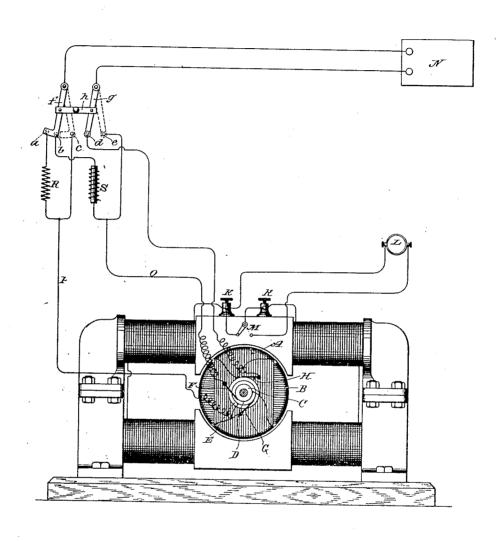
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(No Model.)

N. TESLA. ELECTRO MAGNETIC MOTOR.

No. 418,248.

Patented Dec. 31, 1889.



Witnesses: Happael Netter Robt F. Gay lord

Inventor Nikola Ilsla By Duneau Centes Hago Attorneyo

UNITED STATES PATENT OFFICE.

NIKOLA TESLA, OF NEW YORK, N. Y., ASSIGNOR TO THE TESLA ELECTRIC COMPANY, OF SAME PLACE.

ELECTRO-MAGNETIC MOTOR.

SPECIFICATION forming part of Letters Patent No. 418,248, dated December 31, 1889. Application filed May 20, 1889. Berial No. 311,420. (No model.)

To all whom it may concern:

Be it known that I, NIKOLA TESLA, a subject of the Emperor of Austria-Hungary, formerly of Smiljan, Lika, border country of Austria-Hungary, but now residing at New York, in the county and State of New York, have invented certain new and useful Improvements in Methods of Operating Electro-Magnetic Motors, of which the following is a speci-10 fication, reference being had to the drawing accompanying and forming a part of the same.

In a patent granted to me April 16, 1889, No. 401,520, I have shown and described a method of operating alternating-current motors by first shifting or rotating their magnetic poles until they had reached or passed a synchronous speed and then alternating the poles, or, in other words, by transforming the motor by a change of circuit-connections from 20 one operated by the action of two or more independent energizing-currents to a motor operated by a single current or several acting

The present invention is a specific way of 25 carrying out the same invention; and it consists in the following method: On the start I progressively shift the magnetic poles of one element or field of the motor by alternating currents differing in phase as passed through 30 independent energizing-circuits and shortcircuit the coils of the other element. When the motor thus started reaches or passes the limit of speed synchronous with the generator, I connect up the coils previously short-35 circuited with a source of direct current and by a change of the circuit-connections produce a simple alternation of the poles.

motor then continues to run in synchronism with the generator. There are many specific-40 ally-different ways in which this may be carried out, but I have selected one for illustrating the principle. This is illustrated in the annexed drawing, which is a side view of a motor with a diagram of the circuits and de-45 vices used in the system.

The motor shown is one of the ordinary forms, with field-cores either laminated or solid and with a cylindrical laminated armature wound, for example, with the coils A B 50 at right angles. The shaft of the armature carries three collecting or contact rings C D

E. (Shown, for better illustration, as of dif-

ferent diameters.) One end of coil A connects to one ring, as. and one end of coil B connects with ring D. 55 The remaining ends are connected to ring E. Collecting springs or brushes F G H bear upon the rings and lead to the contacts of a switch, to be hereinafter described. The fieldcoils have their terminals in binding-posts K 60 K, and may be either closed upon themselves or connected with a source of direct current L by means of a switch M. The main or controlling switch has five contacts a b c d e and two levers fg, pivoted and connected by an 65insulating cross-bar h, so as to move in parallelism. These levers are connected to the line-wires from a source of alternating cur-Contact a is connected to brush G and coil B through a dead-resistance R and 70 wire P. Contact b is connected with brush F and coil A through a self-induction coil S and wire O. Contacts c and e are connected to brushes G F, respectively, through the wires P O, and contact d is directly connected with 75 brush H. The lever f has a widened end, which may span the contacts a b. When in such position and with lever g on contact d, the alternating currents divide between the two motor-coils, and by reason of their dif- 80 ferent self-induction a difference of currentphase is obtained that starts the motor in ro-In starting, as I have above stated, the field-coils are short-circuited.

When the motor has attained the desired 85 speed, the switch is shifted to the position shown in dotted lines-that is to say, with the levers fg resting on points ce. This connects up the two armsture-coils in series, and the motor will then wan as a synchronous motor. 90 The field-coils are thrown into circuit with the direct-current source when the main switch is shifted.

What I claim herein as my invention is-1. The method of operating electro-mag- 95 netic motors, which consists in first progressively shifting or rotating the magnetic poles of one element until it has reached a synchmonous speed and then alternating said poles and passing a direct current through the coils 1cc of the other element, as herein set forth.

2. The method of operating electro-mag-

netic motors, which consists in short-circuiting the coils of one element, as the field-magnet, and passing through the energizing coils of the other element, as the armature alternating currents differing in phase, and then when the motor has attained a given speed, passing through the field-coils a direct currents.

Tent and through the armature-coils alternating currents coinciding in phase.

NIKOLA TESLA.

Witnesses:

R. J. Stoney, Jr.,
E. P. Coffin.