerting an outward pull on the rope, as the rope is always in readiness for starting. This latter type of starter thus provides a much more convenient means for starting an outboard motor in that the rope is always in position to be grasped and manipulated to rotate the flywheel, whenever necessary.

Mechanical starters for outboard motors, such as are now in common use, usually have two or more pawls which are mounted on the engine flywheel, and are biased into engaged position by light springs. The pawls are so formed that when the flywheel rotates at any speed above a predetermined minimum, centrifugal force acts to overcome the spring bias and thereby moves the pawls into disengaged positions. With this type of starter, the pawls always tend to move

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into engaged positions when the motor is not running. Thus when the rope is released, and the spring rewinds the drum, the pawls click into the ratchet notches as the drum rotates, resulting in noise. More important, should the motor backfire at low speed or when being started, the pawls may engage the ratchet at the moment the motor reverses its direction of rotation, which may cause serious damage to some of the starter parts.

It is therefore an object of the present invention to provide an improved starter for outboard motors which is so constructed that the movement of the driving pawls is not dependent upon any condition or motion of the motor, but depends entirely upon the starter rope being pulled.

A further object is to provide a mechanical starter for outboard motors comprising a plurality of pawls which, when in normal non-starting positions, are completely disengaged from all moving parts of the motor, and hence, when the starter rope is released after exerting a pull thereon to start the motor, the pawls cannot drop into the ratchet notches provided on the drum secured on the flywheel, thereby eliminating the objectionable clicking noise usually resulting in motor starters of this type wherein the starting pawls are carried by the flywheel.

A further object is to provide an improved starter which is simple and inexpensive in construction and is so designed that many of the various parts thereof may readily be stamped from sheet stock.

A further object is to provide an outboard motor starter comprising a supporting stud having means for mounting it in axial alignment with the engine crank shaft, and upon which stud the ratchet mechanism for starting the engine is mounted and whereby the ratchet mechanism is supported independently of the engine flywheel and has no physical connection therewith when the engine is at rest, or when it is in operation, the ratchet mechanism being so constructed that it operatively engages the flywheel only during the period the starter rope is being pulled to start the engine.

Other objects of the invention reside in the novel manner of supporting the starter mechanism independently of the engine flywheel; in the provision of a single supporting stud for supporting all of the starter parts in operative relation to one another and to the ratchet drum or member secured to the flywheel; in the novel construction of the pawl operating mechanism whereby the pawls are moved into or out of driv-

ing engagement with the ratchet by relative movement of the starter drum with respect to the pawl retaining member, and whereby the pawls are not dependent upon springs for moving them into one position or the other; in the construction of such a starter wherein friction is utilized to control the action of the driving pawls; and in the provision of a motor starter mechanism which is supported upon the cover plate of the engine housing, whereby the starter mechanism may be removed from the motor as a unit, by the simple removal of the engine housing cover plate.

Other objects of the invention will appear from the following description and the accompanying drawings and will be pointed out in the annexed claims.

In the accompanying drawings there has been disclosed a structure designed to carry out the various objects of the invention, but it is to be understood that the invention is not confined to the exact features shown, as various changes may be made within the scope of the claims which follow.

In the drawings:

Figure 1 is a side elevation of an engine showing my improved starter applied thereto;

Figure 2 is a sectional elevation on the line 2—2 of Figure 3;

Figure 3 is a sectional plan view on the line 3—3 of Figure 2;

Figure 4 is a sectional plan view on the line 4—4 of Figure 2; and

Figure 5 is a sectional elevation on the line 5—5 of Figure 4, with the parts detached from one another to more clearly illustrate the constructions thereof.

In the selected embodiment of the invention herein disclosed, there is illustrated in Figure 1, for purposes of disclosure, a portion of an outboard motor comprising a swivel bracket 2 for securing the motor to the transom 3 of a boat, and which provides the means for detachably securing the motor, generally designated by the numeral 4, to the boat.

