(No Model.)

M. HUTIN & M. LEBLANC.

ALTERNATING CURRENT MOTOR.

No. 536,032. Patented Mar. 19, 1895.

Fig. 1.

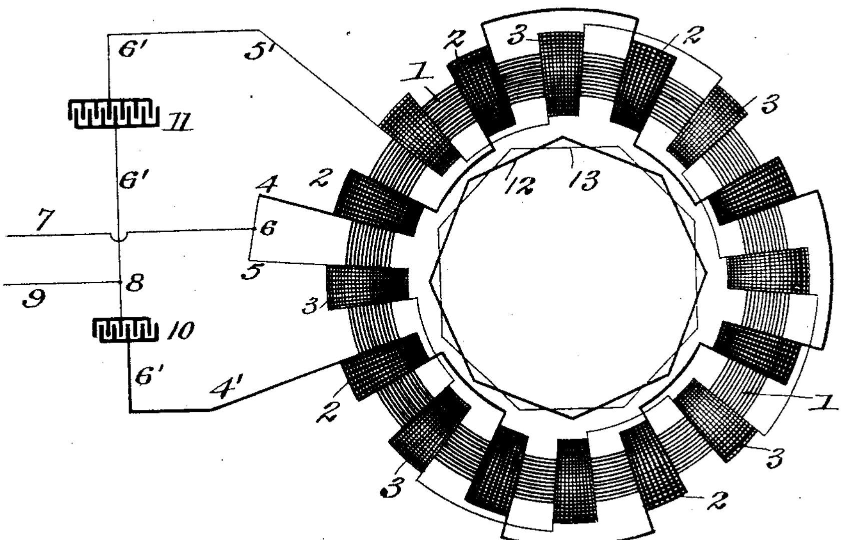
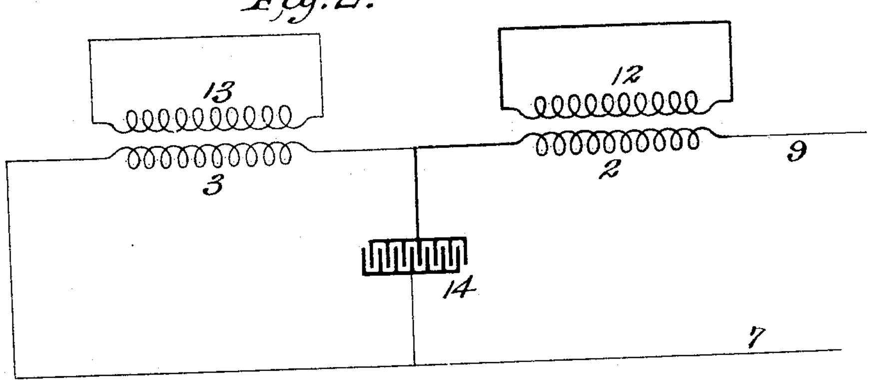


Fig. 2.



WITNESSES:

M D Blondel.

F. T. Chapman

INVENTORS.

Maurice Hutin and

Maurice Leblanc.

BY

Joseph Lyons.

ATTORNEY.

UNITED STATES PATENT OFFICE.

MAURICE HUTIN AND MAURICE LEBLANC, OF PARIS, FRANCE, ASSIGNORS TO THE SOCIÉTÉ ANONYME POUR LA TRANSMISSION DE LA FORCE PAR L'ÉLECTRICITÉ, OF SAME PLACE.

ALTERNATING-CURRENT MOTOR.

SPECIFICATION forming part of Letters Patent No. 536,032, dated March 19, 1895.

Original application filed November 17, 1892, Serial No. 452,292. Divided and this application filed February 14, 1895. Serial No. 538,377. (No model.) Patented in France March 19, 1890, No. 204,456; in Germany July 31, 1890, No. 63,446; in Belgium January 9, 1891, No. 93,385; in England January 12, 1891, No. 584; in Italy January 13, 1891, XXV, 28,966, LVII, 14; in Spain March 5, 1891, No. 11,690; in Austria-Hungary June 16, 1891, No. 3,851 and No. 22,375, and in Switzerland September 12, 1891, No. 3,968.

