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2,659,454

STARTER SPRING CONSTRUCTION

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Fig. 1

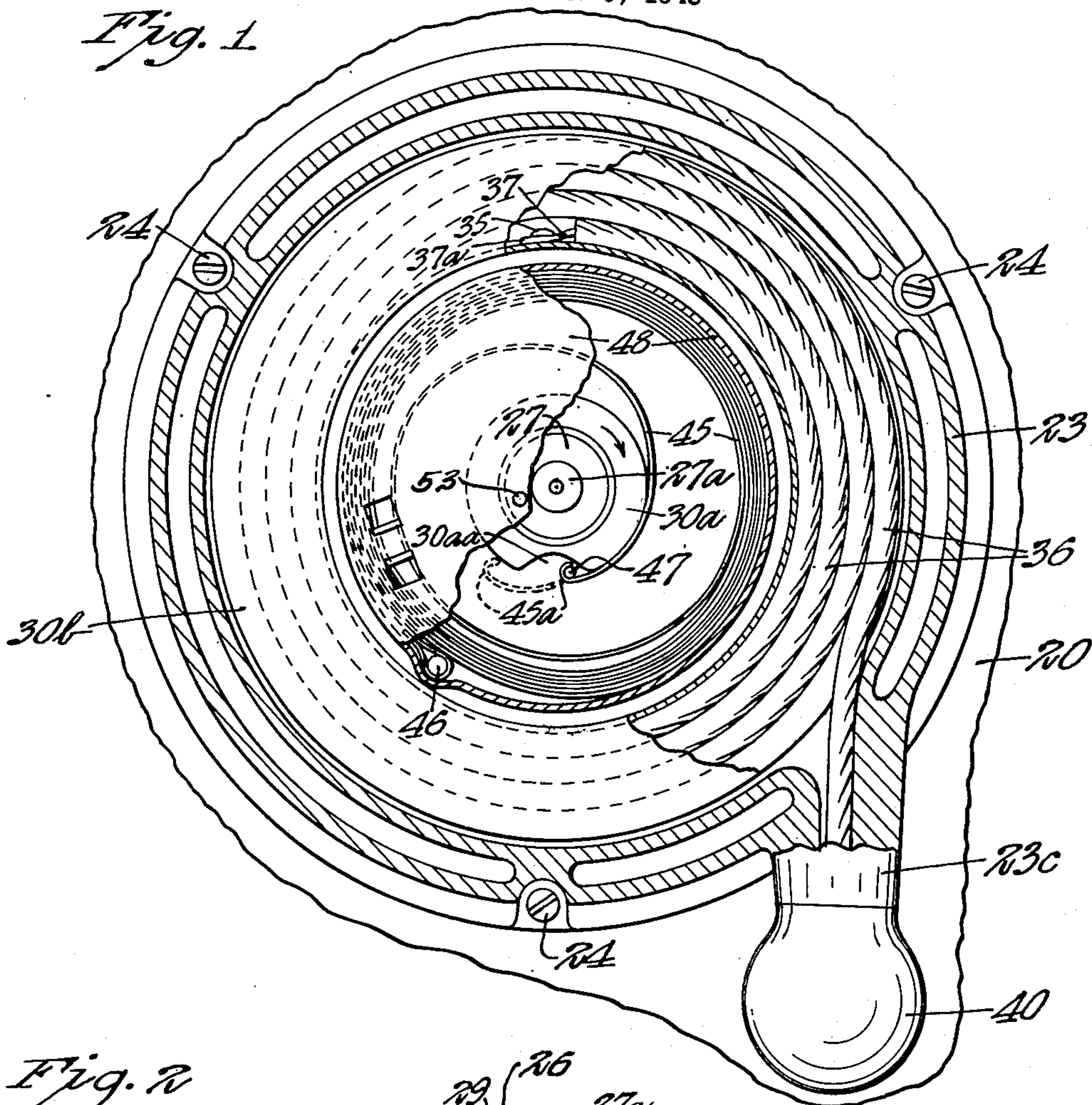


Fig. 2

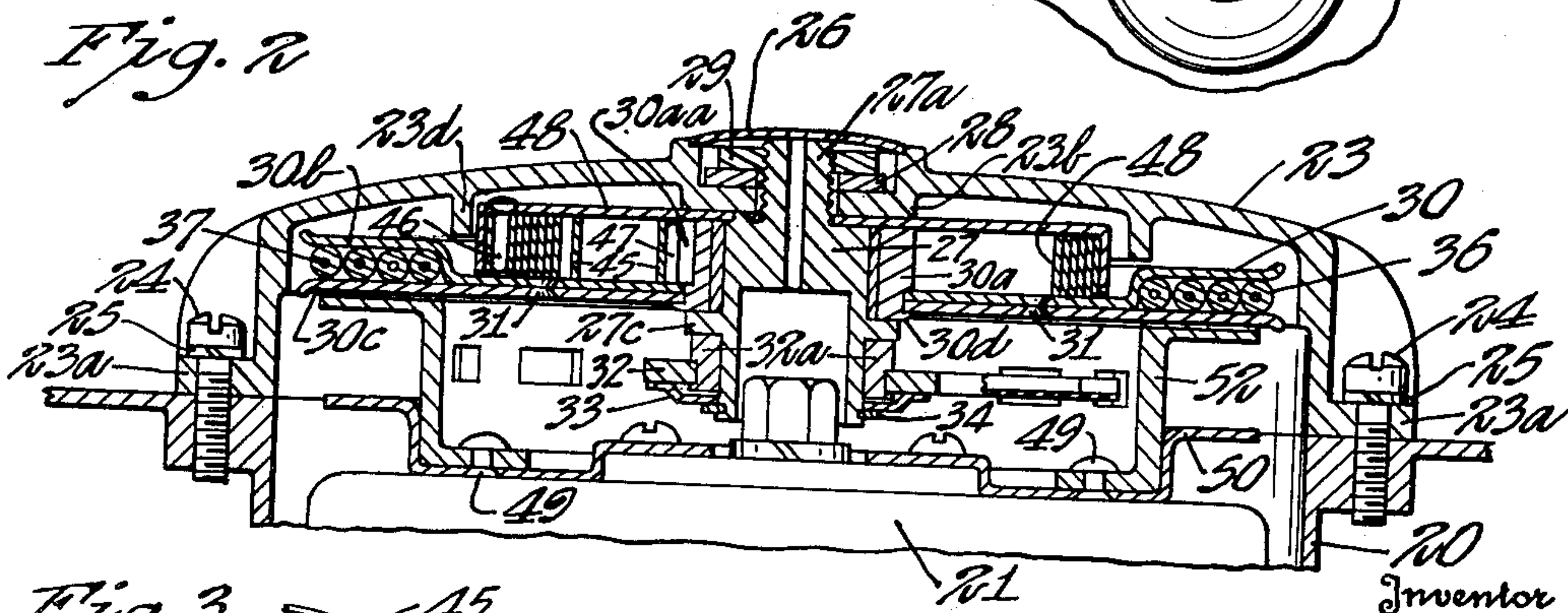
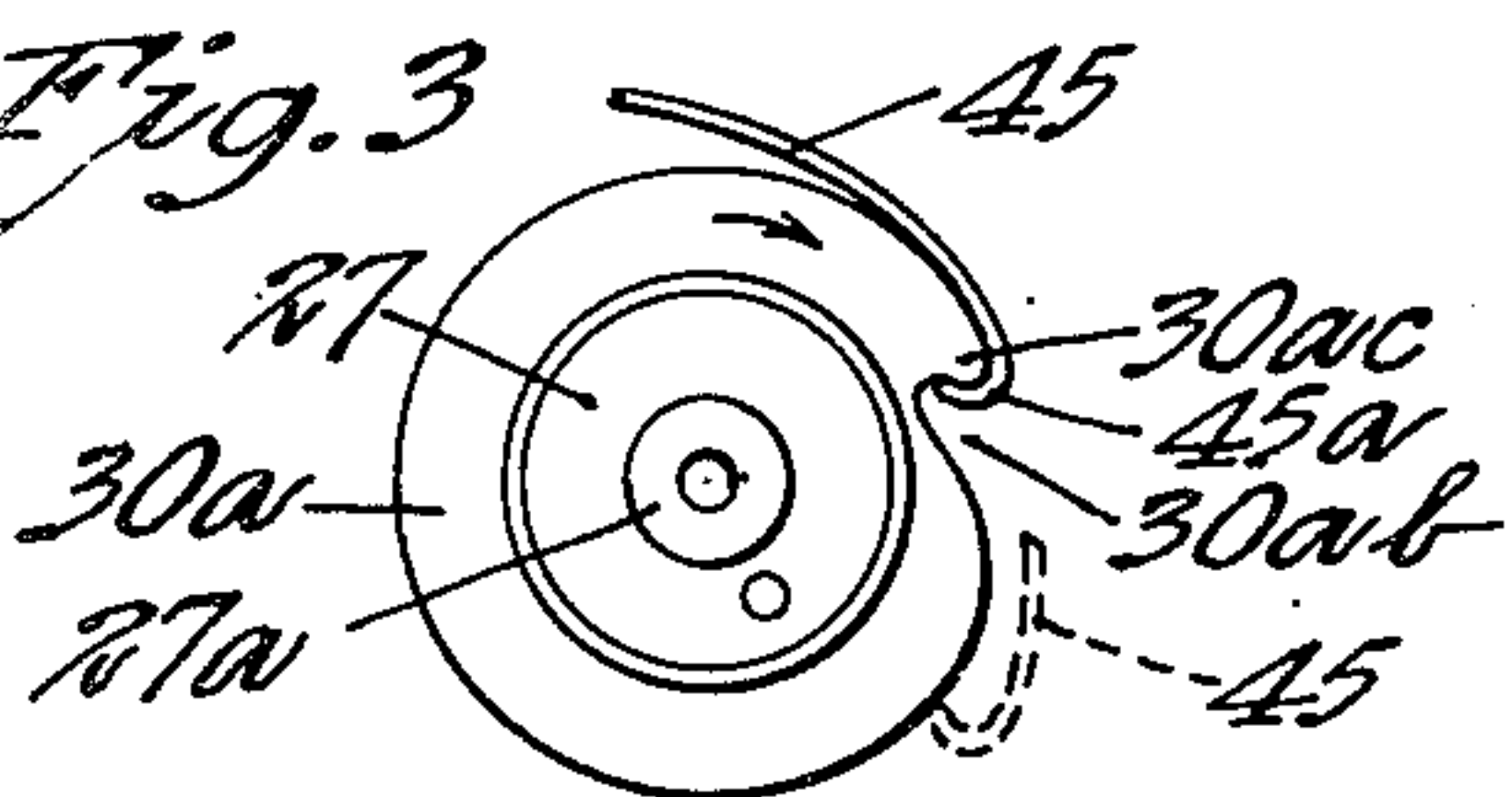