The motor is shown comprising a gas tank 5 provided with a central opening 6 for accommodating the usual engine flywheel 7, mounted upon the upper tapered end portion 8 of the engine crank shaft 9, and secured thereto by a suitable key, not shown in the drawings, and a lock nut 10 received in threaded engagement with the uppermost end 11 of the crank shaft.

An important feature of the present invention resides in the mechanism provided for cranking or initially rotating the flywheel each time the motor is to be started. The starter mechanism is shown comprising a flanged drum member, generally designated by the numeral 12 shown having its central portion 13 seated upon the upper raised portion 14 of the flywheel and secured thereto by a plurality of screws 15.

When the flywheel is provided with a raised central portion 14, as herein shown, the drum member 12 preferably has its central wall portion 13 upwardly offset from the wall portion 16, as shown in Figure 2, whereby the lower portion of the periphery of the member 12 will be disposed in close relation to the upper face 17 of the flywheel, thereby to prevent a starter rope from wedging between the wall portion 16 and the upper face of the flywheel 17, should an emergency develop which would necessitate applying a starter rope directly to the drum member 12 to start the motor. The cylindrical wall portion 18 of the member 12 thus provides a drum for an emergency starter rope, the top face of the flywheel providing, in effect, a flange for the lower side of the drum. The upper peripheral portion of the member 12 is shown formed with a radially disposed flange 19 which cooperates with the upper face of the flywheel to provide an annular rope-receiving groove 20. Rope-receiving slots 75 are provided in the periphery of the flange 19, whereby the end of a conventional starter rope may be attached thereto, should it become necessary, as in the event the mechanical starter should fail.

The starter mechanism comprises a shouldered supporting stud generally designated by the numeral 21, and best shown in Figure 5. This stud, it will be noted, comprises a lower annular flange 22 and two vertically spaced bearing surfaces 23 and 24. The stud 21 has an upper reduced end portion 25 adapted to receive a nut 26, whereby the stud may be suitably secured to a coverplate 27, secured to the gas tank 5 over the engine flywheel and which thus provides the sole support for the starter mechanism, as will be understood by reference to Figure 2. By thus mounting the stud 21, the starter mechanism may be removed as a unit from the motor by simply detaching the coverplate 27 from the gas tank 5. The shape and contour of the coverplate 27 is such that when secured to the gas tank 5, it provides a streamlined effect, as clearly illustrated in Figure 1.

Mounted for relative rotation upon the lower bearing surface 23 of the stud, is a pawl retainer unit, generally designated by the numeral 28, and best shown in Figures 4 and 5. The retainer unit comprises upper and lower spaced plates 29 and 31, secured together by suitable shouldered spacing studs 32. The lower plate 29 is in the form of an annular ring having an open center, and the upper plate is shown formed with a central bearing portion 33 adapted to seat about the bearing portion 23 of the stud 21, as shown in Figure 2. The flange 22 at the lower end of the stud limits the downward movement of the pawl retainer 28 upon the stud, as will be understood.

Movably supported between the plate members 29 and 31 of the pawl retainer 28 are a plurality of pawls 34. These pawls are shown mounted for pivotal movement upon the spacer studs 32, it being understood that the spacing between the shoulders of each such stud is slightly greater than the thickness of each pawl, whereby the pawls may freely pivot about the studs between the plate members 29 and 31, as will subsequently be described.

Another important feature of the invention resides in the means provided for frictionally restraining relative rotation of the pawl retainer 28 upon the bearing surface 23 of the supporting stud 21. Such frictional mounting of the pawl retainer 28 is important as it controls the shifting of the pawls 34 into and out of driving engagement with a plurality of apertures 35, shown provided in the peripheral wall 18 of the drum member 12, each time the starting mechanism is operated. The apertures 35 are clearly shown in Figure 4, and the walls thereof provide abutments for engagement by the pawls 34.

