J. A. BEIRNS.

ELECTRIC STARTER.

APPLICATION FILED APR. 26, 1916.

1,282,172.

Patented Oct. 22, 1918.

3 SHEETS—SHEET 1.

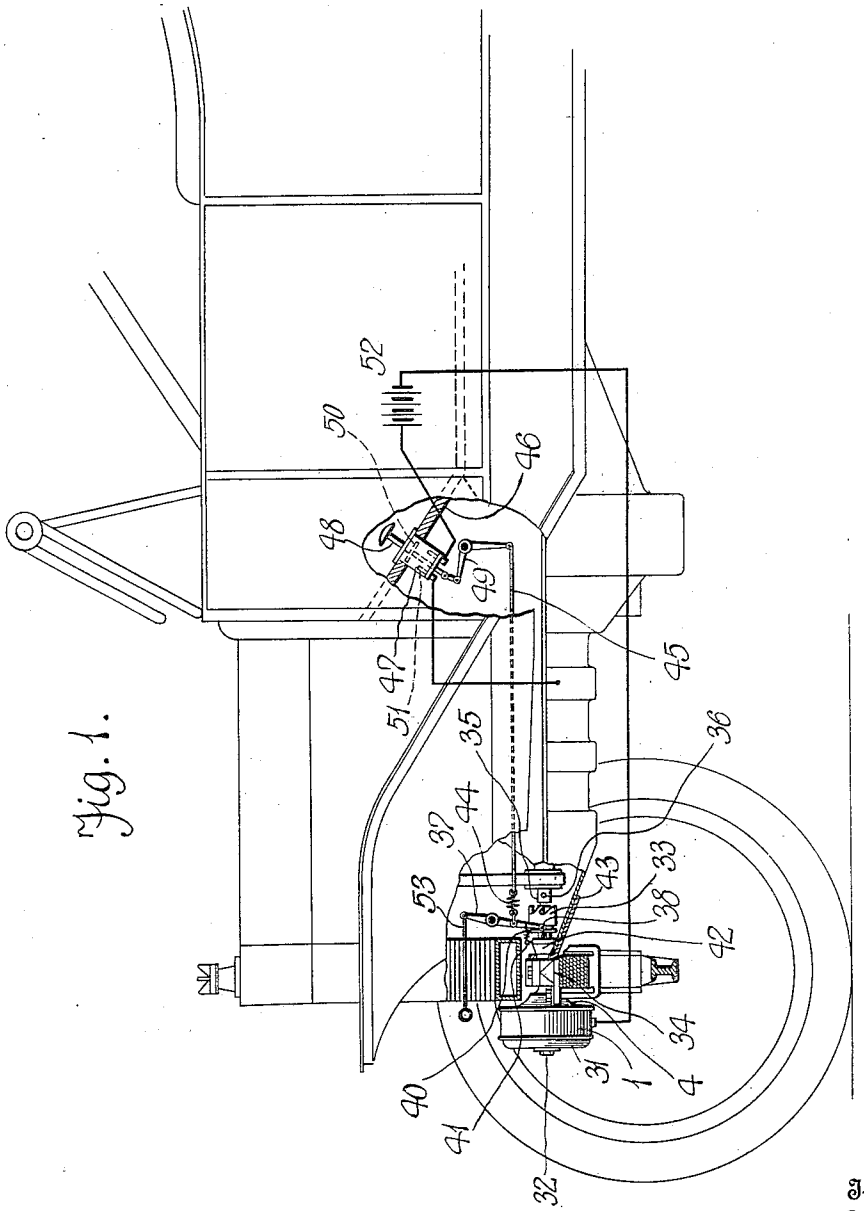


Fig. 1.

Witness

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3 SHEETS—SHEET 2.

Fig. 2.

