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STARTER FOR INTERNAL COMBUSTION ENGINES.

APPLICATION FILED JAN. 2, 1919.

1,337,113. Patented Apr. 13, 1920.

Fig. 1.

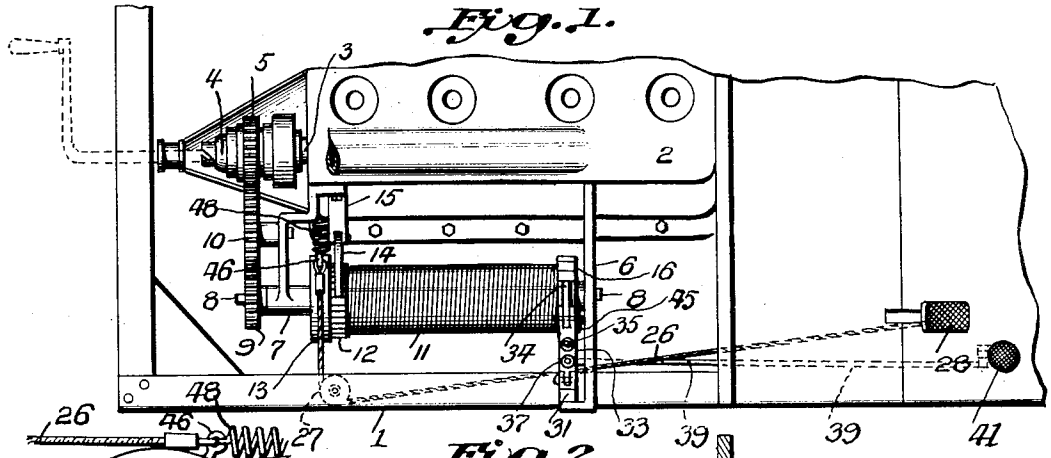


Fig. 2.

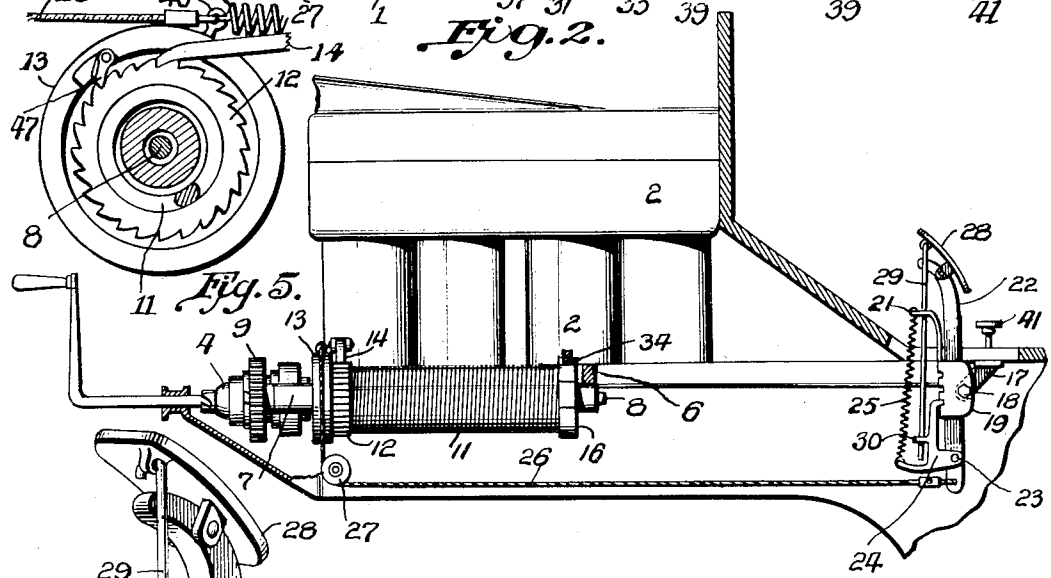


Fig. 5.

