June 7, 1955 D. C. CHANDLER 2,709,994

RECOIL STARTER FOR OUTBOARD MOTOR

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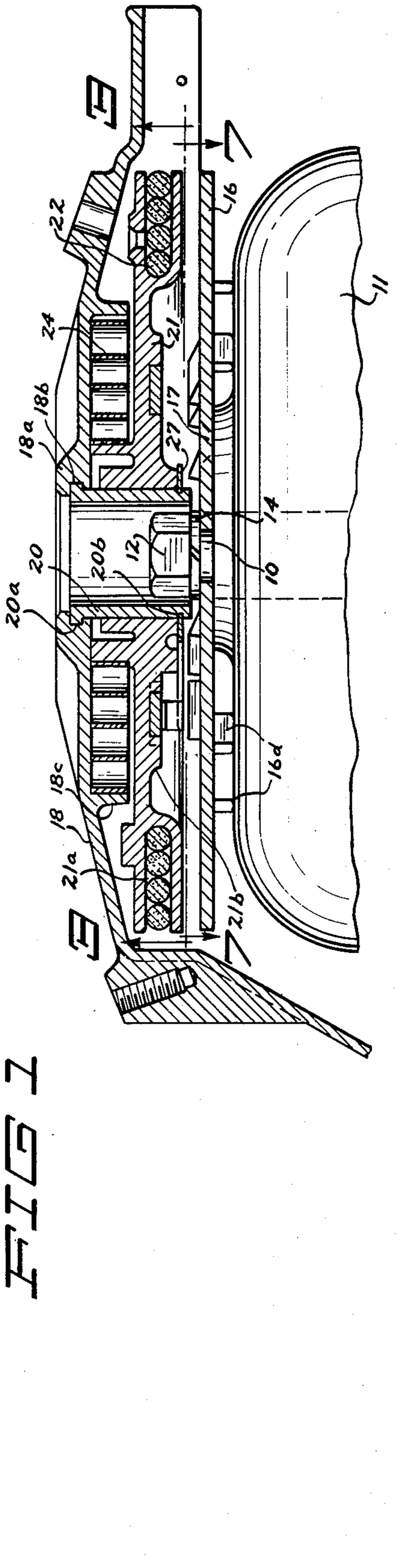

