PATENT SPECIFICATION

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157,262

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Complete Accepted: July 10, 1922.

COMPLETE SPECIFICATION.

Improvements in Electric Motors.

We, H. Otto Traun's Forschungslaboratorium G.m.b.H., of 14, Hüxter, Hamburg, Germany, a German company, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

This invention relates to that type of motor in which rotation is produced by means of the attraction or repulsion of surfaces carrying charges of electricity.

According to this invention a stator and rotor are formed of condenser surfaces and charges of electricity thereon imposed in the form of alternating currents of high frequency.

The invention is more particularly described with reference to the accompanying drawings in which:—

Fig. 1 shows a simple form of motor and feed.

Fig. 2 is a modification of Fig. 1.

Fig. 3 shows one form of a spiral condenser surface.

Fig. 4 shows a wire wound condenser surface.

Fig. 5 is a diagram of one type of rotor,

The inner plates of the condenser 5 and 6 are charged from a spark gap 7, 8 connected to a source of energy of sufficiently high pressure (alternating or direct current), until the potential has risen so far that a spark springs over.

The spark gap 7, 8 forms with the condenser 5 and self inductance 9 and condenser 6 a closed oscillatory circuit and alternating currents of high frequency will be produced in this circuit. The high frequency current produced in the primary circuit 9 excite by induction in the secondary circuit 10 currents of the same periodicity.

[*Price* 1/-]

The improved type of motor is fed by the discharges produced by the induction in the secondary circuit.

Hitherto only Tesla's motor system (shown diagrammatically Fig. 1, 16 and 17) was known for this purpose. The above mentioned diagram is only shown for illustrating the fundamental principle. It has however no practical interest for carrying out large machines by reason of the impossibility of the regulation and the low efficiency.

Now according to this process, all these defects are overcome by the construction of a machine which is applicable for high frequency currents and of a more or less undamped nature. The difference between the principle of construction of these motors as compared with those hitherto customary consists in that the motor is not based on the principle of magnetic induction only (as have been all motors hitherto and also Tesla's motors).

It has been found that the machine constructed according to Fig. 1 can not only be fed directly with static electricity but if it is connected to a source of high frequency alternating current it will operate.

The applicants call this new type of motors "condenser motors" to differentiate them from hitherto existing types.

The simplest form of construction of such condenser motors is shown in Fig. 1, and this motor may be fed with high frequency alternating currents.

At a given moment positive electricity is charged by means of the lead 14 to the stator surface 1 and to the brush 3^x (Fig. 1). The brush 3^x is connected with the rotor condenser surface 3, so that both the stator surface 1 and also the rotor surface 3 is charged with positive elec-

tricity. The stator surface 1 and the rotor surface 3 being both charged with positive electricity and the second rotor surfaces 4 and 4^x by brushes 4^x with negative electricity, such motors can then be started by providing intermediate stator surfaces 11, 12, the earth connection 13 of one of which is broken by a switch (not shown) according to the direction of rotation desired, or alternatively the motor may be started by a separate source of alternating current in a manner similar to the starting of synchronous motors of known construction. After a half revolution of the rotor the brush 3^x comes in contact with the second collector surface 4 so that now this surface is connected by the brush 3^x with the stator surface 1 and the brush 4^x with the collector surface 3. Consequently with a reverse direction of current through the second half of the oscillation period all the hereinbefore mentioned effects take place in the reverse direction, which however, produces no alteration in the direction of rotation because the dead points between two directions of oscillation are overcome by inertia.

Although this motor is easy to start it can only be employed for small experimental and measuring purposes because the stator and rotor surfaces are made of solid metal and are heated by Foucault (eddy) currents. In spite of its simplicity and its unsuitability for use in practice it must however be regarded as a basic type for technical calculations.