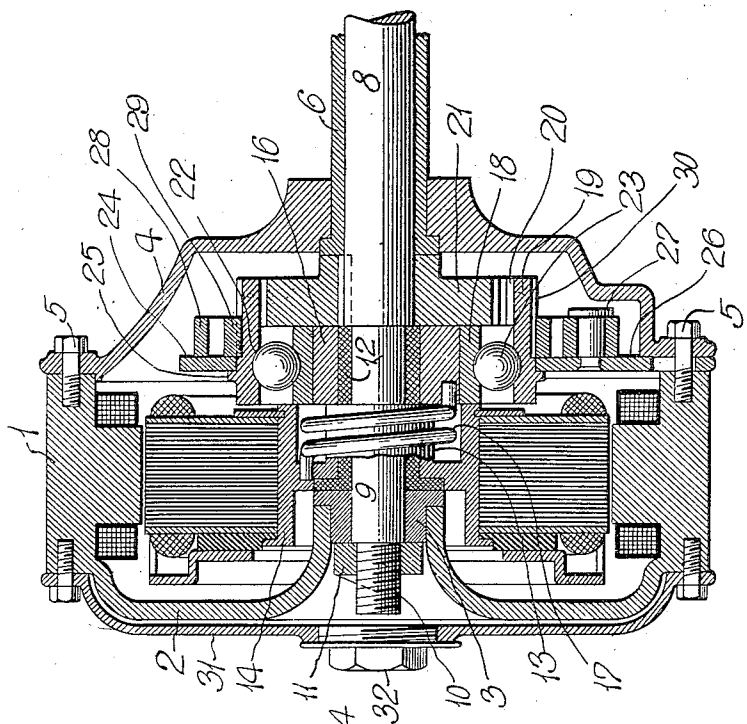
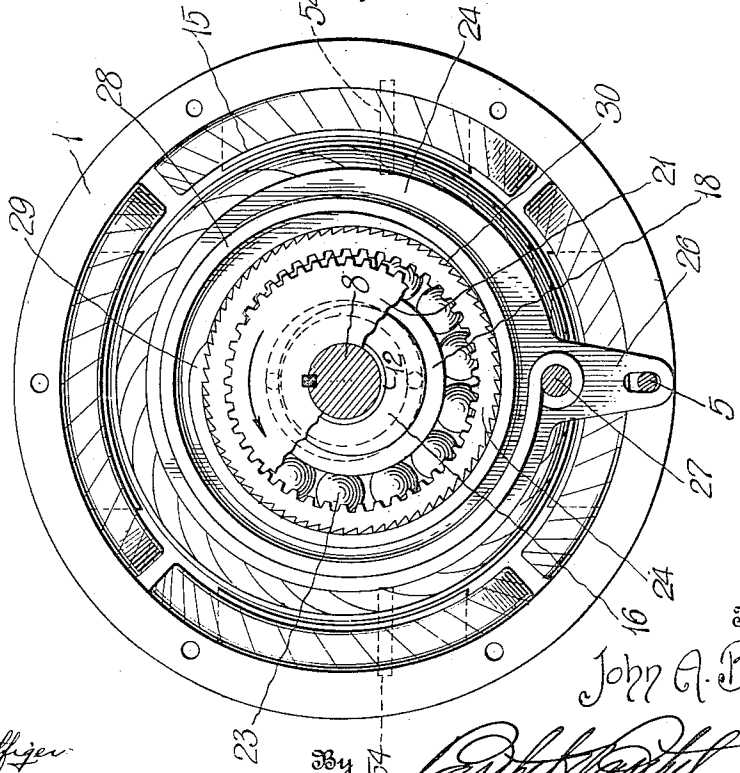


Fig. 3.