FIG 1

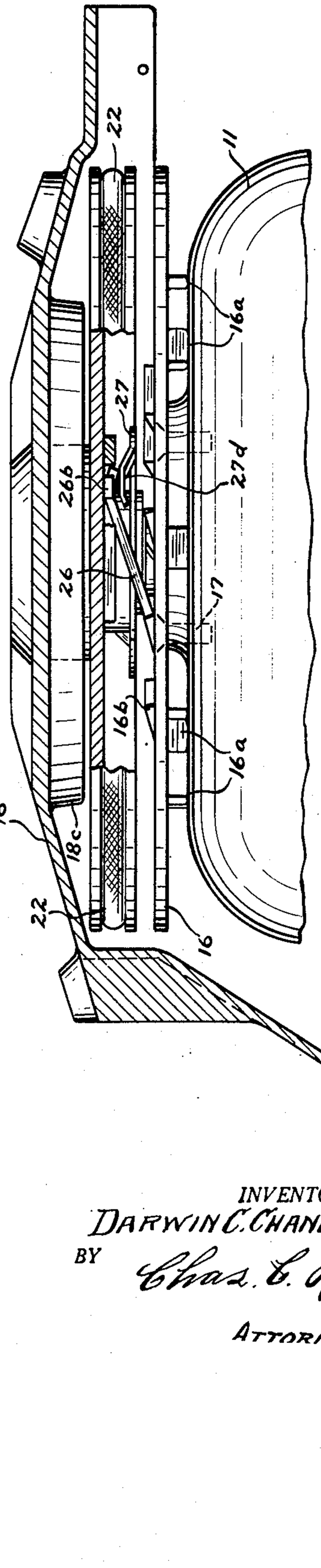

FIG 2

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FIG 3

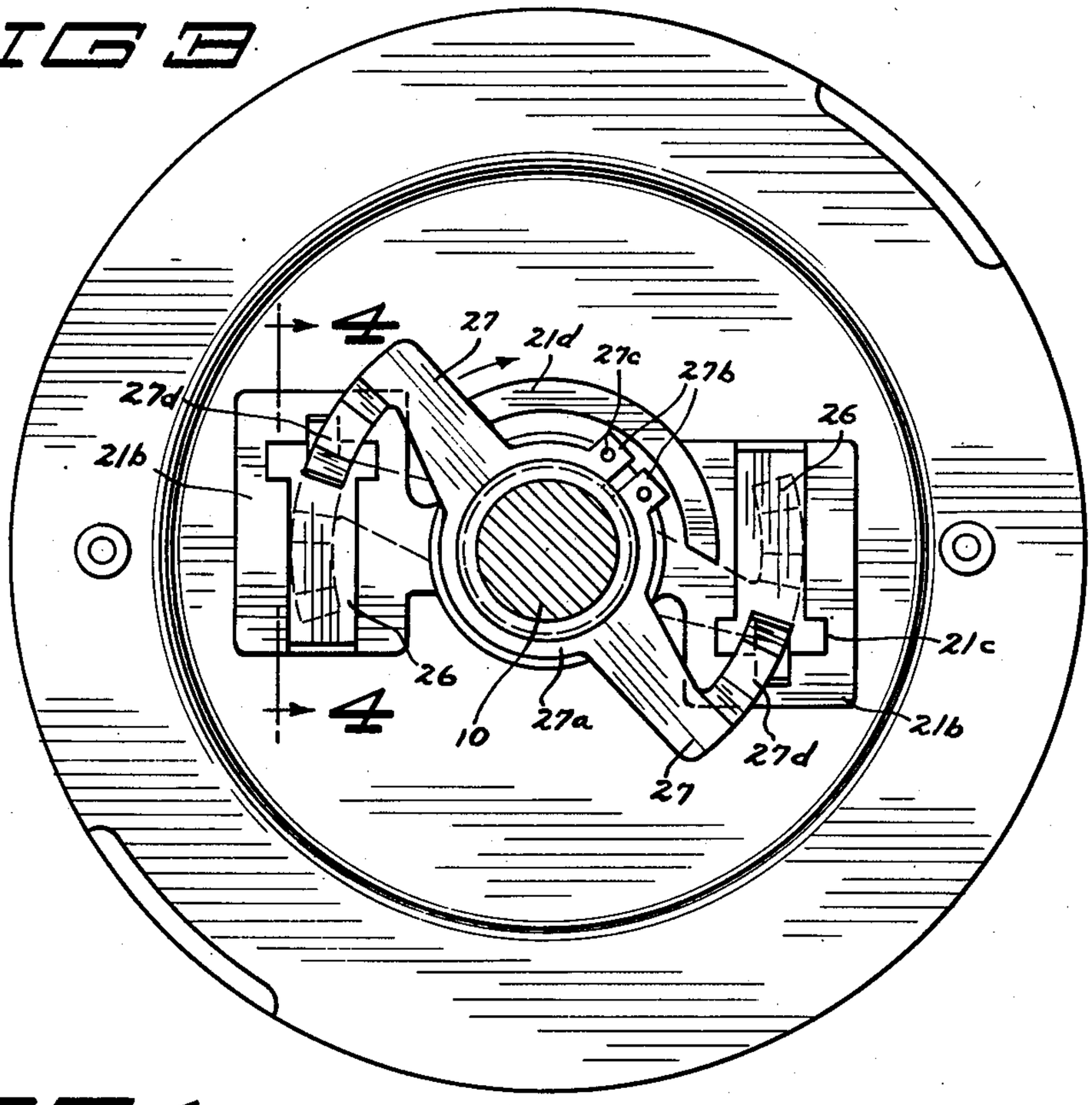


