March 9, 1926

1,575,698

W. L. McGRATH

ENGINE STARTER

Filed August 2, 1919

2 Sheets-Sheet 1

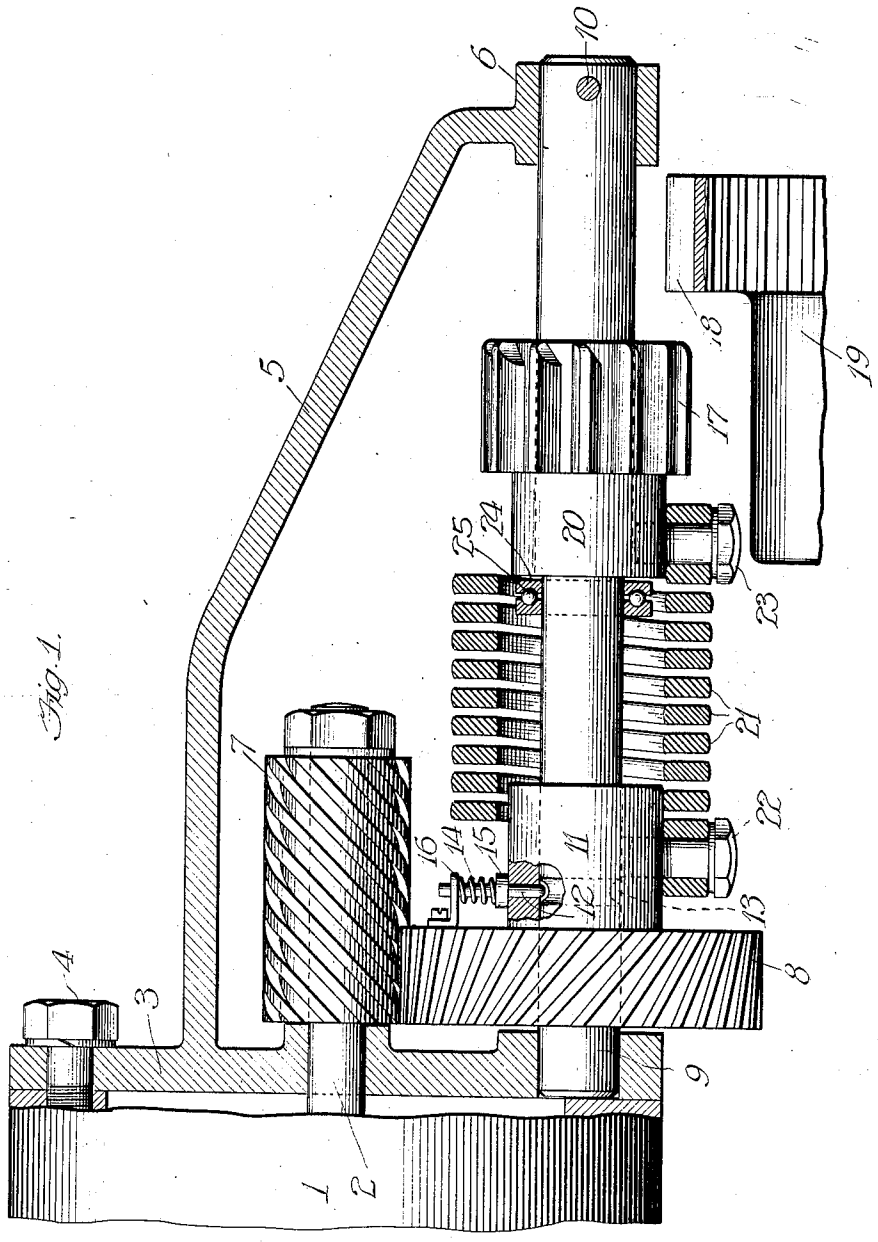


Fig. 1.

Witness
Martin H. Olsen.

Inventor
William L. McGrath
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His Attys.

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Fig. 3.

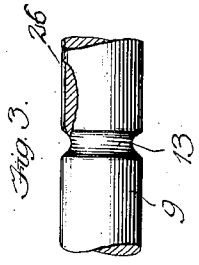


Fig. 2.

