

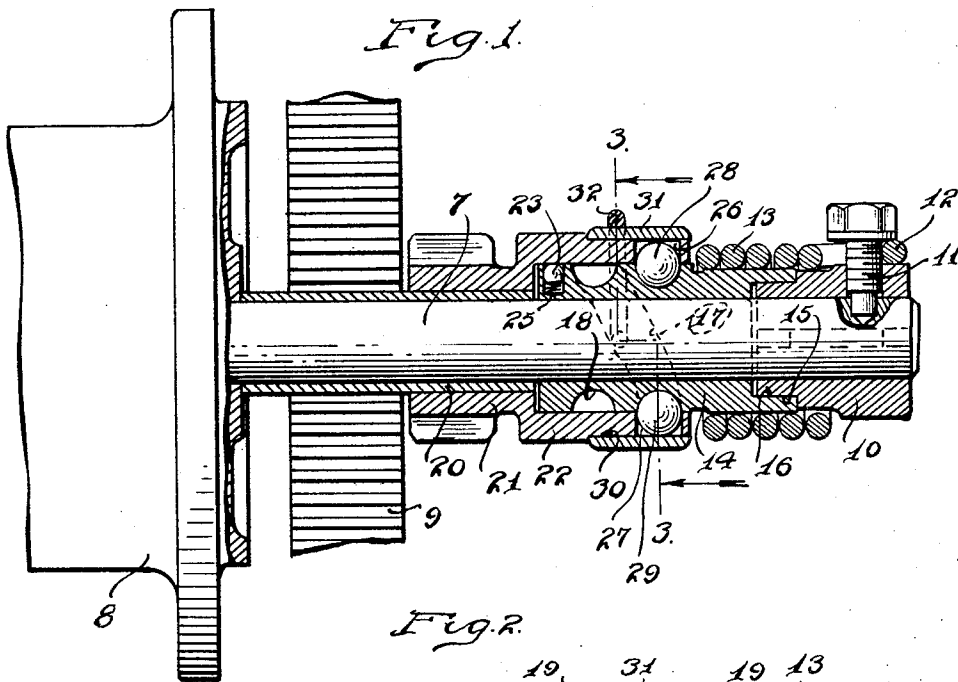
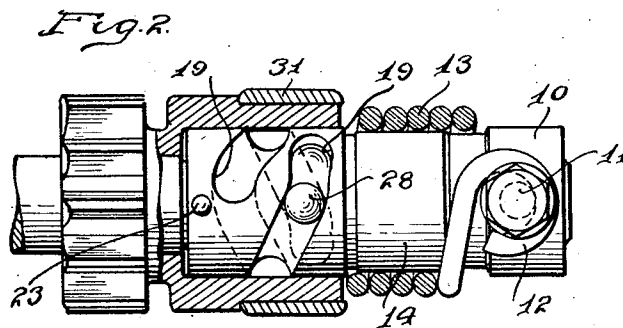
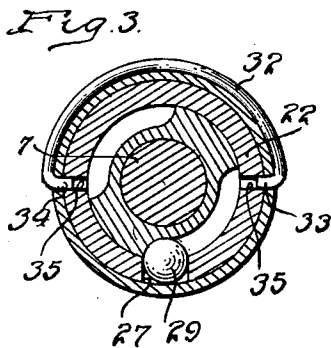
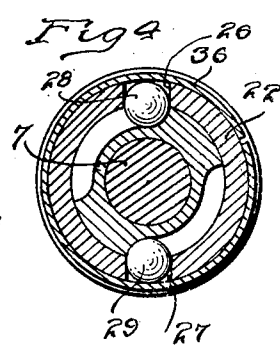
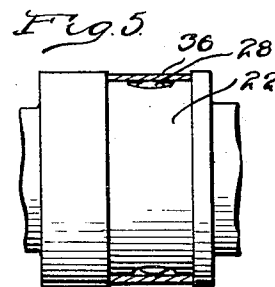
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O. A. PALM ET AL

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STARTER MOTOR DRIVE

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STARTER MOTOR DRIVE

Application filed February 20, 1932. Serial No. 594,218.

Our invention relates to a new and useful improvement in a starter motor drive adapted for use on starter motors and intended to provide a connection between the starter motor and the engine which is to be started.

It is an object of the present invention to provide a starter motor drive of this class, which will be simple in structure, economical of manufacture, durable, highly efficient in use, compact, and easily and quickly assembled.

