Sept. 25, 1934. C. T. CUNNIUS 1,974,985

DRIVING MECHANISM FOR ENGINE STARTERS

Filed Nov. 6, 1931

Fig. 1.

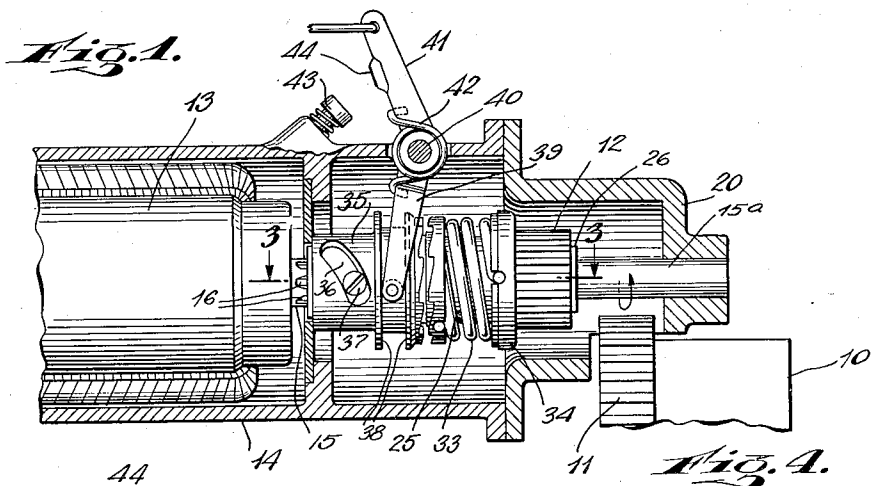


Fig. 2.

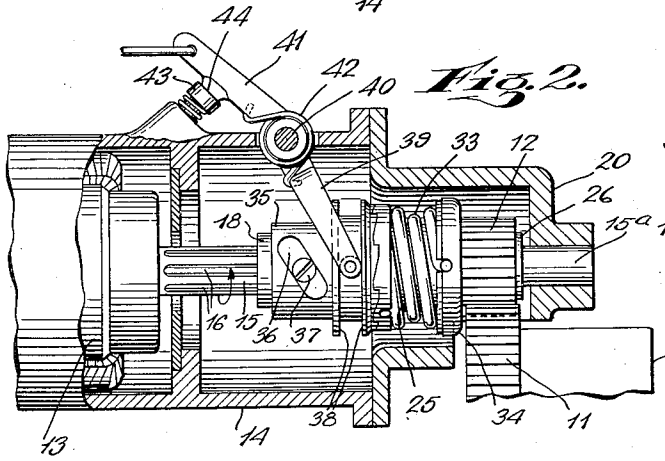


Fig. 4.

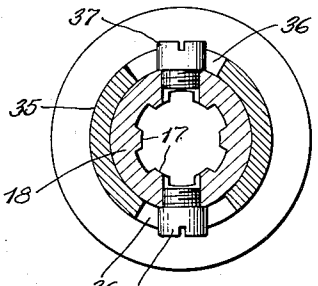


Fig. 5.

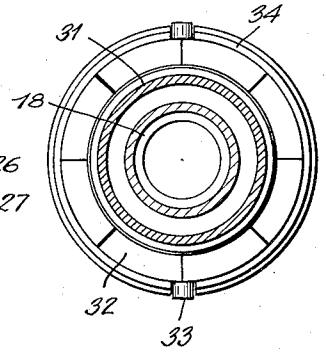
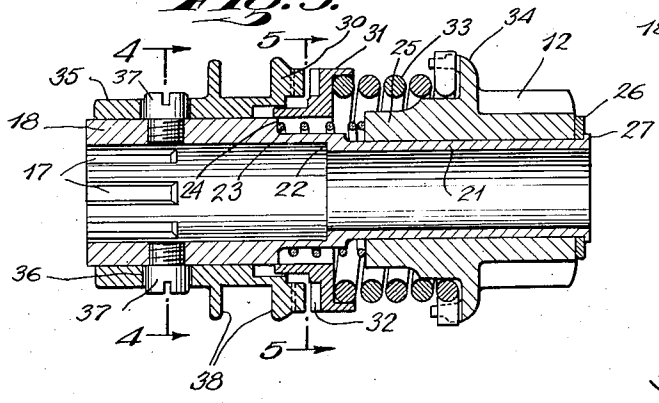


Fig. 3.



