Feb. 28, 1939. E. F. SEAMAN 2,148,507

MOTOR STARTING DEVICE

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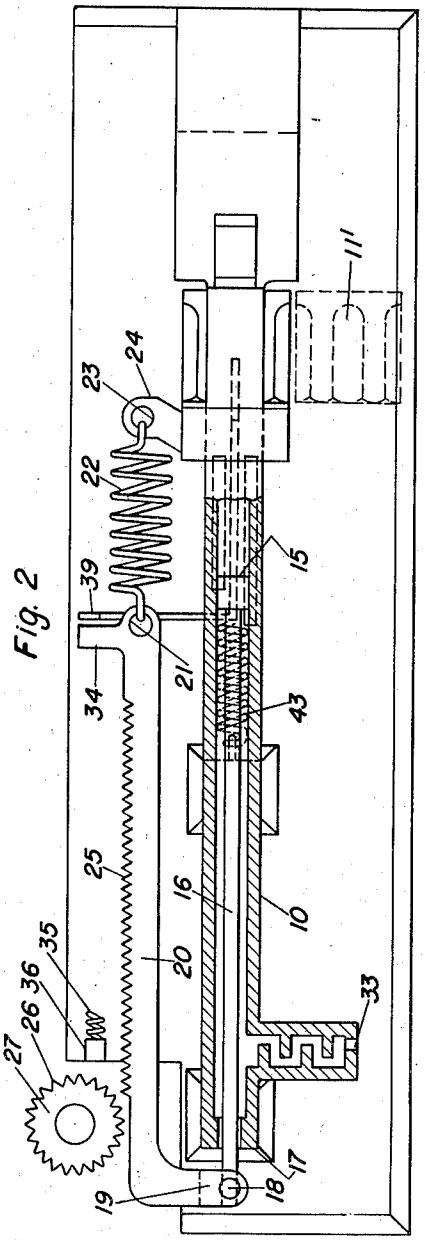

Fig. 2

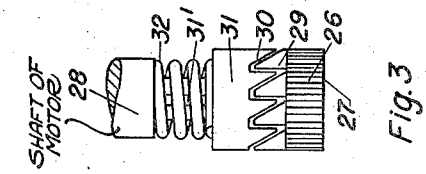

Fig. 3

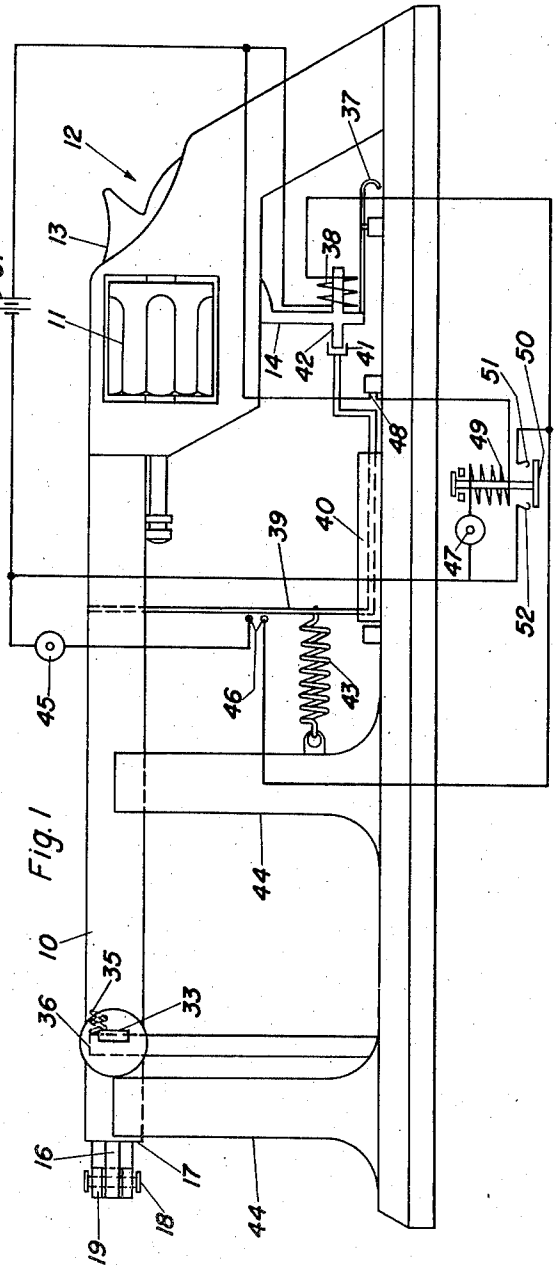

Fig. 1

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MOTOR STARTING DEVICE

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5 Claims. (Cl. 123—183)

(Granted under the act of March 3, 1883, as amended April 30, 1928; 370 O. G. 757)

This invention relates to a motor starting device, and has for an object to provide an improved motor starting device especially intended for large internal combustion engines, Diesel engines, or other engines of a similar type, where it is necessary to give a heavy fly-wheel an inertia in starting the same.

