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(54) **ELECTRIC GENERATOR THAT GENERATES ELECTRICAL ENERGY BY MAGNETIC INDUCTION**

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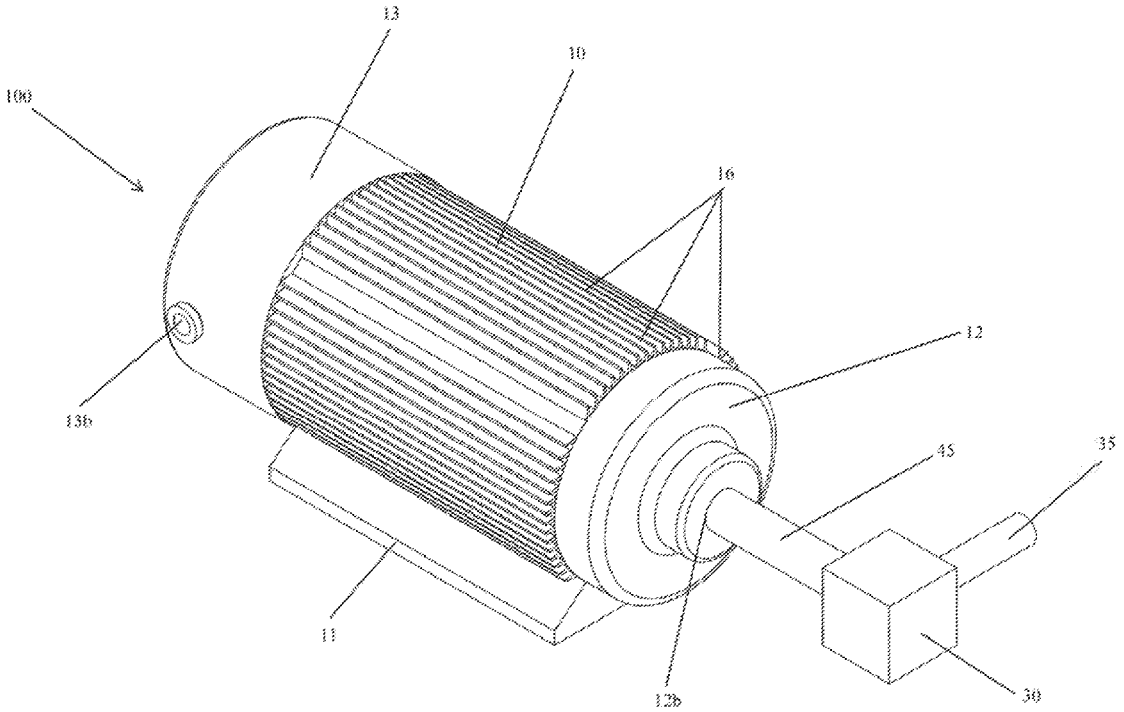
(57) **ABSTRACT**

The present invention relates to an electric generator that uses electric coils and magnets to induce electrical energy by magnetic induction. The present invention utilizes more coils and magnets then the prior art in similar size enclosure so as to maximize the amount of electrical energy generated. Air flow is effectively induced by the present invention to dissipate excess heat created by the added coils and magnets. In addition, the present invention utilizes heat fins strategically placed to maintain the system with n a predetermined operating temperature range.



