

Collectorless direct-current generators

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Abstract

Generators and direct-current motors have excellent operating characteristics, and therefore widely they are used in the technology. The important merit of direct-current motors is large starting torque, which makes with their irreplaceable with the use in transportation means. However, both the generators and the direct-current motors have one essential deficiency, connected with the need of using in them the collector system, which consists of collector and brushes. Collector presents the collection of the lamellas, located on the cylinder, made from insulation, and between the lamellas there are clearances. This leads to the rapid wear of brushes. In addition to this, since during the rotation breaking the circuits of winding, which have inductance, occurs, a principally unavoidable drawback in this collector sparking is. In connection with the indicated, important technical task the search for the construction of generators and direct-current motors, which do not have collector system, appears. However, such devices created were not during entire history of the development of electrical engineering. In this article this problem is solved. In it are examined two versions of the direct-current generators, in which there is no collector. The stated goal is achieved with the aid of the special constructions of the revolving magnets and by the corresponding arrangement of windings. If necessary such generators can be used as the engines.

1. Construction of direct-current generators with the revolving magnets.

One of the versions of direct-current generators with the revolving magnets is shown to Fig.1. Around the fixed gear wheel of larger diameter move two gear wheels of the smaller diameter, to which are fastened the magnets. The relationship

of teeth in gear wheels comprises 2:1. In the initial position (upper figure) opposite of magnet pole move near the turns of toroidal winding. In this case in the winding the current of determinate direction is induced. When small gears achieve position, as shown in average figure, magnets make half of revolution, and their pole they change by places. During further motion of small gear wheels, the magnets continue to be turned to the same side, and when their pole they reach the turns of toroidal winding (lower figure), their position it is differed in no way from initial position. In the process of their further motion of magnet pole they induce in the winding the current pulse of the same polarity as during the motion in the initial position. Thus, during the rotation of small gear wheels around the large gear wheel appears the sequence of the pulses of one polarity, whose average value presents direct current. The rotary motion of magnets in question is equivalent to their reversal of polarity, which with the presence of fixed electromagnets can be achieved only with the aid of those synchronized the rotation of contact systems. The functional diagram of the generator examined is given in Fig. 2

large gear is fixed on the fixed axis, and the small gears, to which the magnets are fastened, on their axes have the bearings, fixed in the cartridge clip (it is shown by black color). During the rotation of cartridge clip the small gears move around the large gear together with the magnets, which in the process of rotation pass the stages, shown in the first figure. It is not shown for the purpose of simplification in the figure on it, is how braked the axis of large gear, and cartridge clip how revolves. The axes of large gear wheel and cartridge clip are shortened for this. In the real construction they can be elongated, and the turns of winding with the coil are bent current in order to go around axes.

somewhat another principle of the construction of beskollektoronogo direct-current generator is demonstrated in Fig. 3. The large gear, on which are fixed the magnets, has the central opening, through which are passed the turns of toroidal winding. In this case, the appearance of single-pole pulses in the winding is connected with a difference in the tangential speeds of the magnet poles, fastened to the gear. In the turns of winding, passing through the opening of gear, emf is not induced. At the same time, pole, falling outside the limits of the outer duct of gear, move near the turns of winding at high speed, inducing in them emf. Summary emf of winding is removed from its output terminals.

