

June 19, 1923.

1,459,358

A. E. BUCHENBERG

ENGINE STARTER

Filed April 14, 1919

2 Sheets-Sheet 1

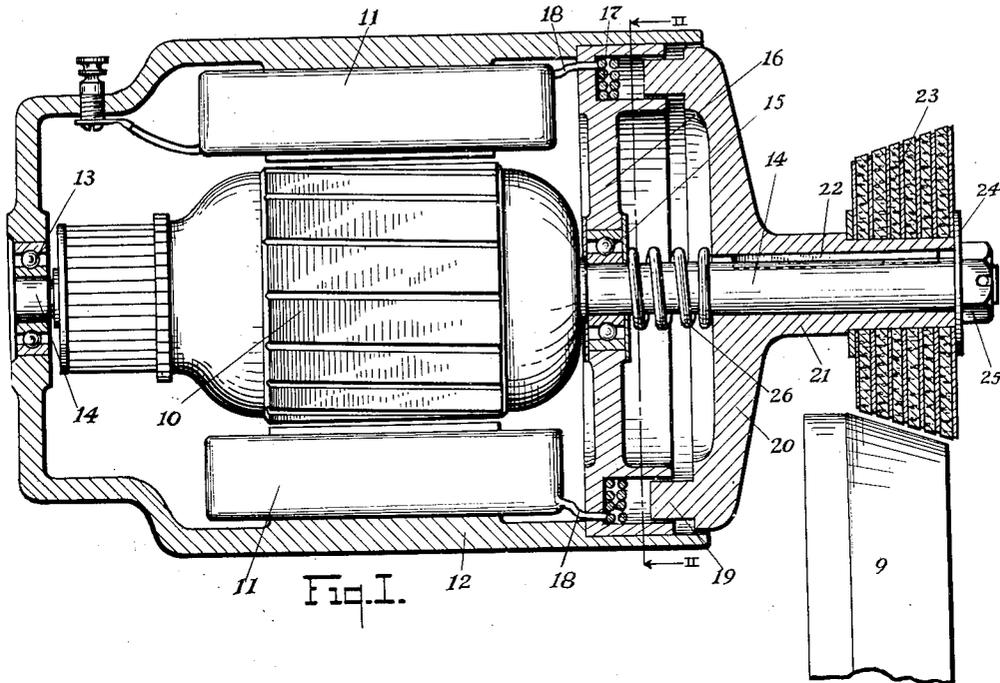


Fig. I.

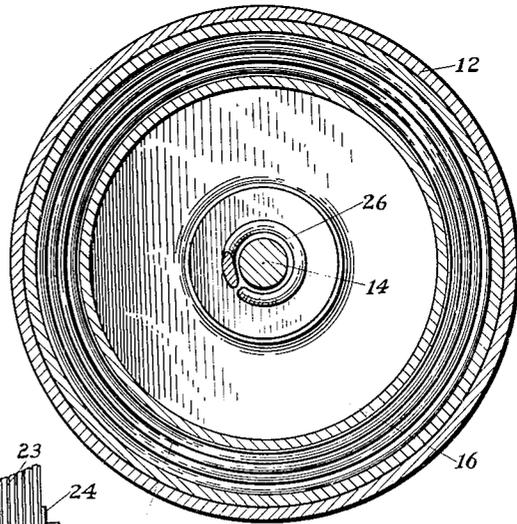


Fig. II.

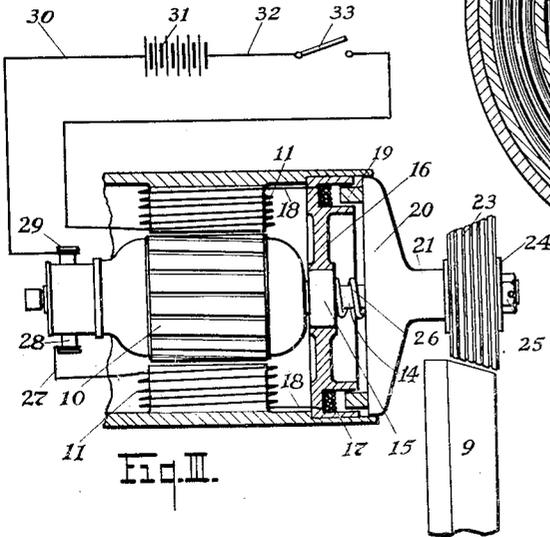


Fig. III.