Fig. 3



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STARTER SPRING CONSTRUCTION

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This invention relates to a spring mounting, and while the invention might have many applications, it is illustrated as used in connection with an outboard motor. Outboard motors are commonly provided with an internal combustion motor having a fly-wheel which is usually located at the top of the device. This fly-wheel is rotated in starting or cranking the motor. Said rotation is commonly done by pulling upon a cord or cable wound on a pulley, which pulley is constructed and arranged to be connected to said fly-wheel and to be disconnected from said fly-wheel. This rotation of the pulley takes place against the tension of a spring usually of the spiral plate type so that said spring is wound up in said rotation. After the fly-wheel is given several rotations it is released to continue its rotation when the motor starts while the direction of rotation of the pulley is reversed by action of said spring. The pull or tension on the cord or cable is relieved, the spring unwinds and rotates the pulley in the reverse direction. The pulley is stopped when the cord or cable is completely wound up thereon and great stress is placed upon the fastening for the inner end of the spring. The spring unwinds completely and the momentum thereof causes said stress which results in reverse bending of the spring at its point of attachment. It has been a rather frequent occurrence that the inner and attached end of the spring is thus bent or broken.

It is an object of this invention to provide a simple and efficient mounting for a spring of the spiral type so that the end thereof will not be bent or broken.

It is a further object of the invention to provide a member adapted to be rotated, a spiral spring connected at one end to said member against the tension of which said member is rotated and which is wound in the rotation of said member, said end of said spring being detachably connected to said member so that when said spring unwinds and said member moves in the opposite direction, said spring will be released and will not be bent or broken.

It is another object of the invention to provide a spring mounting comprising a member to be rotated, a spiral spring against the tension of which said member is rotated, means for rotating said member, said member having a spring connecting means thereon, said spring having a hook formed at its end adapted to engage said means so that when said member is rotated in one direction said end will be pulled upon and said spring wound, but when said member rotates in

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the opposite direction and said spring unwinds, said end will release from said means.

It is still another object of the invention to provide such a structure as set forth in the preceding paragraph, together with cam means on said member for guiding the end of said spring when it is released.