FIG 4

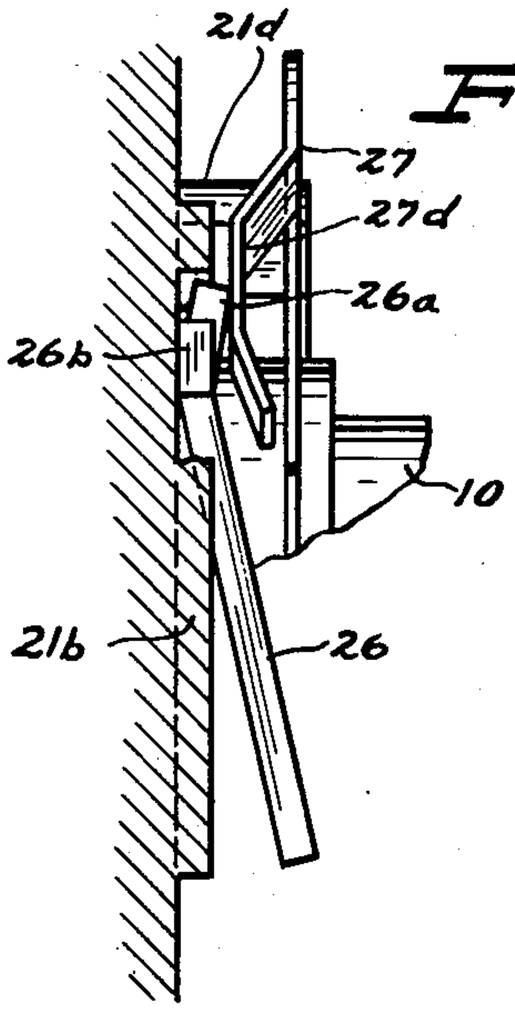


FIG 5

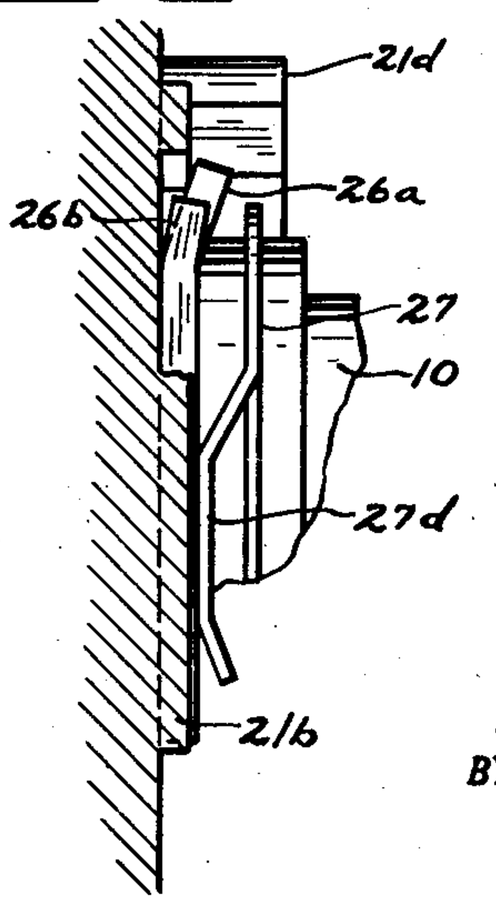
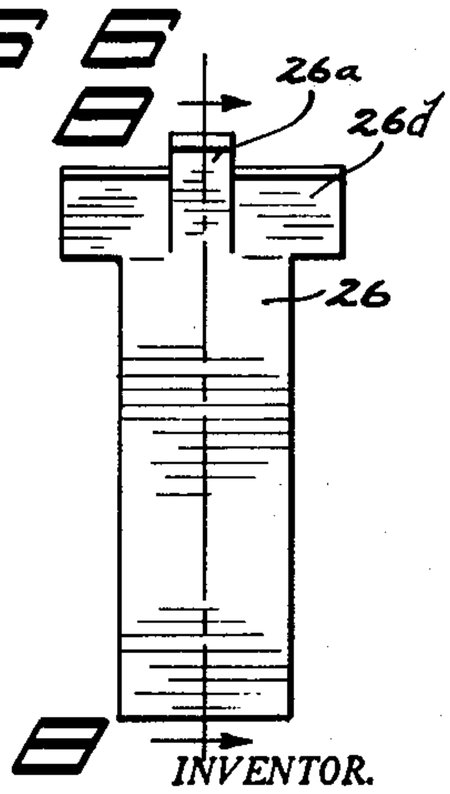