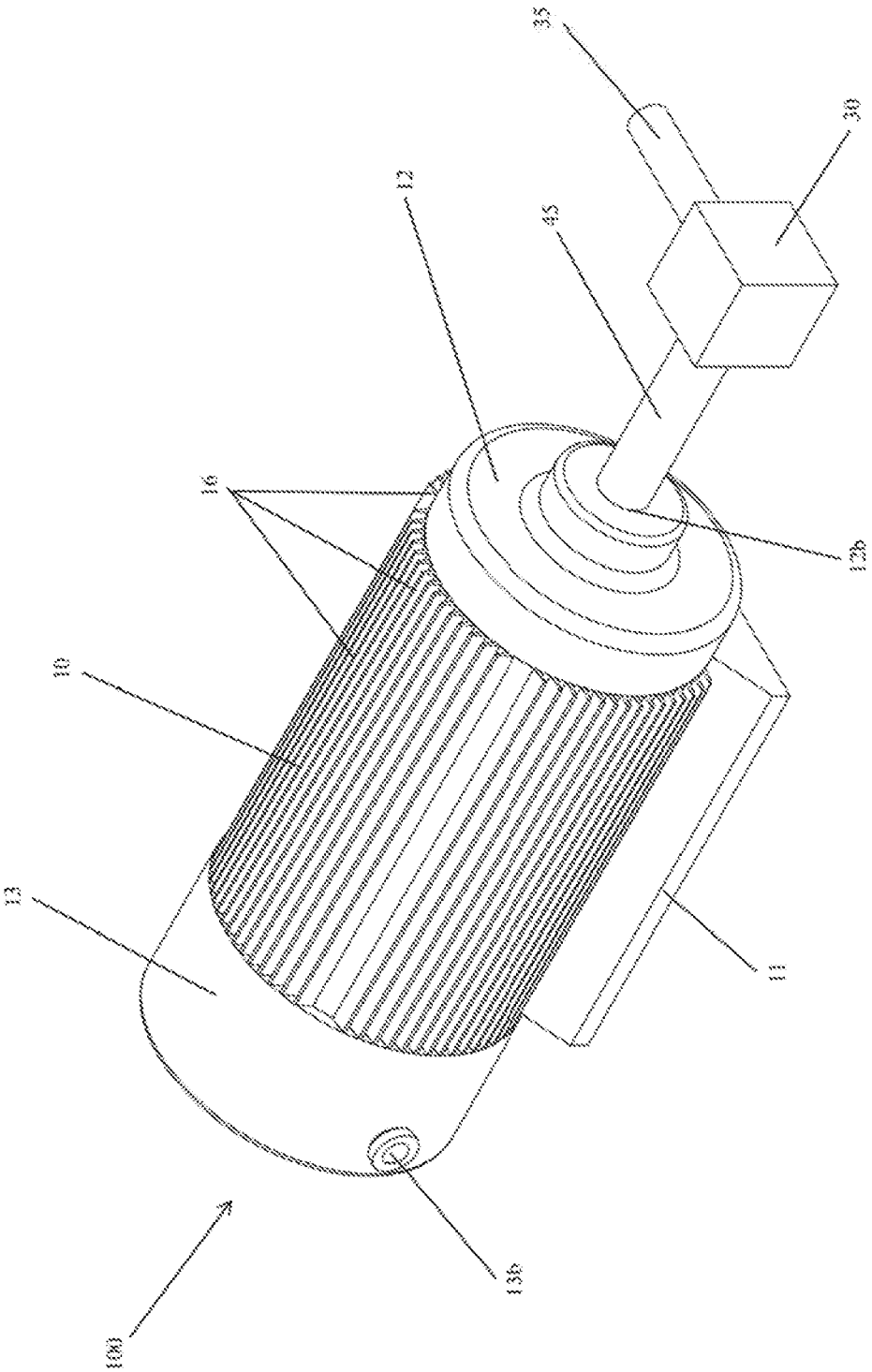


FIG. 1

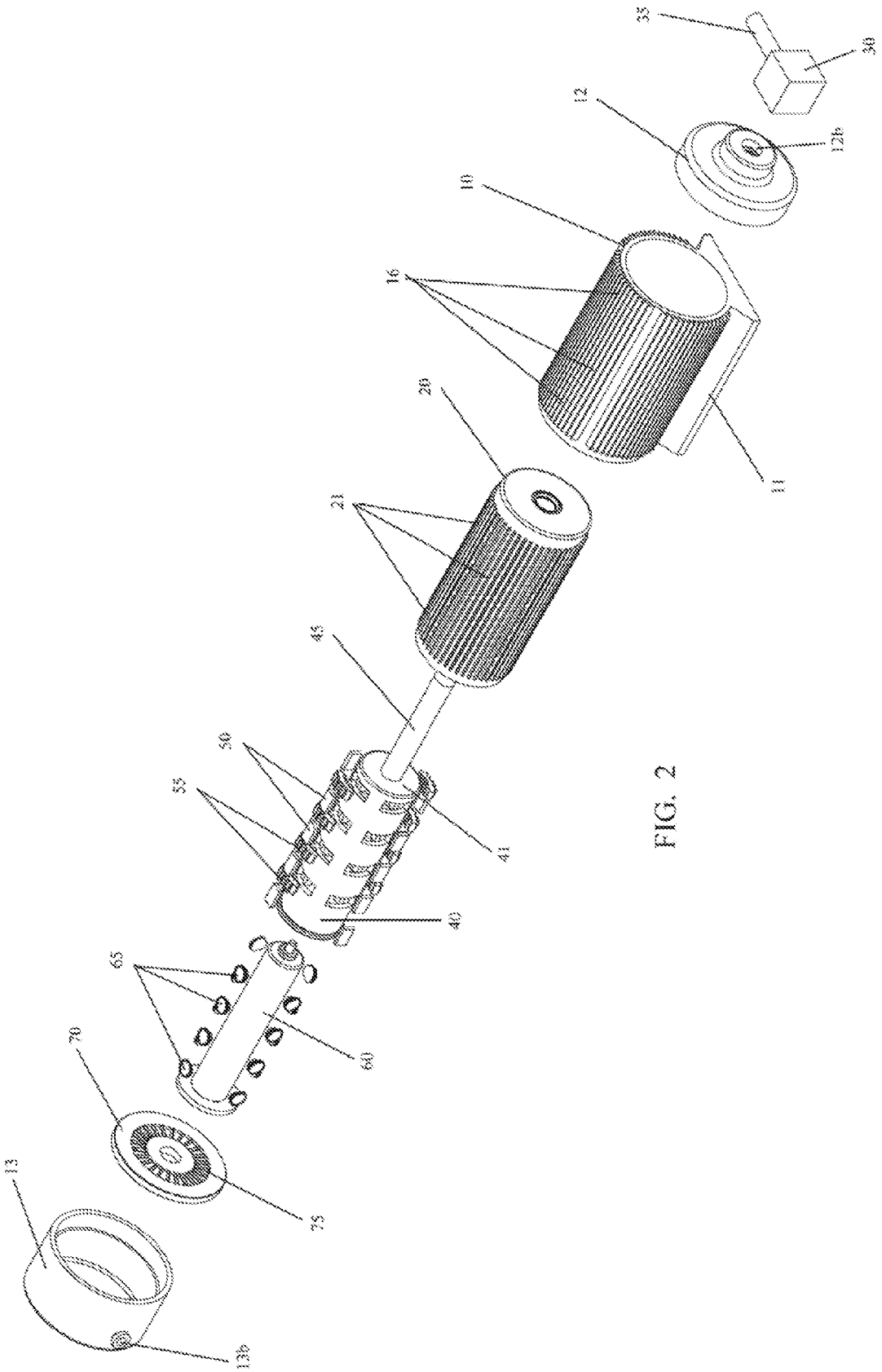


FIG. 2

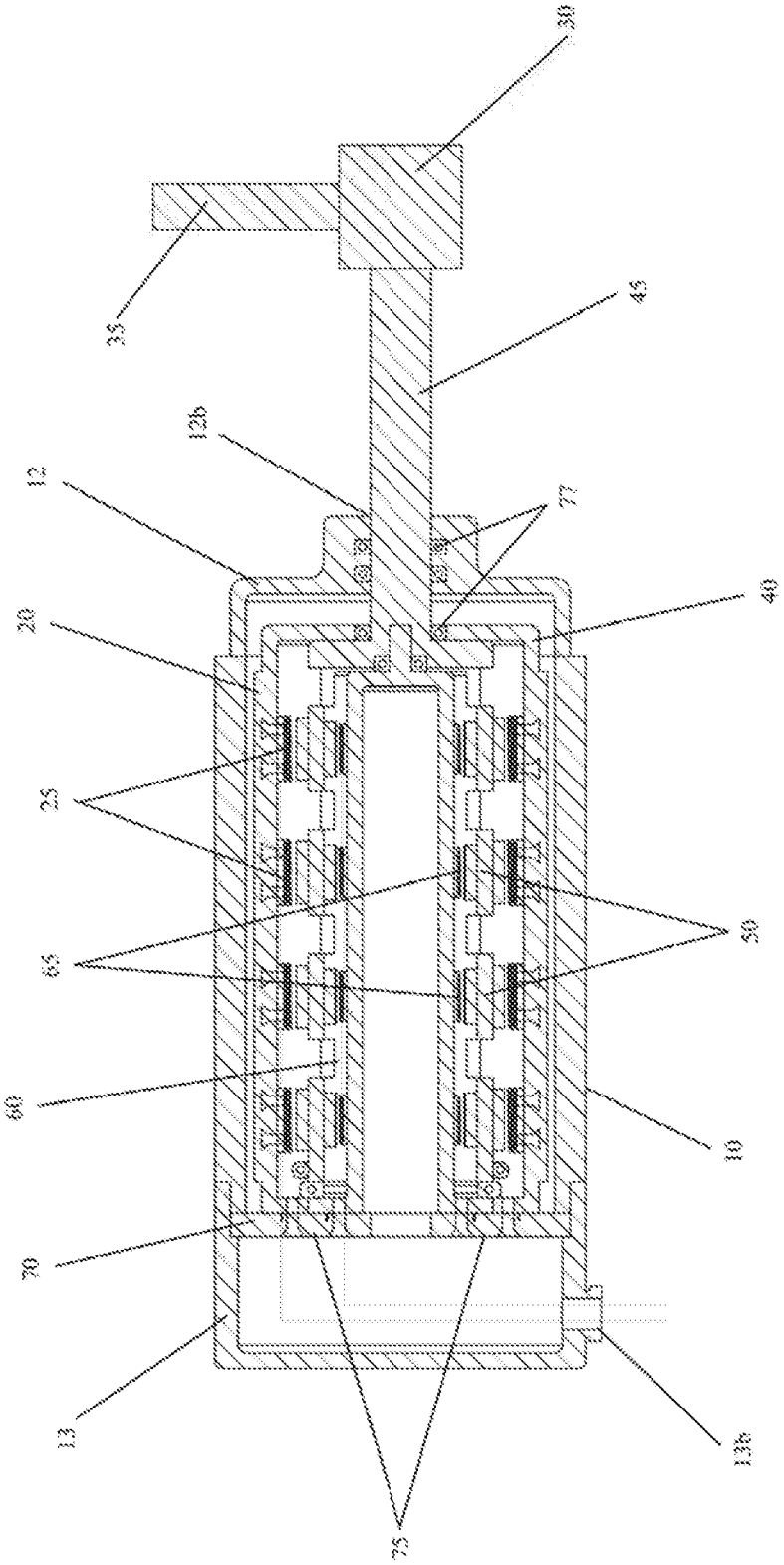


FIG. 3

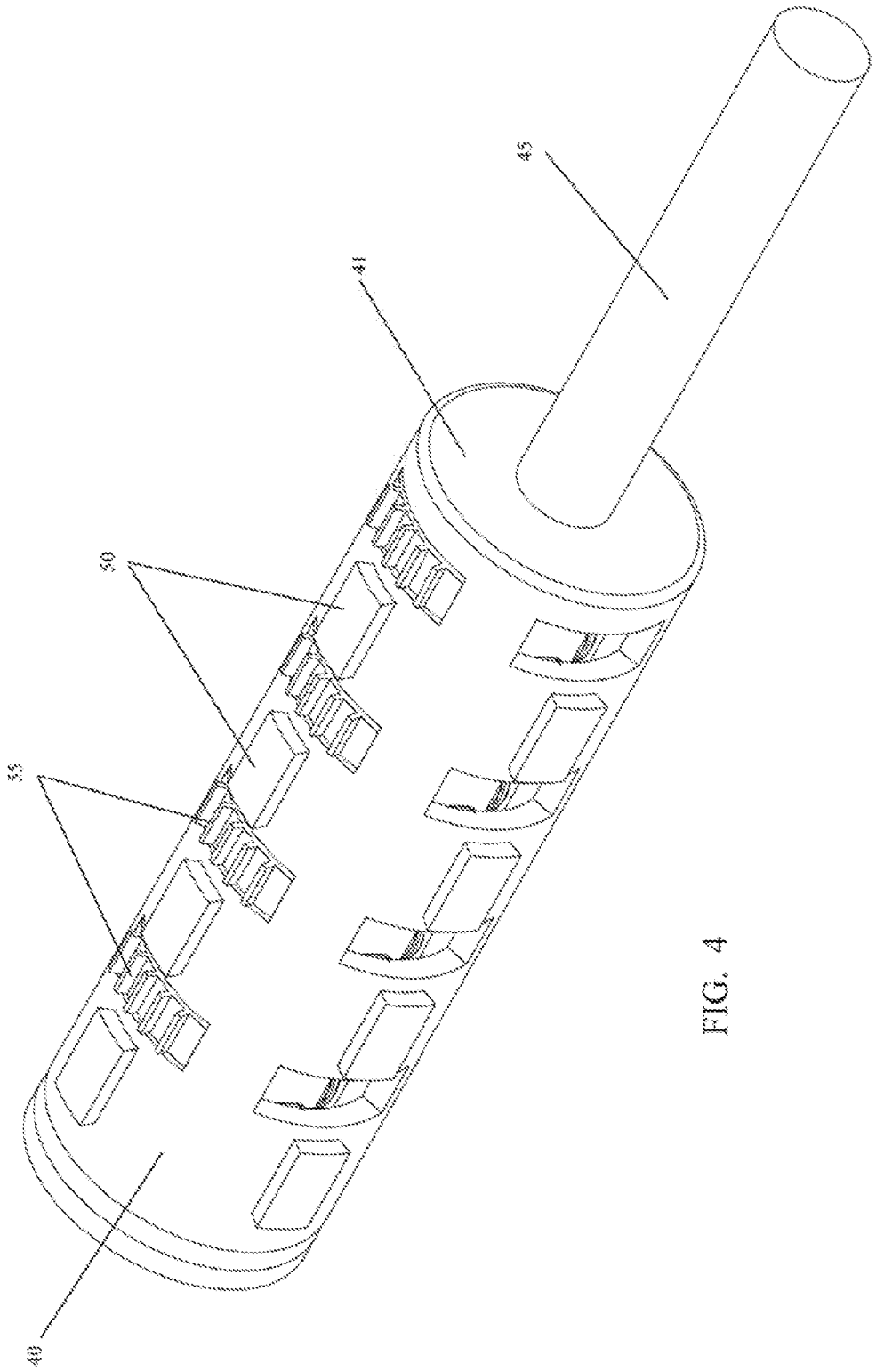


FIG. 4

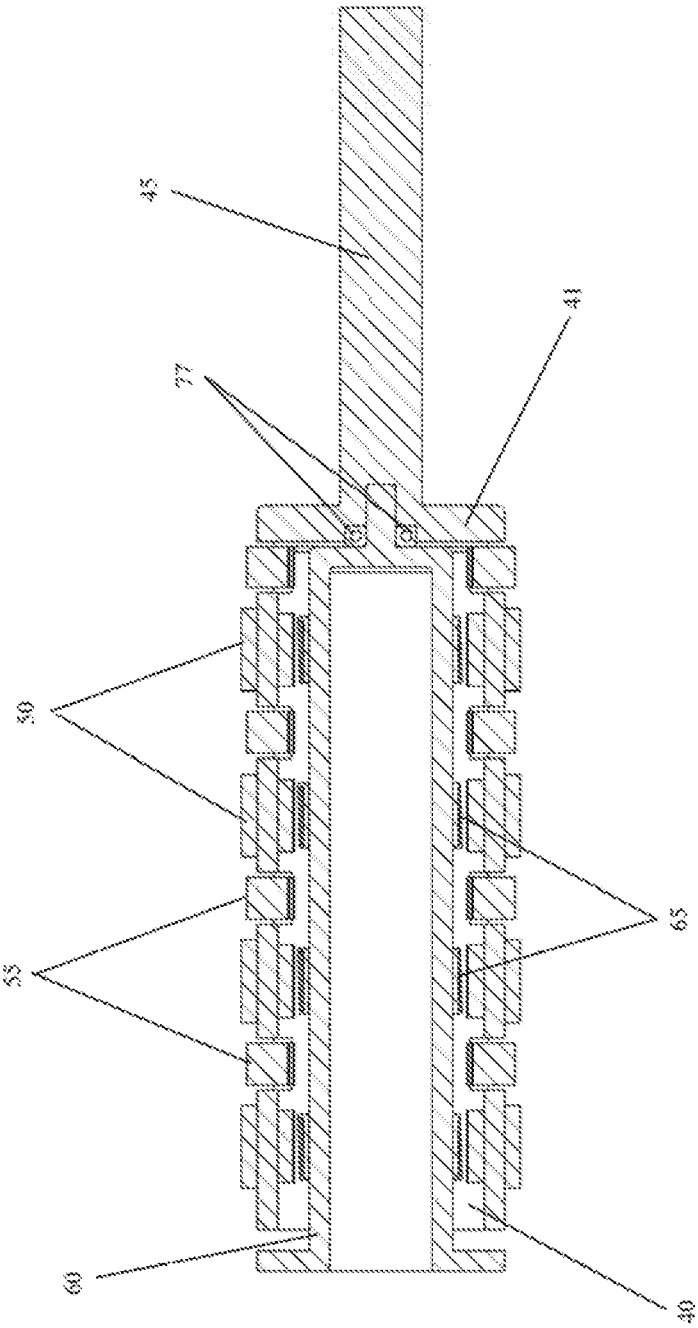


FIG. 5

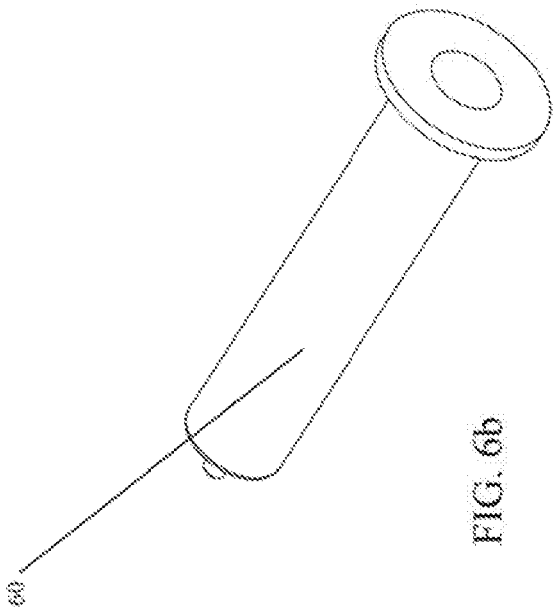


FIG. 6b

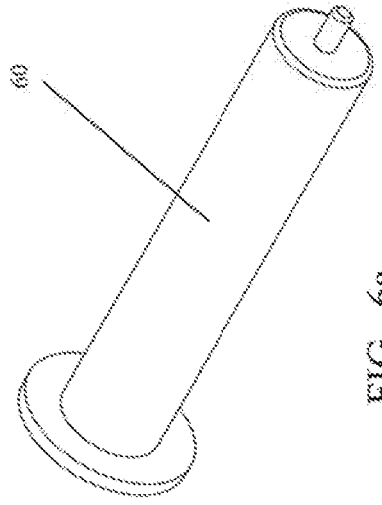


FIG. 6a

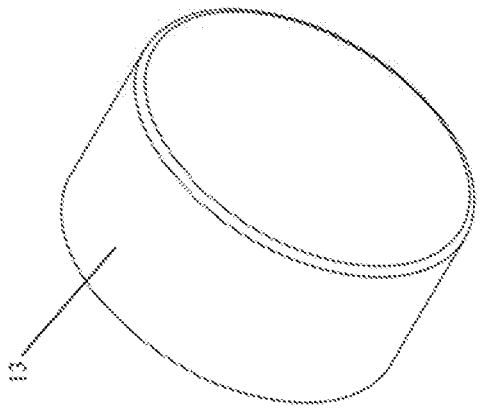


FIG. 7b

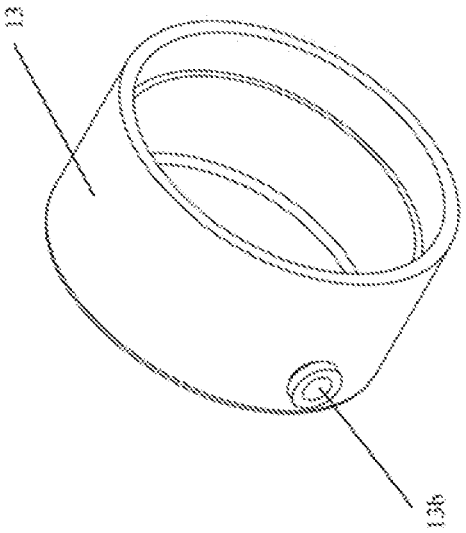


FIG. 7a

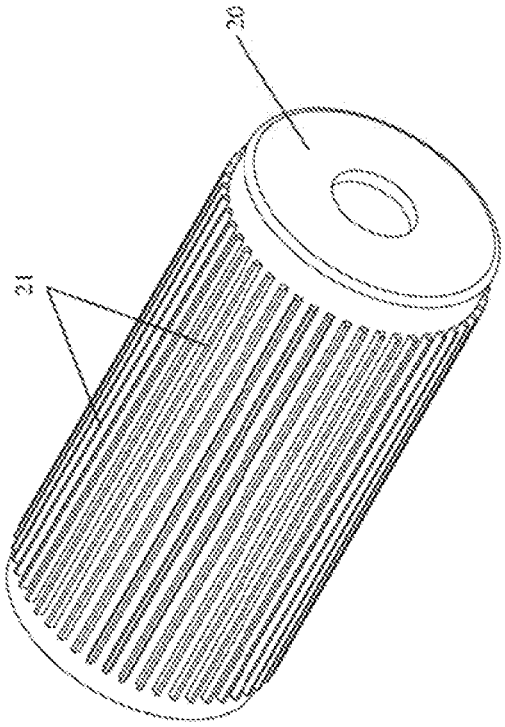


FIG. 8b

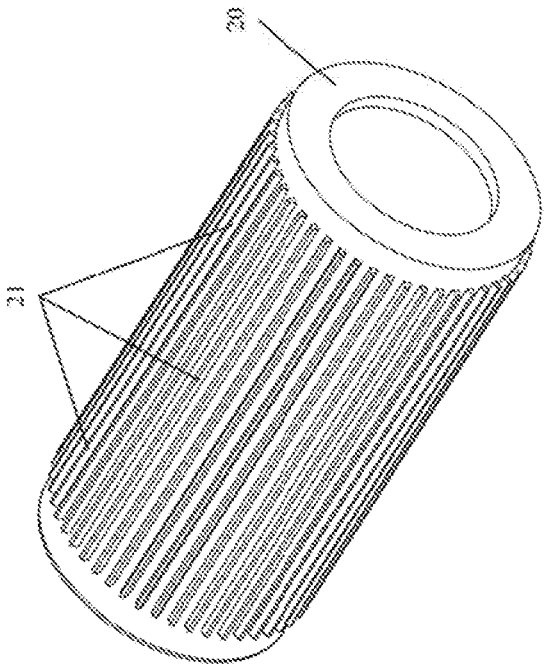


FIG. 8a

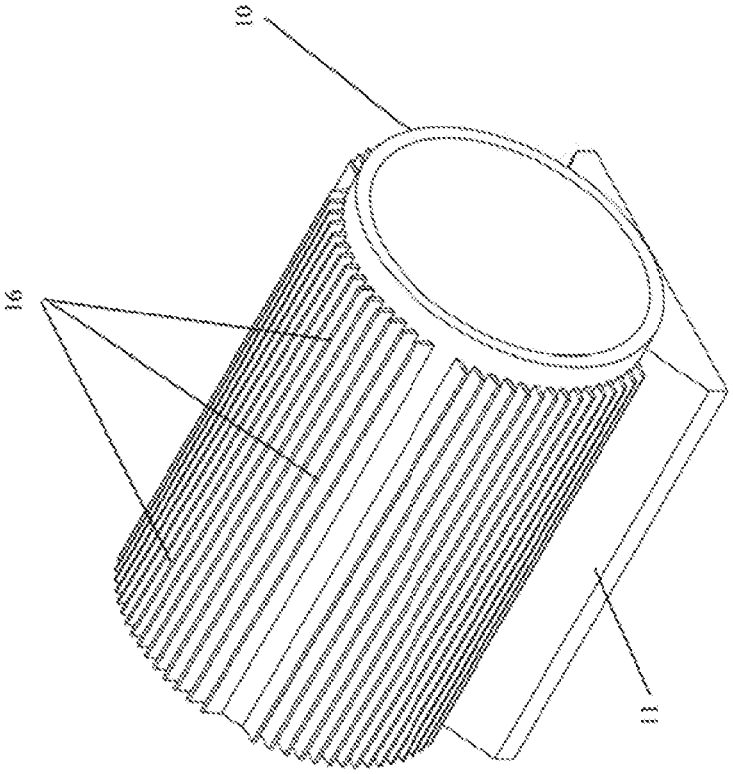


FIG. 9b

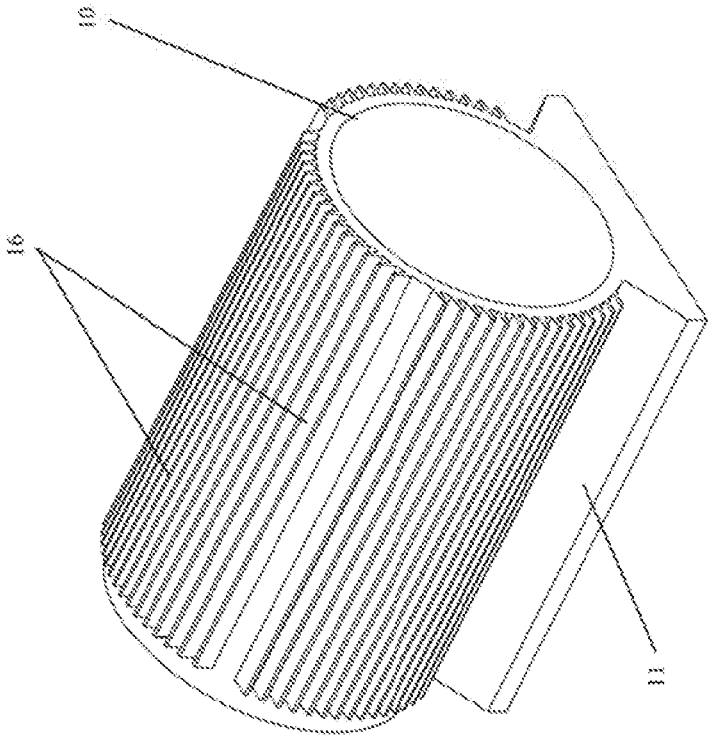


FIG. 9a

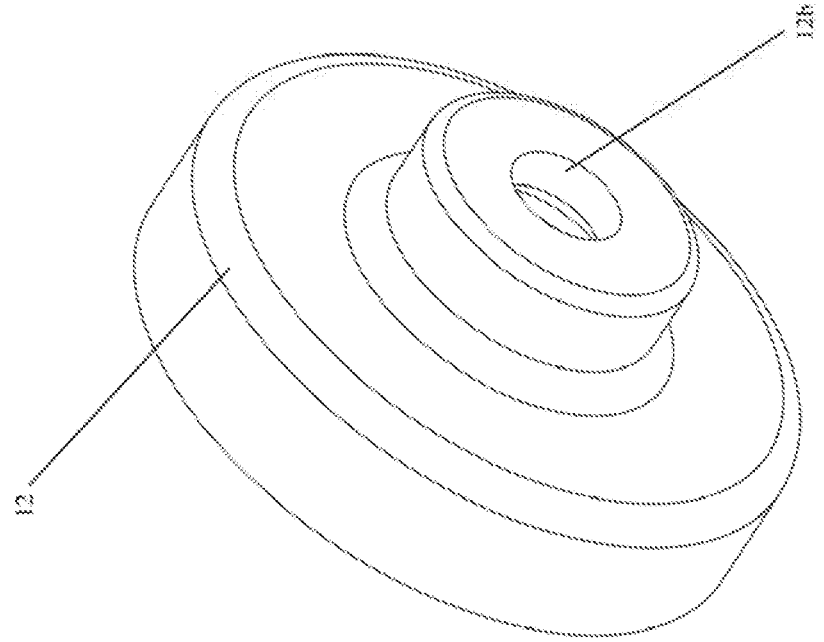