It is more specifically an object of the invention to provide a spring mounting comprising a member adapted to be rotated and having a cylindrical periphery, a spiral spring disposed about said member and having its inner end connected to said member, means for rotating said member against the tension of said spring and to wind said spring, said member having a recess extending inwardly from its periphery having a curved surface, a pin adjacent said surface, said spring having its end formed as an inwardly directed hook adapted to hook over said pin so that when said member is rotated in one direction said end will be pulled upon and said spring will be wound, but when said member is rotated in the opposite direction and said spring unwound, said hook will release from said pin and will be guided radially outwardly by said curved surface.

These and other objects and advantages of the invention will be fully set forth in the following description made in connection with the accompanying drawings in which like reference characters refer to similar parts throughout the several views and in which:

Fig. 1 is a view partly in top plan and partly in horizontal cross section showing the starting mechanism of an outboard motor;

Fig. 2 is a substantially central vertical section of Fig. 1; and

Fig. 3 is a partial plan view showing a modification.

Referring to the drawings, portions of an outboard motor are shown including a portion of a casing 20 which is usually at the top of the device and which surrounds the fly-wheel 21 connected to the crankshaft of the motor. Casing 20 may comprise the gas tank of the device. A casing 23 of general inverted cup-shape is secured to casing 20 by circumferentially spaced screws 24 extending through lugs 23a formed on casing 23. Spring washers 25 are shown disposed under the heads of screws 24 and engaging lugs 23a. Casing 23 has a central hub 23b bored to have pass therethrough a reduced threaded end 27a of a shaft or stud 27. Said hub 23b is counter-bored at its upper end and a washer 28 surrounds portion 27a, the same seating on the

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bottom of said counter-bore. A nut 29 of comparatively small thickness is threaded on portion 27a and engages washer 28. Shaft 27 is thus rigidly held in casing 23. Shaft 27 has an axial opening therethrough for locating certain parts in assembly. A small cover plate 26 formed of a resilient plate is provided, the outer edge portion of which is adapted to snap into and be disposed in an annular groove formed in the top of hub 23b. Shaft 27 has an intermediate cylindrical portion on which is journaled the hub 30a of a sheave or pulley 30. Pulley 30 comprises the superposed plates 30b and 30c having central annular engaging portions connected by circumferentially spaced rivets 31. Plate 30b is reversely bent so as to be offset from or spaced from plate 30c at the outer portions of said plates so that the same form a peripheral groove for pulley 30. Hub 30a has a downwardly projecting annular portion 30d which extends through a central opening in plates 30b and 30c and is turned over or spun outwardly over plate 30c so that said plates are firmly connected to hub 30a. Shaft 27 has an annular portion or collar 27c on which hub 30a rests, and said shaft has a cylindrical portion beneath said collar on which is journaled the hub 32a of a guide means or member 32 which need not be considered in connection with this invention. A spring washer 33 engages the underside of member 32 and is held in place by a retaining ring 34 seated in an annular groove in the lower end of shaft 27. Pulley or sheave 30 is adapted to be rotated by the operator and for this purpose a flexible member 36 is provided illustrated as in the form of a rope or cable, which rope preferably has disposed axially therein a metal member 37, such as a braided bronze cable. Rope 36 is secured to pulley 30 in any suitable manner, as by having cable 37 formed into an eyelet 37a and connected to plate 30b by any suitable fastening means, such as a pin 35. Rope 36 is coiled in the groove of pulley 30 in spiral form, as shown in Fig. 1, said rope extending outwardly through the bore in a hub 23c projecting at one side of casing 23. Rope 36 has connected to its end in any suitable manner, a knob or handle 40. A spring 45, illustrated as a strip coiled into spiral form, is disposed in the central portion of pulley 30, one end thereof being reversely bent and riveted to form an eye through which passes a pin 46 which is secured in the top of a cup-shaped spring-enclosing member 48 and projects downwardly into said eye. Spring 45 surrounds the hub 30a, which hub has a cylindrical periphery. A recess 30aa is formed or milled into the side of hub 30a, and a pin 47 is secured in the lower portion of hub 30a and upstands in said recess 30aa. In accordance with the present invention the inner end of spring 45 is formed into an inwardly directed hook 45a of semi-cylindrical form and of a size to fit about pin 47. Casing 23 has an annular depending flange 23d, the inner side of which is closely adjacent the downwardly extending side of a member 48, the central portion of which is held between hub 27 and hub 23b. Member 48 thus houses spring 45. Plates 50 and 52 are secured to the top of fly-wheel 21 in any suitable manner, as by rivets 49, said plates being vertically spaced at their outer portions. These plates are not pertinent to the present invention. A small pin 53 connects shaft 27 to member 48.

