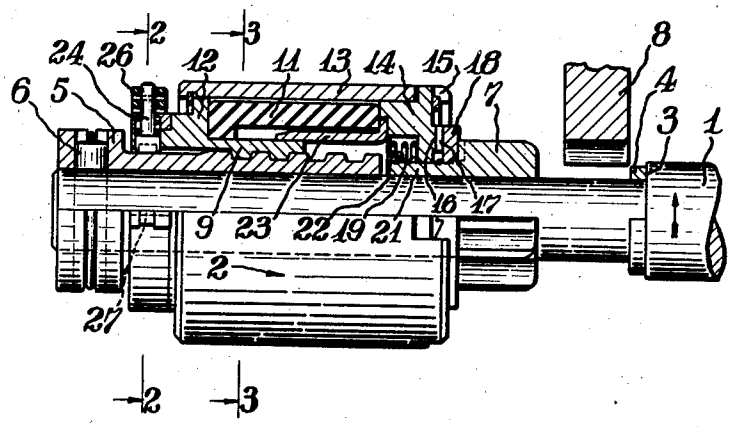
April 4, 1944. J. E. BUXTON 2,345,791

ENGINE STARTER GEARING

Filed Nov. 13, 1942

Fig. 1



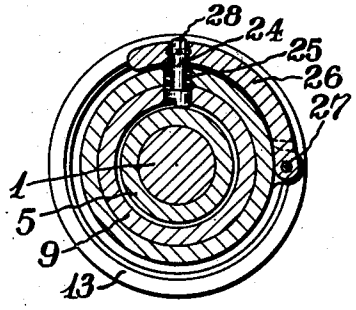


Fig. 2

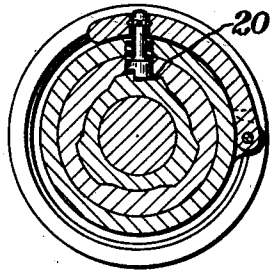


Fig. 3

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ENGINE STARTER GEARING

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2 Claims. (Cl. 74—7)

The present invention relates to engine starter gearing and more particularly to a starter drive of the type in which a motor driven pinion is held in mesh with an engine gear until a successful start is secured.

Starters of this type have been developed that use a latching mechanism to hold the pinion in mesh, which latch is controlled by various centrifugal devices. These arrangements are more or less specialized according to the particular type of control adopted.

It is an object of the present invention to provide a novel starter drive in which the pinion is held in mesh with the engine gear by a latch which is normally engaged, and is disengaged when the starting motor attains a predetermined rotative speed.

It is another object to provide such a device in which the pinion is driven from the starting motor through an overrunning clutch so that the acceleration of the pinion by the engine gear when the engine fires is not transmitted back to the starting motor.

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 preferred embodiment of the invention;

Fig. 2 is a section taken substantially on the line 2—2 of Fig. 1; and

Fig. 3 is a view similar to Fig. 2 showing the parts in latched position.

In Fig. 1 of the drawing there is illustrated a power shaft 1 which may be the extended armature shaft of a starting motor not illustrated. The power shaft is provided with an extended portion 2 of reduced diameter providing a stop shoulder 3 forming a seat for a thrust ring 4. A screw shaft 5 is fixed on the outer end of the power shaft by suitable means such as a cross pin 6, and a pinion 7 is slidably journalled on the power shaft adjacent the end of the screw shaft for movement into and out of mesh with a gear 8 of the engine to be started.

A nut member 9 is threaded on the screw shaft, and a yielding driving connection from the nut to the pinion including an overrunning clutch is provided in order to translate the pinion on the power shaft and transmit rotation thereto to crank the engine. As here shown, this yielding driving connection comprises a cylindrical block 11 of elastically deformable material such as rubber seated on the nut 9 and bearing against a radial flange 12 thereof. A barrel 13 surrounds the block 11, bearing at one end on the flange 12 and having a driving clutch member 14 fixed in its other end in any suitable manner as indicated at 15. Clutch member 14 is provided with ratchet teeth 16 arranged to engage with corresponding teeth 17 on a driven clutch member 18 fixed to the pinion 7. Yielding means for engaging the ratchet teeth 16, 17 is provided in the form of a spring 19 mounted on the extended hub 21 of the pinion 7 and maintained under initial compression by means of a thimble 22 fixed on the end of said hub.