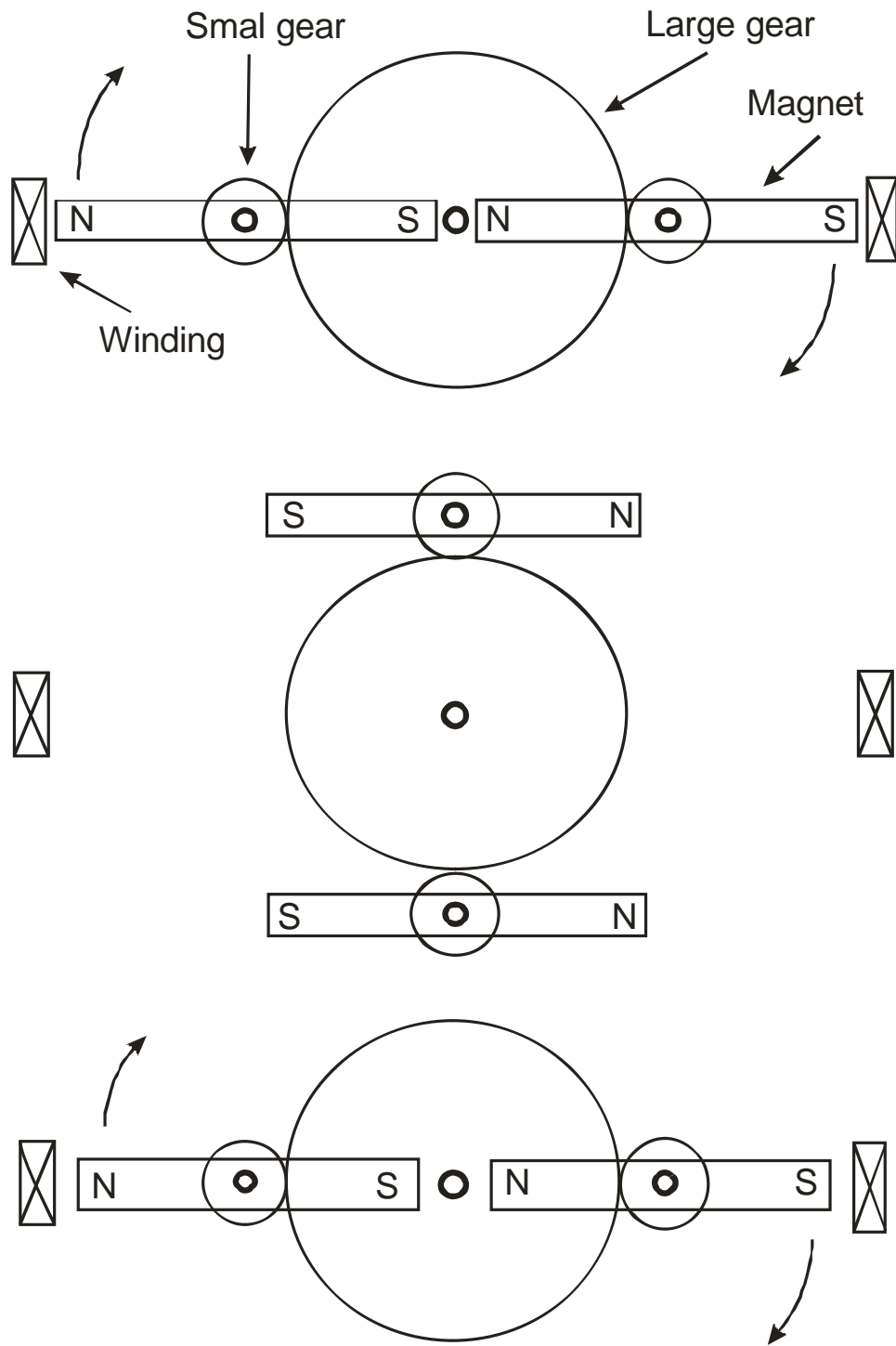


Fig. 1. Schematic of collectorless direct-current generator with the revolving magnets (version 1).

