PATENT SPECIFICATION

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Application Date (in United Kingdom): June 13, 1925. No. 15,419/25.

(Patent of Addition to No. 191,313: March 9, 1922.)

Complete Accepted: June 17, 1926.

COMPLETE SPECIFICATION.

Improvements in and relating to Synchronous Motors.

I, ROBERT MICHL, of Czechoslovakian nationality, of 4—6, Ederova ulica, Kosice, Czechoslovakia, 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 is an improvement in the invention claimed in Specification No. 191,313.

In order to improve the efficiency of the motor for clockwork drives or to reduce the consumption of current to a minimum, according to the present invention the poles of the exciter magnet and the alternating current poles of the electromagnet are placed on different sides of the rotor or its segments. By this means the magnetic lines of force can no longer pass directly between the magnet poles, but only flow by way of the rotor segments. A further feature of the invention relates to the hand-operated accelerating device for starting the motor. The pawl which, on the acceleration taking place, engages in a ratchet wheel on the rotor shaft, is provided with a separate arm, on which the accelerating spring acts. Stop members for the pivoted lever of the pawl and its spring-loaded arm, which are staggered with respect to one another, cause the pawl to engage, on the accelerating knob being turned, and to disengage, after the accelerating rotation has been completed.

The accompanying drawing shows one constructional example of the invention,

Fig. 1 being a side view showing the arrangement of the magnet poles on the rotor,

Fig. 2 a plan view with a section on line A—A of Fig. 1,

Fig. 3 a side view, which is turned through 90° with respect to that of Fig. 1 and

Fig. 4 a top view with a section on line B—B of Fig. 3 showing the accelerating device.

In Figs. 5 and 6 the nose-shaped piece e^1 of the alternating current electromagnet e is shown.

The permanent magnet shown in Figs. 1 and 3 consists of straight steel bars m and m^1, which also act as supporting pillars for the motor. An additional supporting pillar s is provided. Both the steel bars m and m^1 are connected and coupled to an upper covering plate i, which is stamped out of sheet iron and forms with the said steel bars a U-shaped permanent magnet. Between the two steel magnet bars the upper end of the iron core e of the electromagnet is screwed and magnetically coupled to the plate i. The lower ends of the magnet bars m and m^1, that is the free poles, are screwed, as shown in Fig. 2, to the flat pole shoes N and S. Between the latter extends the pole piece e^1 of the electromagnet on the other side of the rotor with relation to its plane of rotation, so that the rotor with its segments a^1, as shown in Fig. 1, can turn between the pole piece e^1 which lies below, and the two pole shoes N and S, which lie above. As the pole piece e^1 of the electromagnet e and the pole shoes N and S of the permanent magnet bars no longer lie close together, but are separated by the rotor, which runs between them, a direct passage of the magnetic lines of force will no longer take place between the magnet poles, but can only take place in its full effect through the rotor segments, whereby the efficiency of the motor is increased.

The example described above is a preferred constructional form, but is not

[*Price* 1/-]

essential, as the rotor with its segments a^1 may be differently constructed and the magnet poles may be disposed in different planes with respect to it. For instance the rotor may be in the form of a spider, at the peripheral end of each of the limbs of which a flat plate is mounted perpendicularly, the inner surfaces of the said plates facing the pole shoes N and S, and their outer surfaces facing the pole shoe or shoes e^1 of the electromagnet or magnets e, the said pole shoe or shoes being arranged around the periphery of the rotor. Also more than one permanent exciter magnet and more than one electromagnet might be arranged according to the number of the rotor segments and the magnetic coupling of the magnets at the neutral point might be done away with.

The arrangement for starting the synchronous motor by hand consists of a small double lever 1, which is loosely rotatable with its bush 10 on the spindle a^2 of the rotor running in the bearing, which is fixed to the base-plate v. The two arms of this double lever are at 180° to one another. On one of these arms the lever pawl 2 is rotatably mounted at 2^1, while with the other arm one of the cams 3, which are fixed on the shaft 9, engages with a pin 1^1. To the lever 2^1 of the pawl 2 the spring 5 is attached. By the tension of the spring 5 the lever 2^1 of the pawl 2 is pressed against the stop pin 6 and the pawl 2 is lifted out of engagement with the ratchet wheel 7, when the other arm of the double lever 1 strikes against the stop pin 8, the position of rest thus being reached in which the spindle a^2 with the ratchet wheel 7 can turn unhindered.

If, after the current coil of the electromagnet e has been connected to an alternating current conductor, the milled head 4 be turned in the direction corresponding to the arrow in Figure 4, lever 1 will be turned in the opposite direction by means of the cam 3, and at the same time spring 5 will be tensioned and will draw the pawl 2 into engagement with the ratchet wheel 7. The turning of the double lever 1 ceases when the cam 3 disengages with the pin 1^1 as shown in dotted lines in Fig. 4. If the lever 1 is freed from the cam 3, the spring 5 will draw the pawl 2 into engagement with the ratchet wheel 7 and therefore by the sudden action of the spring 5 the rotor will now be caused to rotate in a clockwise direction at a speed exceeding the normal speed of revolution, whereupon the motor, after reaching the normal speed of revolution will, with the aid of the synchronising pendulums p fall into the corresponding phase of the alternating current and will continue to rotate synchronously, as the pawl 2 is disengaged from the ratchet wheel 7 by the spring 5, if the arm 2^1 is stopped by the pin 6 and the lever 1 is stopped by the pin 8. Next time the other cam 3 will engage with pin 1^1 of lever 1.

