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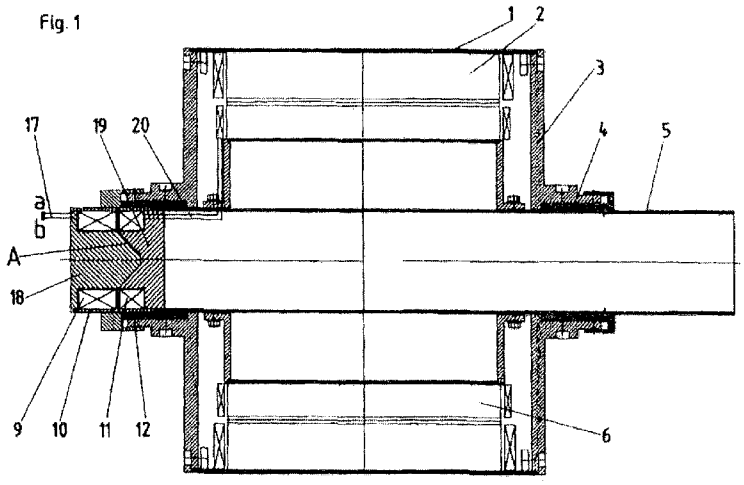
(54) **Title**: LOW SPEED ELECTRIC GENERATOR

Fig. 1



(57) **Abstract**: The invention refers to a low speed electric generator, The generator according to the invention comprises a housing (1] wherein stator winding cores (2) are mounted, said housing (1] being closed at the ends with shields (3) provided with bearings (4) which allow the rotation of an axle (5) whereon rotor winding cores (6) are mounted, said rotor winding cores (6) being supplied by means of an inductive collector (7) from a source (8) which produces an excitation current with alternative and intermittent polarity; the inductive collector (7) consists of a fixed primary winding (9) comprised in a fixed casing (10) integral with the shield (3], and a mobile secondary winding (11) comprised in the mobile housing (12), integral with the axle (5).

LOW SPEED ELECTRIC GENERATOR

The invention refers to a generator which produces electric energy at a speed of 30 rot/min, said generator being meant to be mounted on modular hydrokinetic assemblies, for exploiting the energetic potential of rivers in the plain regions, where the relief does not allow building classical hydro-energetic arrangements, such as dams or culverts.

It is known that the electromotive force e_0 that appears at the lugs of a stator winding when this is circulated through by the magnetic field flux φ_{max} produced by the rotor windings, depends on the frequency ω and the number of spires of the winding N_{sp}:

$$e_0 = \varphi_{max} \times \omega \times N_{sp}$$

wherein φ_{max} and N_{sp} result from calculation and have constructive limits, and the frequency ω results from the number of poles of the rotor and from its speed, as an expression of the frequency at which the magnetic field flux produced by the rotor windings reverses its direction in a stator winding and thus, the increase of capacity in a low speed generator is ultimately carried out by increasing the diameter of the generator. Yet, a generator with a large diameter presents the drawback that it cannot be used to fit modular hydrokinetic assemblies.

The problem that the invention seeks to solve consists in providing an electric generator that produces electric energy at a speed of 30 rot/min and has an optimum diameter for being mounted on modular hydrokinetic assemblies, as the number of poles depends solely on the number of electrical network phases whereto said generator is connected, and said rotor windings are fed from a source in commutation by means of a collector which has no physical contact, said source providing a frequency independent upon the number of poles and upon the rotor speed.

The low speed electric generator according to the invention presents a series of other advantages that are essential for exploiting the energetic potential of plain rivers:

- as the axle rotation is slow, the attrition in the rotor bearings is reduced at a minimum, thus providing a long period of uninterrupted functioning;
- by using a collector without a physical contact between the components, the attrition is eliminated and a practically unlimited time functioning of the collector is ensured;

- by the perfect insulation of the collector, the possibility of electric energy leakage in aquatic environment, specific to the generator, is excluded;

- the ability of producing electric energy at low speed eliminates the necessity of integrating, in the kinematic chain of converting mechanical energy into electrical energy, of a speed multiplier, thus reducing the manufacturing cost of the entire assembly.

An embodiment example of the invention is given below, in relation with Figs. 1 and 2, representing:

- Fig. 1, a longitudinal section in the generator assembly;

- Fig. 2, a block diagram of the excitation current supply source.

According to the invention, the low speed electric generator comprises a housing (1) wherein stator winding cores (2) are mounted, said housing (1) being closed at the ends with shields (3) provided with bearings (4) which allow the rotation of an axle (5) whereon rotor winding cores (6) are mounted, said rotor winding cores (6) being supplied by means of an inductive collector (7) from a source (8) which produces an excitation current with alternative and intermittent polarity.

The inductive collector (7) consists of a fixed primary winding (9) comprised in a fixed casing (10) integral with the shield (3), and a mobile secondary winding (11) comprised in the mobile housing (12), integral with the axle (5).

The source (8) consists of an adjustable impulse forming circuit (13), connected by means of a delaying circuit (14) to a polarity alternating circuit (15) that supplies the rotor windings with a current supplied by a rectifier (16).

The polarity alternating current (15) is connected to the lugs (a) and (b) of the fixed primary winding by means of conductors (17) and the current is transmitted to the mobile secondary winding (11) by electromagnetic induction created in the magnetic field formed by the fixed core (18) and the mobile core (19), circuit that closes by means of the fixed casing (10) integral with the shield (3) and the mobile housing (12) integral with the axle (5), and the excitation current induced in the mobile secondary winding (11) reaches the rotor windings (6) by means of conductors (20).

In order to increase the transfer surface of the magnetic field flux between the fixed core (18) and the mobile core (19), said cores have tapered conjugated facets (A).