In operation when the motor of the device is to be started the operator pulls outwardly upon

knob 40, thus pulling on rope 36 and rotating pulley 30. Hub 30a is thus rotated and said pulley and hub rotate against the tension of spring 45, which spring is wound when knob 40 is pulled outwardly. Spring 45 is formed to press against the side of hub 30a, as shown in Fig. 1, so that it always comes into position to have pin 47 engage in the hook 45a at its end. Spring 45 is thus pulled around and wound. After pulling outwardly on the knob 40, the operator lets go of the knob or releases the tension on rope 36 and the pulley 30 is rotated rather rapidly in the opposite direction as spring 45 unwinds and moves to its normal position. It has been found in practice that when the inner end of spring 45 is positively connected to hub 30a, as shown in the pending application of Daniel A. Armstrong and Herald K. Palmer, S. N. 614,792, filed September 6, 1945, now Patent 2,592,639, the inertia or momentum of hub 30a and attached parts is such that it makes one or more revolutions after the spring is unwound and this causes the end of the spring to bend and often to fracture. The hub 30a and attached parts acquire considerable rotative momentum when tension on rope 36 is suddenly relieved and the spring unwinds. If the end of the spring is positively connected to the hub 30a and pulley 30 the hub acts to bend the end of the spring and to kink and break the same. The hub and attached parts have great inertia. The structure is provided particularly for cases where the rope 36 breaks, the knob 40 pulls off of the rope or where rope is released so suddenly that the hub 30a and the attached parts acquire great momentum. In many such cases it has been necessary to replace the spring as well as the broken rope. With the present structure the inner end of spring 45 merely moves away from pin 47, as indicated in dotted lines in Fig. 1, and is guided outwardly relative to hub 30a by the curved surface of the recess 30aa. The spring continues to hug or engage the periphery of hub 30a so that when the knob 40 is again pulled upon, pin 47 picks up the hook 45a so that the spring is again connected to hub 30a and is pulled around and wound thereby.

In Fig. 3 a modified form of hub 30a is shown. The same has a recess 30ab formed in the side at one end of which is formed a projection 30ac having a substantially semi-cylindrical surface. The spring 45 is formed with the hook 45a as already described, so that when hub 30a is rotated in a clockwise direction as when knob 40 is pulled outwardly, projection 30ac will pick up spring 45 so that said spring will be carried around with hub 30a and wound. When knob 40 is released and spring 45 unwinds, the momentum of its inner end will cause said spring and its hook 45a to move away from projection 30ac. The hook 45a will be guided outwardly by the surface of recess 30ab and will move around the periphery of hub 30a.

From the above description it will be seen that I have provided a mounting for spring 45 which insures that said spring will not be broken when it unwinds. The spring performs all of its intended functions just as well as when it is positively connected to hub 30a. The invention therefore constitutes quite an advance in the art and cures the objectionable action of the spring being bent and broken. The device has been amply demonstrated in actual practice, found to be very successful and efficient and the same is being commercially made.

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It will of course be understood that various changes may be made in the form, details, arrangement and proportions of the parts, without departing from the scope of applicant's invention which, generally stated, consists in a device capable of carrying out the objects above set forth, in the parts and combinations of parts disclosed and defined in the appended claims.

What is claimed is:

1. An outboard motor structure having in combination, a member adapted to be rotated in one direction and being freely rotatable in the opposite direction having a substantially cylindrical hub, a spiral spring fixed at one end and having its other end bent into an open loop, said spring being tensioned so that one side of said loop is held in engagement with and moved in engagement with the periphery of said hub, means on said hub disposed in the path of said loop engaged by said loop when said hub is rotated in said one direction, and means for rotating said member in said first mentioned direction to cause said loop to engage said first mentioned means and rotate said member and wind up said spring, whereby when said last men-

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tioned means is released said hub will be rapidly rotated in the opposite direction and when said spring is unwound and said hub continues to rotate said first mentioned means will move away from said loop and said spring will be detached from said hub and will not be bent or broken.

2. The structure set forth in claim 1, said hub having a recess therein adjacent said first mentioned means, one side of said recess acting to push said loop outwardly of said hub to said periphery.

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