FIG. 10b

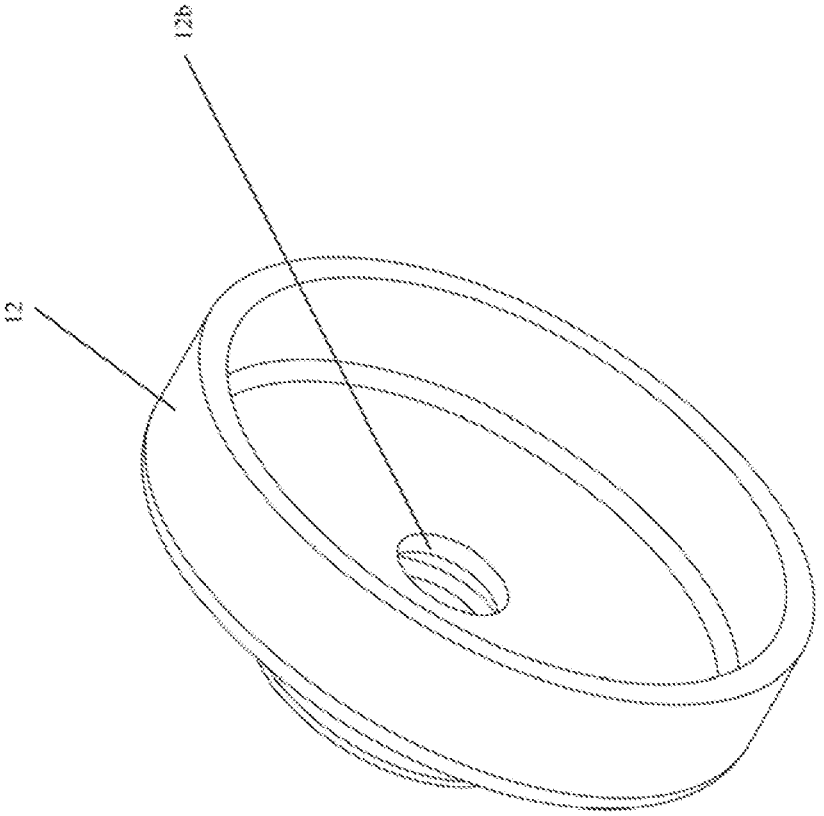


FIG. 10a

ELECTRIC GENERATOR THAT GENERATES ELECTRICAL ENERGY BY MAGNETIC INDUCTION

BACKGROUND OF THE INVENTION

Field of the Invention

[0001] The present invention relates generally to a field of energy production by harnessing the forces of induction. More specifically, the invention relates to an electric generator that uses electric coils and magnets to induce electrical energy by magnetic induction.

Description Of The Prior Art

[0002] The demand for energy has increased dramatically in recent years partly due to the increase in the world's population. Furthermore, fossil fuels, such as oil and natural gas, are