

Aug. 9, 1932.

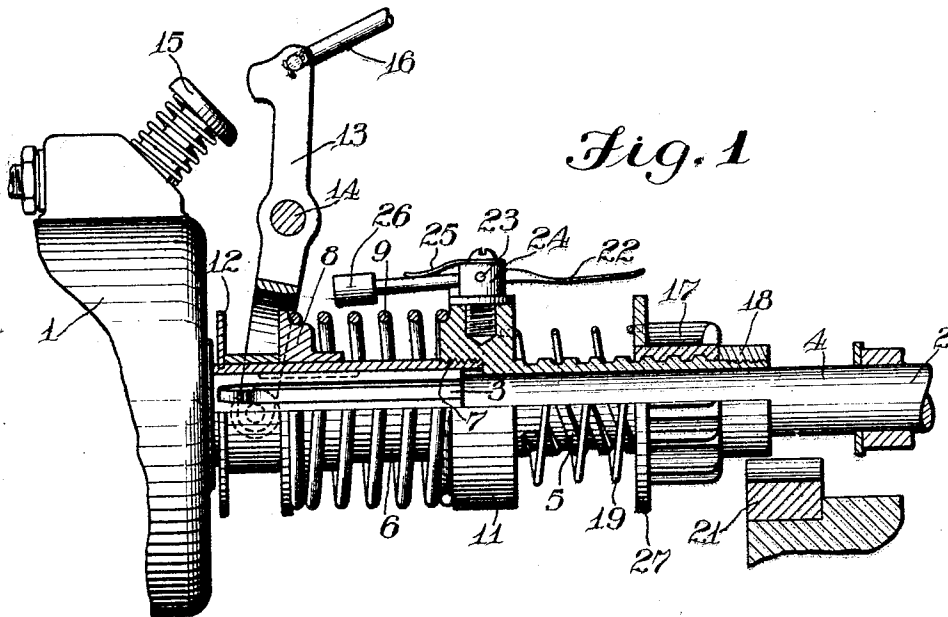
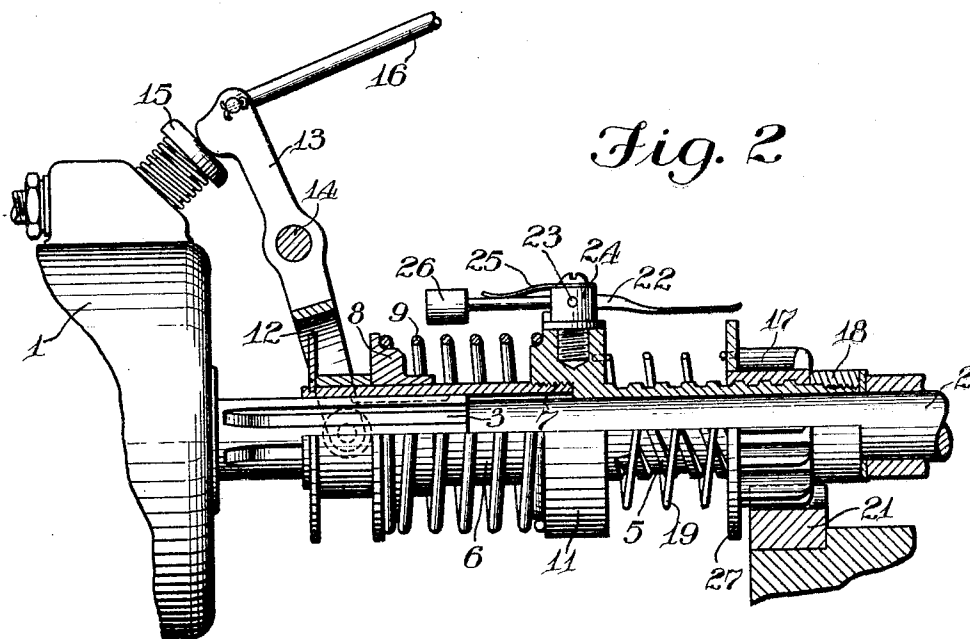
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1,870,366