FIG 6



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RECOIL STARTER FOR OUTBOARD MOTOR

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FIG 7

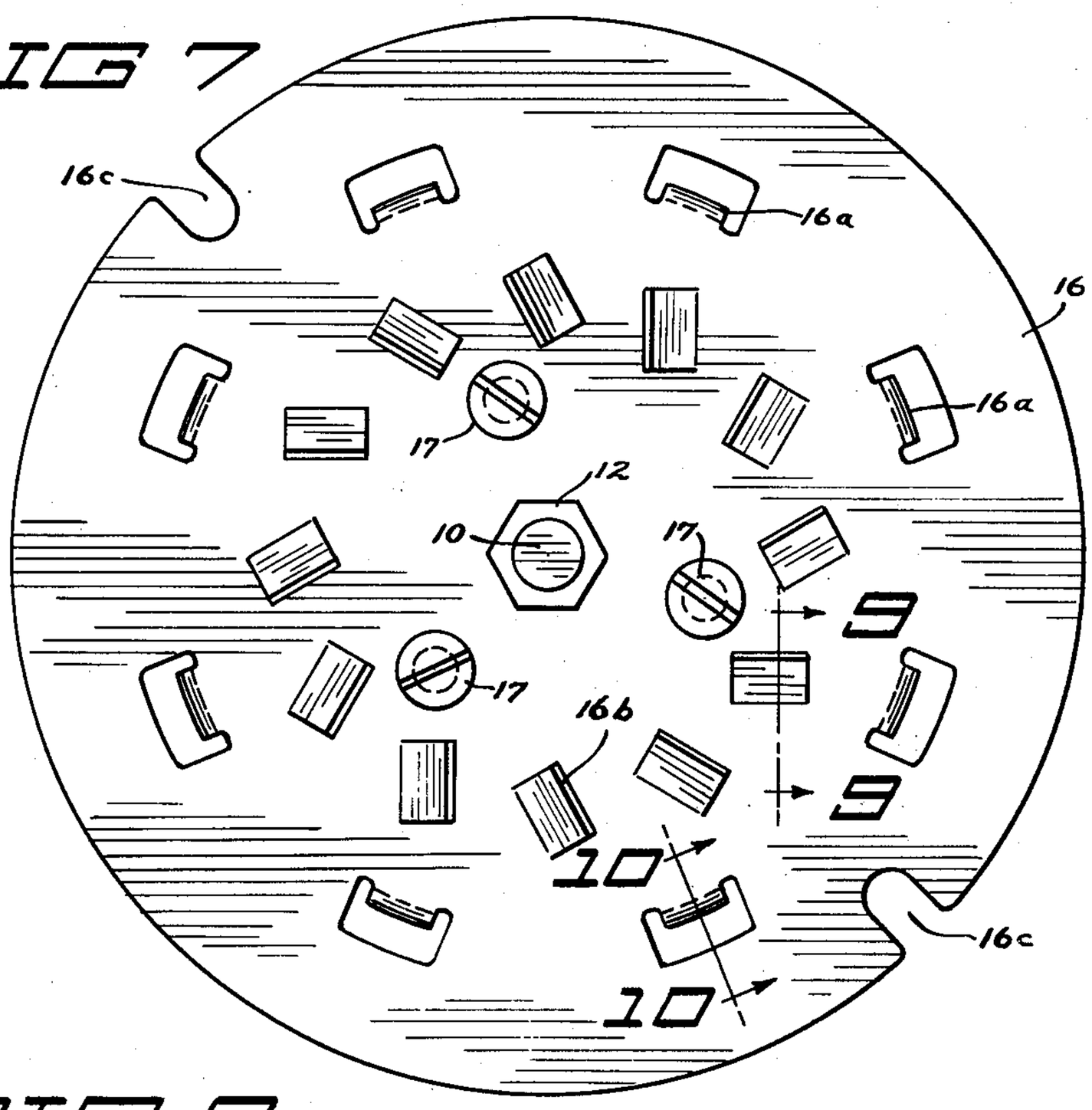
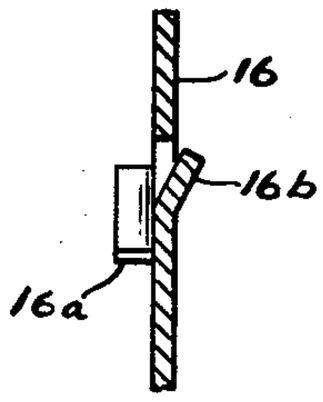
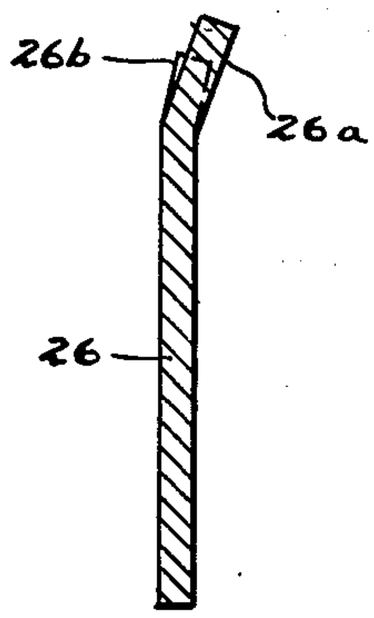


