Sept. 10, 1935. W. T. CARLE 2,013,645

STARTER MECHANISM

Filed Feb. 9, 1935

Fig. 1.

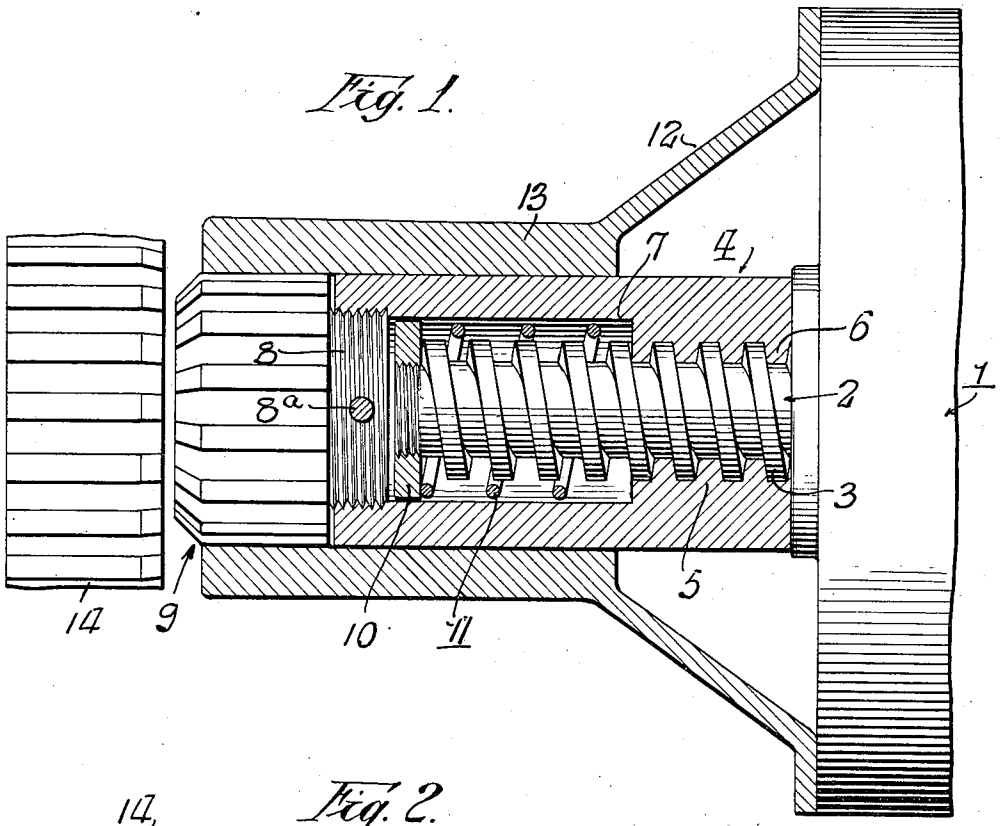
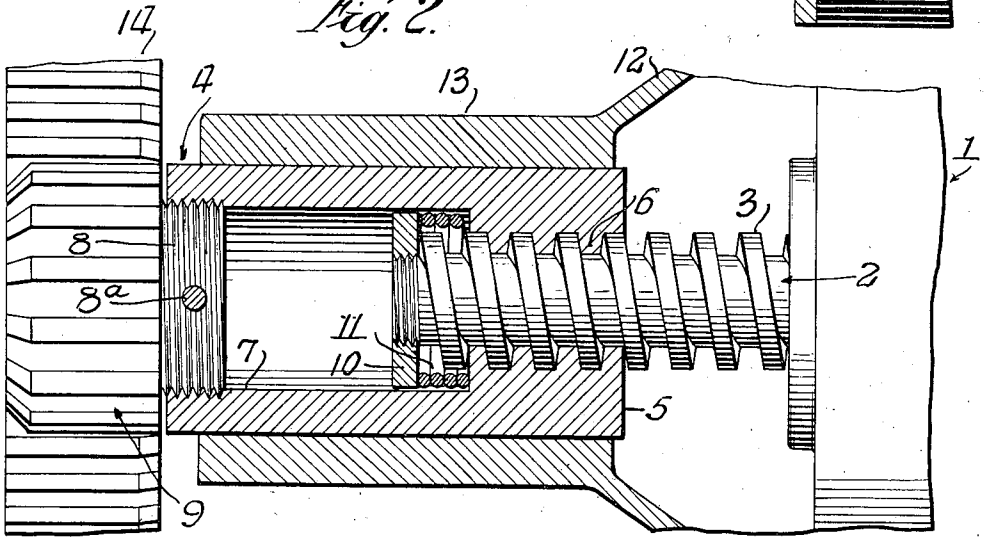


Fig. 2.