A further object of this invention is to provide a motor starting device utilizing the explosive force of a blank cartridge for rotating the motor shaft. Inasmuch as heavy motors are not often started by a single impulse, this invention includes provision for repeating the impulse, utilizing a series of blank cartridges until the motor commences to revolve of itself, after which no further cartridges will be utilized.

A further object of this invention is to provide a motor starting device utilizing a series of impulses provided by a series of blank cartridges such as in a revolving barrel, with provision for cutting off the series of cartridges as soon as the motor starts to operate.

A further object of this invention is to provide a manual means for disconnecting the series of cartridges, and in addition to provide a remotely controllable electrical means for disconnecting the series of cartridges to stop the firing.

With the foregoing and other objects in view, the invention consists in the construction, combination and arrangement of parts, as will be described more fully hereafter.

In the drawing:

Fig. 1 is an elevational view of the motor starting device of this invention.

Fig. 2 is a top plan view of Fig. 1, partly in section, and

Fig. 3 is a fragmentary detail of the motor shaft sprocket.

There is shown at 10 a long cylinder, to one end of which is secured a cartridge barrel 11 and firing mechanism 12, including a hammer 13 for exploding a cartridge in barrel 11 so that the exploding gases therefrom will travel through the cylinder 10 and press against the piston 15 therein. This piston 15 is provided with a push rod 16 extending through the end 17 of the barrel 10, and connected by a shear pin 18 to the bifurcated toe 19 of a rack 20. The other end of the rack 20 is provided with an eye 21 in which is hooked a compression spring 22 whose other end is anchored in an eye 23 in a base 24. The rack 20 is provided with teeth 25 adapted when the rack is moved to mesh with the gear teeth 26 of a gear 27 concentric with the motor shaft 28. This gear 27 is provided with a plurality of spur teeth 29 adapted to engage when rotated in one direction with the spur teeth 30 of a spur gear 31 splined as at 31' on the motor shaft 28, and normally held in mesh therewith by the compression spring 32. When the cartridge is exploded the piston 15 travels through the barrel 10, causing push rod 16 to move the rack 20 into mesh with the gear 27, giving initial starting impulse to the shaft 28.

When the piston 15 reaches the end of the barrel the burnt gases may escape through the baffle passage 33, thus removing the pressure behind the piston and placing it in a position to return. Meantime, the spring 22 is placed under tension and the finger 34 on the rack 20 is cushioned against the spring 35 on the stop 36 to stop the forward motion of the rack 20 and return it to its initial position.

To initiate operation of the device it is necessary to actuate the trigger 14, thus causing the hammer 13 to cock and fire the cartridge in the barrel 11 aligned with the cylinder 10. The trigger 14 may be pulled either manually by means of the lever 37, or by the solenoid 38. In manual operation, for continuous firing of the cartridges in the barrel 11, the lever 37 is pulled and released, thus causing the first explosion. On return of the rack 20 under force of spring 22 the finger 34 contacts with the upper end of the lever 39, which is guided between a pair of guide members 40 and has its other end 41 abut against a boss 42 on trigger 14, so that the movement of finger 34 against lever 39 actuates the trigger 14 to cock the hammer and fire another cartridge. Lever 39 is connected by a spring 43 to one of the cylinder supports 44 to restore it to the forward position away from contact with the trigger abutment 42, thus restoring it to position, ready for firing still another cartridge on the next return movement of the rack 20. If it is desired to stop firing before exhausting all the cartridges in the barrel 11, the lever 37 is grasped and held to prevent the trigger 14 from traveling forward into the position where the trigger abutment 42 may be struck by the lever end 41. If only a single shot is to be fired, the lever 37 will be held in retracted position after it has been pulled to actuate the trigger the first time and held in retracted position until the rack 20 has come to a complete rest.

To re-load the barrel 11 it is merely moved to the position 11' in the same manner as any pistol revolver barrel, the structure of the barrel 11 and firing mechanism being substantially iden-

tical with that of any conventional pistol revolver.

To operate the firing mechanism 12 electrically, as by remote control from a distance, the solenoid 38 is actuated by pressing the momentary type contact starting button 45, the lever 39 when at rest in the forward position bridging the contacts 46. The circuit from the battery or other source of power 57 is then completed through the switch button 45, contacts 46 bridged by lever 39, and solenoid 38.