Means are preferably provided for enclosing the interior of the block 11 so as to prevent any products of abrasion thereof from becoming deposited on the threads of the screw shaft. As here shown, this is accomplished by means of a sleeve 23 seated in the driving clutch member 14 and bearing slidably on the nut 9.

According to the present invention means are provided for holding the pinion in mesh with the engine gear until the starting motor has attained a predetermined rotative speed. As shown in Fig. 2, a latch plunger 24 is mounted in the nut member 9, and is pressed into engagement with the screw shaft by means of a spring 25. The screw shaft is provided with a notch 20 (Fig. 3) adapted to be engaged by the end of the latch when the pinion is in mesh with the engine gear so as to prevent the nut from moving the pinion out of mesh. A centrifugal member 26 is pivoted at 27 to the nut and has at its free end a sliding connection 28 with the latch in order to withdraw the latch when the starting motor rotates the nut at a predetermined speed.

In operation, starting with the parts as illustrated in Fig. 1, rotation of the power shaft by the starting motor is transmitted to the screw shaft 5 whereby the nut 9 and its associated parts are translated along the power shaft, causing the pinion 7 to mesh with the engine gear 8 until the pinion engages the thrust collar 4. Rotation of the power shaft is then transmitted through the yielding member 11 and clutch members 14, 18 to the pinion to crank the engine. At this time, the latch 24 is held in engagement with the notch 20 in the screw shaft so as to lock the pinion in meshed position. When the engine fires, the acceleration of the engine gear causes the pinion to overrun the drive, threading the nut 9 back along the screw shaft 5 until latch 24 engages in notch 20. At this time the clutch members 14, 18 are free to disengage and overrun, thus permitting the pinion to be rotated

freely by the engine gear. If the engine does not continue to be self-operative, the cranking operation will be resumed as soon as the pinion 7 attains a rotative speed corresponding to that of the engine gear. When a successful start has been secured, the release of the cranking load from the starting motor permits the power shaft to accelerate to a predetermined speed, higher than normal cranking speed, which enables the centrifugal member 26 to withdraw the latch 24 from its engagement in notch 20 of the screw shaft. The frictional torque transmitted from the pinion 7 through the overrunning clutch members is then sufficient to cause the nut to be moved back to idle position on the screw shaft, and when the starting motor is de-energized, the parts are yieldably retained in idle position by the frictional engagement of the latch 24 on the screw shaft acting as an anti-drift detent.

Although but one embodiment of the invention is described and shown in detail, it will be understood that other embodiments are possible and that various changes may be made in the design and arrangement of the parts without departing from the spirit of the invention as defined in the claims appended hereto.

What is claimed is:

1. In an engine starter drive a power shaft, a pinion slidably journalled thereon to engage and drive an engine gear, means for actuating the pinion including a screw shaft fixed to the power shaft, a nut on the screw shaft, and a yielding overrunning driving connection between the nut and pinion, a latch on the nut normally engaging the screw shaft and frictionally resisting rotation of the nut therein, said screw shaft having a notch adapted to receive the latch when the pinion is meshed with the engine gear, and centrifugal means on the nut for withdrawing the latch.

2. In an engine starter drive a power shaft, a screw shaft fixed thereon, a pinion slidably journalled on the power shaft, a nut threaded on the screw shaft, yielding driving means connecting the nut and pinion including an overrunning clutch, a latch member on the nut, spring means urging the latch into engagement with the screw shaft, and centrifugal means on the nut for releasing the latch when the starting motor rotates the nut to a predetermined speed of rotation.

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