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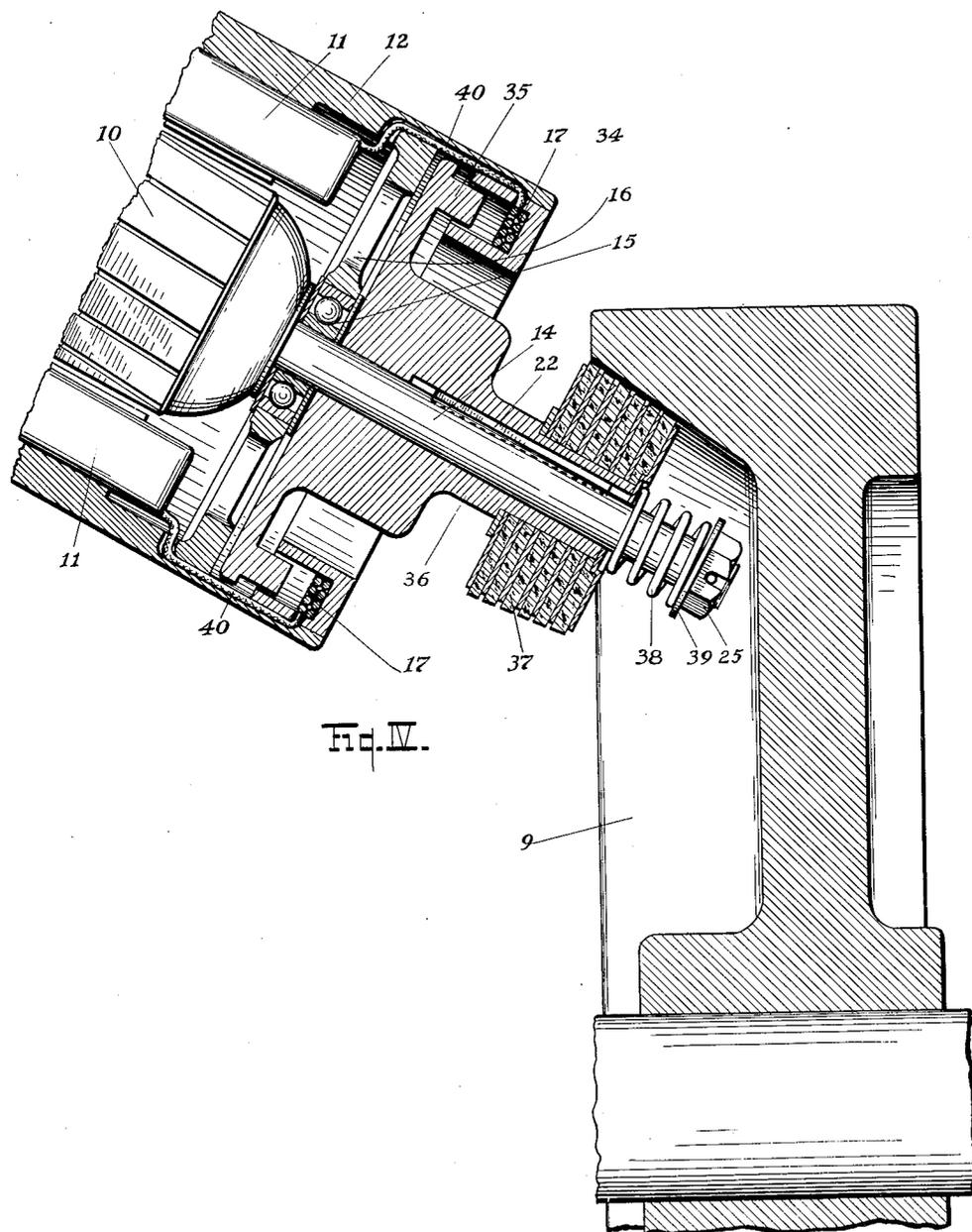


Fig. IV.

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UNITED STATES PATENT OFFICE.

ALVIN E. BUCHENBERG, OF TOLEDO, OHIO, ASSIGNOR TO INDUSTRIAL RESEARCH CORPORATION, OF TOLEDO, OHIO, A CORPORATION OF DELAWARE.

ENGINE STARTER.

Application filed April 14, 1919. Serial No. 289,950.