To frictionally retain the pawl retainer 28 against relative rotation upon the stud, a shallow annular groove or recess 36 is shown provided in the bearing surface 23, intermediate its ends. Seated in the recess 36 is a tortuous-like spring element 37 which, when the pawl retainer is mounted on the stud, as shown in Figure 2, alter-

nately frictionally engages the bottom of the recess 36 and the bearing portion 33 of the pawl retainer. The tortuous shape of the spring element 37 is such that the frictional engagement of said element with the pawl retainer 28 and the stud 21 will tend to prevent the retainer from rotating on the stud 21, and this results in the pawls being engaged and disengaged, as will hereinafter be described.

In other words, the operation of the novel starter herein disclosed is more or less dependent upon the frictional relationship between the pawl retainer 28 and the stud 21, and the spring element 37 adequately serves this purpose. To prevent the pawls from accidentally engaging the walls of the apertures 35 in the drum member 12 as a result of motor vibration, a small biasing spring 30 may be interposed between the pawl retainer 28 and a winding drum, generally designated by the numeral 38, and which is next to be described. When such a biasing spring is used, one end thereof is suitably connected to the pawl retainer 28 and its opposite end to the lower flange 42 of the winding drum 38, as will be understood by reference to Figures 2 and 3. The spring 30 constantly exerts a rotative force on the pawl retainer in a direction to retract the pawls 34. If the motor vibration is of small magnitude, the biasing spring 30 may be dispensed with.

The winding drum 38, is shown comprising a central wall portion 39 provided with vertically spaced flanges 41 and 42, the flange 41 being shown integrally formed with the central wall 39, and the flange 42 being shown independently formed and suitably secured to the wall 39. The drum 38 has a horizontal or central wall portion 43 shown provided with an integral bearing portion 44 adapted to be rotatably mounted upon the bearing portion 24 of the supporting stud 21, as shown in Figure 2. When the pulley 38 is mounted upon the stud, as shown in Figure 2, the annular shoulder 45 of the stud will retain the drum 38 in fixed spaced relation to the pawl retainer 28, as will be clearly understood. To minimize weight as much as possible, the flanges 41 and 42 of the drum 38 may be provided with suitable apertures 49, as shown in Figure 3.

Secured to the horizontal central wall portion 43 of the drum 38 are a plurality of depending studs 46 which pass through suitable apertures provided in the upper plate member 31 of the pawl retainer 28, and into elongated slots 47 provided in the pawls 34, as best illustrated in Figures 3 and 4. Thus, when the starter drum 38 is mounted upon the stud 21 in the position shown in Figure 2, each stud 46 thereof will extend into a slot 47 of one of the pawls 34. Thus when the drum 38 is relatively rotated with reference to the pawl retainer 28, relative pivotal movement is imparted to the pawls, thereby to move them into or out of driving engagement with the drum 12 secured to the flywheel, depending upon the direction of the rotation of the starter drum.

The flanges 41 and 42 cooperate to provide a groove 48 adapted to receive a suitable starter rope or lanyard 49 which is coiled about the drum 38 several times, as shown in Figure 3. The inner end 51 of the starter rope is anchored to the periphery of the cylindrical wall portion 39 of the starter drum by a suitable anchor hook or clip 52, having one end engaging the end wall 53 of a suitable slot or opening 54 provided in the periphery of the drum 38. The opposite end of the rope passes through a guide opening 55 provided in the housing 27, and has a suitable hand knob or grip 56 secured thereto, whereby the starter rope may be conveniently grasped and a pull exerted thereon to start the motor.

Means are provided for constantly urging the starter drum 38 in a direction to wind the starter rope or lanward thereon, whereby each time a pull is exerted upon the starter rope to start the motor, the starter rope, when released, will immediately be rewound onto the drum 38 to be ready for the next starting operation.

To thus automatically rewind the starter rope onto the starter drum, each time it has been unwound, following a pull thereon to start the motor, a suitable flat clock spring 57 is shown provided within the starter drum 38. The outer end of the spring 57 is shown formed with a hook 58 which may be conveniently anchored to the opposite wall 59 of the slot 54 provided in the periphery of the drum 38.