To all whom it may concern:

Be it known that we, MAURICE HUTIN and MAURICE LEBLANC, citizens of the Republic of France, and residents of Paris, in the Department of the Seine, in the Republic of France, have invented certain new and useful Improvements in Alternating-Current Motors and in the Method of Operating the Same, (for which Letters Patent have been obtained in France, dated March 19, 1890, No. 204,456; in Germany, dated July 31, 1890, No. 63,446; in Italy, dated January 13, 1891, XXV, 28,966, LVII, 14; in Spain, dated March 5, 1891, No. 11,690; in Belgium, dated January 9, 1891, No. 93,385; in England, dated January 12, 1891, No. 584; in Austria-Hungary, dated June 16, 1891, No. 3,851 and No. 22,375, and in Switzerland, dated September 12, 1891, No. 3,968,) of which the following is a specification.

Our invention has reference to improvements in alternating current motors and in the method of operating the same, and the object of the invention is to feed alternating current motors of the kind known as "two-phase motors," from a single feeding circuit, carrying mono-phase alternating currents, described in our application, Serial No. 452,292, filed November 17, 1892, and of which this is a division. Motors of this kind, as is well known, require for their operation two alternating currents of the same frequency, but shifted in phase with reference to each other, in order that a rotating magnetic field be produced. Ordinarily, the two currents with shifted phases are conveyed to the motor by two feeding circuits, extending from the generator or generators to the motor. This is not only expensive but also complicated, especially in cases where the contingencies of work require that between the prime generator and the motor transformers be used, so that the latter become the proximate sources of currents for the motor.

It is possible to obtain the two-phase currents, required for the operation of the motor, from a mono-phase current, by dividing the latter in two branches and artificially increasing the self induction of the circuit of one branch, and at the same time increasing the ohmic resistance of the circuit of the other branch. The objection to such arrangement is that, thereby, the apparent resistance of one circuit and the ohmic resistance of the other is unduly increased, so that for the same output of power by the motor the generator must be made unduly large.

With our present invention the two currents of shifted phases are obtained without increasing either the apparent or the ohmic resistance of the motor circuits, in that we produce a difference of phase by making the effective self-induction of the two circuits to differ from each other by such agencies as condensers, which operate to counter-balance the original self induction of the circuits in which they are placed, without perceptibly increasing either the apparent or the actual resistance of such circuits. In fact when condensers are used, the apparent resistance of the circuits is diminished. This fundamental idea of our invention may be utilized in all kinds of two-phase or multi-phase alternating current apparatus, but is utilized with particular advantage in a two-phase motor. All this will more fully appear from the following detail description, with reference to the accompanying drawings, in which—

Figure 1, is a diagram of a two-phase alternating current motor with our invention applied thereto, and Fig. 2, is a simplified diagram of a modification thereof.

Referring now particularly to Fig. 1, the field magnet of the motor there shown consists of a laminated ring core 1, and two sets of coils 2, 2 and 3, 3, the coils of each set being connected in a continuous series, and the alternate coils of each set being wound oppositely, as is indicated in the drawings by the manner in which their ends are connected with each other. Moreover, the coils of the two series alternate, that is to say, between any two successive coils of one series there is a coil of the other series. In the drawings we have shown eight coils in each series, but any other even number of coils may be used.

One terminal 4, of the series of coils 2, 2, is connected with one terminal 5, of the series of coils 3, 3, by a bridge wire 6, from which extends one of the line conductors 7. The second terminal 4′ of the series of coils 2, 2, is connected with the second terminal 5′ of the series of coils 3, 3, by a bridge wire 6′, from a point 8, of which, extends the other line conductor 9. In this bridge wire 6′, are inserted the condensers 10, 11, one on each side of the point 8, where the line conductor 9 connects. These two condensers have different capacities, and in this instance it is assumed that the capacity of the condenser 11 is greater than that of the condenser 10. If now an alternating current is conveyed to the field magnet coils by the line conductors 7, 9, and if we conceive the current entering at 8, it will there divide into two branches; one branch comprising the condenser 10, bridge wire 6′, terminal 4′, and the series of field coils 2, 2, the current passing by the terminal 4 to the bridge wire 6, and returning by the line conductor 7, to the distant generator. The other branch will be by the bridge wire 6′, condenser 11, terminal 5′, and the series of coils 3, 3, from which the current emerges at the terminal 5, and then returns by the bridge wire 6 and line conductor 7, to the distant generator.