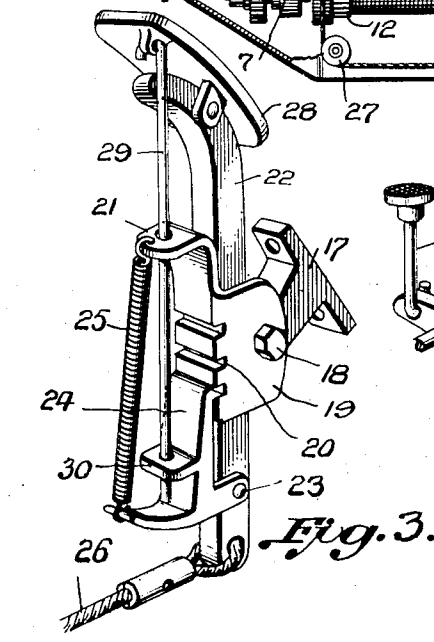
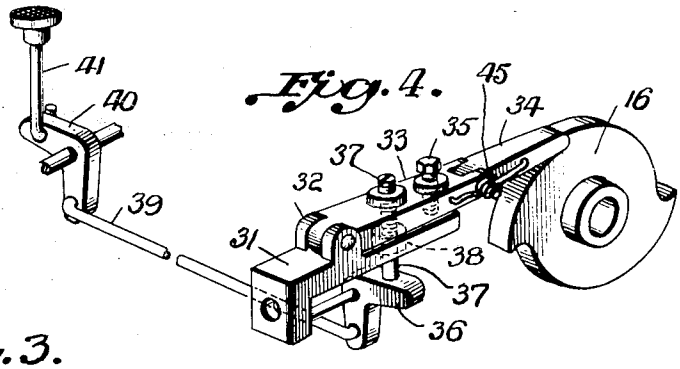


Fig. 3.

Fig. 4.



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STARTER FOR INTERNAL-COMBUSTION ENGINES.

1,337,113. Specification of Letters Patent. Patented Apr. 13, 1920.

Application filed January 2, 1919. Serial No. 269,269.

To all whom it may concern:

Be it known that I, EDMUND M. BOND, a citizen of the United States of America, residing at Detroit, in the county of Wayne and State of Michigan, have invented certain new and useful Improvements in Starters for Internal-Combustion Engines, of which the following is a specification, reference being had therein to the accompanying drawings.

In my pending application for patent on a starter filed Nov. 13, 1917, Serial No. 201,736, there is disclosed a novel spring motor which may be readily employed to turn over or crank the driven shaft of an engine, and associated with the spring motor is a one-way clutch which will prevent the engine from injuring the spring motor or an operator after it has been started. Besides the one-way clutch there are shown novel means for controlling the operation of the spring motor, particularly means for placing the motor in active condition and means for releasing the motor so that it may start the engine.

The present invention includes two improvements, one of which may be considered as treadle actuated means for placing the spring motor in condition to operate the engine when necessary and the other is also treadle actuated to release the spring motor when it is necessary to start the engine, said motor releasing means preventing the spring motor from being injured by back fire of the engine or an excessive overrunning operation of the engine shaft.

The above improvements in connection with the starter will be hereinafter specifically described and then claimed, and reference will now be had to the drawing, wherein—

Figure 1 is a plan of a portion of an engine provided with the starter in accordance with my invention;

Fig. 2 is a side elevation of the same;

Fig. 3 is a perspective view of the treadle operating means for the spring motor;

Fig. 4 is a perspective view of the treadle operated releasing means for the spring motor, and

Fig. 5 is a cross sectional view of the spring motor showing a ratchet mechanism.

