Oct. 2, 1945. J. A. BEARD 2,385,963

ENGINE STARTER

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Fig. 1.

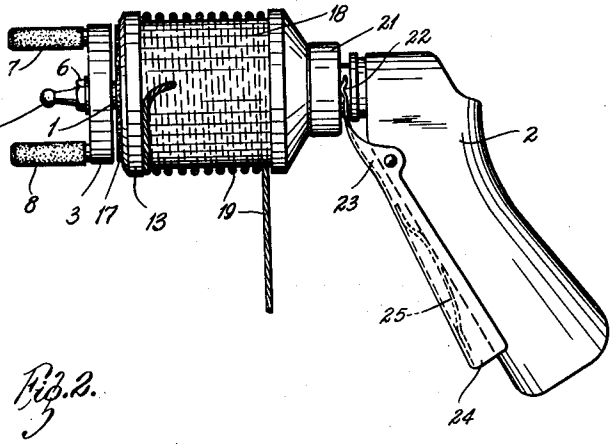


Fig. 2.

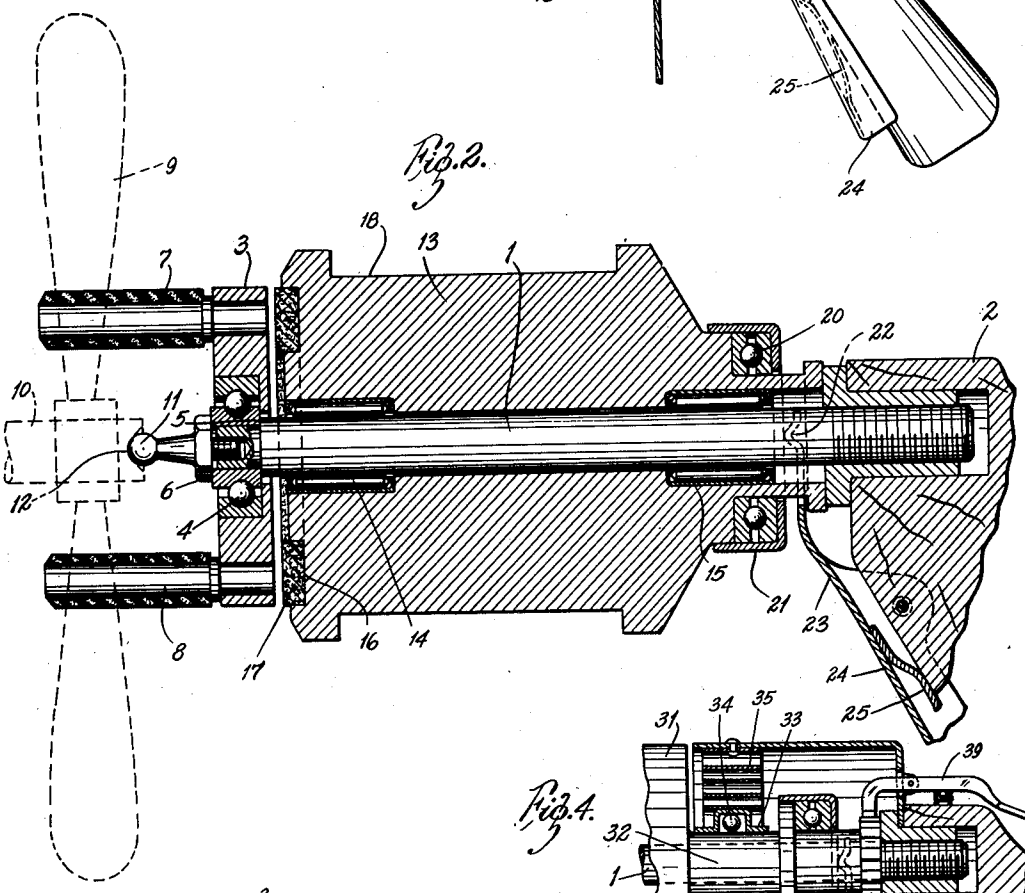
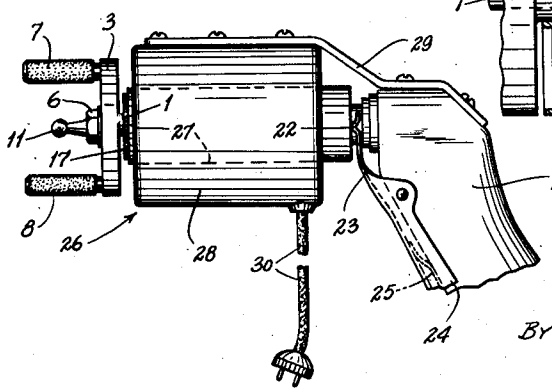