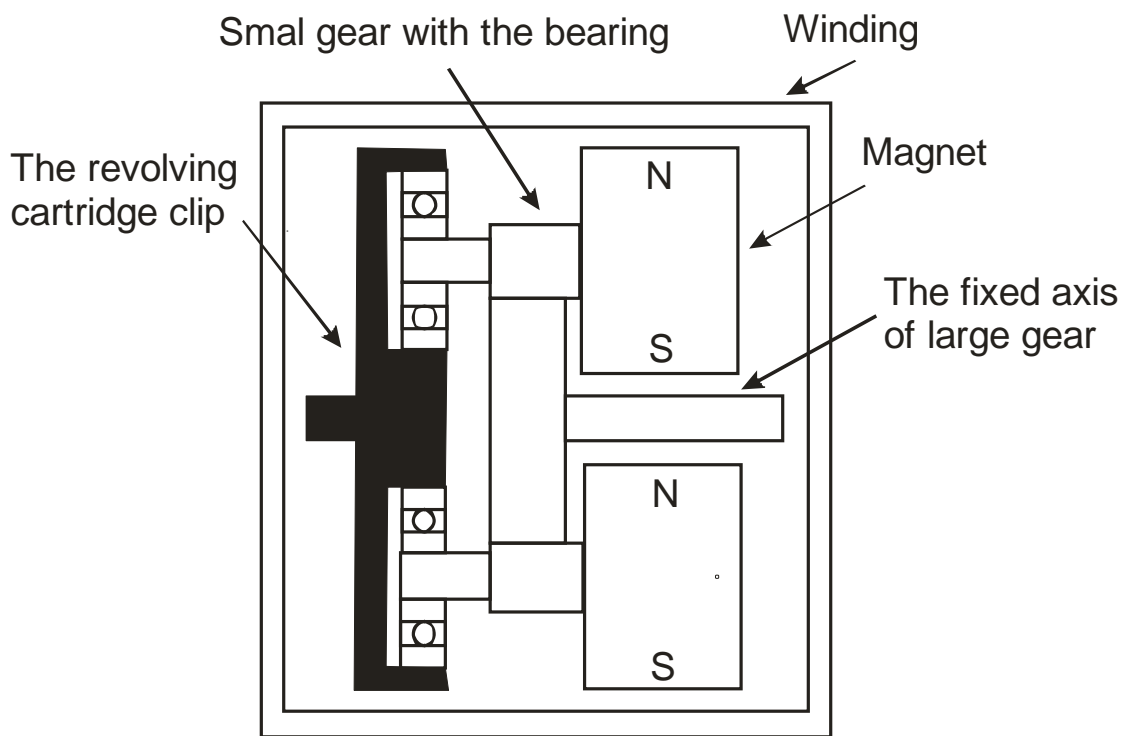


Fig. 2. The functional diagram of beskollektoronogo direct-current generator with the revolving magnets (version 1).

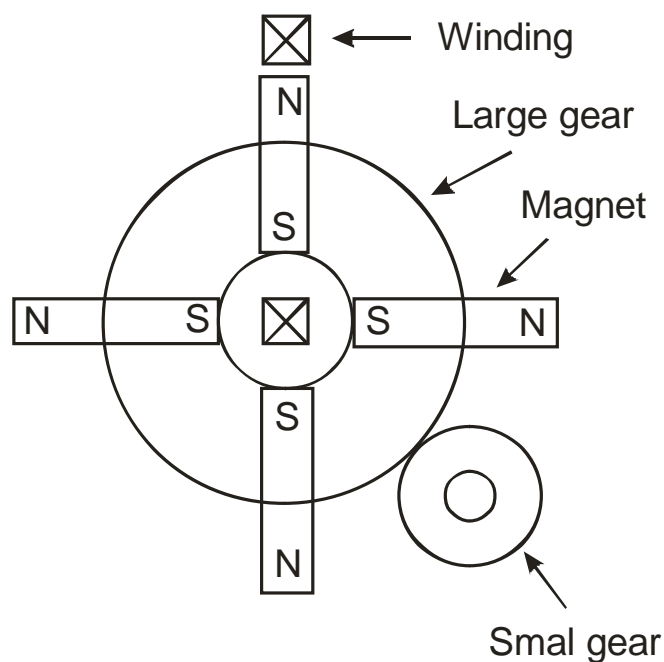


Fig. 3. Schematic of collectorless direct-current generator with the revolving magnets (version 1).

a drawback in this construction is that that they penetrate the turns of winding the central opening of large gear and cover its only half. Therefore there is no

possibility to fasten to this headed ax for its rotation, and to revolve it is possible only by means of the external gear.