In the drawing, the reference numeral 1 denotes an engine supporting frame, as a vehicle chassis, and suitably mounted in said frame is an internal combustion engine 2 having the driven shaft 3 thereof provided with a one-way clutch 4 at its forward end, so that the engine shaft 3 may be cranked and started by hand in the usual manner. The one-way clutch 4 is of the ordinary and well known type and mounted thereon is a gear wheel 5, which forms part of my equipment for an engine that is already in use. Supported from the engine 2 are bearings 6 and 7 and loose in said bearings is a motor shaft or arbor 8 having one end thereof provided with a fixed gear wheel 9 meshing with an intermediate gear wheel 10 which in turn meshes with the clutch gear wheel 5, said intermediate gear wheel being supported from the bearing 7.

About the shaft or arbor 8 between the bearings 6 and 7, there is a coiled spring 11 and this spring when placed under tension, is adapted to have its expansive force start the engine 2. In order that this may be accomplished, one end portion of the spring is attached to a ratchet wheel 12 extending into a head or pulley 13, said ratchet wheel and pulley being loose relative to the shaft and also relative to each other. The ratchet wheel 12 is engaged by a gravity pawl 14 carried by a bracket 15 extending outwardly from the engine, said pawl and ratchet wheel holding one end of the spring while the same has its expansive force expended in rotating the shaft 8. At the opposite end convolution of the spring is a ratchet wheel 16 which is connected to the end convolution of the spring and also suitably connected to the shaft or arbor 8, and the ratchet wheel 16 is adapted to be held, as will be hereinafter explained while the spring 11 is placed under tension through the medium of the pulley 13.

Considering the starter in connection with the engine of an automobile, the foot board or floor of the automobile body is provided with a bracket or bearing 17, and pivotally connected thereto, as at 18, is a guide member 19 having notches 20 and an apertured lug 21 at the front side thereof. Slidable in the guide member 19 is a bar 22 and pivotally connected to the lower end of said bar, as at 23, is a dog 24 adapted to engage in the notches 20 of the guide member and hold the bar 22 in adjusted position relative to said guide member. The dog 24 is connected by a coiled retractile spring 25 to the apertured lug 21 of said guide member and the retractile force of

the spring 25 is adapted to hold the dog 24 normally in one of the notches 20 of said guide member, thus preventing the bar 22 from accidentally slipping or shifting relative to said guide member. The retractile spring will also lift the bar 22 when the dog 24 is retained out of engagement with said bar by slight foot pressure at the upper end thereof.

Connected to the lower end of the bar 22 is a cable or flexible connection 26 which extends forwardly and is trained over sheaves 27 suitably supported by the frame 1, said cable being connected to an eye bolt 46 of the pulley or head 13 so that said cable may be employed for rotating said pulley or head and placing the spring 11 under tension when one end thereof is held by the ratchet wheel 16. This is accomplished by providing the head 13 with an interior pawl 47 engaging the ratchet wheel 12 and connecting said eye bolt 46 by a coiled retractile spring 48 to the engine 2 or a suitable support.

Pivotally connected to the upper end of the bar 22 is a treadle 28, and pivotally connected to the lower face of said treadle is a depending somewhat flexible rod 29, said rod extending through the apertured lug 21 and a similar lug 30 carried by the dog 24. The end of the rod 29 is adapted to impinge upon the dog 24 and shift said dog out of engagement with the guide member 19, so that the bar 22 may be raised and lowered in said guide member. The raising and lowering of the bar 22 is accomplished by the foot on the treadle 28, and the release of said bar relative to the guide member 19 is accomplished by a light pressure on the upper end of the treadle 28 with the toe, such pressure being sufficient to withdraw the dog 24 without retarding the upward movement of the bar. Otherwise, the foot presses on the lower end of said treadle to bodily swing the bar 22 and its guide member relative to the bracket 17, thus actuating or pulling on the cable 26 to partially rotate the pulley or head 13 and place the spring 11 under tension.

The outer end of the bearing 6 is provided with a bracket 31 having apertured ears 32 and pivotally mounted between the apertured ears 32 is an adjustable member 33 which has a pivoted pawl 34 normally engaging the ratchet wheel 16. The pivotal connection between the member 33 and the pawl 34 is by a rule joint that limits the pivotal movement in one direction, said joint permitting of the connection being normally in a plane slightly below the plane common to the outer ends of the member and pawl, so that said joint will serve as a temporary lock or restraining device. Lending to this result is the action of a spring 45 on the end of the pivot pin of the joint, said spring restoring the joint to normal position when broken up.