The condenser motor shown in Fig. 2 differs from Fig. 1 by the rotor surfaces consisting of six condenser surfaces connected one behind the other in series and they are connected with three collector surfaces, so that at any one moment only two adjacent collector surfaces come under the two brushes (3 and 4). In its other actions it corresponds to Fig. 1. The leads 14 and 15 may be connected either to the ends of the secondary coil 10 or directly with the source of energy. The outer thicker line indicates the stator surfaces 1 and 2 (that is to say the unmoving part of the motor), 11 and 12 shown by thick dotted lines mean earthed additional poles of the stator, 8, 9 and 10 are the outer parts of the rotor condenser surfaces which in turn are connected with the collector surfaces 8, 9 and 10. 5, 6, and 7 are the inner parts of the condenser surfaces of the rotor and 3 and 4 are brushes.

Hitherto stator and rotor surfaces of compact metal have been spoken of. These however become highly heated with eddy currents and hardly yield 10—15% of useful effect. In examining into such small useful effects it was found that certain forms of metal sections in the stator and condenser surfaces highly increase these. It was then further found that if slots or notches be cut in the metal surfaces of the stator and rotor in the form of a spiral, not only was a higher useful effect possible, but also an easier starting and even a regulation could be obtained.

Experiments have shown that by such a form of construction it is possible to build a very useful motor for high frequency alternating currents more particularly those of an undamped nature.

If for example the system of construction of a stator shown in Fig. 1, but four polar, be taken and the system of rotor construction shown diagrammatically in Fig. 5, but with the form of construction of the condensers of the stator as well as of the rotor according to Fig. 3, a condenser motor is obtained which works well in either direction for high frequency alternating current. It was also observed that the motors in such forms of construction were found to be more sensitive to resonance effects. Such a motor then works the best if stator and rotor surfaces have equal capacity and self inductance so that the windings both in the stator and also in the rotor are in resonance.

A motor constructed according to the foregoing kind is already fully technically applicable. But even these motors have a series of faults, more particularly in their building construction. For example, the attachment of the spiral condenser surfaces both of the stator and of the rotor shown in Fig. 3 are in practice difficult to carry out. Therefore in practice the condenser and stator surfaces are simply wound of wire or bands in the form shown in Fig. 4. Such stator and rotor surfaces may, without further difficulty be regarded as electromagnetic poles, although they are not made of iron as is the case in electromagnets. Such machines may be spoken of directly as motors for high frequency alternating currents in which the separate pole surfaces consist of wound induction condenser surfaces of which one is wound on the stator and the other on the rotor.

If the coil as shown in Fig. 4 be made of well insulated wires the coil can be embedded in insulating material either for the stator or rotor surfaces as has already been done in the case of ordinary

single and multiphase motors. At the same time the possibility is afforded by increasing the number of turns to produce a greater or smaller alteration of the self induction co-efficients.

In Fig. 5 is shown a modified construction of a rotor for a four pole motor consisting of four condenser surfaces 1, 2, 3, 4, of which 1 and 2 are connected through an inductance 10 while 3 and 4 are connected through an inductance 9 coupled with the coil 10. Four inner surfaces 5, 6, 7, 8 are provided of which 5 and 6 are directly connected also 7 and 8 similarly connected.

The pairs of like poles are connected by wires 14 and 15 to the source of energy. By a suitable selection of the values of the reactance and capacity in these circuits resonance circuits may be formed.

Having now particularly described and ascertained the nature of our said invention and in what manner the same is to be performed, we declare that what we claim is:—

1. An electro motor for alternating current of high frequency in which the stator and rotor comprise condenser surfaces to both of which current is supplied substantially as described.

2. A motor for alternating currents of high frequency either damped or undamped in which the stator and rotor are each composed of multipolar condenser surfaces substantially as described.

3. A motor as claimed in Claim 1 or 2 in which the condenser surfaces are formed of flat spirally wound conductors free from iron substantially as described.

4. A motor as claimed in Claim 1 or 2 in which current is fed to the rotor by means of brushes contacting with a commutator as in direct current practice substantially as described.

5. A motor as claimed in Claims 2 and 4 in which a commutator having as many segments as poles is provided to supply current to the rotor substantially as described.