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DRIVING MECHANISM FOR ENGINE STARTERS

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9 Claims. (Cl. 74—6)

My invention relates to starters for internal combustion engines and has for an object to provide an improved driving mechanism therefor.

Another object of the invention is to provide a resilient driving connection between a starting motor and an internal combustion engine.

The invention relates more particularly to that type of starter drive in which a pinion driven by the starting motor is moved by the operation of a pedal or the like into engagement with a gear such as a toothed fly wheel of the engine. In mechanisms of this type, the pinion is usually driven through an overdrive ball clutch so as to prevent the engine, after it has been started, from driving the motor at an excessive speed. Such clutches after they become worn may be somewhat uncertain in their operation. They may slip and then seize with such suddenness as to put unnecessary stresses on the power transmitting elements.

It is an object of my invention to provide a novel overdrive clutch with a resilient connection between the clutch and the pinion so as to cushion the drive and prevent damage to the gears. Such cushioned drive is also of advantage when the drive pinion is accidentally moved into engagement with the fly wheel gear while the engine is running.

Another object of my invention is to provide a novel overdrive clutch which will always insure a positive drive.

Another object of the invention is to provide a novel means of throwing the clutch members into engagement when the starter motor is energized.

Other objects and advantages of my invention will appear from the following description of a preferred form thereof, and thereafter the novelty and scope of the invention will be pointed out in the claims.

In the accompanying drawing;

Figure 1 is a fragmental view partly in longitudinal section, showing a portion of a starting motor and a portion of an internal combustion engine, with my improved drive mechanism in idle position;

Fig. 2 is a similar view with the drive mechanism in operating position;

Fig. 3 is an enlarged view in longitudinal section of the drive mechanism removed from the starting-motor shaft.

Fig. 4 is a view in cross-section taken on the line 4—4 of Fig. 3; and

Fig. 5 is a view in cross-section taken on the line 5—5 of Fig. 3.

In the drawing, I show a portion of an internal combustion engine 10 having a toothed fly wheel gear 11. This gear is adapted to be driven by a driving member in the form of a pinion 12 which in turn is driven by a starting motor 13.

The motor is mounted in a casing 14 and has a power shaft 15 which is formed with spline grooves 16 adapted to receive spline teeth 17 formed in the bore of a sleeve member 18. The motor shaft 15 is formed with an extension 15a of reduced diameter which is journaled at its outer end in a bearing member 20 secured to the end of the casing 14. The sleeve member 18 is formed with a stepped bore, as clearly shown in Fig. 3, the outer end of the bore being of reduced diameter so as to fit on the portion 15a of the motor shaft. Between the two steps of the sleeve member 18 there is a shoulder 22 adapted to abut against a shoulder (not shown) formed between the portions 15 and 15a of the motor shaft. This serves as a stop to limit the inward movement of the sleeve 18, that is, the movement toward the left as shown in Fig. 1. However, the sleeve member may be moved toward the right to the position shown in Fig. 2.

At its outer end the sleeve member 18 provides a bearing 21 of reduced diameter on which the pinion 12 is journaled. This pinion is normally urged outwardly or toward the right as viewed in Fig. 3, by a spring 23 which bears at one end against an annular shoulder 24 formed on the sleeve 18 and at its opposite end against a hub extension 25 of the pinion 12. The spring 23 presses the pinion against a washer 26 fitted upon the bearing 21 and retained thereon by a shoulder 27 upset at the outer end of said bearing.