Fig. 4.

Fig. 3.



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ENGINE STARTER

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15 Claims. (Cl. 123—179)

This invention relates to engine starters, and more particularly a starter for small internal combustion engines such as those employed on model airplanes, boats and automobiles.

One of the objects of this invention is to produce an improved portable engine starter of the kind referred to which can be held in one hand and readily connected to the engine so as to rapidly turn its crank shaft for starting purposes.

Another object is to produce a portable engine starter embodying a rotatable member which can be held in one hand and connected at will to revolve an engine by merely operating a control means by the same hand that holds the starter.

A further object is to provide in a starter of the kind referred to in which the rotating member can be made to rotate either by mechanical or electrical means.

Other objects of my invention will become apparent from the following description taken in connection with the accompanying drawing in which:

Fig. 1 is a view of an engine starter embodying my invention;

Fig. 2 is an enlarged longitudinal sectional view showing details of construction;

Fig. 3 is a view of a similarly constructed engine starter in which the rotatable member is a rotor of an electric motor; and

Fig. 4 is a view showing a starter in which the rotatable member is spring driven.

Referring first to Figs. 1 and 2, my improved portable starter, as shown, comprises a shaft 1 which has secured to its rear end a revolver type handle 2 for grasping by the hand of the operator. The front end of the shaft has a disc 3 rotatably mounted thereon by a ball bearing 4, the outer race of which is fixed to the disc and the inner race of which is clamped against a shoulder 5 on the shaft by means of a stud bolt 6. The disc carries two diametrically positioned pins 7 and 8 which are preferably covered with rubber. These pins are arranged for engagement with the hub portions of the blades of a propeller 9 which is secured to the end of a crank shaft 10 of a model internal combustion engine (not shown). The engine may be employed as driving power for a model airplane, a model boat, or any other device. The stud bolt 6 which secures the bearing 4 to the shaft has an extension 11 which is adapted to fit into a recess 12 in the end surface of the engine shaft to thereby provide a centering means to align the axes of the shaft 1 and the shaft 10, and to also act as a steady rest when the starter is being employed to turn over the engine during starting.

The shaft 1 has rotatably mounted thereon, between the disc 3 and the handle, a cylindrical member 13 made of heavy material such as steel, cast iron or lead. In order that this weighted member 13 may be freely rotatable on the shaft, there is provided anti-friction bearings 14 and 15 which may be of the cartridge needle type. The bearings are wholly carried by the member 13 and thus do not restrict free axial movement of the member 13 on the shaft. The forward end surface of the member 13 is provided with an annular groove 16 in which is positioned an annular washer 17 made of some suitable friction material such as leather or cork. This friction washer is adapted to cooperate with the adjacent surface of the previously mentioned disc 3 and provides a friction clutch means between the rotatable member 13 and the disc 3 whereby the former may rotate the latter whenever the clutch is engaged.

The outer surface of the member 13 is formed to provide a wide annular groove 18 which facilitates the wrapping of a cord 19 around the member in the manner shown. This cord has its inner end unconnected with the member 13 so that when the outer end is pulled the member 13 will be given a rapid rotation in the same manner as a spinning is accomplished by the use of a string wound on a top. When the member 13 is given a rotation it will continue to rotate at a rapid speed due to the inertia thereof resulting from the heavy body of material employed.

