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ENGINE STARTER GEARING

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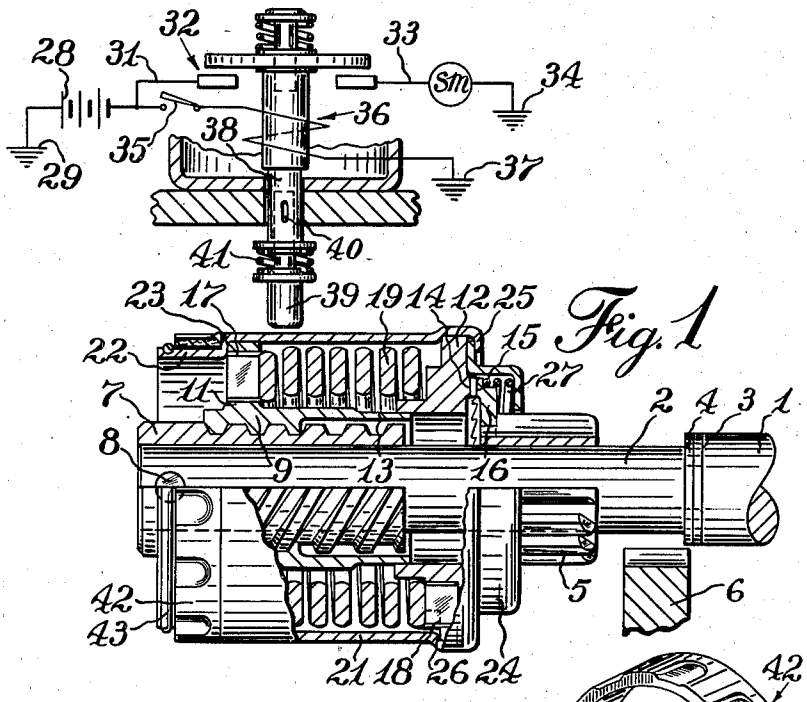


Fig. 1

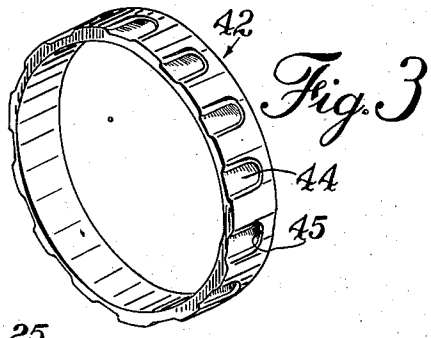


Fig. 3

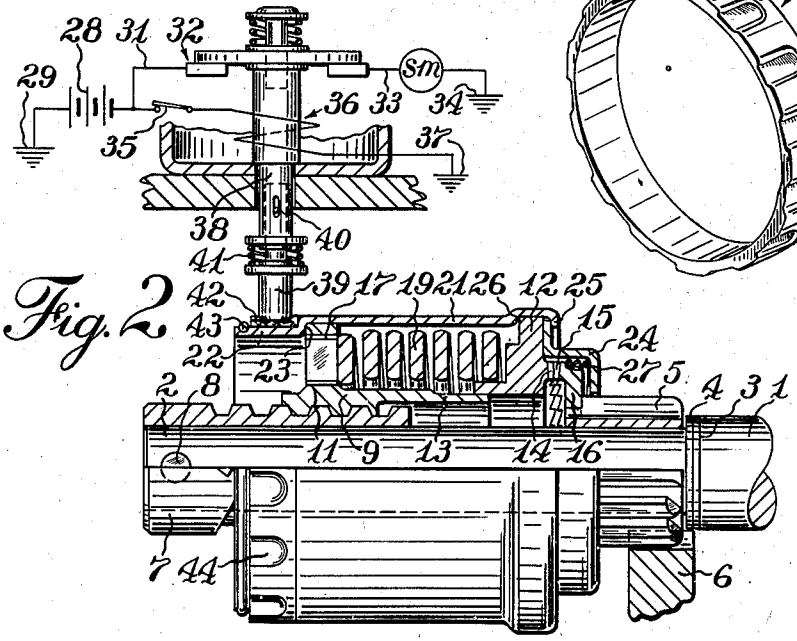


Fig. 2

WITNESS:

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ENGINE STARTER GEARING

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The present invention relates to engine starter gearing and more particularly to that type of drive which engages automatically upon energization of the starting motor and maintains its engagement under the control of the operator.

It is an object of the present invention to provide a novel starter drive of the above type which is efficient and reliable in operation over long periods of use.

It is another object to provide such a device including a novel form of latching mechanism for holding the gearing in mesh.

It is another object to provide such a device in which the latching mechanism comprises a wear member of suitable material such as fiber having a smooth wearing surface of large area.

Further objects and advantages will be apparent from the following description taken in connection with the accompanying drawing, in which:

Fig. 1 is a side elevation partly in section of a drive constituting a preferred embodiment of the invention, the cooperating elements of the starting system being illustrated diagrammatically;

Fig. 2 is a view similar to Fig. 1 showing the parts in the positions assumed when the engine has become self-operative while the gearing is held in mesh; and

Fig. 3 is a detail in perspective of the wear ring forming part of the latching mechanism for the drive.

In Fig. 1 of the drawing, there is illustrated a power shaft 1 having a smooth reduced extension 2 providing a shoulder 3 on which thrust washers 4 are preferably seated. A pinion 5 is slidably journalled on the extension 2 of the power shaft for movement into and out of mesh with a member such as a ring gear 6 of the engine to be started.