FIG 9

FIG 8





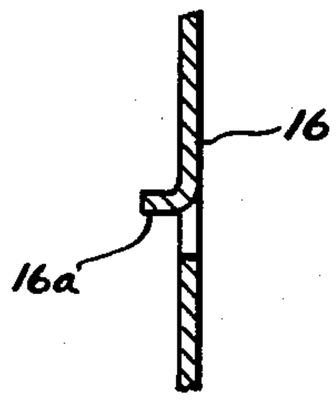


FIG 10

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RECOIL STARTER FOR OUTBOARD MOTOR

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Application June 7, 1952, Serial No. 292,285

13 Claims. (Cl. 123—185)

This invention relates to an internal combustion engine, and particularly to such an engine embodied in an outboard motor. It is now the common practice to start outboard motors by pulling upon a cable which rotates a pulley connected by readily disconnectible means to the crankshaft of the motor. The operator pulls upon the cable and then releases the same and the pulley is rotated back to normal position usually by a spring and is disconnected from the crankshaft in this latter movement.

It is an object of this invention to provide a very simple and very efficient structure of a starting means for an internal combustion engine, such as an outboard motor.

It is a further object of the invention to provide such a starting means comprising a rotatable pulley adapted to be rotated by a cable, a member attached to the crankshaft of the motor having spaced lugs thereon, a member rotatable with said pulley having a pair of pawls thereon adapted to engage respectively with a pair of said lugs, said pawls being movable to operative and inoperative positions respectively, and a member movable with said pulley for engaging said pawls to move the same into and hold the same in operative and inoperative positions.