increasingly becoming higher in cost and their availability is limited. Additionally, efforts to generate energy by nuclear power have been tempered by environmental and safety concerns. In the face of these challenges and growing demand, energy generation has become the focus of much research. Energy generation through magnetic induction has become desirable because it can be converted to practical use without environmental contamination or chemical pollution concerns.

[0003] Electric generators are rotating devices that can be used for a variety of purposes. Using an electric generator provides a renewable source of electricity which does not require fossil fuels or excrete carbon byproducts.

[0004] Traditional electric generators are horizontal axis electric generators, wherein a horizontally supported shaft rotates and the rotation can be transformed in to electrical energy. Other generators have a vertical axis, wherein a rotating shaft is mounted vertically on a vertically supported axis. A problem with vertical axis electric generator is that the shaft has a tall and large surface area that create inefficiencies due to drag.

[0005] Whether an electric generator operates on a vertical or horizontal axis, the concept is still the same. The rotation of a shaft can be used to induce electrical energy using magnets that rotate around stationary coils, as described in detail in this application.

[0006] In recent years, various electricity generating utilities promoted schemes to decentralize the commercial electricity grid. Utilities have promoted the generation of energy by the use of decentralized devices located on buildings or on land or in yards belonging to small commercial companies or even individuals. In many areas of the country where grid connection is available, electrical utilities offer "net metering", such that both the utility and the end user can generate electricity. Therefore, as the interest in co-generation of electrical energy grows, there will be a need for better, more efficient renewable-energy electricity generating devices.