The adjustable member 33 and its pawl 34 are normally in an approximate horizontal plane tangential to the periphery of the ratchet wheel 16 and the pivotal connection between said member and pawl may be adjusted to and from such horizontal plane by a set screw 35, carried by the member 33 and engaging the bracket 31 beneath said member. It is through the medium of this set screw that the pivotal connection between the adjustable member 33 and pawl 34 may be made more or less sensitive as a break-up joint. In other words, with the pawl 34 practically in alinement with the adjustable member 33 it will require some force by the ratchet wheel 16 to break up the adjustable member and its pawl so that the ratchet wheel 16 will be released by the pawl. With the pawl 34 at an obtuse angle relative to the adjustable member 33, it is possible for the ratchet wheel 16 to readily run under the pawl, and such pawl supporting means has been provided so that any back fire operation of the engine 2 will not injure the spring 11 but wind the spring and place it under greater tension.

The bracket 31 assists in supporting a bell crank 36 having a pin 37 extending through an opening 38 in the bracket 31 and connected to the adjustable member 33, so that when the bell crank 36 is rocked the adjustable member 33 may be actuated to raise the pawl 34 and release the ratchet wheel 16. Connected to the bell crank 36 is a rod 39 which extends rearwardly to another bell crank 40 having a treadle 41, the bell crank 40 being pivotally supported by any suitable means beneath the foot board or floor of the automobile body. The treadles 28 and 41 are located in proximity to each other, as shown in Fig. 1, so as to be convenient to the chauffeur or operator of the automobile.

Through the medium of the adjustable bar 22 the treadle 28 can be positioned for the convenience of an operator having a short or long limb but more particularly positioned whereby a desired degree of leverage can be obtained for placing the spring 11 under tension. This permits of a person of inferior strength easily operating the treadle. Assuming that this has been accomplished and that the pawl 14 is so holding the spring, it is only necessary for the operator to press on the treadle 41 when it is desired to utilize the expansive force of the spring 11 to start the engine 2. When the ratchet wheel 16 is released by the pawl 34, the spring 11, which is attached to said ratchet wheel revolves said wheel and the shaft 8, causing said shaft to turn over the engine shaft 3, through the medium of the train of gears 5, 10 and 9

at the forward end of the engine. Immediately upon the engine 2 picking up speed the one-way clutch 4 releases the train of gears relative to the engine shaft 3, thus allowing the spring motor to remain inactive, but should there be a back fire or counterclockwise rotation of the engine shaft 3, the break-up pawl 34 temporarily releases the ratchet wheel 16, thereby allowing the shaft 8 to freely revolve. The engine, during back fire, will increase the tension of the spring 11 and the pawl 34 will maintain such expansive force for future use. Repeated operations of the ratchet mechanism (elements 28, 26, 13, 12, 47 and 48) will wind the spring motor when run down, but this seldom occurs, as only a portion of the expansive force of the spring motor is expended at one time. Back firing is a factor of danger which seldom occurs and is not primarily depended on to wind the spring motor, but if such occurs, it is beneficial instead of detrimental.

What I claim is:—

The combination with an engine shaft, a spring motor shaft adapted for imparting movement to said engine shaft, and a spring adapted to have its retractile force impart movement to said motor shaft, of means adapted to hold and release said spring said means comprising a ratchet wheel, a break-up pawl engaging said ratchet wheel, means adapted for adjusting said break-up pawl relative to said ratchet wheel, and means adapted for actuating said pawl to release said ratchet wheel.

In testimony whereof I affix my signature in the presence of two witnesses.

EDMUND M. BOND.

Witnesses:

ANNA M. DORR,

KARL H. BUTLER.