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

1. A synchronous motor, more particularly for the electric driving of clockwork, as claimed in my earlier Specification No. 191,313, characterised by the feature that the poles of the permanent exciter magnet and the alternating current poles of the electromagnet are placed on different sides of the rotor or its segments in order to prevent a direct passage of the magnetic lines of force between the magnet poles.

2. A synchronous motor as claimed in Claim 1, in which the starting is effected by hand by means of an accelerating device, characterised by the feature, that the starting force, for instance a spring acts on a lever connected to a starting pawl, so that, on starting, the pawl is forced into a ratchet wheel fixed on the rotor shaft and is disengaged from the same, on the pawl lever striking against a stop member.

3. The improved synchronous motor, more particularly for the electric driving of clockwork, substantially as hereinbefore described and as illustrated in and by the accompanying drawing.

Dated this 12th day of June, 1925.

MARKS & CLERK.

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FIG. 1.

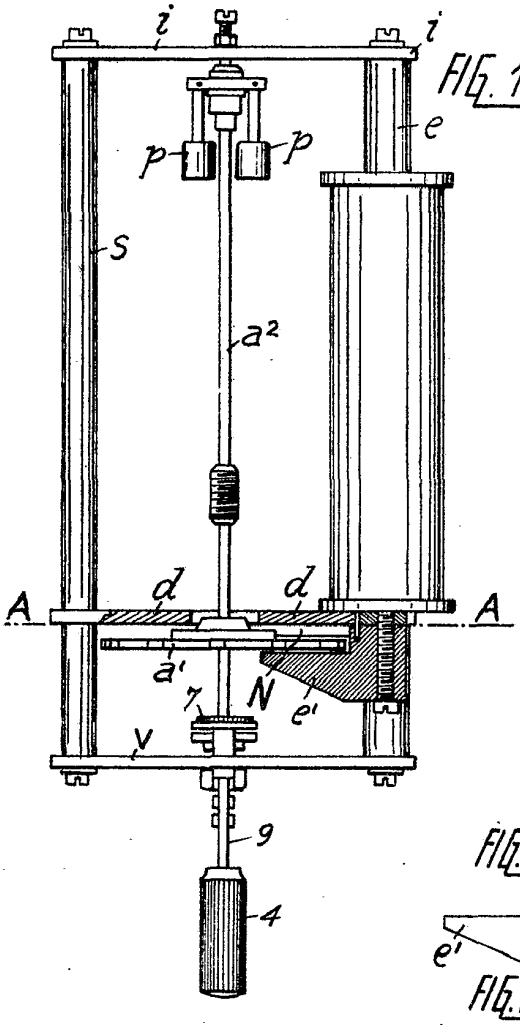


FIG. 3.

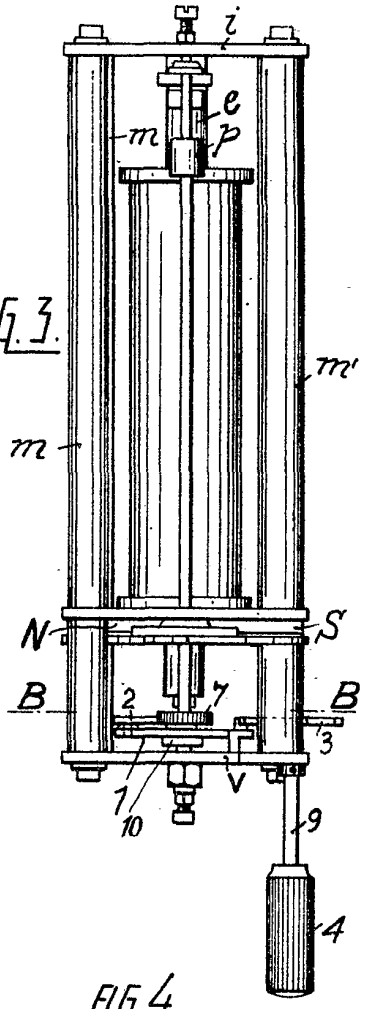


FIG. 5.

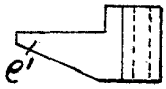


FIG. 6.

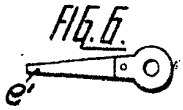


FIG. 2.

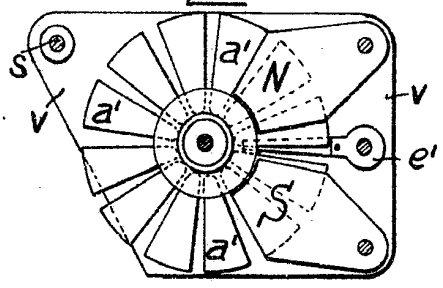
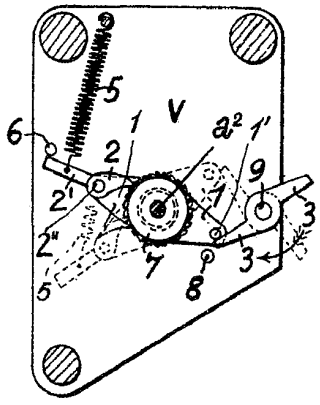


FIG. 4.



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