Mounted upon the sleeve 18 is an overdrive clutch composed of a driving member 30 and a driven member 31. These members are formed on their adjacent annular faces with ratchet-shaped teeth 32. The driven member 31 is connected to the pinion member by a yielding driving connection in the form of one or more coil springs 33. These are secured at one end to the clutch member 31 and at the other to a flanged collar 34 formed on the pinion 12.

The driving member 30 of the clutch has a sleeve extension 35 in which is formed a pair of helical slots 36. A pair of screws or pins 37 are threaded or otherwise secured to the sleeve member 18 and project into the slots 36. Also formed on the sleeve extension 35 is an annular recess

defined by shoulders 38 adapted to receive suitable studs or rollers on the end of a yoke arm 39. The latter is pivotally mounted on a stud 40 carried by the casing 14. Also pivotally mounted on this stud is an operating arm 41 which is connected by a spring 42 to the yoke arm 39 so that when the arm 41 is moved from the position shown in Fig. 1 to that shown in Fig. 2 it will slide the drive mechanism from idle to operating position. However, this movement will not be positive because it must be effected through the spring 42.

Mounted on the casing 14 is a spring-pressed switch button 43 which is adapted to be depressed by a lug 44 on the arm 41 when the latter is moved to the position shown in Fig. 2. The switch button 43 controls the energizing circuit of the motor 13 so that when this button is depressed the motor is started.

The operation of the mechanism is as follows: Whenever it is desired to start the engine the arm 41 is depressed. For this purpose the arm 41 is suitably connected to a starter pedal or other means by which an operator may depress said arm. When the arm 41 is depressed all of the mechanism supported thereon is slid outward on the motor shaft bringing the drive pinion 12 into mesh with the gear 11. In the meantime the clutch members 30 and 31 will be in disengaged position, as shown in Fig. 1, because although the yoke member 39 advances the clutch member 30 toward the right, the member 31 will also move in the same direction because of its connection to the pinion which is carried upon the sleeve member 18 and the latter is advanced by engagement of the pins 37 with the slots 36. When, however, the switch button 43 is depressed the motor is started and the shaft 15 together with the sleeve 18 is rotated. However, because of inertia, as well as the frictional engagement of the yoke member 39 therewith, the clutch member 30 will not immediately turn with the sleeve 18 but will be fed into engagement with the member 31 by the wedging action of the pins 37 in the helical slots 36. As soon as the teeth of the two clutch members are in mesh, the pinion 12 will be turned by the starting motor and this will drive the gear 11 and turn the engine over. When the engine starts it immediately speeds up, over driving the pinion 12. Thereupon the ratchet teeth of the clutch members will wedge said members apart to disengaging position. In this way disengagement of the clutch is effected even though the arm 41 is held depressed.

If when the arm 41 is depressed to start the engine, the teeth of pinion 12 should jam against the end of the teeth of the gear 11 the spring 23 or spring 42 or both, would yield and permit the gears to work their way into mesh. However, should they remain in jammed position the spring 42 would yield sufficiently for the lug 44 to depress the switch button 43 and start the motor, then as soon as the motor started the pinion would spring into mesh with the gear 11.

The spring 23 might be omitted since its function could be performed by the spring 42. However, I prefer to use both springs 23 and 42, the spring 23 being a light spring which is more adapted to permit the pinion 12 to work into mesh with the gear 11.

It will be observed that in the embodiment of my invention described above, the member 31 is resiliently connected to the pinion 12, so that there is a resilient drive between the motor and the engine. It will also be observed that because I use a ratchet clutch instead of a ball clutch there is a positive connection between the members of the clutch when they are in engagement and there is no opportunity for slippage.

While I have described a preferred embodiment of my invention, it will be understood that this is to be taken as illustrative and not limitative and that various changes may be made in form, construction and arrangement of parts without departing from the spirit and scope of my invention as pointed out in the following claims.

