INTEGRATED LAYER ALTERNATOR GENERATOR

Description of Drawings

[0001] Fig. **1** illustrates a front view and a half-sectional side view of a stator assembly **101**, in which one half of the stator assembly is shown in section to illustrate internal structure. Fig. **1A** illustrates an isometric disassembled view of the stator assembly **101** prior to assembly. Fig. **1B** illustrates a front view of coils **34** layout.

The stator assembly **101** comprises a shaft **32**, a plurality of stator coils **34**, a stator mounted back plate **36**, and fastening elements such as stud screws **38**.

[0002] The stator mounted back plate **36** is configured to support and secure the stator coils **34** and the shaft **32**. The back plate **36** is preferably formed from a non-magnetic material, such as aluminium or a non-magnetic alloy, to avoid interference with the magnetic field generated by the cylindrical layer rotor **100**.

[0003] The dimensions of the stator assembly **101** including the diameter and thickness of the back plate **36** and the arrangement of the coils **34**, may vary depending on the size and power requirements of the integrated layer alternator generator **102**.

[0004] The shaft **32** may be formed from a suitable metallic material, for example steel, and is configured to support rotation of the cylindrical layer rotor **100**. The diameter and length of the shaft **32** may vary depending on the design requirements of the integrated layer alternator generator **102**. In one example embodiment, the shaft **32** has a diameter of approximately 12 mm and a length of approximately 90 mm, and may include a threaded portion for mounting.

[0005] The stator coils **34** are spaced circumferentially at approximately equal angular intervals of about 40 degrees, as illustrated in Fig. **1B**, and are configured to interact with the magnetic field produced by the cylindrical layer rotor **100** to generate electrical output.

[0006] The stator coils **34** are arranged circumferentially around the stator mounted back plate **36**. Each stator coil **34** may be formed from conductive wire and wound with a selected number of turns depending on the desired electrical output characteristics. In one example embodiment, each stator coil **34** comprises approximately 65 turns of 20 AWG wire. The stator coils **34** may be connected in a multi-phase configuration, for example a three-phase star connection. In one example embodiment, the resistance of three stator coils **34** connected in the star configuration is approximately 1 ohm.

[0007] Fig. 2 Cylindrical Layer Rotor (100)

Fig. **2** illustrates a front view and a half-sectional side view of a cylindrical layer rotor **100**. The cylindrical layer rotor **100** may be formed from a suitable material such as aluminium, cast iron, mild steel, or an alloy material.

[0008] Fig. 2A and Fig. 2B

Fig. **2A** illustrates an isometric disassembled view of the cylindrical layer rotor **100**, showing the outer rotor **20**, inner rotor **22**, magnet bars **25**, **26**, slots **24**, **24A**, and bearings **28**.

Fig. **2B** illustrates a simplified front view of the cylindrical layer rotor **100** without magnet bars **25**, **26**, and bearings **28**, showing the arrangement of slots (**24**, **24A**) and the cylindrical space **30**.

The cylindrical layer rotor **100** comprises an outer rotor **20** and an inner rotor **22** arranged concentrically relative to one another.

[0009] Outer Rotor (20)

The outer rotor **20** includes a plurality of circumferentially arranged slots **24**. In one example embodiment, the outer rotor **20** comprises twelve slots **24** spaced at approximately equal angular intervals of about 30 degrees, as illustrated in Fig. **2B**.

Each slot **24** is formed within the body of the outer rotor **20** and is configured to receive and retain a magnet bar **26** positioned within the slot **24**. The magnet bars **26** are arranged such that adjacent magnet bars have alternating north-pole **26**(**N**) and south-pole **26**(**S**) polarity.

[0010] Inner Rotor (22)

The inner rotor **22** includes a plurality of circumferentially arranged slots **24A**. In one example embodiment, the inner rotor **22** comprises twelve slots **24A** spaced at approximately equal angular intervals of about 30 degrees, as illustrated in Fig. **2B**.

Each slot **24A** is formed within the body of the inner rotor **22** and is configured to receive and retain a magnet bar **25** positioned within the slot **24A**. The magnet bars **25** are arranged with alternating north-pole **25**(N) and south-pole **25**(S) polarity, as illustrated in Fig. **2**.

[0011] Cylindrical Space (30) and Bearings (28)

A cylindrical space **30** is defined between the outer rotor **20** and the inner rotor **22**. The cylindrical space **30** is configured to accommodate a stator assembly **101**, such that stator coils **34** are positioned within the cylindrical space **30** to interact with magnetic fields generated by the magnet bars **25**, **26**.

The cylindrical layer rotor **100** further includes bearings **28** provided at opposite ends of the rotor assembly to support rotational movement of the cylindrical layer rotor **100**.

[0012] Dimensional Variations

The number of slots **24**, **24A** and magnet bars **25**, **26** may vary depending on the diameter of the cylindrical layer rotor **100** and the required power output. In one example embodiment, the cylindrical layer rotor **100** has a diameter of approximately 100 mm.

Fig. 1 illustrates a front view and a half-sectional side view of a stator assembly 101

[0013] The stator coils **34,** shaft **32** and back plate 3**6** are fixed together by a casting process to form an integrated stator assembly **101**. Fastening elements such as stud screws **38** are used to secure the shaft **32** to the back plate **36**.

[0014] Fig. **3** illustrates a half-sectional side view of an assembled integrated layer alternator generator **102**. The integrated layer alternator generator **102** comprises a cylindrical layer rotor **100** and a stator assembly **101**. Fig. **3A** illustrates an isometric assembly view of the integrated layer alternator generator **102**.

[0015] The stator assembly **101** includes a shaft **32**, stator coils **34**, and a stator mounted back plate **36**. The cylindrical layer rotor **100** is arranged concentrically around the stator assembly **101** such that the stator assembly **101** is positioned within the cylindrical space **30** of the cylindrical layer rotor **100**.

[0016] The cylindrical layer rotor **100** is rotatably supported relative to the stator assembly **101** by bearings **28** provided within the cylindrical layer rotor **100**, thereby enabling rotation of the cylindrical layer rotor **100** relative to the shaft **32**. A retaining element, such as a snap ring, may be provided in a groove of the shaft **32** to retain the cylindrical layer rotor **100** in position relative to the stator assembly **101**.

[0017] The stator coils **34** are positioned within the cylindrical space **30** defined between the outer rotor **20** and the inner rotor **22** of the cylindrical layer rotor **100**. Magnetic flux generated by the magnet bars **25**, **26** interacts with the stator coils **34** to induce electrical output during rotation of the cylindrical layer rotor **100**.

[0018] Electrical connections from the stator coils **34** are routed outward, as indicated by reference numeral **40**, for connection to an external circuit as illustrated in Fig. **3**.

[0019] A gap is provided between the cylindrical layer rotor **100** and the stator assembly **101** to permit rotation of the cylindrical layer rotor **100** relative to the stator assembly **101** while allowing electromagnetic interaction between the magnet bars **25**, **26** and the stator coils **34**. The size of the gap may vary according to design requirements of the integrated layer alternator generator **102**.

[0020] Summary Of Invention

Permanent magnets such as neodymium magnets may be used in electrical generators and alternators for generating electrical energy.

The present invention provides an integrated layer alternator generator having a cylindrical layer rotor and a stator assembly arranged within a cylindrical space of the cylindrical layer rotor.

The structural arrangement allows magnetic interaction between magnet bars of the cylindrical layer rotor and stator coils positioned within the cylindrical space.

Magnetic flux generated by the magnet bars **25**, **26** passes across the cylindrical space **30** to induce electrical current in the stator coils **34**.