B. F. HUTCHES, JR.

ELECTROMOTOR.

APPLICATION FILED MAY 19, 1910.

1,013,494 Patented Jan. 2. 1912.

Fig. 1.

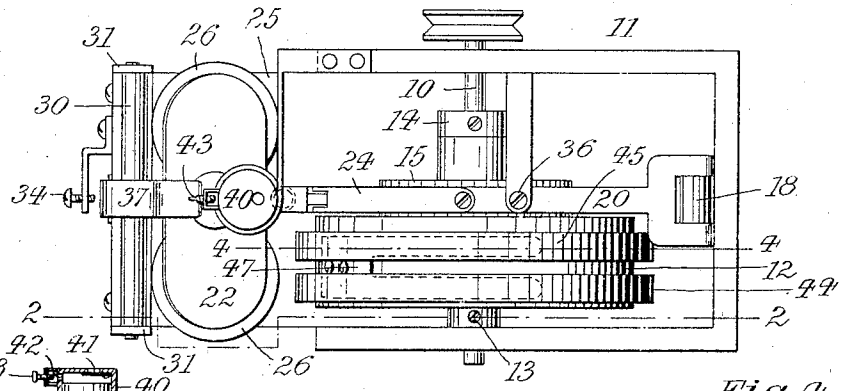


Fig. 2.

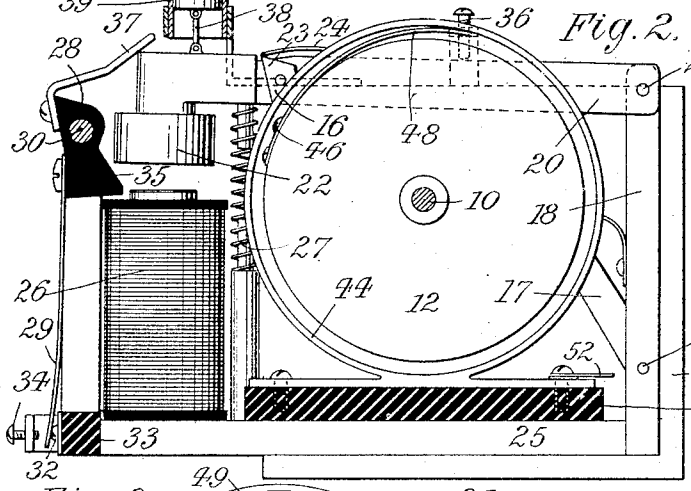


Fig. 4.

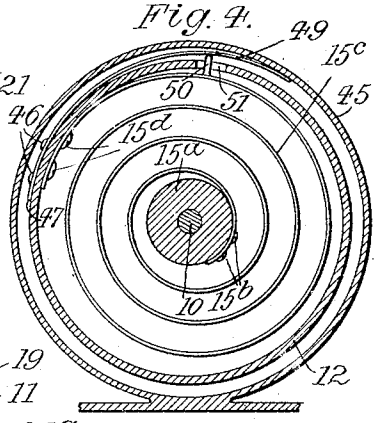


Fig. 3.

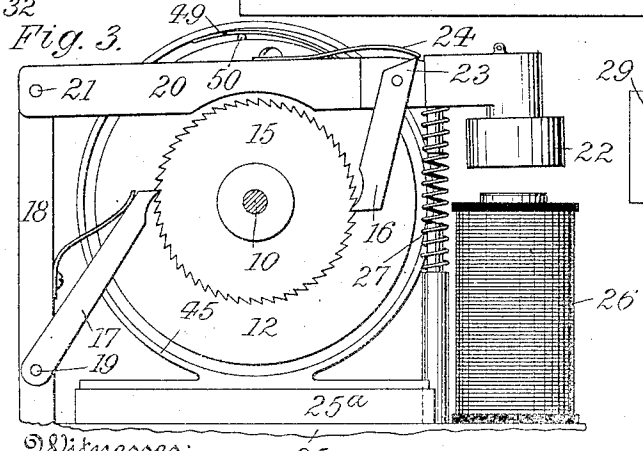


Fig. 6.

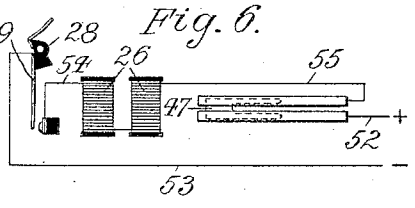
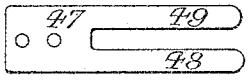


Fig. 5.



Witnesses:
Katherine Koch
Daniel Holmgr

Inventor
Benjamin F. Hutches Jr.,
By his Attorneys
Bakewell & Jones

UNITED STATES PATENT OFFICE.

BENJAMIN F. HUTCHES, JR., OF ALLENDALE, NEW JERSEY.

ELECTROMOTOR.