To all whom it may concern:

Be it known that I, ALVIN E. BUCHENBERG, a citizen of the United States, residing at Toledo, in the county of Lucas and State of Ohio, have invented certain new and useful Improvements in Engine Starters, of which I declare the following to be a full, clear, and exact description.

This invention relates to starters for gas engines, and consists principally in electromagnetic means for shifting the driving wheel into operative relation with the fly-wheel of the engine.

One of the objects of the invention is the provision of a driving wheel longitudinally slidable upon the shaft of the starting motor, together with electrical means for moving the driving wheel upon the shaft into operative relation with the fly-wheel of the engine.

Another object of the invention is the provision of electrical connections, such that the coil of the electro-magnet which moves the driving wheel, will be energized at the same time that current is sent into the electric starting motor, one switch being employed to accomplish the two purposes.

Another object is the provision of an armature upon which the driving wheel is mounted, said armature sliding back and forth upon the motor shaft and being so formed as to constitute substantially a closure for the end of the motor casing.

Other objects, and objects relating to details of construction and economies of manufacture, will appear as I proceed with the description of that embodiment of the invention, which, for the purposes of the present application, I have illustrated in the accompanying drawing, in which:

Figure I is a view partly in elevation and partly in vertical, longitudinal section, of a machine embodying my invention.

Fig. II is a cross section on the line II—II, Fig. I.

Fig. III is a view, largely diagrammatic, illustrating electrical connections which may be employed in carrying out my invention.

Fig. IV is a view, principally in section, showing a different modification of the invention.

Similar reference characters refer to like parts throughout the views.

The starting motor is preferably an elec-

tric motor, having a rotating armature 10 and field coils 11, the latter being supported upon a casing 12, which is closed at one end and provided therein with a bearing 13 for the armature shaft 14. The other bearing 15 is carried in a circular element 16 mounted in the opposite end of the casing.

In the modification shown in Figs. I, II and III, the circular element 16 is formed at its periphery into an annular shell, U shaped in cross section, which shell constitutes the magnetic path of an electro-magnet, having a coil 17 laid in the bottom of the shell. The coil 17 is preferably connected by means of wires 18 with the field coils 11 of the motor. The armature for the electro-magnet consists of an iron ring 19, which is carried by and is preferably integral with a circular disc 20, which is elongated at the middle to form a sleeve 21 capable of sliding movement upon the shaft 14, relative rotary motion between the two being prevented by means of a key 22. Since the parts 19, 20 and 21 are preferably all cast in one piece, they may be spoken of collectively as "the armature" and will be so referred to hereinafter. Fixed upon the outer end of the sleeve 21 is a drive wheel 23, which in the present instance I have illustrated as a series of friction discs clamped together and shaped to engage an inclined surface upon the fly-wheel 9 of the engine with which the invention is employed. This particular character of drive wheel is not to be considered essential to the invention in its broader aspect, but it is believed that the friction drive will be found to be particularly suited to the type of starter described herein and vice versa. Outward motion of the sleeve 21 upon the shaft is limited by a collar or washer 24, which is held in place by a nut 25 threaded upon the end of the shaft 14. A spring 26 tends to hold the armature out, or in the unattracted position.

The preferred electrical connections to be employed in my invention are illustrated diagrammatically in Fig. III. As explained heretofore, the magnet coil 17 is connected through wires 18 with the upper and lower field coils 11. The other end of the lower field coil 11 is connected by a wire 27 with a brush 28 of the motor, while from the other brush 29 a wire 30 leads to one terminal of a storage battery, or other suitable source of current, 31. From the opposite terminal 110

of the battery a wire 32 leads through a switch 33 back to the upper field coil 11, completing the circuit.

In the modification of Fig. IV, the electro-magnet consists of an annular shell 34 of the same cross-sectional form as that of the first modification, but open towards the interior of the motor instead of towards the outside thereof. The effect of the magnet upon the armature 35, therefore, is to shift it outwardly whenever the magnet is energized. The armature 35 has integral therewith a sleeve 36 which carries a drive wheel 37 and is prevented from rotating with respect to the shaft 14 by a key 22. A spring 38 mounted upon the shaft between the drive wheel 37 and a washer 39 tends to move the armature inwardly upon the shaft or into the unattracted position. In this modification the connecting wires 40 between the coil 17 and the field coils 11 are let into grooves in the inner surface of the motor casing.

