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2,900,525

ENGINE STARTER GEARING

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1 Claim. (Cl. 290—38)

The present invention relates to engine starter gearing and more particularly to that type in which the armature of the starting motor is normally decentered with respect to its field, and when centered by energization of its windings it moves a pinion mounted on the armature shaft into mesh with a gear of an engine to be started. One example of a starter drive of this type is shown in the patent to Buxton 2,394,531.

It is an object of the present invention to provide a novel starter gearing of this type including electro-magnetic means for holding the motor armature in centered position as long as the starting switch is closed.

It is another object to provide such a device in which the electro-magnetic holding means also serves to assist in shifting the armature into its centered position.

It is another object to provide such a device in which the holding means serves as a support for the commutator brushes of the motor whereby the brushes and the commutator may be of conventional construction.

Further objects and advantages will be apparent from the following description taken in connection with the accompanying drawing in which the figure shows a preferred embodiment of the invention in side elevation, partly broken away and in section, portions of the electrical system being shown diagrammatically.

In the drawing there is illustrated a starting motor 1 having a stationary field 2 and a rotary armature 3 mounted on a shaft 4 which is axially slidable in bearings 5, 6 in the ends of the motor frame.

A pinion 7 is slidably journaled on the shaft 4 for movement thereon and therewith into and out of mesh with a gear 8 of the engine to be started. An overrunning traversing connection indicated generally by the numeral 9 actuates the pinion 7 from the armature shaft 4. Since this connection forms no part of the present invention, and is illustrated and described in the patent to Buxton above cited, further description is believed to be unnecessary.

The motor armature is provided with a commutator 11 of conventional form, and brushes 12 connecting the armature winding in series with the winding of the field 2 and the input terminal 13 in the usual manner for a series wound motor.

A battery 14 grounded at 15 is connected through an electro-magnetic starter switch 16 to the terminal 13 of the motor, the motor being grounded as indicated at 17 to complete the starting circuit. The switch 16 is actuated by a solenoid 18 controlled by a manual switch 19.

A ring member 21 of magnetic material is swiveled on the armature shaft 4 adjacent the commutator 11 as by means of a lock ring 22, and an electro-magnet 23 is mounted in the adjacent end of the motor frame in position to attract and hold the ring 21 in the position indicated in dotted lines, at which time the armature 3 of the motor is in its centered operative position with respect to the field 2. One terminal of the electro-magnet 23 is connected to the motor terminal 13 by a lead 24, and the opposite end of the electro-magnet is grounded on the motor frame whereby the electro-magnet is energized concurrently with the starter motor windings upon closure of the starting switch 16.

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The motor brushes 12, of which only one is illustrated, are mounted on the ring 21 so as to move axially with the ring and the armature shaft 4 and thereby maintain their operative relation to the commutator 11 without the necessity of any special formation of the commutator or brushes. Means in the form of one or more pins 25 mounted in the motor frame are slidably engaged in openings 26 in the ring 21 to thereby prevent rotation of the ring.

The armature 3 is normally maintained in its idle, decentered position by means of a plurality of springs 27 mounted on the end of the motor frame and bearing against the ring 21.

In operation, starting with the parts in the positions illustrated, closure of the manual switch 19 energizes the coil 18 to close the starting switch 16 whereby the battery 14 is connected to the windings of the field 2 and armature 3 of the motor, and simultaneously to the electro-magnet 23. The consequent energization of the motor windings and the coil 23 draws the armature into centered relation to the field as indicated in dotted lines, where it is firmly held by the attraction of the electro magnet 23 to the ring 21. This axial movement of the armature shaft 4 draws the pinion 7 into initial meshing engagement with the engine gear 8, after which rotation of the armature shaft causes full engagement of the gearing and cranking of the engine to take place in the usual manner.

As long as the starting switch 16 is held closed, the armature 3 of the starting motor is held in its centered operative position by the attraction of the electro-magnet 23 to the ring 21 irrespective of initial explosions in the engine. In fact, the relief of the load on the starting motor by such initial explosions strengthens the electro-magnet 23 by relieving the cranking load on the battery 14.

When the engine starts, and the operator opens the starting switch, the parts are returned to their idle positions with the assistance of the decentering springs 27.

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

I claim:

In an electrical starting system for internal combustion engines, a starting motor having a stationary field and a rotary armature including a shaft which is shiftable axially to move the armature into and out of centered relation to the field, yielding means normally holding the armature in decentered position, a pinion mounted on the armature shaft for movement therewith into and out of engagement with a gear of the engine to be started, an overrunning driving connection from said shaft to the pinion, a ring of magnetic material swiveled on the armature shaft, an annular electromagnet fixedly mounted in one end of the motor in position, when energized, to attract said ring and thereby move the armature to its centered position, and means for simultaneously energizing said motor and electro magnet; the starting motor armature having a commutator on its end adjacent the electro-magnet, and brushes bearing on the commutator mounted on said ring; and means for preventing rotation of the ring.

References Cited in the file of this patent

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