It is more specifically an object of the invention to provide a starter for an outboard motor comprising a plate connected to the crankshaft of said motor and having a plurality of circumferentially spaced lugs struck up therefrom, a rotatable pulley, a member movable with said pulley carrying one or more pawls adapted respectively to engage with said lugs, and a second member movable with said pulley having a resilient portion or portions adapted to engage said pawls respectively and to move and hold said pawls in operative position in one of its positions and to move and hold said pawls in inoperative position in another of its positions.

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 vertical central section through the starter;

Fig. 2 is a view similar to Fig. 1 showing the parts in different positions;

Fig. 3 is a horizontal section taken substantially on line 3—3 of Fig. 1, as indicated by the arrows;

Fig. 4 is a vertical section taken substantially on line 4—4 of Fig. 3, as indicated by the arrows;

Fig. 5 is a view similar to Fig. 4 showing the parts in different positions;

Fig. 6 is a plan view of one of the pawls used;

Fig. 7 is a vertical section taken on line 7—7 of Fig. 7, as indicated by the arrows;

Fig. 8 is a vertical section taken on line 8—8 of Fig. 6, as indicated by the arrows;

Fig. 9 is a vertical section taken on line 9—9 of Fig. 7; and Fig. 10 is a vertical section taken on line 10—10 of Fig. 7, Figs. 9 and 10 being taken as indicated by the arrows.

Referring to the drawings, well known parts of an outboard motor are shown, including a portion of the crankshaft 10 which is secured to a fly-wheel 11. A nut 12 is threaded to the upper end of the crankshaft and overlies a spring washer 14. Washer 14 engages a plate 16 which is preferably of circular formation and which has formed therein a plurality of downwardly bent lugs 16*a* of uniform height which engage the top of fly-wheel 11. Plate 16 also engages a central hub 11*a* of said fly-wheel. Plate 16 also has struck upwardly therefrom a plurality of lugs 16*b*, the same being shown in Figs. 7 and 8. Lugs 16*b* have straight portions and edges extending at a slight angle to the radius of plate 16. Plate 16 is provided with a pair of diametrically opposite slots 16*c* provided for purposes of manipulation. Plate 16 is secured to fly-wheel 11 by a plurality of circumferentially spaced screws 17 shown as having countersunk heads.

A casing 18 is provided which is stationary and secured by any suitable means, not shown, to the frame of the outboard motor. Said casing has a top lug 18*a* which is provided with an annular slot 18*b* extending from a central opening in said lug. A member 20 of tubular form has a flange 20*a* secured in the slot 18*b*. Member 20 extends downwardly from the top of casing 18 and has journaled thereon a pulley 21. Pulley 21 has an annular groove 21*a* in its periphery in which a cable 22 is arranged to be wound, as indicated in Fig. 1. The end of cable 22 projects to without the casing 18 and will be provided with a suitable handle to be grasped by the operator. Casing 18 has a depending annular flange 18*c* within which is disposed a spiral plate spring 24. Spring 24 will be secured at one end to pulley 21 and at its outer end will be secured to casing 18. Pulley 21 has on its lower side a pair of diametrically oppositely disposed lugs 21*b* in each of which is formed a groove or recess 21*c* of cross shape in plan. Each recess 21*c* is adapted to receive a pawl 26, shown in plan in Fig. 6. Pawl 26 is of cross shape in plan and fits loosely in recess 21*c*, the same having a tongue 26*a* struck up from the central portion of its transverse arm, as clearly shown in Fig. 8. The cross arm 26*d* of lug 26 is also bent up at a slight angle, as shown in Figs. 6 and 8. A member 27 is provided of plate-like form having a central annular portion 27*a* bored to be received in an annular slot 20*b* formed in the periphery of member 20. Member 27 is split at one side, as shown in Fig. 3, having lugs 27*b* at each side of the split, which lugs are provided with apertures 27*c*. Member 27 is made of spring steel or metal and portion 27*a* can be spread sufficiently by a tool inserted in apertures 27*c* to permit member 27 to pass over the periphery of member 20 and be received in slot 20*b*. Member 27 grips member 20 with such force so as to be frictionally held thereon. Member 27 has curved resilient arms 27*d* at each end extending in opposite directions, said arms being adapted to engage and press upon the surfaces of pawls 26 respectively. The bottom of the hub of pulley 21 is provided with a downwardly projecting rib 21*d* of arcuate form, the same extending for considerably less than 180 degrees. The ends of rib 21*d* are formed to be parallel to and engage the arms of member 27.