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STARTER MECHANISM

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Application February 9, 1935, Serial No. 5,746

5 Claims. (Cl. 74—7)

This invention relates to improvements in starter mechanisms and it consists of the matters hereinafter described and more particularly pointed out in the appended claims.

The invention in this instance, is more particularly concerned with the mounting of the starter pinion whereby it is moved into and out of operative engagement with the fly wheel ring gear.

At the present time, engine manufacturers find it advisable to employ fly wheels of smaller diameter and this, of course, reduces the size of the ring gears thereon. With such fly wheels, it is desirable to employ smaller diameter pinions for the starting motor to increase relative leverage between the ring gear and pinion so as to give a smoother and quicker turn over action to the fly wheel.

In starter mechanisms employing torque reaction pinions, it is the present practice to provide interengaging helical splines or threads on the armature shaft and in the pinion respectively. This, of course, limits the diameter of the pinions so that they cannot be reduced to that small diameter necessary for use in connection with small diameter fly wheels to give the quick snappy starting action desired.

One of the objects of the invention is to provide a simple and efficient structure in a starting mechanism which permits of the use of a smaller and more efficient pinion.

Another object of the invention is to provide in a structure of this kind, a sleeve which carries a pinion at one end and not only has an external bearing but is also formed for cooperation with the armature shaft to move into and out of operative engagement with the ring gear in a relative rotation between the said sleeve and armature shaft of the starting motor.

Still a further object of the invention is to provide a structure of this kind wherein means are provided to cushion the action of the sleeve and its pinion as the latter moves into complete operative engagement with the fly wheel and to assist the sleeve and pinion in moving away from the ring gear as the engine runs under its own power and drives the pinion.

The above mentioned objects of the invention, as well as others, together with the many advantages thereof, will more fully appear as I proceeds with my specification.

In the drawing—

Fig. 1 is a longitudinal vertical sectional view through a starter mechanism embodying the preferred form of the invention and with the pinion in its normal position, out of engagement with the fly wheel ring gear.

Fig. 2 is a view similar to Fig. 1 with the parts in the position they assume as when the pinion is in complete operative engagement with the ring gear to drive the same.

Referring now in detail to that embodiment of the invention, illustrated in the accompanying drawing—

1 indicates, as a whole, a conventional starting motor having an armature shaft 2 with an external helical thread or rib 3 thereon. Mounted on said shaft is a sleeve 4, the inner end 5 of which is formed with an internal helical thread or rib 6, to operatively coact with the thread or rib on the shaft. This sleeve, which is of a length greater than that of the threaded part of the armature shaft, is provided in its outer end with an axial recess 7 in which is received the stud 8 of a pinion 9. A pin 8a passes through the front end of the sleeve and through the stud 8 to operatively connect the pinion to the sleeve. This structure is not essential so far as the invention is concerned, but makes an economical way to produce the sleeve and pinion as a unit.

On the outer end of the shaft 2, within the bore or recess 7, is secured a collar 10 and surrounding that part of the shaft within said bore or recess is a helical expansion spring 11. This spring is of a diameter having a relative snug fit in the bore or recess and is preferably of a length a trifle shorter than the distance between the collar 10 and the inner end 5 of the sleeve.

On the end of the motor 1 is mounted a casing 12 that terminates in an annular portion 13 providing an external bearing in which the sleeve 4 may have a rotative as well as an endwise movement.

The sleeve 4 has a rather snug fit in the bearing portion 13 to provide a sufficient drag on the sleeve so that a relative torque reaction is possible between said sleeve and the armature shaft.

In Fig. 1, the parts are shown in their normal inoperative position, wherein the sleeve is in its rearmost position and the pinion 9 is out of engagement with the ring gear.

When the motor 1 is energized, this, of course, causes rotation of the armature shaft. Due to the coacting threads or ribs 3 and 6 on said shaft 2 and in the sleeve 4 respectively, and the drag afforded by the bearing portion 13 on the sleeve 4, the sleeve and the pinion will advance outwardly to operatively engage the pinion with the ring gear 14. As the spring 11 is somewhat shorter than the distance between the

collar 10 and inner end 5 of the sleeve 4 when the pinion is in the position shown in Fig. 1, the initial outward movement of the sleeve and pinion is relatively free. After the pinion is in initial engagement with the ring gear and advances into complete driving engagement therewith, the spring 11 is compressed and cushions the pinion as it moves finally into said complete engagement.