1,013,494. Specification of Letters Patent. Patented Jan. 2, 1912.

Application filed May 19, 1910. Serial No. 562,128.

To all whom it may concern:

Be it known that I, BENJAMIN F. HUTCHES, Jr., a citizen of the United States, residing at Allendale, county of Bergen, State of New Jersey, have invented new and useful Improvements in Electromotors, of which the following is a specification.

This invention relates to an electromotor of novel construction which is more particularly designed to develop high power at a comparatively low speed. For this purpose, the vibrations of the armature of an electromagnet are utilized to advance a suitably constructed wheel which in turn transmits motion to the motor shaft by means of an interposed spring, acting as a compensator.

The invention also comprises novel means for controlling the velocity of the armature-vibrations and for breaking the circuit of the electromagnet in such a manner that sparking is reduced to a minimum.

Finally my invention includes means for preventing any overloading of the electromotor by automatically cutting-off the electric current in case the load exceeds the power for which the motor is intended, so that waste of electric energy is avoided, while overheating of the electromagnets is prevented.

In the accompanying drawing: Figure 1 is a plan of my improved electromotor, Fig. 2 a vertical longitudinal section on line 2—2, Fig. 1, Fig. 3 a rear view partly broken away of the motor, Fig. 4 a vertical section on line 4—4, Fig. 1, Fig. 5 a detail of the circuit-controlling spring, and Fig. 6 a wiring diagram.

The power shaft 10 of the electromotor is journaled in a suitable frame 11 and carries a spring barrel 12 secured to said shaft by a screw 13 or otherwise. Intermediate barrel 12 and a fixed collar 14, there is loosely mounted on shaft 10 a ratchet wheel 15. To the hub 15^a of wheel 15, is secured at 15^b one end of a coiled spring 15^c the other end of which is connected to barrel 12 at 15^d. Ratchet wheel 15 is adapted to be intermittently advanced by means of a pawl 16, while its return movement is prevented by a spring-influenced detent 17, pivoted to a standard 18 as at 19. Pawl 16 is fulcrumed to a lever 20 pivoted at 21 to standard 18 and carrying at its free end a magnetizable armature 22. The heel 23 of pawl 16 is engaged by a spring 24 which tends to hold said pawl in operative engagement with ratchet wheel 15. Below armature 22, there are mounted upon a suitable base plate 25 a pair of electromagnets 26 which, when energized, will lower lever 20 together with pawl 16 to advance ratchet wheel 15 for the length of one tooth. Lever 20 is influenced by a spring 27 which tends to maintain the lever in its raised position.

Electromagnets 26 are intermittently energized by means of an interrupter which is shown to consist of an insulating block 28 provided with a downwardly extending contact spring or tongue 29. Block 28 is secured to a spindle 30 which is supported by bearings 31 in such a manner that it will maintain any position to which it has been set. Tongue 29 is adapted to engage a contact button 32 secured to an insulator 33, while the play of the spring may be regulated by an adjusting screw 34. When spring 29 engages button 32, an electric circuit is closed which energizes electromagnets 26 to attract armature 22. This armature while descending, impinges against an inclined section or lower abutment 35 of block 28 so as to tilt the latter and swing spring 29 away from button 32, thereby interrupting the electric current previously flowing through electromagnets 26. After the electromagnets have thus become deenergized, spring 27 is free to raise lever 20 until it abuts against an adjusting screw 36. During the last stage of its ascent, lever 20 engages a bent arm or upper abutment 37 extending upwardly from block 28, thereby slightly tilting the block and thus returning contact spring 29 to the position shown in Fig. 2. In this way, electromagnets 26 become again energized and the operation described will be repeated. It will be seen that by the above construction, the interrupter is forced to dwell at the terminals of its oscillative movement, so that a proper and distinct energizing and deënergizing of the electromagnets can take place. In order to regulate the speed of armature 22 during its upward movement, a dash pot or other brake may be provided. As shown, lever 20 is by link 38 connected to a piston 39 playing in a cylinder 40. During the descent of lever 20, air has free access to cylinder 40 through a downwardly opening flap valve 41, while during the ascent of the lever, the air es-

capes through a vent 42, the area of which may be controlled by a regulating screw 43. By properly setting this screw, the speed and consequently the number of oscillations of armature 22 in a certain time may be regulated.