The rear end of the member 13 adjacent the handle 2 has associated therewith a thrust bearing 20 and a cover 21. This thrust bearing is arranged to be engaged by the yoke end 22 and an actuating lever 23, said lever being pivotally mounted intermediate its ends on the handle. The lever is so constructed that the yoke end is yieldable with respect to the main body of the lever. The end of the lever 24 opposite the yoke end extends downwardly alongside the gripping portion of the handle so that when said handle is grasped by the hand of an operator, the hand will also grasp the end 24. Thus by squeezing the handle the lever can be operated so as to cause the yoke 22 to move the member 13 forwardly and bring about a connection between the said member 13 and the disc 3 which carries the pins for engaging and rotating the pro-

peller. A leaf spring 25 is positioned between the end 24 and the handle so as to return the handle to its inoperative position and thereby disengage the clutch.

Operation

To operate the starter the cord is first wrapped around the weighted member 13 and then pulled at its free end. This gives a rapid rotation to the member 13 and will spin freely on the shaft since the clutch is disengaged. The starter is then placed in operative position with respect to the propeller, the extension 11 being placed in the recess 12 of the propeller of the shaft and the pins interengaged with the propeller blades. With the member 13 spinning the operator will squeeze the handle which will result in the lever 23 moving the member 13 forwardly and bringing about an engagement of the friction clutch means. The disc 3 will now be rotated and consequently the crank shaft will be given a sufficient rotation to start the engine. As soon as the engine is started the lever 13 should be released, thus disengaging the friction clutch. The light disc 3 will now turn freely with the propeller and will have no tendency to stop or retard the engine after it is started. The starter then can be disengaged from the propeller by moving it away.

With the use of my portable starter the engine can be turned over a considerable number of times which should be sufficient to readily start the engine under ordinary conditions. The starter will eliminate the necessity of flipping the propeller by a finger, which often results in damage to the finger. The starter can be readily engaged with and disengaged from the propeller, and the driving member 13 can be connected to drive the propeller at will merely by squeezing the handle by which the starter is held and placed in an operative position.

Referring to Fig. 3, there is shown a similar portable starter wherein the member 13 is replaced by an electric motor, generally indicated by the numeral 26. The rotor 27 of this motor is rotatably mounted upon the shaft 1 in the same manner as the member 13 is rotatably mounted on said shaft in the starter shown in Fig. 1. This rotor is also axially slidable on the shaft. The stator 28 of the motor is supported from the handle by a bracket 29. The forward end of the rotor carries the annular friction disc 17 whereby the rotor can be frictionally connected to the disc 3 by axially moving the rotor by means of the lever 23 mounted on the handle 2 in the manner already described. The motor receives its electrical current through a cord 30.

The electric motor driven type of portable starter is very useful in places where a source of electrical current is available. The starter is employed to turn over the engine in the same manner as the starter described in connection with that shown in Fig. 1. The only difference is that the driving force is obtained by electrical means instead of by a spinning weighted body.

In Fig. 4 is shown a portable starter in which a spring is employed as the driving power for the rotatable member. The rotatable member 31 is mounted on the shaft 1 in the previously described manner, said shaft being secured to the handle 2. The rotatable member has a cylindrical extension 32 upon which is mounted a sleeve 33. Between this sleeve and extension is a one-way roller clutch 34. The sleeve has secured thereto the inner end of a helical torsion spring 35 and its outer end is secured to a cup-shaped casing 36 fixed to the handle 2 by the shaft holding means. The extension 32, rearward of the sleeve, has associated therewith a thrust bearing 37 which is arranged to be engaged by the yoke end of the actuating lever 23 pivoted on the handle. The rear end of the extension 32 is provided with ratchet teeth 38 and a dog 39 is pivoted on the cup-shaped casing for engaging the teeth. This dog is so mounted as to be released by the thumb of the operator's hand which grasps the handle.

The spring can be wound up by holding the handle in one hand and turning the rotatable member with the other. The dog during the winding will ratchet over the teeth, and when the spring is completely wound it will engage a tooth and hold it from unwinding. To cause the rotatable member to be rotated, the dog need only be released. When the member has reached its maximum speed, the actuating lever is squeezed, thus moving the rotatable member slightly axially and causing the friction clutch at the forward end of the rotatable member to be engaged so as to rotate the engine crank shaft. When the spring is fully unwound, it will not retard the rotation of the rotatable member as the one-way clutch permits the member to continue to freely rotate relative to the sleeve.