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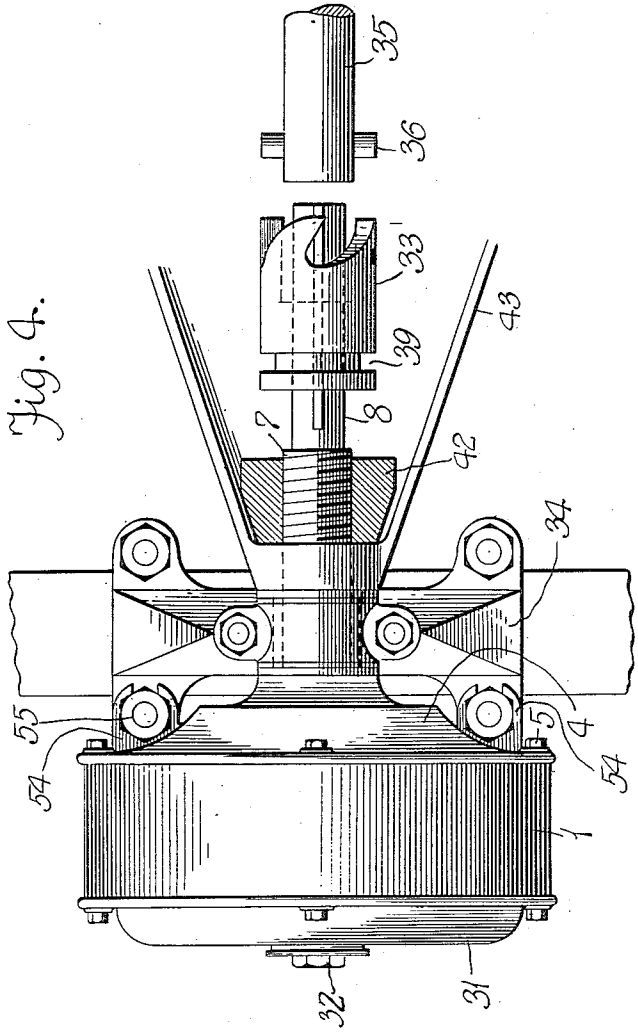
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3 SHEETS—SHEET 3.

Fig. 4.



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UNITED STATES PATENT OFFICE.

JOHN A. BEIRNS, OF DETROIT, MICHIGAN.

ELECTRIC STARTER.

1,282,172. Specification of Letters Patent. Patented Oct. 22, 1918.

Application filed April 26, 1916. Serial No. 93,701.

To all whom it may concern:

Be it known that I, JOHN A. BEIRNS, 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 Electric Starters, of which the following is a specification, reference being had therein to the accompanying drawings.

This invention relates to an electric starter for automobiles, and more particularly to an electrical device which may be advantageously used for starting a multi-cylinder explosive engine without any danger of back firing injuring the device or a person in the vicinity of the same.

The primary object of my invention is to provide an electric starter of the above type wherein positive and reliable means are employed, in a manner hereinafter set forth, to compensate for sudden jars or shocks incurred when placing the starter in operation and transmitting the power thereof to an engine shaft, such shocks often resulting in broken or strained connections detrimental and defeating the purpose of easily starting an engine.

Another object of my invention is to provide an electric starter embodying a planetary eccentric gear, which not only constitutes a reduction gear but constitutes a yieldable connection between a rotary armature and a starter shaft, and a novel overrunning clutch permits of this same starter shaft being manually operated for turning over an engine shaft when necessary.

A further object of my invention is to provide an electric starter for automobiles that is applicable to various types of machines and is composed of compact, durable, inexpensive and easily assembled parts.

The above and other objects are attached by a mechanical construction that will be hereinafter described and then claimed, and reference will now be had to the drawings, wherein

Figure 1 is a side elevation of the electric starting device as applied to an automobile;

Fig. 2 is an enlarged longitudinal sectional view of the starting device;

Fig. 3 is an end view of a portion of the same, partly broken away and partly in section, and

Fig. 4 is a plan of the starting device illustrating its relation to a support and engine shaft.

In describing my invention by aid of the views above referred to I desire to point out that the same are intended as merely illustrative of an example whereby my invention may be applied in practice, and I do not care to confine my invention to the precise construction and arrangement of parts shown. The following description is therefore to be broadly construed as including substitute constructions and arrangement of parts which are the obvious equivalent of those to be hereinafter referred to.

