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DRAWINGS ATTACHED

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COMPLETE SPECIFICATION

Improvements in Driving Systems for Electric Generators

5 We, SOCIETE ANONYME ANDRE CITROEN, a French Body Corporate, of 117/167, Quai Andre Citroen, Paris (Seine), France, do hereby declare the invention for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

10 This invention relates to electric generators such as are used on automotive vehicles for example.

15 An electric generator is necessarily driven by a motor and must in consequence be provided with a coupling, which imposes conditions of centering and alignment which can only be fulfilled by accurate machining of the parts which are to be coupled together.

20 In the case of generators which are adaptable to a vehicle motor, it is additionally necessary to provide the necessary emplacement on the motor to be equipped.

25 Furthermore, it will be necessary to provide means to be employed for the compensation, when so required, of the variations in speed of the motor, or to adapt the operation of the generator to the variable speeds of the motor. This involves the difficulty of the correct application of devices for regulating either the speed or the voltage or the output of the generator.

30 The main object of the present invention is to provide a generator which is independent, both from the point of view of its operation and also as regards its position in the mechanical group with which it is used, by the elimination of mechanical coupling between the generator and its driving motor.

35 According to the present invention a combined electric generator driving motor unit for use in motor vehicles comprising a generator having a stator and a rotor, a driving motor having a rotor driven by the action of a fluid under pressure and housed inside the stator of said generator and means coupling said

45 motor rotor with the rotor of said generator, the driving motor comprising a piston barrel housed inside the generator stator, an inclined impeller plate cooperating with the barrel and a distributor for supplying fluid under controlled pressure to the barrel to cause the rotor to rotate.

50 The unit can be produced without difficulty in all cases where a source of fluid under pressure is available, such as is the case with many vehicles. It is only necessary for the pressure of the fluid to be controlled and maintained at a substantially constant value for the independence of operation to be ensured. It is also not impossible, when starting from a variable pressure, to provide means for regulating, at least approximately, the speed, output, or any other characteristic of the generator in any suitable way.

55 Moreover, the motor-generator group, being only provided with fluid piping systems and electrical connections, forms a mechanically independent unit which can therefore be placed at any available point of the installation to be equipped and does not involve any particular mounting difficulties.

60 In a preferred unit of the invention the driving motor comprises a barrel with pistons, housed in the generator stator, and co-operating with an inclined impeller-plate, this barrel being supplied from a distributor of fluid under a controlled pressure.

65 In order that the invention may be more fully understood embodiments in accordance therewith will now be described by way of example with reference to the accompanying drawings, in which:

70 Fig. 1 shows a cross-section in a plane passing through the axis of symmetry a—a of a generator-driving motor unit in accordance with the invention.

75 Figs. 2 and 3 show an alternative form of embodiment in which the driving motor has a variable cylinder capacity.

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In fig. 2, the unit is shown in cross-section taken along a plane passing through the axis of symmetry b—b.

Fig. 3 is a view partially in cross-section along an axial plane perpendicular to Fig. 2.

In the drawings the same references are used to designate similar parts.

In the accompanying drawings, the generator has been shown very diagrammatically, and it will only be indicated that it comprises a stator 2 forming the armature within which a rotor 3 is mounted without defining its structure and without any limitation as to its type.

In the preferred example of construction shown, it can be seen that the driving motor comprises a non-rotating impeller-plate 6, a rotary piston barrel 5 and a fixed distributor 7.

The barrel 5 is coupled to or incorporated with the rotor 3 of the generator, which eliminates all mechanical coupling between the generator and the motor.

In this way, the difficulties of centering and alignment inherent in the conventional solutions are eliminated, including the coupling between the generator and the motor, at the same time considerably reducing the overall size of the unit.

The operation of the device is as follows:

When one of the pistons of the barrel, such as 8, is subjected by the distributor to the action of the fluid under pressure, it receives from the impeller plate, by reason of the inclination of this latter, a reaction to the pressure force applied by the fluid which includes a tangential component tending to drive the barrel in rotation.

This tangential component would have a tendency to rotate the barrel in the opposite direction when the piston moves farther in, as shown at 9, but in fact, as the pressure is then replaced by a suction as a result of an appropriate arrangement of the distributor, the reaction is then cancelled.

The impeller plate 6 comprises a fixed bowl 10 and a moving ball 11, between which is provided a ring of balls 12.

As in conventional motors of this kind the pistons 8, 9 are located spaced circularly in the cylinders in the barrel.

The extreme end of a piston bears upon an inclined surface 11 while the different cylinders of the barrel are alternately in communication with the bored orifices in the distributor for the inlet and outlet of fluid upon a fixed surface of a distributor 7 adjacent the barrel.

When the fluid under pressure arrives in a cylinder it pushes back the piston which by reason of its contact by its rounded head with the inclined surface 11 is subjected to a reaction comprising an inclined component of such a kind that the piston and consequently the barrel slides laterally and is displaced in rotation in the direction which tends to allow the piston to move more fully across the barrel.

This is true for all the pistons located at the same side of the line of the greatest slope of the support surface 11. The pistons located upon the other side of such line are in communication with the return of the fluid in which there is a reduced pressure. The pistons therefore drive back the fluid towards such channels, being actuated by the barrel. The surface 11 can be fixed in inclination and in such case variation in the power is obtained by varying the pressure of the fluid, for example, by locating upon the inlet channel a pneumatic accumulator with a regulatable pressure. The surface 11 can have a variable inclination which will vary the swept volume of the cylinders of the motor.

Thus in the form of construction of Fig. 1, the fixed bowl 10 is made a driving fit on a thrust supporting member 13 fixed to the generator stator.

In the alternative form of Figs. 2 and 3, the ball thrust bearing is supported by a fork 14 fixed to the stator of the generator by a screw 15. In addition, the said thrust bearing is applied on a piston 16 (Fig. 2) which enables its inclination to be varied, which causes a variation in the output speed of the motor.

It should be observed that in the two forms of construction described, it is possible to obtain a regulation of the parameters of operation of the motor with a view to adapt them to the conditions of operation. In the first case, the parameter is the pressure of the fluid and in the second case the parameters are the pressure and the inclination of the plate.

WHAT WE CLAIM IS:—

1. A combined electric generator driving motor unit for use in motor vehicles comprising a generator having a stator and a rotor, a driving motor having a rotor driven by the action of a fluid under pressure and housed inside the stator of said generator, and means coupling said motor rotor with the rotor of said generator, the driving motor comprising a piston barrel housed inside the generator stator, an inclined impeller plate cooperating with the barrel and a distributor for supplying fluid under controlled pressure to the barrel to cause the rotor to rotate.

2. A combined electric generator driving motor unit according to Claim 1, wherein the impeller plate is supported on a fluid controlled piston operable to vary the inclination of the impeller plate.

3. A combined electric generator driving motor unit according to Claim 1 or 2, wherein means are provided to vary the pressure of the fluid to regulate the characteristics of the generator.

4. A combined electric generator driving motor unit substantially as herein described with reference to Fig. 1 or to Figs. 2 and 3 of the accompanying drawings.

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