It is another object of the present invention to provide in a device of this class a gear, which is axially movable into operative and inoperative position and which is provided with yieldable, frictional means for resisting axial movement so as to prevent undue movement of the gear from inoperative to operative position.

Other objects will appear hereinafter.

The invention consists in the combination and arrangement of parts hereinafter described and claimed.

The invention will be best understood by a reference to the accompanying drawing which forms a part of this specification, and in which:

Fig. 1 is a longitudinal, central, vertical, sectional view of the invention, showing the gear in inoperative position.

Fig. 2 is a top plan view with parts broken away and parts shown in section.

Fig. 3 is a sectional view taken on line 3—3 of Fig. 1.

Fig. 4 is a sectional view taken on line 4—4 of Fig. 1.

Fig. 5 is a fragmentary, sectional view of a modified form of the invention with parts broken away.

The invention is adapted for use with a shaft 7, which projects outwardly from a starter motor 8 and driven thereby. This motor is located in proximity to the gear 9, which is fixedly mounted on the driving shaft of the internal combustion engine, which it is designed to start. Fixedly mounted on the end of the shaft 7 is a collar 10 into which is threaded the set screw 11. This set screw is projected through the eyelet 12 formed on one end of the coil spring 13, which embraces the

sleeve 14 loosely positioned on the shaft 7. The collar 10 is cut away as at 15 and the sleeve 14 is recessed as at 16, so that these parts at this particular location overlap. Formed in the periphery of the sleeve 14 are two spiral grooves 17 and 18, each of which terminates with an offset end 19.

Embracing the shaft 7 is a bushing 20, which is adapted to engage the face of the motor 8 and the end of the sleeve 14 so as to prevent axial movement of the sleeve 14. Slidable and rotatable on the bushing 20, which is of hard metal to prevent wear of the shaft 7, is the starter gear 21 which carries the cup-shaped sleeve 22 which embraces the end of the sleeve 14, and is rotatable and axially movable thereon. A ball 23 is positioned in a recess 24 formed in the sleeve 14 and normally forced by the spring 25 to project into engagement with the inner surface of the cup-shaped portion 22 and resist movement of these parts, so that any undue movement of the gear 21 relatively to the sleeve 14 will be prevented. Positioned in pockets 26 and 27 formed in the cup-shaped portion 22 are balls 28 and 29 respectively, each adapted to engage in one of the grooves 17 or 18. The cup-shaped portion is cut away as at 30, and on this cut away portion is positioned a retainer ring 31, which serves to retain the balls 28 and 29 in position in the pockets 26 and 27. A wire spring clip 32 having the inturned ends 33 and 34 is provided to lock the retainer ring 31 on the cup-shaped portion 22. These inturned ends 33 and 34 project through an opening formed in the ring 31 and into the passages 35 formed in the cup-shaped portion 22. The construction is such that when the retainer ring 31 is in position the balls will rest in the pockets 26 and 27, and also engage in the grooves 17 and 18. In the form shown in Fig. 5 we have provided a split resilient retaining ring 36 so that the wire clip 32 may be dispensed with, this member 36 serving the function of the retainer ring 31.

The construction is such that when the shaft 7 is rotated by the motor 8 the collar 10 will carry with it in its rotation the end of the coiled spring 13 and the spring 13 will

thus be wound tightly upon the sleeve 14 and effect a rotation of the sleeve 14 in unison with the collar 10. As the sleeve 14 rotates the engagement of the balls 28 and 29 in the grooves 17 and 18 will effect an axial movement of the gear 21 until the balls 28 and 29 arrive at the ends of the grooves, that is the off-set portion 19 upon which the gear 21 will have moved into mesh with the gear 9 and will then rotate in unison with the collar 10. It is obvious that the connection between the shaft 7 and the gear 21 is a frictional connection and one in which the gear 21 will be free to move in one direction, automatically becoming released from the frictional connection upon rotation of the gear 21 in one direction at a greater speed than the rotation of the collar 10. As the gear 21 rotates at a greater speed in one direction than the collar 10 a reverse axial movement of the gear will be effected, thus moving the gear 21 out of mesh with the gear 9. On account of the coiled spring connection should a sudden backward thrust be delivered to the gear 21 as might result from a back fire or the like, the spring connection will permit such release of the connecting parts as to allow the gear 21 to move in a reverse direction thus relieving the device of the sudden strain and adding to its durability.

While we have illustrated and described the preferred form of construction, we do not wish to limit ourselves to the precise details of structure shown, but we desire to avail ourselves of such variations and modifications as come within the scope of the appended claims.