In the drawing, 1 denotes a cylindrical casing provided with an integral spider 2 supporting a bearing or bushing 3 concentrically of the casing 1.

4 denotes a closure plate connected to the rear end of the casing 1 by screw bolts 5 or other fastening means, said closure plate constituting an offset rear wall for the casing and concentrically of said closure plate there is a supporting sleeve 6 which has the outer end thereof screwthreaded, as at 7.

8 denotes a starter shaft journaled in the sleeve 6 and having the inner end thereof provided with reduced portions 9 and 10, the latter being screwthreaded. The reduced portion 9 is journaled in the bushing or bearing 3, and the threaded reduced end 10 of the starter shaft is provided with a clutch member 11 whereby an ordinary hand operated starting crank may be applied to the end of the starter shaft for manually turning the same.

12 denotes a bushing on the reduced portion 9 of the starter shaft abutting the bearing or bushing 3 and revoluble on the bushing 12 is the hub 13 of an armature 14. This armature is of a conventional form including armature plates, windings, commutator and suitable insulation. The armature is concentric of the magnetic field carried by the casing 1 composed of pole pieces 15.

16 denotes an eccentric loose on the bushing 12 abutting the hub 13 of the armature 14, and encircling the hub 13 of the

armature is a coiled spring 17, having one end thereof mounted in the end of the eccentric 16 and the other end thereof connected to the armature 14, as best shown in Fig. 2, said spring constituting a yieldable connection between the driving armature 14 and the eccentric 16.

18 denotes a race member loose on the eccentric 16 and surrounding the race member 18 is the outer member 19 of a planetary eccentric gear having an internal rack 20 meshing with a pinion 21 keyed or otherwise fixed upon the starter shaft 8. The outer member 19 of the planetary eccentric gear affords an outer race 22 and between this race and the race member 18 there are anti-frictional bearings 23 either of the ball or roller type.

24 denotes a ring loosely mounted upon the outer member 19 against an annular shoulder 25 thereof and said ring has a radial slotted arm 26 loosely held by one of the screw bolts 5 connecting the closure plate 4 to the casing 1. Connected to the ring 24, by a stud 27 or other fastening means is one end of a spiral band spring 28 encircling the outer planetary gear member 19, said spring having the opposite end thereof provided with ratchet teeth 29 to engage ratchet teeth 30 on the periphery of the member 18.

31 denotes a cap connected to the outer end of the casing 1 and said cap has a central detachable plug 32 which may be removed when it is desired to place a hand crank in engagement with the clutch member 11 on the end of the starter shaft 8.

33 denotes a clutch member slidably mounted or keyed upon the inner end of the starter shaft 8 for rotative continuity therewith, and as illustrating an installation of the electric starting device relative to an automobile, reference will now be had to Figs. 1 and 4.

34 denotes the front end bearing of an automobile spring and the usual crank starting shaft is removed and the sleeve 3 substituted therefor with the end of the starter shaft 8 confronting and alining with the engine shaft 35 of the automobile, to permit of the clutch member 33 being slipped into engagement with the usual cross pin or cross member 36 carried by the end of the engine shaft. To prevent the motor casing 1 and its appurtenant parts from turning about the starter shaft 8, the closure plate 4 has lugs 64 held by the fastening means 65 associated with the front end bearing 34.

To shift the clutch member 33 into engagement with the end of the engine shaft, a lever 37 is suitably supported above the inner end of the starter shaft 8 and said lever has a yoke 38 extending into an annular groove 39 in the clutch member 33 to permit of such clutch member being moved longitudinally of the starter shaft 8 during the rotation thereof. The lower end of the lever 37 is also connected by a coiled retractile spring 40 to a screw eye or cotter pin 41 holding a nut 42 in locked engagement with the threaded portion 7 of the sleeve 3, said nut preventing longitudinal displacement of the sleeve 3 relative to the front end bearing 34 and the end of an engine crank case 43.