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UNITED STATES PATENT OFFICE.

WILLIAM L. McGRATH, OF ELMIRA, NEW YORK, ASSIGNOR TO ECLIPSE MACHINE COMPANY, OF ELMIRA, NEW YORK, A CORPORATION OF NEW YORK.

ENGINE STARTER.

Application filed August 2, 1919. Serial No. 314,952.

To all whom it may concern:

Be it known that I, WILLIAM L. McGRATH, a citizen of the United States, residing at Elmira, in the county of Chemung and State of New York, have invented certain new and useful Improvements in Engine Starters, of which the following is a specification.

My invention relates to an engine starter and more particularly to the drive or transmission between the source of power such as a starting motor, and the engine member such as the fly wheel of the engine to be started. The object of my invention is to improve and make practical that type of drive in which the automatic shifting movement of the driving member or pinion into engagement with the engine member is accomplished by the employment of a pair of coacting spiral gears, one of which is a driving gear driven by the starting motor either directly or indirectly, and the other a driven gear mounted for axial or longitudinal movement along the driving gear. The particular objects of my invention are first to provide this type of drive with a yielding driving connection, and second to provide the drive with means for holding the driven gear in normal position and to prevent re-meshing, which means is also capable of enforcing longitudinal movement of such driven gear when being automatically moved axially or longitudinally. Other features of advantage and utility in my construction of drive will be apparent from the description hereinafter given.

In the drawing Fig. 1 is a sectional elevation of an engine starter embodying my invention, this particular construction being of the out-board type; Fig. 2 a sectional elevation on a modified form of construction illustrating the in-board type; and Fig. 3 a detail view of a modified form.

Referring to the particular embodiment of my invention as shown in Fig. 1 the electric starting motor indicated at 1 is provided with an armature shaft 2 bearing in and extended beyond the end plate 3, attached to the motor frame in suitable manner as by bolts 4. This plate 3 is provided with a laterally projecting bracket 5 terminating at its outer end in a bearing 6 and also constituting a partial housing for the drive below.

Upon this extended armature shaft 2 there is secured a spiral gear 7 which is therefore driven or rotated by the starting motor. This gear meshes and coacts with a complementary spiral gear 8 which is mounted loosely and adapted to slide longitudinally upon a supporting shaft 9. This shaft is supported at its inner end in the plate 3 and at its outer end in the bearing 6 to which latter it is secured in suitable manner as by means of the pin 10. The gear 8 is provided with an outwardly extending hub 11 in which is mounted the means for holding the gear 8 in its normal position axially with respect to its supporting shaft. These means comprise in the present instance a plunger 12 reciprocating through a radial opening in the hub 11 and projected inwardly into the bore of such hub and into a circumferential groove 13 in the shaft 9. This plunger is spring pressed by means of the coil spring 14 bearing at its lower end against a collar 15 secured to the plunger and against a bracket 16 secured to and projecting from the outer face of the gear 8. The groove 13 and the plunger are so located that they coact at the time when the gear 8 is in its normal or home position illustrated in Fig. 1. This plunger or spring pin is not permitted to contact with the bottom of the groove but only with a side thereof for reasons hereinafter explained. The driving member is here in the form of a pinion 17 adapted to engage with the teeth 18 of the flywheel 19 of the engine such as an internal combustion engine. This pinion is loosely mounted on the shaft 9 so as to slide and also rotate thereon. The shaft is made of two diameters, the pinion being mounted on the larger diameter. The pinion is provided with an inwardly extending hub 20 and the two hubs 11 and 20 are operatively connected by a yielding driving connection which is here a coiled drive spring 21 whose opposite ends are secured to said hubs by the anchor studs 22 and 23 respectively. At the shoulder 24 formed at the junction between the two diameters of the shaft 9 I locate an anti-friction bearing 25 against which the hub 11 is adapted to bear and with which it is adapted to rotate when the gear 8 is in its right hand operating position.