I claim:

1. The combination with a starting motor and an engine including a starting gear, of a pinion, means for moving the pinion into mesh with the gear, a switch operable by said means to start the motor, and an overdrive clutch comprising a driven member connected to the pinion and a driving member and means connecting the driving member to the motor, the latter means including a pin and helical slot connection whereby the driving member will be forced by inertia into engagement with the driven member when the motor is started.

2. The combination with a starting motor and an engine including a starting gear, of a pinion, a resilient device for moving the pinion into mesh with the gear, a switch operable by said means to start the motor, and an overdrive clutch comprising a pair of toothed members, and means connecting said members to the motor and the pinion respectively, one of said means including a pin and helical slot connection whereby the clutch members will be forced by inertia into mutual engagement when the motor is started.

3. The combination with a starting motor having a driving shaft and an engine having a starting gear, of a sleeve slidable axially on the shaft, means compelling rotation of the sleeve with the shaft, a pinion journaled on the sleeve, a toothed overdrive clutch comprising a driven member connected to the pinion and a driving member formed with a helical slot, a pin fixed to the sleeve and engaging the slot whereby the driving member will be forced by inertia into engagement with the driven member when the motor is started, means for sliding the sleeve to carry the pinion into mesh with the gear, and a switch controlled by the latter means for starting the motor.

4. The combination with a starting motor having a driving shaft and an engine having a starting gear, of a sleeve slidable axially on the shaft, means compelling rotation of the sleeve with the shaft, a pinion journaled on the sleeve, an overdrive clutch comprising a driving member and a driven member, resilient means connecting the driven member to the pinion, the driving member being formed with a helical slot, a pin fixed to the sleeve and engaging the slot whereby the driving member will be forced by inertia into engagement with the driven member when the motor is started, means for sliding the sleeve to carry the pinion into mesh with the gear, and a switch controlled by the latter means for starting the motor.

5. The combination with a starting motor having a driving shaft and an engine having a starting gear, of a sleeve splined on the shaft, a pinion journaled on the sleeve and slidable axially thereon, resilient means for limiting the sliding movement of the pinion on the sleeve, a toothed overdrive clutch comprising a driven member connected to the pinion and a driving member

formed with a helical slot, a pin fixed to the sleeve and engaging the slot whereby the driving member will be forced by inertia into engagement with the driven member when the motor is started, means for sliding the sleeve to carry the pinion into mesh with the gear, and a switch controlled by the latter means for starting the motor.

6. An engine starter drive including a shaft, a driving member and a pair of clutch members slidably and rotatably mounted on the shaft, manual means for shifting one of said clutch members, a yielding shifting and driving connection between the other clutch member and the driving member for moving the driving member into engagement with a member of the engine to be started, and means for rotating said one clutch member from the shaft.

7. An engine starter drive including a shaft, a driving member and a pair of clutch members slidably and rotatably mounted on the shaft, yielding means normally separating the clutch members, manual means for shifting one of said clutch members, means for rotating said one clutch member from the shaft, a shifting and driving connection between the other clutch member and the driving member for moving the driving member into engagement with a member of the engine to be started, said parts being so arranged that obstruction of the engaging movement of the driving member causes engagement of said clutch members.

8. An engine starter drive including a shaft, a driving member and a pair of clutch members slidably and rotatably mounted on the shaft, manual means for shifting one of said clutch members, a shifting and driving connection between the other clutch member and the driving member for moving the driving member into engagement with a member of the engine to be started, and means whereby rotation of the shaft is transmitted to one of said clutch members to cause it to engage and drive the other clutch member.

9. An engine starter drive including a power shaft, a sleeve splined thereon, a driving member journalled on the sleeve, means for shifting the sleeve to move the driving member into and out of engagement with a member of the engine to be started, means including normally disengaged clutch members for rotating the driving member from the sleeve, and means whereby initial rotation of the sleeve causes engagement of the clutch members, said means for rotating the driving member including a yielding driving connection between the clutch members and said driving member.

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