The lower end of the bell crank 37 is furthermore connected to a coiled spring 44 and said spring is connected to a rod 45 extending rearwardly to a point beneath the foot board 46 of the automobile. The foot board 46 has a treadle switch 47 including a push rod 48 connected to a bell crank 49 pivoted below the foot board 46, said bell crank being connected to the rear end of the rod 45. The push rod 48 has a contact member 50 adapted to engage contacts 51 and establish an electrical circuit. One of the contacts 51 has been illustrated as grounded by a connection to the engine crank case 43 and the other contact has been illustrated as connected to a suitable source of electrical energy 52 which supplies the motor within the casing 1.

In operation, an initial pressure upon the push rod 48 actuates the bell crank 49 and lever 37 to shift the clutch member 33 into engagement with the engine shaft 35, and a further movement of the push rod 48 establishes a closed circuit for the motor within the casing 1. As this electric motor is started and the armature 14 revolves, the coiled spring 17 between the armature 14 and the eccentric 16 prevents a sudden start of the armature from effecting a movement of the eccentric 16 and as this eccentric is primarily employed for retaining the outer member 19 of the planetary eccentric gear in mesh with the inner pinion member 21, the outer member 19 will gradually take up the inner member and rotate the same at a reduced speed relative to the armature 14. The spiral band spring 28 coöperates with the eccentric 16 in retaining the outer member of the planetary eccentric gear in engagement with the inner pinion member, and when the speed of the engine shaft 35 exceeds that of the starter shaft 8, the outer member 19 will be actuated by the inner pinion member 21 and the toothed end of the spiral band spring 28 will recede over the ratchet piece on the periphery of the outer member.

Any stresses or strains between the driven armature 14 and the starter shaft 8 are further taken up by the anti-frictional bearing between the planetary eccentric gear and the eccentric.

The antifrictional bearings, either of the roller or ball type, will avoid a thrust that

may tend to strip the internal rack or pinion of teeth and with the antifrictional bearings coöperating with the springs 17, it is practically impossible for the motor to injure connections with the engine shaft when suddenly started.

In order that the clutch member 33 may be shifted into engagement with the engine shaft 35 when it is desired to manually start the engine, the upper end of the lever 37 is provided with a pull rod 53 extending through the radiator of the automobile. This rod may be pulled upon to shift the clutch member 33 and said rod held while the starter shaft is manually rotated.

What I claim is:—

1. In an electric starter, the combination with an engine shaft, a starter shaft, and means adapted for coupling said starter shaft to said engine shaft, of a motor having a revoluble armature, a planetary eccentric gearing actuated by the motor armature for imparting movement to said starter shaft, and a yieldable connection between the motor armature and said planetary eccentric gearing.

2. In an electric starter, the combination with an engine shaft, a starter shaft, and means adapted for coupling said starter shaft to said engine shaft, of a motor for imparting a rotary movement to said starter shaft, an eccentric on said starter shaft and having a yieldable drive connection with the armature of said motor, and a planetary eccentric gearing actuated by said eccentric and adapted to impart movement to said starter shaft.

3. In an electric starter, the combination with an engine shaft, a starter shaft, and a means for coupling said starter shaft to said engine shaft, of an electric motor having a revoluble armature, an eccentric on said starter shaft having a yieldable drive connection with the armature of said motor, a planetary eccentric gearing actuated by said eccentric and adapted to impart movement to said starter shaft, and anti-frictional bearings between said eccentric and said planetary eccentric gearing.

4. In an electric starter, the combination with an engine shaft, a starter shaft, and means adapted for coupling said starter shaft to said engine shaft, of a motor casing at the outer end of said starter shaft, a revoluble armature within said motor casing, an eccentric on said starter shaft within said casing and having a yieldable drive connection with said armature, and a planetary eccentric gearing actuated by said eccentric and adapted to impart movement to said starter shaft.

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

JOHN A. BEIRNS.

Witnesses:
ANNA M. DORR,
KARL H. BUTLER.