The inner end of the spring 57 is shown provided with a suitable hook 61 which is anchored in an opening 62 provided in the periphery of a cup-shaped spring anchor 63, shown in Figures 2 and 5. The cup-shaped spring anchor 63 has an elongated opening 64 in its upper wall adapted to receive a correspondingly shaped portion 65 provided on the stud 21 at the base of the reduced threaded portion 25 thereof. The configurations of the portion 65 of the stud and also the shape of the opening 64 in the spring anchor 63 are best shown in Figure 3, wherein it will be noted that when the spring anchor 63 is secured to the stud, as shown in Figure 2, it cannot relatively rotate thereon. The metal thickness of the spring anchor 63 is relatively greater than the shoulder length of the stud portion 65, whereby tightening of the nut 26 positively secures the spring anchor in fixed position upon the stud. The knob 56 engaging the coverplate 27 limits rotation of the drum 38 in rope-winding direction.

When mounting the starter upon the motor, it is desirable that the supporting stud 21 be disposed in concentric relation to the engine crank shaft 8 in order that the pawls 34 will properly engage the slots 35 in the drum member 12. To accomplish this, the upper reduced end portion 25 of the stud 21 is provided with an axial bore 66 terminating at its lowered end in an enlarged counterbore 67 adapted to receive the upper end of the crank shaft and the lock nut 10 secured thereto, as clearly illustrated in Figure 2.

The bore 66 extends upwardly through the reduced end portion 25 of the stud and is threaded to receive a screw 68.

To axially align the stud 21 with the crank shaft, a centering pin 69, indicated in dotted lines in Figure 2, and having a tapered lower terminal, is inserted through the bore 66 in the stud until the tapered lower end enters a correspondingly shaped centering recess provided in the upper end of the crank shaft. The upper reduced end portion 25 of the stud, it will be noted, passes through an enlarged opening 71 in the housing 27, whereby the stud may be relatively shifted about it in the opening 71 to accurately axially align it with the crank shaft.

When the stud has been axially aligned with the crank shaft, which is positively assured when the tapered end of the centering pin 69 is firmly seated on the bottom of the recess in the end of the crank shaft, the clamping nut 26 is tightened against a washer 72, whereupon the stud will be firmly secured to the starter hous-

ing 27 with the assurance that the starter parts will be properly aligned with the engine flywheel.

Means is also provided for quickly and conveniently winding the clock spring 57 to the proper tension, whereby it will quickly rewind the starter rope each time it has been unwound from the drum 38 as a result of an attempt having been made to start the motor.

To thus wind the spring 57, the upper end of the stud 21 is shown provided with a screw driver slot 73 adapted to receive a screw driver or other similar instrument, as will be understood. To wind the spring 57, the nut 26 is loosened sufficiently to permit the stud to be relatively rotated with respect to the housing 27. The stud, and with it spring anchor 63, is then relatively rotated in a counter-clockwise direction, when viewed as shown in Figure 3, whereupon the inner end of the spring is wound about the spring anchor 63 until the spring has been sufficiently tensioned. The lock nut 26 is then tightened to firmly secure the supporting stud against relative rotation in the starter housing 27, after which a small finishing cap 74 is preferably placed over the lock nut 26 and secured in position on the housing 27 by the screw 68, as will be clearly understood by reference to Figure 2.

Operation

To start a motor with the novel starter herein disclosed, a pull is exerted on the starter rope 49 whereupon the winding drum 38 is rotated. As the drum 38 initially starts to rotate, the pins or studs 46 depending therefrom into the slots 47 in the pawls will swing the pawls in a counter-clockwise direction, when viewed as shown in Figure 4, thereby to move them into driving engagement with the slots 35 in the periphery of the member or ring 12, as will be understood by reference to Figure 4. Such relative rotation of the pawls about their pivots 32 results because of the action of the friction spring 37 which, as hereinbefore stated, tends to resist relative rotation of the pawl retainer 28. When the pawls have thus been rotated into driving engagement with the slots 35, they are prevented from further rotation as a result of the studs 46 engaging the ends of the slots 47 remote from the effective ends of the pawls.