In operation of the device, when the motor is to be started, the operator pulls upon the end of cable 22, thus rotating pulley 21 in the direction indicated by the arrow in Fig. 3. The pulley will rotate a short distance and the end of rib 21*d* will then engage one arm of the member 27 and move the same to the position shown in Fig. 3. The ends of the arms 27*d* are now disposed over one end of the pawls 26. The pawls 26 are disposed in the slots 21*c* with their convex sides engaging the bottoms of said slots respectively. The pawls can thus oscillate or rock on this convex angular side. When the member 27 is in the position shown, it presses

the tongue **26***a* and cross arm **26***b* against the bottom of the slot **21***c* and this moves the long arm of the pawl downwardly, as shown in Figs. 2 and 4. The pawls are now in position to engage the lugs **16***b*. Further rotation of pulley **21** now moves plate **16** and thus flywheel **11** and crankshaft **10**. The crankshaft is thus rotated to start the motor. The operator releases the cable **22** after having pulled it out and spring **24** then rotates pulley **21** in the direction opposite that in which it was moved by the cable so that the pulley is quickly returned to its original or normal position. As stated, member **27** is frictionally mounted on member **20** and does not move always with the pulley. After pulley **21** makes a certain amount of return movement in the direction opposite that indicated by the arrow in Fig. 3, the other end of rib **21***d* will engage an arm of member **27** and move the same to the dotted line position shown in Fig. 3. The portions **27***d* are now moved over the long arms of the pawls **26** respectively and the pawls are moved or rocked in slots **21***c* so that said long arm is now disposed in the slot and parallel to plate **16**. The pawls are now in an inoperative position and do not engage the lugs **16***b*. The pulley can thus move back to its original position without turning plate **16**.

From the above description it will be seen that I have provided quite a simple, compact and very efficient structure for a starter for an internal combustion engine, such as an outboard motor. The parts are quite few and easily made out of standard and easily procured material. The parts are also easily assembled. The device has been amply demonstrated in actual practice, found to be very successful and efficient and is in progress for commercial production.

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. A starting structure for an internal combustion motor having a crankshaft having in combination, a plate secured to said crankshaft having circumferentially spaced lugs bent upwardly therefrom, a stationary casing mounted above said plate, a second plate rotatably mounted on said casing, a pulley for rotating said second plate, a pair of pawls carried by said second plate movable substantially perpendicularly to said first mentioned plate to operative positions respectively to engage said lugs and to inoperative positions, means acting to move said pawls movable relatively to said second plate to move said pawls to operative position to engage said lugs when said pulley moves in one direction and to inoperative positions in a different horizontal plane from and out of line with said lugs when said pulley moves in the opposite direction.

2. A starting structure for an internal combustion motor having a crankshaft having in combination, a member secured to said crankshaft having circumferentially spaced vertically disposed members thereon, a stationary member spaced from said first mentioned member, a pulley journaled on said stationary member, a second member being rotatable with said pulley, a plate-like pawl carried by said second member oscillatable in a vertical plane to operative position so as to engage one of said vertically disposed members and movable to inoperative position in a different horizontal plane from and out of line with said vertically disposed members, and a member movable by said second member for engaging the face of said pawl for moving and holding said pawl in operative position and in inoperative position.