STARTING MECHANISM

Filed Sept. 1, 1931

2 Sheets-Sheet 1



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2 Sheets-Sheet 2

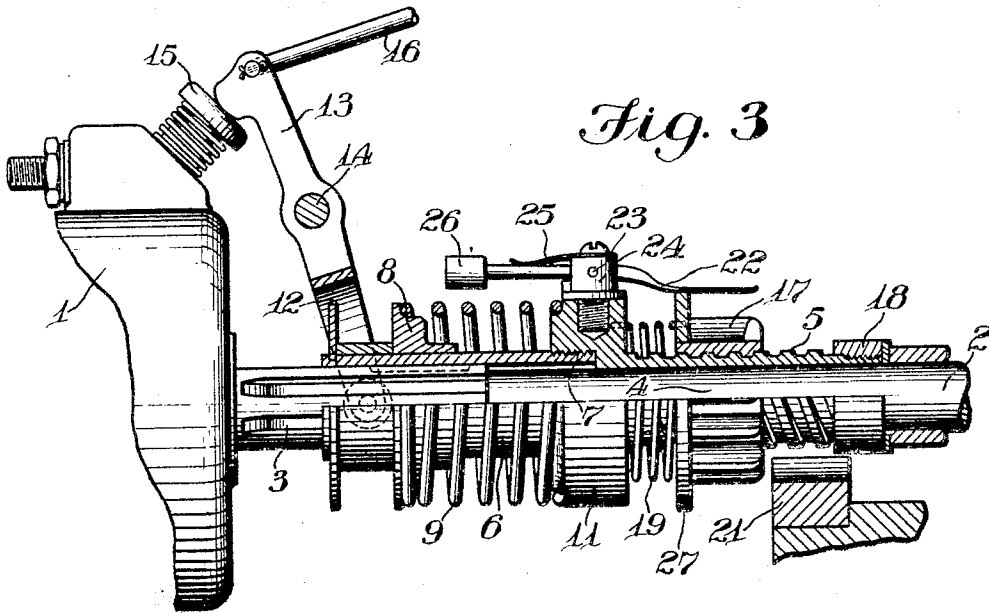


Fig. 3

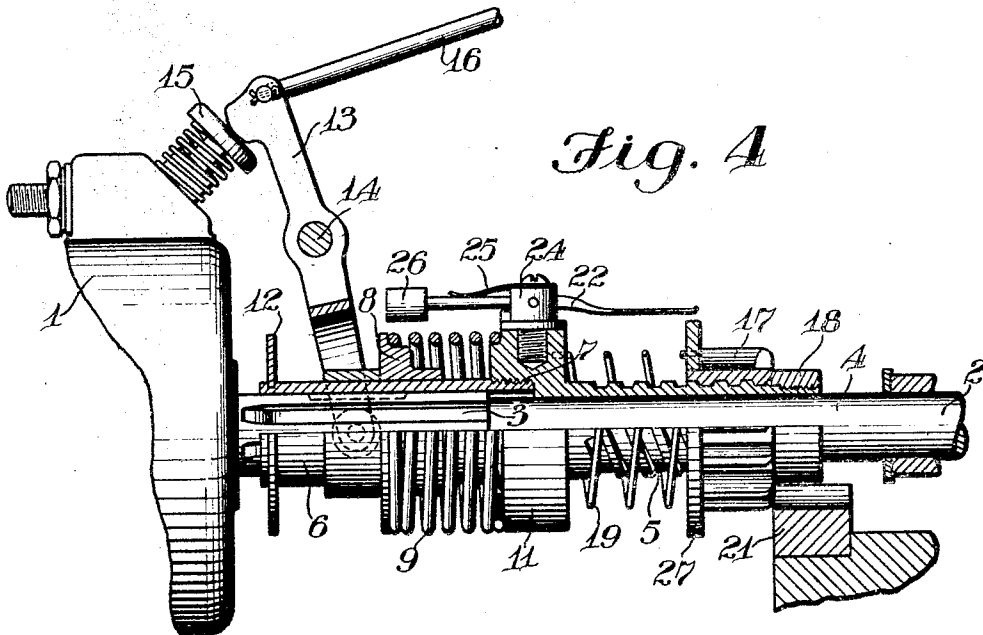


Fig. 4

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STARTING MECHANISM

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This invention relates to starting mechanism for internal combustion engines and more particularly to a pinion rebound check for starter gearing of the type embodying manual shifting means for moving a pinion into mesh with an engine gear and automatic means for disengaging the pinion.

