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ENGINE STARTING MECHANISM

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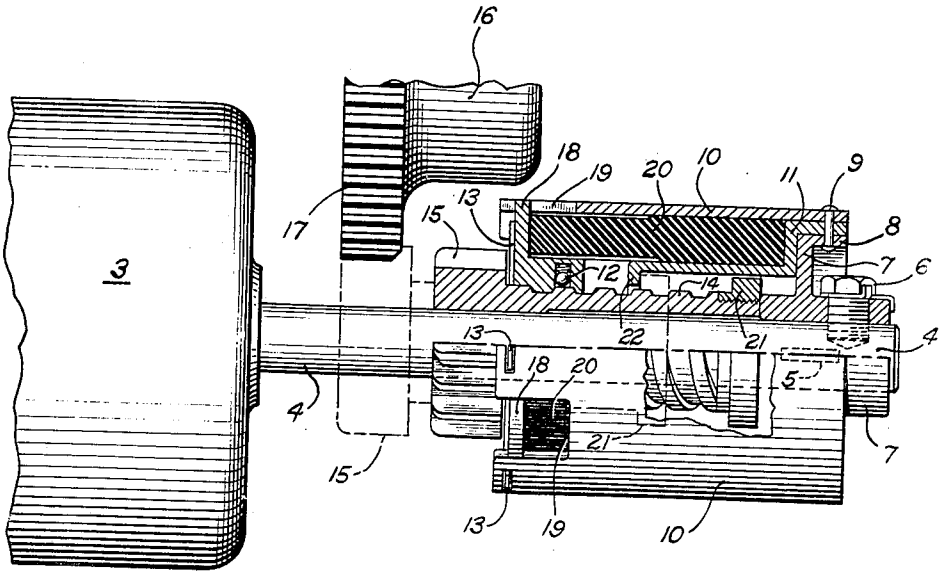

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ENGINE STARTING MECHANISM

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1 Claim. (Cl. 74—7)

This invention relates to a starter for an engine such as an internal combustion engine, and pertains more particularly to the means for connecting the starting motor or other source of power to a member or part of the engine to be started and thereafter transmitting power thereto to start the engine.

An object of the invention is to provide a novel starter of the type embodying a drive which is characterized by the employment of a rotatable driving member, or prime mover, such as an electric motor, and a driven member, such as a pinion, mounted on the armature shaft of the motor for longitudinal movement thereof and rotary movement therewith, and adapted to be drivably connected with the engine member.

Another object is to provide in a starter having the foregoing characteristics, novel means for effecting automatic movement of the driven member into mesh with the engine member in response to energization of the prime mover, and prior to any rotary movement of the driven member.

A further object is to provide automatic meshing means of the foregoing character adapted to be actuated by novel resilient transmitting means capable of exerting an axial thrust upon the driven member in response to rotary movement of the driving member.

A further object is to provide novel means for causing the gradual establishment of a driving connection between the prime mover and driven member subsequent to the attainment of the meshed condition. In this connection, a feature of the invention is the employment of novel impact absorbing means in the dual capacity of yieldably actuating the driven member in its meshing movement, and subsequently controlling the establishment and maintenance of driving relation between the prime mover and the driven member. In other words, the invention contemplates the use of novel resilient compressible means for transmitting the drive from the prime mover to the engine-engaging member during both its engine-engaging and engine rotating actions.

Another object of the invention is to provide simple, compact and efficient means for the foregoing purposes.

These and other objects and advantages to be derived from the use of the invention disclosed herein will become evident on an inspection of the following description when read with reference to the accompanying drawing illustrating one embodiment of the invention. It is to be expressly understood, however, that the drawing is for the purpose of illustration only, and is not to be construed as a definition of the limits of the invention, reference being had for this purpose to the appended claim.

In the drawing, which is a view in elevation of a starter embodying the invention, reference character 3 designates an electric motor having an extended armature shaft 4 to which is rigidly secured, by suitable means, such as a key 5 and a set screw 6, a sleeve or collar 7, having an outer cylindrical rim 8 rigidly connected, as by means of rivets 9, for example, to a pair of complemental clutch members 10 and 11, constituting part of the novel means for converting the rotation of the shaft 4 into, first, a meshing, and then a rotary movement of the engine-engaging member to be described hereafter.