3. A starting structure for an internal combustion motor having a crankshaft having in combination, a member secured to said crankshaft and having circumferentially spaced lugs projecting therefrom, a stationary member, a pulley journaled in said stationary member, a plate carried by said pulley, a pawl mounted on said plate for oscillation transversely of the plane of said plate to operative position so as to engage one of said lugs and to inoperative position out of line with said lugs, and a member frictionally carried on said stationary member and movable in opposite directions by said plate for engaging said pawl and moving it to operative and inoperative positions respectively.

4. The structure set forth in claim 3, said pawl being of plate-like form, said plate having a recess therein in which the major portion of said pawl is disposed when in inoperative position.

5. The structure set forth in claim 3, said pawl being in the form of a cross-shaped plate having one end bent at a slight angle and having a tongue at said end bent at a slightly greater angle, said pawl being mounted to oscillate about the convex side of said angles.

6. A starting structure for an internal combustion motor having a crankshaft having in combination, a plate secured to said crankshaft, a stationary member above said plate, a pulley mounted for rotation in said stationary member, means for rotating said pulley in one direction, means for rotating said pulley in the opposite direction, a second plate carried by said pulley, a pair of pawls oscillatably mounted in said second plate to move to operative position so as to engage said lugs respectively and to inoperative position where they will not engage said lugs, a second member frictionally mounted on said stationary member having resilient arms, means on said second plate engaging said second member to move the same to position to cause said arms to engage said pawls and move the same to operative position when said pulley is rotated in one direction and movable by means on said second plate to engage and move said pawls to inoperative position when said pulley is rotated in the opposite direction.

7. The structure set forth in claim 4, said pawls comprising plates bent at an angle adjacent one end thereof and being oscillatable about the apex line of said angle.

8. A starting structure for an internal combustion motor having a crankshaft having in combination, a member secured to said crankshaft having circumferentially spaced lugs thereon, a stationary member spaced from said first mentioned member, a pulley journaled on said stationary member, a plate-like member being rotatable with said pulley, a plate-like pawl mounted on said plate-like member, said pawl being bent at an angle intermediate its ends and oscillatable about the convex side of said angle, a second member frictionally mounted on said stationary member, and movable by said plate-like member to engage said pawl and move the same to operative position toward said first mentioned member to engage one of said lugs, and movable by said plate-like member when the latter moves in the opposite direction to engage said pawl and move the same to inoperative position out of line with said lugs.

9. The structure set forth in claim 8, said second member having a resilient portion for engaging said pawl.

10. A starting structure for an internal combustion motor having a crankshaft having in combination, a member secured to said crankshaft having circumferentially spaced members thereon, a stationary member spaced from said first mentioned member, a pulley journaled on said stationary member, a second member rotatable with said pulley, a plate-like pawl carried by said second member and oscillatable in a plane substantially at right angles to the plane of revolution of said second member, the same being movable to operative position so as to engage one of said members and being movable to inoperative position and to a horizontal plane out of line with said members and

means for oscillating said pawl when said pulley is rotated.

11. A starting structure for an internal combustion motor having a crankshaft having in combination, a member secured to said crankshaft and having circumferentially spaced portions projecting therefrom, a stationary member, a pulley journaled in said stationary member, a plate carried by said pulley, a pawl mounted on said plate oscillatable transversely of the plane of said plate to operative position so as to engage one of said portions and to inoperative position out of line with said portions and means for oscillating said pawl when said pulley is rotated.

12. The structure set forth in claim 11, said pawl being of plate-like form, said plate having a recess therein in which the major portion of said pawl is disposed when in inoperative position.

13. The structure set forth in claim 11, said pawl being in the form of a cross-shaped plate having one end bent at a slight angle having tongue at said end bent at a slightly greater angle, said pawl being mounted to oscillate about the convex side of said angles.

References Cited in the file of this patent

UNITED STATES PATENTS

2,530,623 Martin ---------- Nov. 21, 1950