It is an object of the present invention to provide a starter gearing of the manual mesh and automatic demesh type embodying novel means for preventing the starting pinion, when thrown out of mesh, from bounding back toward the engine gear.

Another object is to provide such a device in which the starting pinion is automatically thrown back along the manual shifting means when the engine starts, and novel means are provided for holding the pinion in its retracted position on the shifting means until the starting mechanism is released.

Another object is to provide such a device in which the holding means is frictional rather than positive and is automatically actuated by the rotation of the driving means.

Further objects and advantages will be apparent to those skilled in this art from the following description taken in connection with the accompanying drawings in which:

Fig. 1 is a side elevation partly in section of a preferred embodiment of the invention showing the parts in their normal or idle positions;

Fig. 2 is a similar view showing the parts in driving position;

Fig. 3 is a similar view showing the parts in the positions assumed when the driving pinion is thrown out of engagement with the engine gear; and

Fig. 4 is a similar view showing the parts in the positions assumed in case, during the engaging movement of the driving pinion, a tooth thereof should abut end to end with a tooth on the engine gear.

Referring first to Fig. 1 of the drawings, there is illustrated a starting motor 1 having an extended armature shaft 2 which is splined for a portion of its length as shown at 3 and is reduced in diameter and smooth for the remainder of its length as indicated at 4.

A power member in the form of a screw

shaft 5 is slidably journaled on the plain portion 4 of the motor shaft and is connected to rotate therewith as by means of an extension 6 fixed thereto by a threaded connection 7 and slidably keyed on the splined portion 3 of the motor shaft. Manual means are provided for moving the power member 5 longitudinally along the motor shaft 4 in the form of a shift collar 8 slidably mounted on the shaft extension 6 and yieldably connected to the screw shaft as by means of a compression spring 9 bearing at one end on said shift collar and at the other end on a collar 11 formed integrally on the end of said screw shaft. An annular stop member 12 is fixed on the end of the shaft extension 6 for limiting the expansion of the spring 9. A shifting fork 13 is arranged to extend at its lower end into the channel formed between the shift collar 8 and the stop member 12. This shifting fork is pivoted at 14 and formed at its upper end to engage a starting switch button 15. Suitable manually operated means such as indicated at 16 are provided whereby the shifting fork may be actuated to slide the screw shaft 5 along the motor shaft and thereafter close the starting switch.

A driving member in the form of a pinion 17 is threaded on the screw shaft 5 and is normally maintained at the outer end thereof against a stop nut 18 by means such as a torsion spring 19 engaging the pinion at one end and the collar 11 at its other end. An engine member in the form of a flywheel gear 21 is arranged adjacent the normal position of the pinion 17 so that longitudinal motion of the pinion with the screw shaft 5 when the shifting fork is actuated will cause the pinion to engage the engine member. Subsequent rotation of the motor shaft when the motor switch is closed causes the pinion 17 to rotate and crank the engine, and self-operation of the engine causes the pinion to be threaded back along the screw shaft 5 out of mesh with the engine gear.

According to the present invention, means are provided for automatically retaining the pinion 17 in its retracted position on the screw shaft 5 when thrown back by the overrunning action of the engine gear. As here illustrated

this means takes the form of a friction brake member 22 hinged at 23 to a stud 24 fixed on the collar 11. The brake member 22 is normally maintained out of engagement with the pinion 17 as illustrated in Fig. 1 by means of a spring member 25, but is arranged upon rapid rotation of the drive, to be moved into frictional engagement with the pinion by means of a weight 26 fixed on the free end of said brake member and movable by centrifugal force to cause such engagement. The pinion 17 is preferably provided with a circular flange 27 on which the brake member 22 is adapted to bear.