If any of the portable starters are desired to be employed to start an engine which does not have a propeller, then special interengaging means can be employed on disc 3 and the end of the engine crank shaft.

Being aware of the possibility of modification in the particular structure herein described without departing from the fundamental principles of my invention, I do not intend that its scope be limited except as set forth in the appended claims.

What is claimed is:

1. A portable engine starter comprising two rotatable members, means for mounting the members to rotate on the same axis, means carried by one member for detachably connecting it to an engine crank shaft, means operable by an axial movement of one member for connecting the two members together for simultaneous rotation, a handle member by which the starter may be held, and control means for operating the connecting means at will, said control means comprising an element so arranged as to be manipulated by the same hand of the operator that grasps the handle member.

2. A portable engine starter comprising two rotatable members one of which is capable of being rotated by a turning force imparted thereto, means for mounting the members to rotate on the same axis, means carried by the other member for detachably connecting it to an engine crank shaft, clutch means for connecting the two members together for simultaneous rotation, a handle member by which the starter may be held, said handle member being at the opposite end of the starter from the detachable connecting means and provided with a single shaft means on which both rotatable members rotate and control means for operating the clutch connecting means at will, said control means comprising an element so arranged as to be manipulated by the same hand of the operator that grasps the handle member.

3. A portable starter for a model internal combustion engine having a propeller, said starter comprising two rotatable members one of which

is capable of being rotated by a turning force imparted thereto, means for mounting the members to rotate on the same axis, spaced pins carried by the other member for engaging a propeller, means operable by an axial movement of one member for connecting the two members together for simultaneous rotation, a handle member for holding the starter in operative position by a single hand of an operator, and control means for operating the connecting means at will, said control means comprising an element so arranged as to be manipulated by the same hand of the operator that grasps the handle member and to produce a direct axial force on the said one member for moving it axially.

4. A portable engine starter comprising a shaft a handle member secured to the shaft to permit a hand of an operator to handle the starter and hold it in operative position, a member rotatably mounted on the shaft and capable of being rotated by a turning force imparted thereto, a second member rotatably mounted on the shaft, means carried by the second rotatable member for detachably connecting it to an engine crank shaft, cooperable clutch means carried by the members for connecting said members together, and control means for moving one of the members relatively to the other to cause the clutch means to be engaged, said control means being so arranged as to be manipulated by the same hand of an operator that grasps the handle member.

5. A portable engine starter comprising a shaft, a handle member secured to the shaft to permit a hand of an operator to handle the starter and hold it in operative position, a member rotatably mounted on the shaft and capable of being rotated by a turning force imparted thereto, said member also being mounted for axial movement, a second member rotatably mounted on the shaft and held from axial movement, means carried by the second rotatable member for detachably connecting it to an engine crank shaft, cooperable clutch means carried by adjacent ends of the members for connecting said members together, and control means for moving the first member axially relatively to the other to cause the clutch means to be engaged, said control means being so arranged as to be manipulated by the same hand of an operator that grasps the handle member.

6. A portable engine starter comprising a shaft, a handle secured to one end of the shaft, a rotatable member mounted on the intermediate portion of the shaft for axial movement thereon, a second rotatable member mounted on the other end of the shaft and held from axial movement on the shaft, means carried by the second rotatable member for detachably connecting it to an engine crank shaft, cooperating friction members carried by adjacent portions of the two rotatable members, and means for moving the first rotatable member at will axially of the shaft to engage the friction members whereby the first rotatable member can drive the second rotatable member.