It will be seen that by the construction described, the interrupter may be set to any desired speed while at the same time sparking is reduced to a minimum. As abutment 35 is engaged only during the last stage of the downward movement of the armature to tilt block 28, and as furthermore the length of spring 29 considerably exceeds the leverage of abutment 35, a quick and positive movement is imparted to the spring when opening the circuit. In this way, any lingering of the contact spring opposite button 32 is prevented so that the formation of electric arcs is obviated. Furthermore the electromagnets have ample time to recover during the up-stroke of the armature so that upon their subsequent reënergizing, a powerful impetus is imparted to the latter. By interpolating the coiled spring 15^c between ratchet wheel 15 and shaft 10, the energy developed by armature 22 is partly stored in said spring so that a uniform rotation of shaft 10 is obtained irrespective of the step-like movement of ratchet wheel 15. Spring 15^c has the additional function of breaking the circuit in case the motor should become overloaded, thus economizing energy. For this purpose, barrel 12 is loosely encircled by a pair of spaced rings or contact members 44, 45 rigidly secured to an insulating plate 25^a which is in turn secured to base plate 25. To barrel 12, there is fastened at 46 a forked contact spring 47, having resilient legs 48, 49 that are arranged opposite rings 44, 45 respectively. Leg 48 is so bent as to be maintained in permanent contact with ring 44, while leg 49 has the tendency to recede from ring 45. In order to temporarily force leg 49 against ring 45 and thereby close the electric circuit, there is interposed between the outermost convolute of spring 15^c and leg 49 a spacing pin 50. This pin is shown to be secured to spring 15^c and passes through a perforation 51 of barrel 12. Ring 44 is by wire 52 connected to one pole of a suitable source of electricity, the other pole of which is, by wire 53 connected to spring 29. Button 32 is by wire 54, connected to electromagnets 26, while the latter are by wire 55, connected to ring 45.

It will be seen that during the normal operation of the motor, the current flows through ring 44, spring 47, ring 45, wire 55, electromagnets 26, wire 54, button 32 and spring 29, which circuit is alternately closed and broken owing to the oscillation of armature 22 as hereinabove described. This oscillation of the armature is utilized for rotating shaft 10, whereby the speed of said shaft may be controlled by adjusting screw 43. During this operation, spring 15^c is partly coiled around hub 15^a to equalize the intermittent impulses imparted to ratchet wheel 15. It is evident that the greater the power, which is transmitted through spring 15^c and shaft 10, the more closely the spring will be wound around hub 15^a of ratchet wheel 15, until finally pin 50 is retracted from leg 49 of spring 47. Leg 49 is thus free to recede from ring 45 thereby breaking the current previously flowing through electromagnets 26. The parts will remain in this inoperative position until the load coupled to shaft 10 has been reduced, so that during the non-working of the device no current will flow through the same, thus economizing electric energy and preventing any undue heating of the electro-magnets. By properly dimensioning pin 50, the motor may be set to any maximum load and if this load is exceeded, the motor will be automatically arrested, while the energy previously stored in spring 15^c will remain stored during the time the motor remains inoperative.

Although my improved means for alternately opening and closing the circuit through electro-magnets 26 to oscillate their armature, and also the means for regulating the speed of such oscillations have been shown in connection with an electromotor, it is obvious that these means may also be applied to other contrivances which depend upon the alternating closing and opening of electric circuits, such as sparkers for automobiles, coherers for wireless telegraphy, and similar devices.

I claim:

1. In a device of the character described, an electromagnet, an armature controlled thereby, a movable contact, an upper abutment and a lower abutment secured thereto, both of said abutments being adapted to be engaged by the armature, and a fixed contact adapted to be engaged by the movable contact.

2. In a device of the character described, an electromagnet, a spring-influenced armature controlled thereby, an oscillative contact-spring, an upper abutment and a lower abutment secured thereto, both of said abutments being adapted to be engaged by the armature, and a fixed contact adapted to be engaged by the contact-spring.

3. In a device of the character described, an electromagnet, an armature controlled thereby, a pivoted insulating block having a lower abutment and an upper abutment, both of said abutments being adapted to be engaged by the armature, a tongue depending from the block, and a contact and an adjusting screw adapted to be alternately engaged by the tongue.

4. In a device of the character described,

a frame, an electromagnet, an armature controlled thereby, a spindle hung in the frame, an insulating block carried by said spindle and having a lower abutment and an upper abutment, both of said abutments being adapted to be engaged by the armature, a tongue depending from the block, and a contact and an adjusting screw adapted to be alternately engaged by the tongue.

5. In a device of the character described, a barrel, a coiled spring inclosed therein, a pair of conductive rings encircling the barrel, and means controlled by the spring for establishing and interrupting electric communication between said rings.

6. In a device of the character described, a barrel, a coiled spring inclosed therein, a pair of conductive rings encircling the barrel, a forked spring secured to the barrel and adapted to conductively connect both rings, and means controlled by the coiled spring for displacing the forked spring.

7. In a device of the character described, a barrel, a coiled first spring inclosed therein, a pair of conductive rings encircling the barrel, a second spring secured to the barrel and having a pair of legs which are adapted to engage the rings, and a pin adapted to operatively connect the coiled spring with one of said legs.

BENJAMIN F. HUTCHES, JR.

Witnesses:

FRANK V. BRIESEN,

ARTHUR E. ZUMPE.