[0007] The electric generator of the present invention maximizes the generation of electrical energy within the same size footprint as the prior art. The electric generator of the present invention is novel and nonobvious primarily due to the efficient arrangement of coils and magnets that jointly induce electrical energy from the rotation of a shaft. The inventor of this application believes that the most relevant prior art is U.S. Pat. No. 8,796,878 (hereinafter referred to as "the '878 Patent"), which discloses a vertical axis electric generator having stationary coils attached to the center stat nary shaft and magnets attached to the housing or shell that is rotated by the vertical foils. Thus, the magnets rotate around the stationary coils. This rotation induces the generation of electrical energy by magnetic induction. The electrical energy is then transferred to batteries or coupled to the power grid.

[0008] As described in detail in this application, the electric generator of the present invention incorporates substantially more coils and magnets within substantially the same footprint size as the '878 Patent to induce substantially more electrical energy.

[0009] in addition, unlike the prior art, the electric generator of the present invention also provides a cooling system driven by self-induced air flow combined with the use of heat fins configured to maintain the temperature within the system within a predetermined range.

[0010] Thus, based on the increase demand for electrical energy, a heretofore unaddressed need exists for an electric generator that can maximize the induction of electrical energy without overheating the system.

SUMMARY OF THE INVENTION

[0011] Accordingly, the present invention has been made in view of the above-mentioned disadvantages occurring in the prior art. The present invention is an electric generator that efficiently induces electrical energy that can then be transferred to batteries or the power grid.

[0012] It is therefore a primary objective of the present invention to maximize the amount of electrical energy generated through magnetic induction by utilizing substantially more coils and magnets than the prior art.

[0013] A further objective of the present invention is to utilize coils on opposite sides of each magnet so as to maximize the induction of electrical energy.

[0014] A yet further objective of the present invention is to attach the magnets to a cylinder that is rotated around the coils that are stationary.

[0015] A yet further objective of the present invention is to induce air flow as part of its cooling system to dissipate excess heat and maintain the system within a predetermined temperature range.

[0016] A yet further objective of the present invention is to utilize heat fins as part of its cooling system to dissipate excess heat and maintain the system within a predetermined temperature range.

[0017] A yet further objective of the present invention is to include a robust housing that provides structural protection against sudden impact.

[0018] A yet further objective of the present invention is to include a base that allows the present invention to be installed either horizontally or vertically depending on the specific application.

[0019] The above objects and other features of the present invention, as well as the structure and operation of various embodiments of the present invention, are described in detail below and with reference to the accompanying drawings.

DESCRIPTION OF THE DRAWINGS

[0020] The accompanying drawings which are incorporated by reference herein and form part of the specification,

illustrate various embodiments of the present invention and, together with the description, further serve the explain the principles of the invention and to enable a person skilled in the pertinent art to make and use the invention. In the drawings, like reference numbers indicate identical or functional similar elements. A more complete appreciation of the invention and many of the attendant advantages thereof will be readily obtained as the same becomes better understood by reference to the following detailed description when considered in connection with the accompanying drawings, wherein:

[0021] FIG. **1** is a perspective view of the electric generator of the present invention in its assembled state as it would be used to induce electrical energy.

[0022] FIG. **2** is an exploded view of the electric generator of the present invention.

[0023] FIG. **3** is a sectional view of the electric generator of the present invention.

[0024] FIG. **4** is a perspective view of the rotor assembly of the electric generator of the present invention.

[0025] FIG. **5** is a sectional view of the rotor assembly of the electric generator of the present invention.

[0026] FIGS. **6***a* and **6***b* is a perspective view of the coil shaft of the electric generator of the present invention.

[0027] FIGS. **7***a* and **7***b* is a perspective view of the rear end caps of the electric generator of the present invention.

[0028] FIGS. **8***a* and **8***b* is a perspective view of the shell of the electric generator of the present invention.

[0029] FIGS. **9***a* and **9***b* is a perspective view of the housing of the electric generator of the present invention.

[0030] FIGS. **10***a* and **10***b* is a perspective view of the front end caps of the electric generator of the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0031] Reference will not be made to the drawings in which various elements of the present invention will be given numerical designations and in which the invention will be discussed so as to enable one skilled in the art to make and use the invention.

[0032] The electric generator **100** of the present invention comprises a housing **10**, a base **11**, a front end cap **12**, a rear end. cap **13**, a shell **20**, a plurality of inner coils **25**, a gear box **30**, a generator shaft **35**, a rotor cylinder **40**, a rotor shaft **45**, a plurality of magnets **50**, a plurality of fan blades **55**, a coil shaft **60**, a plurality of outer coils **65**, and a bearing plate **70**. FIG. **1** shows a perspective view of the electric generator **100** of the present invention in its assembled state as it would be used to generate electrical energy. FIG. **2** shows an exploded view of the electric generator **100** of the present invention to depict in greater detail the various components that comprise the electric generator **100**.

[0033] FIGS. **4** and **5** show a perspective view and a sectional view of the rotor assembly in which the rear end of the rotor shaft **45** is centrally attached to a plate **41** of the rotor cylinder **40**. Further, a sidewall **42** is attached to the perimeter of the plate **41** and extends so as to define a hollow cylinder. Finally, attached to the sidewall **42** are a plurality of magnets **50** and a plurality of fan blades **55**. As shown in FIG. **5**, each magnet **60** has a positive polarity side and a negative polarity side. The magnets **50** are attached to the sidewall **42** in an alternating polarity configuration. In other words, the magnets **50** are attached to the rotor cylinder **40** in alternating positive polarity side and negative polarity side.

[0034] Thereafter, the rotor shaft **45** is connected to the gear box **30** as show in FIG. **1**. In addition, the generator shaft **35** is attached to the gear box **30**. The gear ratio of the gear box **30** is configured so that for every rotation of the generator shaft **35**, the rotor shaft **45** is rotated at least twice. Furthermore, the generator shaft **35** is caused to rotate by a mechanical force, for example, it can be attached to the rotating wheel of an automobile or the rotating blades of a wind turbine. In essence, the mechanical force rotates the generator shaft **35** on its axis. The gear box **30** then transmits the rotating power of the generator shaft **35** to rotate the rotor shaft **45** at a higher rate and at a perpendicular angle relative to the generator shaft **35**. The rotation of the rotor shaft **45** then induces the rotation of the rotor cylinder **40**.