CLAIMS

1. Low speed electric generator **characterized in that,** it comprises a housing (1) wherein stator winding cores (2) are mounted, said housing (1) being closed at the ends with shields (3) provided with bearings (4) which allow the rotation of an axle (5) whereon rotor winding cores (6) are mounted, said rotor winding cores (6) being supplied by means of an inductive collector (7) from a source (8) which produces an excitation current with alternative and intermittent polarity.

2. Low speed electric generator according to claim 1, **characterized in that,** the inductive collector (7) consists of a fixed primary winding (9) comprised in a fixed casing (10) integral with the shield (3), and a mobile secondary winding (11) comprised in the mobile housing (12), integral with the axle (5).

3. Low speed electric generator according to claim 1, **characterized in that,** the source (8) consists of an adjustable impulse forming circuit (13), connected by means of a delaying circuit (14) to a polarity alternating circuit (15) that supplies the rotor windings with a current supplied by a rectifier (16).

4. Low speed electric generator according to claims 1 to 3, **characterized in that,** the rotor windings are supplied through the lugs (a) and (b) from the source (8), by means of the inductive collector (7), wherein the electromagnetic induction is transmitted from the fixed primary winding (9) to the mobile secondary winding (11) by the magnetic circuit formed by the fixed core (18) and the mobile core (19), circuit that closes by means of the fixed casing (10) integral with the shield (3) and the mobile housing (12) integral with the axle (5), and the excitation current induced in the mobile secondary winding (11) reaches the rotor windings (6) by means of conductors (20).

5. Low speed electric generator according to claim 4, **characterized in that,** in order to increase the transfer surface of the magnetic field flux between the fixed core (18) and the mobile core (19), said cores have tapered conjugated facets (A).

6. Low speed electric generator according to claims 1 to 4, **characterized in that,** between two direction reversals of the excitation current, the delaying circuit (14) cuts the supply of the rotor windings upon the command of the adjustable impulse forming circuit (13), in order to protect the components of the commutation circuit (15).

7. Low speed electric generator according to claim 5, **characterized in that,** during the movement of a rotor winding core over a stator winding core, the excitation current

reverses its direction at a frequency determined by means of the adjustable impulse forming circuit (13) and produces the reversal of direction of the magnetic field flux in the rotor core and, implicitly, in the stator core, thus determining the occurrence in the stator core of a frequency ω that does not depend on the speed of the rotor core over the stator core and, during the entire period wherein the excitation current has a certain polarity, in the gap between the rotor core and the stator core a spinning magnetic field occurs, producing an electromotive force in the stator winding having the frequency resulted from the relative rotation movement between said cores, under the action of the mechanical force that drives the rotor.

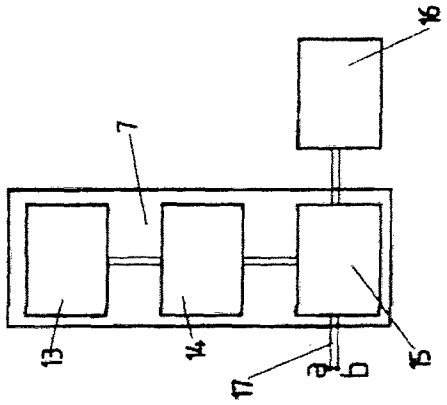


Fig. 2

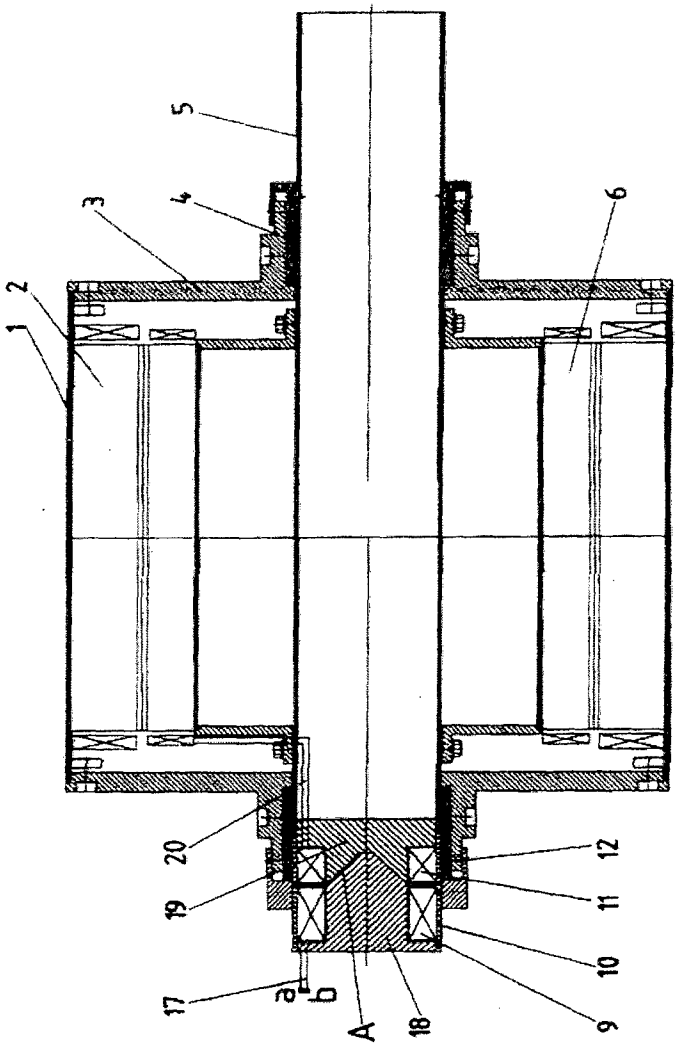


Fig. 1