The operation of the invention will be obvious from the foregoing description. When it is desired to start the engine to which the invention is attached, the switch 33 is closed causing an electric current to pass from the battery 31 through wire 30 and brush 29 into the armature of the motor, thence from brush 28 through wire 27, lower field coil 11 and wire 18 to the magnet coil 17, from the latter coil through upper field coil 11 and wire 32 containing switch 33, back to the battery. The magnet coil is therefore in series with the field coils and with the armature of the motor. Hence the electro-magnet acts to shift the drive wheel into engagement with the fly-wheel simultaneously with the starting of the electric motor. When the engine begins operation under its own power and the switch 33 is opened to stop the motor, current ceases to flow through coil 17, which therefore releases the armature, permitting it to be acted upon by the spring 26, or the spring 38, as the case may be, to shift the driving wheel out of contact with the fly-wheel.

Attention is called to the fact that in both modification of the invention, the parts are so designed that when the device is in operation very little frictional loss is encountered, the connection which holds the driving wheel in place being an electrical one rather than a mechanical one, and the armatures 19 and 35 respectively rotating without touching the sides of the electro-magnet.

I am aware that the particular embodiments of my invention described, and illustrated in the accompanying drawings, are susceptible of considerable variation without departing from the spirit thereof, and therefore I desire to claim my invention broadly, as well as specifically, as indicated by the appended claims.

I claim as my invention:

1. In combination with a motor shaft, a non-rotatable electro-magnet, a drive wheel adapted to engage and ride a driven element slidable upon said shaft and arranged to be positively rotated thereby, an armature for said magnet surrounding and slidable upon said shaft, said armature and drive wheel being rigidly connected, and means for energizing said electro-magnet and thereby moving said drive wheel longitudinally upon said shaft.

2. In combination with a motor shaft, a non-rotatable electro-magnet, an armature for said magnet slidable upon said shaft, and keyed to rotate therewith, and a drive wheel mounted directly upon said armature and adapted to engage a driven member, said wheel being wedged into operative relationship with said driven member upon the energization of the electro-magnet.

3. In combination, an electric motor including a motor shaft and a motor casing open at one end, an electro-magnet fixedly mounted at one end of said casing in said opening, an armature for said magnet surrounding said shaft and normally held away from said magnet, a drive wheel rotated by said shaft adapted to engage a member to be driven and operatively connected to slide with said armature upon the shaft, and means for energizing said electro-magnet and starting said motor.

4. In combination, a motor including a motor shaft and a motor casing open at one end, an annular electro-magnet arranged to fit snugly in the open end of said casing, a circular armature for said magnet surrounding said shaft and normally held away from said magnet, a drive wheel rotated by said shaft adapted to engage a driven member and operatively connected to slide with said armature upon the shaft, and means for energizing said electro-magnet.

5. In combination, a motor including a motor shaft and a cylindrical motor casing open at one end, an annular electromagnet mounted in the open end of said casing, an armature for said magnet slidable upon said shaft and keyed to rotate therewith, and a drive wheel adapted to engage a driven member fixed to said armature.

6. In combination, a motor including a motor shaft and a cylindrical motor casing open at one end, an annular electro-magnet fixedly mounted in said open end of said casing, an armature for said magnet slidable upon said shaft and arranged to rotate therewith, said armature constituting a closure for the end of said casing, and a drive wheel adapted to engage a member to be driven fixed to said armature.

7. In combination, a motor including a motor shaft and a motor casing, a bearing for said shaft, a support for said bearing,

an annular electro-magnet carried by said support and fitting snugly within the periphery of said casing, an armature for said electro-magnet surrounding said shaft, a drive wheel rotated by said shaft adapted to engage a driven member and operatively connected to slide with said armature upon the shaft, and means for energizing said electro-magnet.

8. In combination, a motor including a motor shaft and a motor casing open at one end, an annular electro-magnet fixedly mounted in the open end of said casing, said magnet having a core U-shaped in cross section with the legs of the U directed toward the said open end, a drive wheel slidable on, but non-rotatable with respect to said shaft, and a disk surrounding said shaft and connected to said wheel to slide therewith, said disk having an annular projection of magnetically active material adapted to slide between the legs of the U-shaped magnet core.

In testimony whereof, I affix my signature.

ALVIN E. BUCHENBERG.