By the condensers 10, 11, of unequal capacities, the currents in the two branches are dephased with reference to each other, their periods remaining unchanged. This is due to the fact that the effective self-induction of a circuit is changed by changing the static capacity of the same, and this effective self-induction may be made to have, within certain limits, any positive or negative value, if the static capacity is properly determined with respect to the original self-induction and the resistance of the circuit. In other words, the effective self-induction of a circuit is a function of the resistance, the original self-induction, and the static capacity of the circuit, and may be either positive or negative. The current phase, therefore, may be retarded or advanced, and in this manner, by properly choosing the capacities of the condensers 10 and 11, any desired difference of phase between the currents in the field branches may be produced. In the present case, where we have shown two field branches, the difference of phase should be ninety degrees, in order to produce a rotary field, which is the object of the invention. If more than two sets of field coils are used the difference of phase required will be different, as is well understood by those skilled in the art. In this manner we produce a rotary field by alternating currents derived from a line carrying mono-phase alternating currents, and it is of course immaterial how many reversely wound coils there are in each set of field coils, and in fact it is immaterial what the general construction and shape of the motor may be.

We prefer to use in our motor as many independent armature windings, each closed upon itself, as there are sets of field coils, and this is indicated in the drawings by the two regular polygons 12, 13, which indicate by their relative position that the two armature windings are shifted with reference to each other, in such manner that when the currents induced in one of these windings are at a minimum, they are at a maximum in the other circuit. In this manner continuously rotating polar lines are generated by the two armature circuits, rendering the action of the motor sensibly constant from moment to moment, instead of variable from moment to moment, as is the case when only a single armature circuit is used. Our invention, however, is not limited to any particular construction of the armature; nor is it absolutely necessary that the two sets of field coils be in multiple arc relation to each other, since it is practicable to have the two sets of field coils in series with each other, and to use a single condenser for affecting both sets. This is indicated in diagram in Fig. 2. In this arrangement the two sets of field coils 2, 3, are connected in series, and between them and the return conductor 7 of the line is interposed a condenser 14, which is thus placed in series with one of the series of field coils and in shunt around the other series of field coils. The capacity of this condenser 14, can be so chosen as to produce the required difference of phase. The armature windings 12, 13, each closed upon itself, which are here shown separated from each other, the same as the field coils, will be understood to be on the same core and to rotate in inductive relation to the field coils.

Having now fully described our invention, we claim and desire to secure by Letters Patent—

1. The method of rotating the polar line or lines of a magnetic field of force, produced by energized circularly arranged field magnet coils, which consists in dephasing, with reference to each other, the alternating currents of the same period, passing through distinct branches of the said coils, by producing a difference between the self-inductions of said circuits by differences of static capacity, substantially as described.

2. The method of rotating the polar line or lines of a magnetic field of force, which consists in dephasing, with reference to each other, the alternating currents of the same period, passing through distinct branches of circularly arranged field magnet coils, by neutralizing the self-induction of each branch to a different degree, substantially as described.

3. The combination of a feeding circuit, carrying mono-phase alternating currents, and a field magnet the coils of which are in parallel branches derived from the feeding

circuit; with a condenser of different capacity in each branch, whereby differences of phase between the currents in the branches are produced and the polar line or lines are rotated, substantially as described.

4. A rotary field alternating current motor with two sets of field magnet coils supplied from a source of simple alternating currents, and a condenser or condensers connected up with the said field magnet circuits, whereby the currents in the same are displaced in phase, as and for the purpose described.

5. A two-phase alternating current motor, comprising two sets of field coils, each set in a separate branch derived from a single phase alternating current circuit, a condenser in each branch, but each of different capacity, so as to produce a difference of phase of one quarter of a wave between the currents in the two branches, and a suitable armature, substantially as described.

6. In an alternating current motor, the combination of two sets of field coils, each in a branch derived from a single phase alternating current circuit; with condensers for unequally shifting the phases of currents in the branches and thereby producing a rotary field, and a suitable armature, substantially as described.

In testimony whereof we have signed our names to this specification in the presence of two subscribing witnesses.

MAURICE HUTIN.
MAURICE LEBLANC.

Witnesses:
CHD. LOMÉINIE,
CLYDE SHROPSHIRE.