After the first cartridge has been fired successive cartridges will be fired through rack finger 34 hitting lever 39 to actuate trigger 14 in the same manner as in the manual firing set forth above. To stop the firing electrically a stop button 47 is pressed. Then when the lever 39 is in retracted firing position it will bridge the contacts 48 and complete the circuit through the solenoid 49. This in turn will raise the bridge 50 to be held on the bi-metallic hook contacts 51 and 52, thus completing the circuit through the solenoid 38 and holding the trigger in retracted position, preventing it from assuming a position to be hit back when the rack returns. The bi-metallic hook contacts 51 and 52, however, will heat up as the circuit passes therethrough, straightening them out at the end of a few seconds and allowing the bridge contact 50 to disengage and thus break the circuit again, the time that it takes for the bridge contact 50 to disengage being slightly longer than the time necessary for the rack 20 to come to rest.

If only two cartridges are desired to be fired electrically both buttons 45 and 47 should be pressed simultaneously, so that when the contacts 48 are bridged as the second cartridge is exploded the trigger 14 will then be held in retracted position until the rack comes to rest. If more than two cartridges are to be fired, the button 47 should not be pressed until just before firing of the next to the last cartridge that it is desired to fire.

Although the invention has been described as utilizing the direct explosion of the cartridge as the power stroke for actuating the gear 27, it is obvious that the sequence may be reversed by changing the teeth 29 and 30 so that the explosion of the cartridge will act merely to start energy in the spring 22 which will then provide a power stroke as it retracts the rack 20 to the initial position.

Other modifications and changes in the proportions and arrangements of the parts may be made by those skilled in the art without departing from the nature of the invention, within the scope of what is hereinafter claimed.

The invention described herein may be manufactured and used by or for the Government of the United States of America for governmental purposes without the payment of any royalties thereon or therefor.

Having thus set forth and disclosed the nature of this invention, what is claimed is:

1. A motor starting device comprising a rack and gear for rotating the motor crankshaft, explosive cartridge operated means for actuating said rack in an advancing direction, spring means for operating said rack in a retracting direction, means for exploding a cartridge to actuate said rack, and means actuatable by said retracting rack to explode a successive cartridge to successively actuate said rack.

2. A motor starting device comprising a rack and gear for rotating the motor crankshaft, explosive cartridge operated means for actuating said rack in an advancing direction, spring means for operating said rack in a retracting direction, means for exploding a cartridge to actuate said rack, means actuatable by said retracting rack to explode a successive cartridge to successively actuate said rack, said successive cartridge actuating means including a trigger, and means in the path of said retracting rack to trip said trigger as said rack is retracted.

3. A motor starting device comprising a rack and gear for rotating the motor crankshaft, explosive cartridge operated means for actuating said rack in an advancing direction, spring means for operating said rack in a retracting direction, means for exploding a cartridge to actuate said rack, means actuatable by said retracting rack to explode a successive cartridge to successively actuate said rack, said successive cartridge actuating means including a trigger, means in the path of said retracting rack to trip said trigger as said rack is retracted, and manual means for initially tripping said trigger and for withholding said trigger from successive tripping position.

4. A motor starting device comprising a rack and gear for rotating the motor crankshaft, explosive cartridge operated means for actuating said rack in an advancing direction, spring means for operating said rack in a retracting direction, means for exploding a cartridge to actuate said rack, means actuatable by said retracting rack to explode a successive cartridge to successively actuate said rack, said successive cartridge actuating means including a trigger, means in the path of said retracting rack to trip said trigger as said rack is retracted, and electrical means for tripping said trigger and for holding said trigger in retracted position away from said rack actuated trigger tripping means.

5. A motor starting device comprising a rack and gear for rotating the motor crankshaft, explosive cartridge operated means for actuating said rack in an advancing direction, spring means for operating said rack in a retracting direction, means for exploding a cartridge to actuate said rack, means actuatable by said retracting rack to explode a successive cartridge to successively actuate said rack, said successive cartridge actuating means including a trigger, means in the path of said retracting rack to trip said trigger as said rack is retracted, electrical means for tripping said trigger and for holding said trigger in retracted position away from said rack actuated trigger tripping means, said electrical means including a starter switch and a stopping switch, said starter switch momentarily completing a circuit to a solenoid when initially tripping said trigger, said circuit including a part of said rack actuated trigger tripping mechanism in rest position, said switch stopping circuit including a part of said rack actuated trigger tripping mechanism in trigger tripping position, and a time delay circuit actuated in turn to hold the trigger in retracted position.

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