7. A portable engine starter for a model internal combustion engine having a propeller, said starter comprising a shaft, a handle secured to one end of the shaft, a rotatable member mounted on the intermediate portion of the shaft for axial movement thereon, a second rotatable member mounted on the other end of the shaft and held from axial movement on the shaft, spaced pins carried by the outer end of the second rotatable member for interengaging with the propeller, cooperating friction members carried by adjacent portions of the two rotatable members, and means for moving the first rotatable member at will axially of the shaft to engage the friction members whereby the first rotatable member can drive the second rotatable member, said last-named means comprising a lever having a part lying adjacent the handle and adapted to be operated by the same hand that grasps the handle.

8. A portable engine starter comprising a shaft, a revolver type handle secured to one end of the shaft, a rotatable member mounted on the shaft and capable of being rotated by a turning force imparted thereto, a second member rotatably mounted on the shaft, means carried by the second member for detachably connecting it to an engine crank shaft, cooperating clutch means carried by the members for connecting said members together, a lever pivoted to the handle, and arranged to be actuated by the same hand of the operator that grasps the handle, and means for connecting the lever to move one of the rotatable members axially with respect to the other to thereby control the operativeness of the clutch means.

9. A portable engine starter comprising two rotatable members, means for mounting the members to rotate on the same axis, one of said members being heavily weighted with its center of gravity coinciding with its axis of rotation and arranged to be rotated by pulling a cord wrapped therearound, means carried by the other member by connecting it to an engine crank shaft, a handle member secured to the mounting means for permitting the starter to be handled by a hand of an operator and held in operative position, clutch means for connecting the two members together, and means for operating the clutch means by a member so arranged with respect to the handle member that it can be manipulated by the same hand that grasps the handle member.

10. A portable starter for a model internal combustion engine, a handle, a shaft secured to the handle, an electric motor having a rotor rotatably mounted on the shaft and capable of limited axial movement, a member rotatably mounted on the shaft, means carried by said member for ready connection with the crank shaft of an engine, cooperating clutch means associated with the rotor and member, and means for moving the rotor axially at will to engage the clutch means.

11. A portable starter for a model internal combustion engine having a propeller, a handle, a shaft secured to the handle, an electric motor having a rotor rotatably mounted on the shaft and capable of limited axial movement, a member rotatably mounted on the shaft, spaced pins carried by said member for interengaging with the propeller, cooperating clutch friction means associated with the rotor and member, and means for moving the rotor axially at will to engage the clutch means, said last-named means comprising an element arranged to be actuated by the same hand of the operator that grasps the handle.

12. In a portable engine starter for a model engine having a propeller and a propeller rotating shaft, a shaft, a rotatable member mounted on the shaft, diametrically positioned pins extending from the end of the rotatable member for engaging the blades of the propeller, a centering pro-

jection carried by the shaft for cooperation with a recess in the propeller shaft to axially align the two shafts when the pins are in operative position, means comprising a second rotatable member for driving the first rotatable member, and clutch means operable at will for connecting the two rotatable members together.

13. A portable starter for a model internal combustion engine, a handle, a shaft secured to the handle, a rotatable member mounted on the shaft, a second rotatable member provided with means for detachably connecting it to an engine crank shaft, spring means for driving the first rotatable member, means for connecting the two members together for simultaneous rotation, and control means for operating the connecting means at will by manipulation of an element by the same hand of the operator that grasps the handle.

14. A portable starter for a model internal combustion engine, a handle, a shaft secured to the handle, a rotatable member mounted on the shaft, a second rotatable member provided with means for detachably connecting it to an engine crank shaft, spring means for driving the first rotatable member, releasable ratchet means for holding the spring means when tensioned from turning the rotatable member, means for connecting the two members together for simultaneous rotation, and control means for operating the connecting means at will by manipulation of an element by the same hand of the operator that grasps the handle.

15. A portable starter for a model internal combustion engine, a handle, a shaft secured to the handle, a rotatable member mounted on the shaft, a second rotatable member provided with means for detachably connecting it to an engine crank shaft, a coil spring for driving the first rotatable member, means for securing one end of the spring against movement relative to the shaft, means comprising a one-way clutch connection between the other end of the spring and the rotatable member, a releasable ratchet means for preventing rotation of the rotatable member by the spring, means for connecting the two members together for simultaneous rotation, and control means for causing the connecting means to be operative at will.

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