A screw shaft 7 is anchored to the outer end of the power shaft 1 by suitable means such as a cross pin 8, and has threaded thereon a control nut 9 having a radial flange 11 at one end. A driving clutch member 12 is journalled on a reduced extension 13 of the nut 9 and is provided with dentals 14 adapted to engage dentals 15 of a driven clutch member 16 rigidly mounted in any suitable manner on the pinion 5.

The flange 11 of the control nut 9, and the driving clutch member 12 are provided with radial slots 17, 18 respectively, adapted to receive the outturned ends of a drive spring 19 for completing a yielding driving connection from the control nut to the pinion.

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A barrel member 21 is arranged to surround and enclose the control nut and driving clutch member, and is provided with a reduced portion 22 at its rear end forming a thrust shoulder 23 against which the flange 11 of the control nut is normally seated. A thimble 24 surrounding the driven clutch member 16 is held in engagement with the driving clutch member 12 in any suitable manner as by spinning over a flange 25 on the end of the barrel 21 so as to clamp the driving clutch member 12 against an internal shoulder 26 in the barrel. A spring 27 in the thimble 24 bears against the driving clutch member 16 so as to maintain the clutch members normally in engagement.

The power shaft 1 is adapted to be rotated by a starting motor indicated diagrammatically at SM, and means for energizing the starting motor is provided comprising a battery 28 grounded at 29 and connected by a lead 31 to a magnetic starting switch 32. Said switch is connected in turn by a lead 33 to the starting motor, the circuit being completed through the ground connection 34. A control circuit for the magnetic starting switch is provided comprising a manually operable switch 35 which connects the battery lead 31 to a solenoid 36 for closing the starting switch, the solenoid being grounded at 37 to complete the control circuit.

The plunger 38 of the starting switch is provided with a telescopically arranged extension or tip 39 which is retained thereon by a pin 40, and yieldably held in extended relation therewith by means of a spring 41. The tip 39 is located adjacent the barrel member 21 of the drive in position to engage the barrel and bear frictionally thereon when the starting switch is closed.

A ring 42 of suitable material such as fiber is arranged to cooperate with the plunger tip 39 to form a latching mechanism preventing demeshing of pinion 5 as long as the starting switch is closed. Ring 42 is freely journalled on the reduced extension 22 of the barrel, being retained thereon by a lock wire 43 which holds the ring in loose bearing engagement with the shoulder 23 of the barrel. The periphery of the ring 42 is provided with a series of U-shaped pockets or depressions 44 (Fig. 3) adapted to receive loosely the end of the plunger tip 39. The shoulders 45 forming the boundary of the pockets in the ring 42 are preferably of such height that when the tip of the plunger is seated in a pocket, the ring 42 is prevented from rotation and from longitudinal movement to the left in Fig. 1. The plunger 38 of the starting switch is so located

with respect to the drive that the tip 39 comes into registry with the pockets 44 in ring 42 shortly before the pinion 5 has moved completely into mesh with the engine gear 6.

In operation, starting with the parts in the positions illustrated in Fig. 1, closure of the manual switch 35 causes energization of the solenoid 36 to close the starting switch 32 thereby energizing the starting motor SM and at the same time pressing the end of the plunger extension 39 against the periphery of the barrel 21. Rotation of the power shaft 1 by the starting motor causes the screw shaft 7 to traverse the control nut 9 to the right in Fig. 1 thus moving the pinion 5 into mesh with the engine gear 6, after which the spring 19 will be compressed and torqued by the control nut until sufficient rotary force is applied to the pinion to crank the engine. During this time, the plunger extension 39 has dropped down into one of the pockets 44 in the latch ring 42 thus holding the ring stationary on the rotating barrel 21.

When the engine fires, the acceleration of the engine gear 6 causes the pinion 5 and its associated parts to rotate faster than the starting motor whereby the control nut 9 backs off slightly on the screw shaft 7 as shown in Fig. 2, thus permitting the dentals 14, 15 of clutch members 12, 16 to disengage, and allowing the pinion 5 to overrun. Further backward movement of the control nut 9 and barrel 21 is prevented by the engagement of the plunger extension 39 with the shoulder 45 of the latch ring 42.

If the engine should not remain self-operative, as soon as the speed of the starting motor exceeds the speed of rotation of the pinion 5 the control nut 9 will again be traversed to the right to close the clutch 12, 16 and cranking will be resumed. When the engine is reliably self-operative, the operator opens switch 35 thus allowing the parts to return to their idle positions as illustrated in Fig. 1.

Although but one embodiment of the invention has been shown and described in detail, it will be understood that other embodiments are possible and changes may be made in the form and arrangement of the parts without departing from the spirit of the invention.

What is claimed is:

1. In an engine starter drive, a power shaft, a pinion slidably journalled thereon for movement into and out of mesh with a gear of an engine to be started, means actuated by rotation of the power shaft for tranversing and rotating the pinion including a barrel member having an inclined connection with the power shaft and an overrunning clutch connection to the pinion, a ring member swiveled on the barrel, and means for engaging the ring to restrict demeshing movement of the barrel and pinion.

2. An engine starter drive as set forth in claim 1 in which the means for engaging the ring is in the form of a plunger movable radially with respect to the barrel, and the ring is provided with means for receiving the end of the plunger to prevent relative movement.

3. An engine starter drive as set forth in claim 1 including further means for actuating the power shaft including a starting switch, and the means for engaging the ring is in the form of a plunger connected to the starting switch and movable radially into engagement with the barrel upon closure of the starting switch, said ring having a seat receiving the end of the plunger when the pinion is in mesh with the engine gear.

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