Describing a cycle of operation and starting with the normal position of the parts as shown in Fig. 1, when the starting motor 1 is operated and the armature shaft 2 is rotated the spiral gear 7 is rotated with the result that the gear 8 will be automatically

moved along its shaft 9 to the right and the pinion 17 will be correspondingly moved longitudinally and into mesh with the flywheel gear. When the electric motor is thus started the acceleration is such as to jump the plunger or spring pin out of the groove 13 and permit said longitudinal movement of the parts. This longitudinal movement is assured by reason of the fact that the plunger 12 is in frictional contact with the surface of the shaft 9 whereby any tendency of the driven gear 8 to rotate is retarded. In such cases as might so require means may be provided on the supporting shaft 9 to further accentuate this effect such as the longitudinal corrugation 26 as illustrated in Fig. 3.

After the pinion 17 is in mesh with the flywheel gear and its longitudinal movement is arrested by contact of the hub 11 against the bearing 25, the gear 8 will rotate and such rotary motion will be communicated through the drive spring to such pinion which latter will thereupon rotate the flywheel. When the motor starts on its own power the assembly of pinion spring and spiral gear 8 are of course caused to rotate at a higher rate of speed than they are driven by the driving gear 7 and the demeshing will therefore automatically occur in the usual manner. By the provision of the plunger the gear 8 will be retained in its normal or home position and remeshing is prevented even though the armature and gears continue to rotate. It will be noted that the plunger does not contact the bottom of the groove but only the side thereof, since contacting with the bottom would tend to resist rotation of the gear 8 and increase the tendency to longitudinal movement, whereas contact with the side of the groove prevents longitudinal movement of the gear on account of its state of rotation.

In Fig. 2 I have shown a modified form of construction in which the corresponding parts are similarly numbered. In this construction the spiral gearing on the gears 7 and 8 run in an opposite direction to that shown in Fig. 1 with the result that the assembly of driven gear spring and pinion will be automatically moved to the left along the supporting shaft when meshing with the flywheel gear. This represents the in-board type of drive inasmuch as the pinion moves inwardly towards the motor when meshing with the flywheel gear. In this construction the anti-friction bearing 25 is located at the inner end of the shaft 9 so as to be contacted by the inner end of the inner side of the gear 8 when in operating position.

In both forms of construction, the drive spring permits of the relative longitudinal movement of the pinion and driven gear which is desirable for meshing purposes.

I claim:

1. An engine starter drive comprising a driving spiral gear, a second spiral gear driven thereby, an engine driving member adapted to be moved automatically into operative engagement with a member of the engine to be started and to thereupon drive such engine member, a shaft on which said driven gear and said driving member are loosely mounted, for both rotary and longitudinal movements, a driving connection between said driven gear and said driving member, and means initially tending to hold the pinion against longitudinal movement and thereafter to assure such movement and prevent rotary movement thereof on the shaft.

2. An engine starter drive comprising a driving spiral gear, a second spiral gear drven thereby, an engine driving member adapted to be moved automatically into operative engagement with a member of the engine to be started and to thereupon drive such engine member, a shaft on which said driven gear and said driving member are loosely mounted, for both rotary and longitudinal movements, a driving connection between said driven gear and said driving member, and means initially tending to hold the pinion against longitudinal movement and thereafter to assure such movement and prevent rotary movement thereof on the shaft, such means consisting of a spring pressed plunger moutned on the driven gear and a groove in the shaft adjacent the normal position of the driven gear, the plunger normally being positioned in the groove but adapted to frictionally engage the shaft after the driven gear has moved longitudinally.

3. An engine starter drive comprising a driving spiral gear, a second spiral gear driven thereby and having a hub, an engine driving member adapted to be moved automatically into operative engagement with a member of the engine to be started and to thereupon drive such engine member, a shaft on which said driven gear and said driving member are loosely mounted for both rotary and longitudinal movements, said shaft being of two diameters with a dividing shoulder and with the driving member on the larger diameter, an anti-friction bearing at such shoulder against which bearing said gear hub abuts in the driving operation, and yielding driving connection between said driven gear and said driving member.

WILLIAM L. McGRATH.