6. An electro-motor for alternating current of high periodicity, constructed and arranged to operate substantially as described, with reference to the accompanying drawings.

Dated this 8th day of January, 1921.

For the Applicants:—
W. P. THOMPSON & Co.,
12, Church Street, Liverpool,
Chartered Patent Agents.

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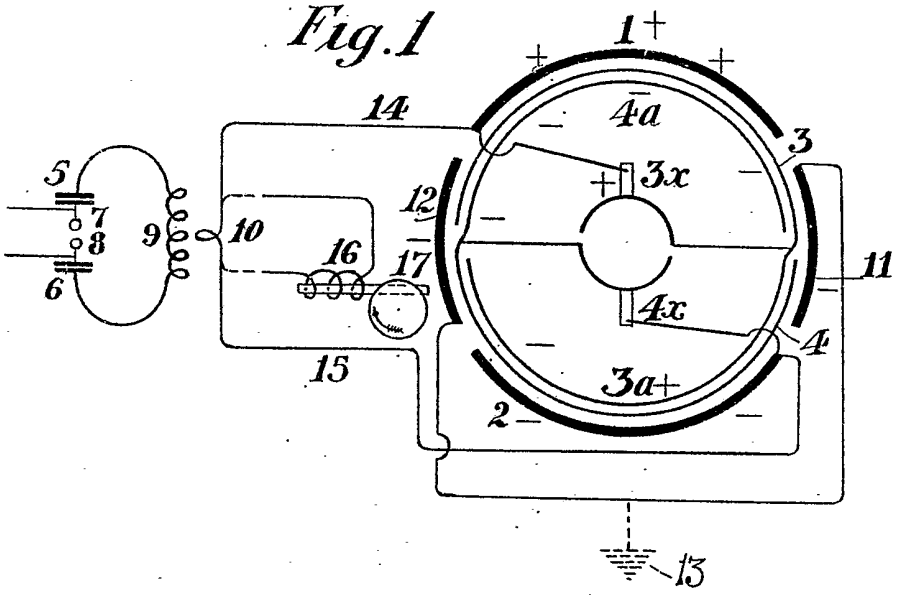
[This Drawing is a reproduction of the Original on a reduced scale]