In operation, starting with the parts in the positions shown in Fig. 1, actuation of the shifting fork 13 by the operator in a counter clock-wise direction causes the pinion 17 to be carried by the screw shaft 5 into engagement with the engine gear 21 as illustrated in Fig. 2. Further movement of the shifting fork causes closure of the starting switch, and the consequent energization of the starting motor 1 causes the pinion 17 to be rotated with the screw shaft 5 to crank the engine. When the engine starts, the rapid acceleration of the flywheel gear 21 causes the pinion 17 to overrun the screw shaft and therefore to be thrown backward out of mesh with the engine gear. At this time, the rapid rotation of the starter drive due to the release of the load thereon causes the weight 26 to move the brake member 22 into frictional engagement with the flange 27 on the pinion 17 as illustrated in Fig. 3, whereby the momentum of the pinion is dissipated and the pinion is retained in its repulsed position as there illustrated. When the operator returns the shifting fork 13 to its normal position, the screw shaft 5 is moved back to the position shown in Fig. 1, and the starting switch is opened. The consequent deceleration of the starting motor 1 allows the spring 25 to move the brake 22 out of contact with the pinion 17 whereupon the torsion spring 19 returns the pinion to its normal position on the screw shaft.

In case, during the meshing movement of the pinion 17, tooth abutment should occur with the engine gear, the spring 9 is arranged to yield sufficiently to allow closure of the starting switch while the pinion is being pressed against the flywheel, whereupon the actuation of the starting motor causes the pinion to be indexed into proper relation with the flywheel gear whereupon meshing and starting occur as usual.

Although but one form of the invention has been shown and described in detail, it will be understood that various changes may be made in the proportions and arrangements of the parts and various other embodiments are possible without departing from the spirit of the invention as defined in the claims appended hereto.

What is claimed is:—

1. Engine starting mechanism including a driving member, manual means for moving said driving member into engagement with a member of an engine to be started, automatic means for retracting said member from such engagement, and means responsive to rotation of said moving means for holding said member retracted.

2. Engine starting mechanism including a power member, a driving member mounted thereon, means for shifting the power member to move the driving member into engagement with an engine member, means for throwing the driving member along the power member out of engagement with the engine member when the engine starts, and speed responsive means for holding the driving member in its repulsed position.

3. Engine starting mechanism including a power member, a driving member mounted thereon for longitudinal movement therewith and thereof into and out of engagement with a member of an engine to be started, means for shifting the power member to move the driving member into engagement with the engine member, means for throwing the driving member along the power member out of engagement with the engine member when the engine starts, and speed responsive means on the power member for holding the driving member in its repulsed position.

4. Engine starting mechanism including a power member, a driving member mounted thereon, means for shifting the power member to move the driving member into engagement with the engine member, means for throwing the driving member along the power member out of engagement with the engine member when the engine starts, frictional means for holding the driving member in its repulsed position, and yielding means for returning the driving member to its normal position on the power member.

5. Engine starting mechanism including a power member, a driving member mounted thereon, means for shifting the power member to move the driving member into engagement with the engine member, means for throwing the driving member along the power member out of engagement with the engine member when the engine starts, speed responsive means mounted on said power member for frictionally engaging said driving member and holding the same in repulsed position, and yielding means on the power member for returning the driving member to its normal position.

6. In an engine starter a shiftable power shaft, a driving pinion mounted thereon and arranged to be shifted thereby into and out of mesh with a gear of the engine to be started, means for shifting the power shaft to mesh the pinion with the engine gear, means to throw the pinion back along said

shaft when the engine starts, and a centrifugal brake on said shaft adapted to engage and hold the pinion in its repulsed position.

7. In an engine starter, a shiftable screw
5 shaft, a pinion threaded thereon, means for shifting the screw shaft to mesh the pinion with a gear of the engine to be started, said threaded connection being arranged to automatically demesh the pinion when the engine
10 starts, a friction member operative on rapid rotation of the screw shaft to engage and hold the pinion in its demeshed position and yielding means for returning said pinion to its normal position on the shaft.

15 In testimony whereof I have signed this specification.

DANIEL P. KEARNEY.

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