When this occurs, a direct driving relationship exists between the drum 38 and the pawl retainer 28, whereupon continued rotation of the drum will impart a corresponding motion to the pawl retainer, and therefore to the engine crank shaft, because of the pawls being interlocked or drivingly engaged with the slots 35 in the drum member or ring 12, as shown in Figure 2.

When the starter rope is released, the rewind spring 57 rotates the drum 38 in the reverse direction, thereby rewinding the starter rope onto the drum. When the drum begins to rotate in a reverse direction, the studs 46 depending from the drum 38 into the slots 47 in the pawls, will impart relative rotation to the pawls about their axes in a clockwise direction, when viewed as shown in Figure 4, thereby causing the pawls to retract or move to their disengaged positions, wherein it will be noted the studs 46 are engaged with the opposite ends of the slots 35 or the ends thereof nearest to the effective terminals of the pawls, thereby preventing further relative rotation of the pawls. The slots 47 in the pawls and the studs 46 therefore limit the relative rotation of the drum 38 with relation to the pawl retainer 28, when the starter is operated to start the engine.

From the above, it will be apparent that the pawls 34 are necessarily in disengaged position at all times, except when the starter rope is being pulled to start the engine. This results in quiet operation, because the pawls cannot engage the notches or slots 35 in the member or ring 12 when the winding drum 38 is being rotated to rewind the starter rope thereon. Also, should the motor back fire when being started, or when running at slow speed, the starter pawls cannot accidentally engage the slots 35 in the drum member 12, which avoids all danger of breakage or damage to the parts, should the motor backfire.

Under severe conditions of motor vibration, the pawl retainer may creep or tend to relatively rotate with reference to the winding drum 38, which may be sufficient to cause the pawls to tend to drivingly engage the slots 35 in the pulley member 12. Such tendency toward engagement of the pawls with the member 12 is not serious when the motor is operating under normal conditions, but it may cause considerable noise as a result of the ends of the pawls riding over the openings or slots 35 provided in the member 12. Such creeping or rotating of the pawl retainer may be positively prevented by the use of the biasing spring 30, shown in Figures 2 and 3.

From the foregoing, it will be noted that all of the starter parts, with the exception of the member 12, are supported directly upon the stud 21, which in turn is mounted in the starter cover plate 27, as will be clear from Figure 2. Thus, the starter mechanism may be conveniently removed from the motor as a unit by simply detaching the cover plate 27, whereby convenient access may be had to the flywheel.

The novel starter herein disclosed is extremely simple and inexpensive. It comprises few parts, and the majority of such parts are so designed that they may readily be stamped from sheet metal at extremely low cost. The mounting of the stud 21 is such that it may readily and quickly be axially aligned with the crank shaft regardless of the position of the starter housing 27. The stud also provides the sole support for all of the starter parts, with the exception of the member 12. It will also be noted that the movement of the pawls into and out of driving engagement with the member 12 is controlled through the action of the friction imposed between the stud 21 and pawl retainer 28, which is such as to at all times accurately control the movement of the pawls, when the winding drum 38 is rotated by manipulation of the starter rope.

It will be apparent to those skilled in the art that the embodiments herein described may be variously changed and modified without departing from the spirit of the invention, and that the invention is capable of uses and has advantages not herein specifically described; hence it will be appreciated that the herein disclosed embodiments are illustrative only, and that my invention is not limited thereto.

I claim as my invention:

1. A starter for outboard motors comprising a fixed supporting stud, a drum rotatively mounted on the stud and having one end of a rope secured thereto, a ratchet mechanism for operatively connecting the drum to the engine flywheel, including a plurality of pawls and a retaining unit for said pawls mounted for relative rotation on said stud, a member secured to the flywheel

adapted to be engaged by said pawls, and means including friction means for effecting the operation of said pawls, and whereby when a pull is exerted on the rope to start the engine, said pawls will drivingly engage the member on the flywheel, and when the rope is released, said pawls will be disengaged from said member.