Having thus described our invention, what we claim as new and desire to secure by Letters Patent is:

1. A starter motor drive of the class described adapted for use with a starter motor having a driving shaft comprising: a collar fixedly mounted on said driving shaft; a sleeve loosely mounted on said driving shaft; means for preventing axial movement of said sleeve on said driving shaft; a coiled spring connected to said collar and embracing one end of said sleeve; a gear axially movable on said driving shaft; a sleeve forming member carried by said gear and embracing one end of said first mentioned sleeve, said first mentioned sleeve having formed in its periphery at the portion embraced by said sleeve forming portion spirally directed grooves; and means carried by said sleeve forming portion engageable in said grooves and effecting upon engagement of the same with the ends of said grooves the rotation of said sleeve forming portion in unison with said first mentioned sleeve.

2. A starter motor drive of the class described adapted for use with a starter motor having a driving shaft comprising: a collar fixedly mounted on said driving shaft; a

sleeve loosely mounted on said driving shaft; means for preventing axial movement of said sleeve on said driving shaft; a coiled spring connected to said collar and embracing one end of said sleeve; a gear axially movable on said driving shaft; a sleeve forming member carried by said gear and embracing one end of said first mentioned sleeve, said first mentioned sleeve having formed in its periphery at the portion embraced by said sleeve forming portion spirally directed grooves; and means carried by said sleeve forming portion engageable in said grooves and effecting upon engagement of the same with the ends of said grooves the rotation of said sleeve forming portion in unison with said first mentioned sleeve; and hence carried by said first mentioned sleeve for resisting relative movement of said first mentioned sleeve and said sleeve forming portion.

3. A starter motor drive of the class described adapted for use with a motor having a driving shaft comprising: a collar fixedly mounted on said driving shaft; a sleeve loosely mounted on said driving shaft; means for preventing axial movement of said sleeve on said shaft; a spring connected at one end to said collar and embracing one end of said sleeve, the opposite end of said spring being loose; a gear loosely mounted on said shaft; means carried by said sleeve for effecting axial movement of said gear, a predetermined distance, upon rotation of said sleeve and then, after said axial movement, effecting a rotation of said gear in unison with said sleeve; and yieldable means for resisting undue relative movement of said sleeve and said gear.

4. A starter motor drive of the class described adapted for use with a motor having a driving shaft comprising: a collar fixedly mounted on the driving shaft; a spring embracing said collar and connected at one end thereto and projecting at its opposite end beyond the end of said collar; a sleeve loosely positioned on said shaft and embraced at one end by the loose end of said spring, said sleeve having spiral grooves formed therein; a gear loosely mounted on said shaft; a cup-shaped portion carried by said gear and embracing the grooved portion of said sleeve, said cup-shaped portion having pockets formed therein; a ball mounted in each of said pockets and engaging in one of said grooves; and a retaining ring mounted on said cup-shaped portion over said pockets for retaining said balls in said pockets.

5. A starter motor drive of the class described adapted for use with a motor having a driving shaft comprising: a collar fixedly mounted on the driving shaft; a spring embracing said collar and connected at one end thereto and projecting at its opposite end beyond the end of said collar; a sleeve loosely positioned on said shaft and embraced at one

end by the loose end of said spring, said sleeve having spiral grooves formed therein; a gear loosely mounted on said shaft; a cup-shaped portion carried by said gear and embracing the grooved portion of said sleeve, said cup-shaped portion having pockets formed therein; a ball mounted in each of said pockets and engaging in one of said grooves; a retaining ring mounted on said cup-shaped portion over said pockets for retaining said balls in said pockets; and resilient means for retaining said ring in position on said cup-shaped portion.

6. A starter motor drive of the class described adapted for use with a motor having a driving shaft comprising: a collar fixedly mounted on the driving shaft; a spring embracing said collar and connected at one end thereto and projecting at its opposite end beyond the end of said collar; a sleeve loosely positioned on said shaft and embraced at one end by the loose end of said spring, said sleeve having spiral grooves formed therein; a gear loosely mounted on said shaft; a cup-shaped portion carried by said gear and embracing the grooved portion of said sleeve, said cup-shaped portion having pockets formed therein; a ball mounted in each of said pockets and engaging in one of said grooves; a retaining ring mounted on said cup-shaped portion over said pockets retaining said balls in said pockets; and yieldable means carried by said sleeve engageable with the inner surface of said cup-shaped portion for resisting undue relative movement of said cup-shaped portion and said sleeve.

In testimony whereof we have signed the foregoing specifications.

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