Should the teeth of the pinion meet head-on with the teeth of the ring gear, the sleeve and pinion will rotate with the armature shaft to slip by the teeth of the ring gear to enter the grooves between said teeth. The pinion will then pass into complete full meshing engagement with the ring gear as shown in Fig. 2.

The pinion will now act to drive the ring gear and crank the engine. As soon as the engine runs under its own power the fly wheel will drive the pinion at a speed greater than that of the armature shaft. When the pinion is thus driven, the sleeve will move inwardly on the armature shaft and in this movement is assisted by the spring 11 which previously compressed, now expands. The parts are then positioned as shown in Fig. 1.

Should the engine sputter in starting, due to the misfiring of one or more cylinders, with the starting motor running, the pinion will not, when thrown out of engagement with the ring gear, tend to spin idly, but will immediately reengage the ring gear to further crank the engine.

With the arrangement shown, as the threaded armature shaft does not pass through the pinion, said pinion may be materially reduced in diameter to the small size desired. In this respect, it is pointed out that by the provision of the external bearing for the sleeve, this arrangement is possible because the sleeve is thus operatively secured against wabbling or chattering on the shaft so that it will always run true. The recess 7 may contain sufficient lubricant to last for a long time.

By the arrangement described, fewer parts are embodied in the mechanism and the motor can be brought into a position closer to the ring gear than has heretofore been possible.

While in describing the invention, I have referred in detail to the form, arrangement and construction of the various parts, this is to be considered only in the illustrative sense so that I do not wish to be limited thereto except as may be specifically set forth in the appended claims.

I claim as my invention—

1. In an engine starting mechanism, a starting motor, an armature shaft therefore, a sleeve surrounding said shaft and normally engaging at one end against said motor, coacting means on parts of said shaft and sleeve respectively for producing a relative rotative and a relative endwise movement between said shaft and sleeve, means carried by the motor providing an external bearing for said sleeve, and a pinion including a stud operatively engaged in that end of the sleeve opposite the end facing the motor.

2. In an engine starting mechanism, a starting motor, an armature shaft therefor having an external helical rib thereon, a sleeve surrounding said shaft and normally engaging at one end against said motor and formed at said one end with an internal helical rib to engage the rib on said shaft, said sleeve having a recess in its other end, a pinion having a stud fixed in said recess and a second sleeve supported from the motor and providing an external bearing for said first sleeve.

3. In an engine starting mechanism, a starting motor, an armature shaft therefor having an external helical rib thereon, a sleeve surrounding said shaft and normally engaging at one end against said motor and formed at said one end with an internal helical rib to engage the rib on said shaft, said sleeve having a recess in its other end, a collar on said shaft within the recess, a spring in said recess and surrounding that part of said shaft between said collar and the first mentioned end of the sleeve, a pinion having a stud fixed in said recess and a second sleeve supported from the motor and providing an external bearing for the first sleeve.

4. In an engine starting mechanism, a starting motor, an armature shaft therefor, a sleeve surrounding said shaft and normally engaging at one end with the motor, coacting means on said shaft and on said end of said sleeve for producing a relative endwise movement between said shaft and sleeve in a relative rotation between them, the other part of said sleeve being hollow to form a lubricant recess about a part of said shaft, means carried by the motor providing an external bearing for said sleeve and a pinion carried by the other end of said sleeve.

5. In an engine starting mechanism, a starting motor, an armature shaft therefor having a helical rib thereon, a sleeve normally surrounding said shaft and engaged at one end against the motor and formed outwardly beyond said end with a lubricant receiving recess, said first mentioned end of the sleeve being formed with a helical rib to coact with the one on the shaft to produce a relative longitudinal movement between the shaft and sleeve in a relative rotation between them, means carried by the motor providing an external bearing for the sleeve and a pinion carried by the other end of the sleeve.

WILLIAM T. CARLE.

CERTIFICATE OF CORRECTION.

Patent No. 2,013,645.

September 10, 1935.

WILLIAM T. CARLE.

It is hereby certified that the name of the assignee in the above numbered patent was erroneously written and printed as "Roy F. Fulcher" whereas said name should have been written and printed as Roy G. Fulcher, as shown by the records of assignments in this office; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 8th day of October, A. D. 1935.

(Seal)

Leslie Frazer
Acting Commissioner of Patents.