2. A starter for outboard motors comprising a fixed supporting stud, a drum rotatively mounted on the stud and having one end of a rope secured thereto, a ratchet mechanism for operatively connecting the drum to the engine flywheel, including a plurality of pawls and a retaining unit for said pawls mounted for relative rotation on the stud, a member secured to the flywheel adapted to be engaged by said pawls, friction means interposed between the retaining unit and said stud, and means for effecting movement of said pawls into and out of driving engagement with the member fixed to the flywheel, when the starter rope is manipulated to start the engine.

3. In an outboard motor starter comprising a stud and a drum rotatably mounted thereon yieldingly urged in one direction and rotatable in the opposite direction for starting, a retainer rotatably mounted on said stud, means impressing a drag on said retainer resisting rotation thereof in either direction, a driven member secured on the motor shaft, clutch elements on said retainer movable into clutching engagement with said driven member and out of engagement therewith clear thereof, and connections between said drum and said clutch elements and retainer effective for moving said clutch elements into engagement with said driven member and then picking up said retainer for rotation with said drum responsive to rotation of the latter in said opposite direction and for moving said clutch elements clear of said driven member and then picking up said retainer for rotation with said drum responsive to rotation of the latter in said one direction, said retainer being otherwise free from said drum.

4. In an outboard motor starter comprising a stud and a drum rotatably mounted thereon yieldingly urged in one direction and rotatable in the opposite direction for starting, a pawl retainer rotatably mounted on said stud, a driven clutch member secured on the motor shaft, clutch pawls carried by said retainer movable into clutching engagement with said driven member, means on said stud providing a drag on said retainer resisting rotation thereof in either direction, and operating connections between said drum and said pawls and retainer effective for moving said pawls into clutching engagement with said driven clutch member and then picking up said retainer for rotation with said drum responsive to rotation of the latter in said opposite direction and for moving said pawls clear of said driven clutch member and then picking up said retainer for rotation with said drum responsive to rotation of the latter in said one direction, said retainer being otherwise free from said drum.

5. In an outboard motor starter comprising a rotatably mounted drum yieldingly urged in one direction and rotatable in the opposite direction for starting, a pawl retainer rotatable about the axis of said drum, means imposing drag on said retainer resisting rotation thereof in either direction, a driven clutch member secured on the motor shaft encircling said retainer, pawls carried by said retainer movable outward thereof to projected position in clutching engagement with said driven member and inward to retracted position clear thereof, and operating connections between said drum and said pawls and retainer effective for projecting said pawls and then picking up said retainer for rotation with said drum responsive to rotating of the latter in said opposite direction and for retracting said pawls and then picking up said retainer for rotation with said drum responsive to rotation of the latter in said one direction, said retainer being otherwise free from said drum.

6. In an outboard motor starter comprising a rotatably mounted drum yieldingly urged in one direction and rotatable in the opposite direction for starting, a pawl retainer rotatable about the axis of said drum, means imposing drag on said retainer resisting rotation thereof in either direction, a driven clutch member secured on the motor shaft encircling said retainer, pawls carried by said retainer movable outward thereof to projected position in clutching engagement with said driven member and inward to retracted position clear thereof, studs carried by said drum extending therefrom into openings in said pawls effective for projecting and retracting the latter responsive to rotation of said drum in said opposite direction and in said one direction respectively, and means supplementary to said pawls for rotating said retainer with said drum when said pawls have been projected and retracted.

7. In an outboard motor starter comprising a removable support, a mounting stud carried thereby and a winding drum rotatably mounted on said stud yieldingly urged in one direction and rotatable in the opposite direction for starting; a pawl retainer rotatably mounted on said stud, means carried by said stud contacting said retainer imposing drag thereon resisting rotation thereof in either direction, a driven clutch member secured on the motor shaft encircling said retainer, pawls carried by said retainer movable outward thereof to projected position in clutching engagement with said driven member and inward to retracted position clear thereof, and operating connections between said drum and said pawls and retainer effective for projecting said pawls and then picking up said retainer for rotation with said drum responsive to rotation of the latter in said opposite direction and for retracting said pawls and then picking up said retainer for rotation with said drum responsive to rotation of the latter in said one direction, said retainer being otherwise free from said drum.