Fig. 1



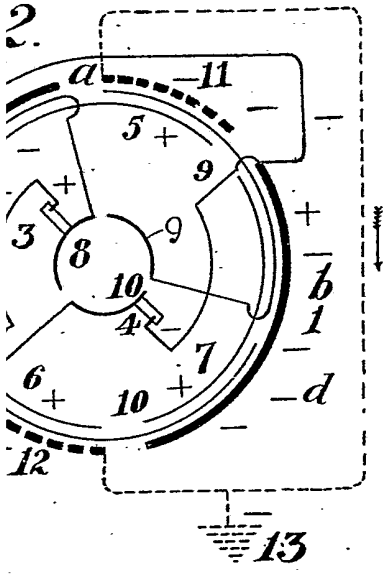


Fig. 3

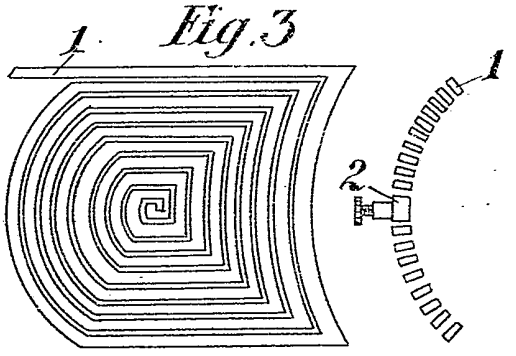


Fig. 4

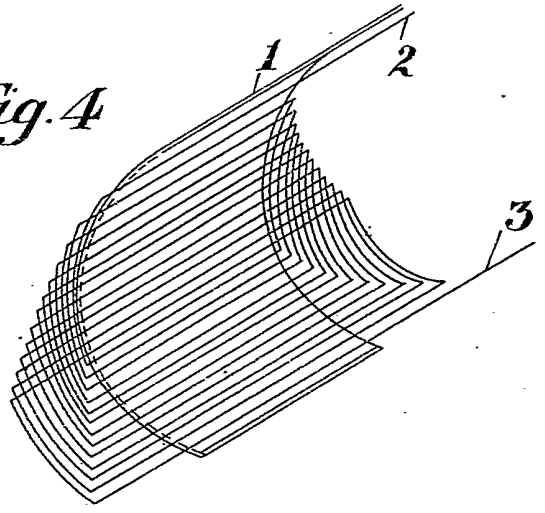


Fig. 5.

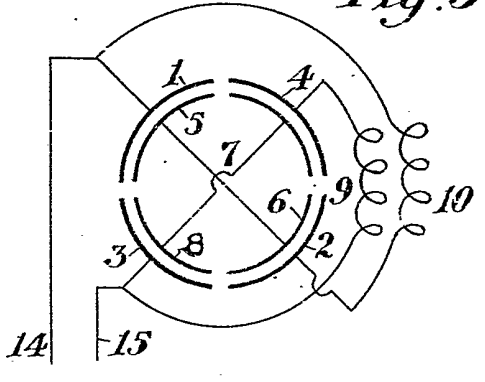


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Fig.1

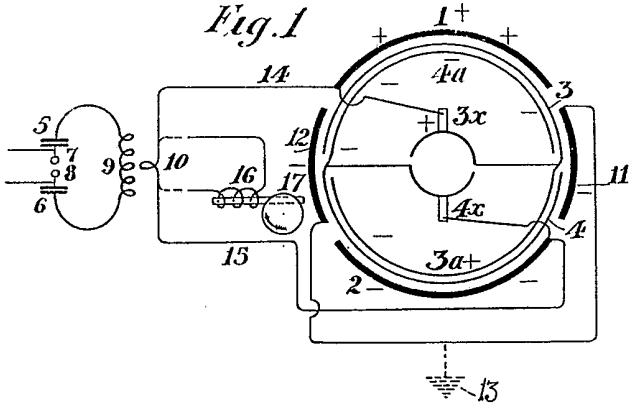


Fig.2.

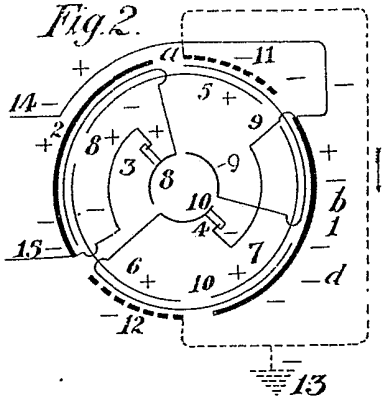


Fig.3

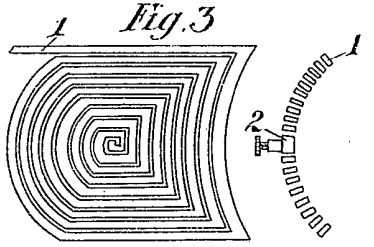


Fig.4

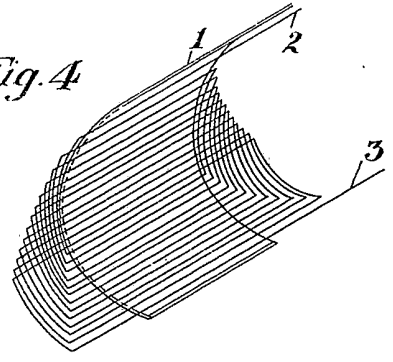
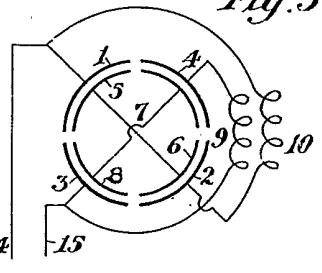


Fig.5.



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