The functional diagram of the generator examined is given in Fig. 4. All elements of generator are attached to the bed (it is shown black). The magnets are attached to the large gear, and its hollow axis with the aid of the bearing is attached to the bed. To the bed with the aid of the bearing is fastened the axis of small gear. To the bed is attached also the toroidal winding.

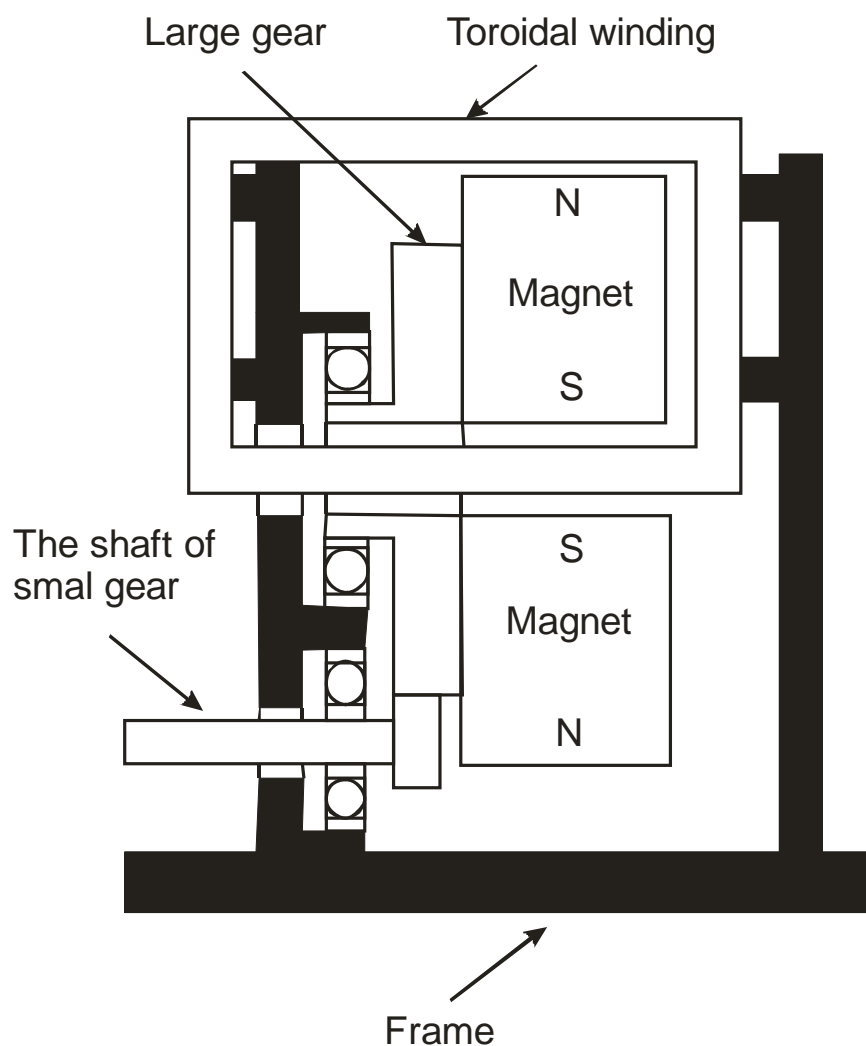


Fig. 4. The functional diagram of beskollektoronogo direct-current generator with the revolving magnets (version 1).

This article does not pretend to the development of the concrete functional designs of collectorless generators, in it are only shown the diagrams, which make it possible to carry out such generators.