8. In an outboard motor starter comprising a removable support, a mounting stud carried thereby and a winding drum rotatably mounted on said stud yieldingly urged in one direction and rotatable in the opposite direction for starting; a pawl retainer rotatably mounted on said stud, resilient means confined under compression between said stud and said retainer imposing drag on the latter resisting rotation thereof in either direction, a driven clutch member secured on the motor shaft encircling said retainer, pawls carried by said retainer movable outward thereof to projected position in clutching engagement with said driven member and inward to retracted position clear thereof, and operating connections between said drum and said pawls and retainer effective for projecting said pawls and then picking up said retainer for rotation with said drum responsive to rotation of the latter in said opposite direction and for retracting said pawls and then picking up said retainer for rotation with

said drum responsive to rotation of the latter in said one direction, said retainer being otherwise free from said drum.

9. In a starter for an outboard motor comprising an engine having a crank shaft with a fly wheel secured thereon and a housing enclosing the flywheel provided with a removable cover member; a mounting stud carried by said cover member, a winding drum rotatable on said stud yieldingly urged in one direction and rotatable in the opposite direction for starting, a pawl retainer rotatably mounted on said stud, a driven clutch member secured on said fly wheel providing a drum encircling said retainer adapted for reception of a pull rope wound thereon for emergency starting, pawls pivoted on said retainer for swinging movement outward to projected position in clutching engagement with said second drum and inward to retracted position clear thereof, pin and slot connections between said winding drum and said pawls effective for projecting and retracting the latter and then establishing driving connection between said retainer and said winding drum responsive to rotation of the latter in said opposite direction and in said one direction respectively, and means on said stud imposing drag on said retainer resisting rotation thereof in either direction, said retainer being otherwise free from said winding drum, said cover member and stud and the parts carried thereby being removable as a unit to give access to said second drum.

10. In an outboard motor starter, a mounting stud and a winding drum rotatably mounted on said stud yieldingly urged in one direction and rotatable in the opposite direction for starting, a pawl retainer rotatably mounted on said stud, means carried by said stud imposing a drag on said retainer resisting rotation thereof in either direction, a driven clutch member secured on the motor shaft encircling said retainer, clutch pawls pivoted intermediate their ends on said retainer for swinging movement outward to projected position in clutching engagement with said driven member and inward to retracted position clear thereof, and pin and slot connections between

said winding drum and the inner arms of said pawls effective for projecting and retracting the latter and then picking up said retainer for rotation with said winding drum responsive to rotation thereof in said opposite direction and in said one direction respectively, said retainer being otherwise free from said winding drum.

11. In an outboard motor starter comprising a rotatably mounted drum yieldingly urged in one direction and rotatable in the opposite direction for starting, a retainer rotatable about the axis of said drum, means imposing a drag on said retainer resisting rotation thereof in either direction, a driven clutch member secured on the motor shaft, clutch elements carried by said retainer movable relative thereto into clutching engagement with said driven member and to declutching position clear of said driven member, and operating connections between said drum and retainer and clutch elements effective for moving said clutch elements into clutching engagement with said driven member and then picking up said retainer for rotation with said drum responsive to rotation of the latter in said opposite direction and for moving said clutch elements to declutching position and then picking up said retainer for rotation with said drum responsive to rotation of the latter in said one direction.

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REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
934,576	Seyler	Sept. 21, 1909
1,449,865	Maas	Mar. 27, 1923
2,266,865	Herrington	Dec. 23, 1941
2,338,929	Goiot	Jan. 11, 1944

FOREIGN PATENTS

Number	Country	Date
682,945	Germany	Oct. 25, 1939