The novel means for producing automatic meshing action between the starter and the engine to be started in response to energization of the prime mover 3 preferably comprises an engine-engaging member 14 which in the embodiment now being described is constituted by an elongated sleeve, loosely fitting on the shaft 4 and provided at its inner end with an enlarged portion 15 constituting a pinion adapted to drive the engine member 16, which may be the engine flywheel, on which is provided a spur gear 17, of relative large diameter with which the pinion 15 is caused to mesh on longitudinal movement along the shaft 4.

Mounted on the threaded portion 14 of the engine-engaging member is a correspondingly threaded nut 18 having a splined or equivalent connection, as indicated at 13 and 19, with the clutch member 10, and preferably nut 18 carries means for normally holding the member 14 in the position indicated with a yieldable force. As shown, such means takes the form of a spring pressed member 12 provided in a recess in the nut 18, and exerting the desired amount of frictional pressure on the surface of member 14. With this construction it is evident that upon energization of the motor 3 by suitable means (not shown) the resulting initial rotation of shaft 4, communicated to the nut 18 through the collar 7, barrel 10, and splines 19, produces a screw action on the sleeve 14 causing the latter to move to the left as shown in broken line position in Fig. 1 overcoming the light frictional restraining effect of the spring pressed member 12 and establishing meshed relation between the pinion 15 and the gear 17.

The novel means for controlling the applica-

tion of torque to the pinion 15 and gear 17 after these two members have become meshed comprises in conjunction with the clutch members 10 and 11, a cylindrical resilient member 20 of compressible material, preferably rubber, having its opposite ends abutting the nut 18 and the member 11, respectively. The effect of this construction is that upon continued rotation of the shaft 4 following establishment of meshed relation, and due to the prevention of any further longitudinal movement of the sleeve 14 by virtue of the contact of stop 21 thereon with the inwardly turned end 22 of the clutch member 11, the nut 18 is caused to travel to the right as viewed in Fig. 1, thereby compressing the cylindrical buffer 20 and gradually building up therein, a resistance which, when it has reached the required point, will be effective to cause the transmission of driving torque to the sleeve 14 through the member 18 and thus cause rotation of the engine member 16.

When the engine has been started by the means just described, and the motor 3 de-energized, the resulting deceleration of the member 18, in conjunction with the acceleration of the sleeve 14 (which is now driven by the engine member 16) causes the return of the nut 18 to the position shown in Fig. 1, in which position the stress previously built up in the member 20 is eliminated. At the same time these forces act to return the sleeve 14 to the position shown in Fig. 1 thereby demeshing the pinion.

In the event that the teeth of pinion 15 fail to register with those of the gear 17 on first contact therewith, the resistance thus offered to further longitudinal movement of the sleeve 14 will cause the nut 18 to compress the buffer 20 and thereby produce rotation of the members 13 and 14 to a sufficient extent to cause proper meshing of the pinion with the gear, whereupon the elasticity of the buffer 20 is effective to exert a thrust through the nut 18, on the sleeve 14, to cause the pinion to move forward into full meshing position. It is thus apparent that the buffer 20 may act not only as the torque transmitting means, but also as the means for insuring full mesh of the pinion with the gear 17 in the event of abutting of the teeth of these two members.

This application is a division of my prior case, Serial No. 555,633, filed Aug. 6, 1931.

What is claimed is:—

In a device of the class described, a driving shaft, a driven gear, a member connected with said shaft to rotate therewith, a nut splined to said member for rotary movement therewith and limited movement axially thereof, a sleeve freely mounted on said shaft and threadedly engaging said nut, a plurality of teeth on said sleeve engageable with the teeth of said gear on movement of said sleeve along said shaft, and compressible means interposed between said rotatable member and said nut for absorbing the shock incident to the application of torque to said pinion and gear through said nut.

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