[0035] As shown in FIG. **3**, the coil shaft **60** is rigidly attached to the bearing plate **70**. Furthermore, the plurality of inner coils **25** are attached along the coil shaft **60**, as shown in FIG. **5**. The plurality of inner coils **25** are stationary along the coil shaft **60**, thus, the inner coils are stators of the electric generator **100** of the present invention. The coil shaft **60** is hollow so that wires from the inner coils **25** are routed through the hollow section of the coil shaft **60**.

[0036] Then the rotor cylinder **40** is positioned so that it encloses the coil shaft **60**, as shown in FIG. **3**. In fact, the magnets **50** are attached to the rotor cylinder **40** such that each magnet **50** is in alignment with an inner coil **25** on one side and an outer coil **65** on the other side. Furthermore, the rotor cylinder rests against a plurality of bearings **75** placed on the bearing plate **70**, as shown in FIG. **3**. The bearings **75** reduce any frictional forces that would resist the rotation o the rotor cylinder **40**.

[0037] As shown in FIG. **3**, the shell **20** is a hollow cylindrical shell that is rigidly attached to the bearing plate **70** and encloses the coil shaft **60** and the rotor cylinder **40**. Furthermore, the plurality of outer coils **65** are rigidly attached to the interior face **21** of the shell **20**, as shown in FIG. **3**. In the preferred embodiment of the present invention, the outer coils **65** are positioned so as to be in alignment with the inner coils **25**.

[0038] As shown in FIGS. **1** and **3**, the rear end cap **13** is then placed over the bearing plate **70** and is coupled with the housing **10** that is placed over the shell **20**. The front end cap **12** is then coupled to the other end of the housing **10** with the rotor shaft **45** passing through the hole **12***b* is said front end cap **12**.

[0039] Once the electric generator **100** of the present invention is assembled as shown in FIG. **1**, the generator shaft **35** is rotated and the gear box **30** induces at least two rotations of the rotor shaft **45** for every rotation of the generator shaft **35**. Rotation of the rotor shaft **45** facilitates the rotation of the rotor cylinder **40**. The rotation of the rotor cylinder **40** causes the rotation of the magnets **50** around the coil shaft **60**. Thus, the rotation of the rotor cylinder **40** induces the rotation of the magnets **50** around the inner coils **25** and the outer coils **65**. The rotational motion of the magnets **50** induces electrical energy in the inner coils **25** and outer coils **65** by magnetic induction. The electrical energy is then transferred through wires attached to the inner coils **25** and outer coils **65**. The wires attached to the inner coils **25** and outer coils **65** are routed rearward into the rear end cap **13** and out through a wire hole **13***b* in the rear end

cap **13**. The wires can then he connected to batteries or coupled to the power grid. The electrical energy can then be transferred to batteries or coupled to the power grid through said wires.

[0040] Furthermore, as electrical energy is induced, the temperature inside the shell **20** may have a tendency to increase. However, the fan blades **55** attached to the sidewall **42** of the rotor cylinder **40** are configured to induce air flow inside the shell **20** as the rotor cylinder **40** rotates. The air flow allows for cooling within the shell **20** so that the temperature therewithin is maintained within a predetermined range.

[0041] In addition, a plurality of heat fins **21** are attached to the outer surface of the shell **20**. The heat fins **21** allow for the dissipation of heat out of the shell **20**. The heat fins **21** are configured with sufficient surface area to allow heat from within the shell **20** to dissipate by induction and convection at a predetermined rate. Even further, a plurality of venting boles are added throughout the shell **20** and the rotor cylinder **40** to allow the air to flow and circulate within the housing **10**. Then another set of venting boles are location in the housing **10** to allow the air to flow and circulate within the electric generator **100** of the present invention.

[0042] Additionally, the preferred embodiment of the present invention has another set of fins **16** attached to the outer surface of the housing **10**. The fins **16** are configured to induce some heat dissipation and to provide structural support and protection against sudden impact. Thus, the housing **10** is configured to provide robust protection to the electric generator **100** of the present invention.

[0043] Even more, the preferred embodiment of the present invention has a base **11** that allows the electric generator **100** of the present invention to provide stability as it is installed horizontally. However, a similar base can be added to the rear end of the electric generator **100** of the present invention to allow for a vertical installation.

[0044] Finally, the preferred embodiment of the present invention has a plurality of ball bearings **77** around the rotor cylinder **40** and the rotor shaft **45** to facilitate their rotation as described above, as shown in FIG. **3**.

[0045] The electric generator **100** of the present invention is configured to maximize the induction of electrical energy as compared to the prior art, in particular, U.S. Pat. No. 8,796,878 (hereinafter referred to as "the '878 Patent"). The '878 Patent teaches an electric generator with magnets that revolve around one set of coils to induce electrical energy. However, the electric generator **100** of the present invention in a novel and non-obvious manner incorporates the rotor cylinder **40** so that the magnets **50** would be rotated around two sets of coils, the inner coils **25** and the outer coils **65**, so as to induce substantially more electrical energy within the same structural footprint as the prior art. In addition, unlike the prior art, the electric generator **100** of the present invention incorporates a novel and non-obvious cooling system.

[0046] It is understood that the described embodiments of the present invention are illustrative only, and that modifications thereof may occur to those skilled in the art. Accordingly, this invention is not to be regarded as limited to the embodiments disclosed, but to be limited only as defined by the appended claims herein.

What is claimed is:

1. An electric generator that comprises:
- a housing attached to a base;
- a front end cap;
- a rear end cap;
- a plurality of outer coils attached to a coil shaft that is centrally attached to said rear end cap;
- a plurality of inner coils attached to a shell that is attached to said rear end cap and concentric to said coil shaft;
- a plurality of magnets attached to a rotor cylinder that has a rotor shaft and that is rotatably placed between said shell and said coil shaft;
- wherein said housing is attached to said rear end cap and concentric said coil shaft;
- wherein said front end cap is attached to said housing and has a centrally located hole through which said rotor shaft extends; and
- wherein rotation of said rotor shaft rotatably displaces said magnets in between said inner coils and outer coils so as to generate electrical energy by magnetic induction.

2. The electric generator of claim **1** that further comprises a gear box attached to said rotor shaft and having a generator shaft that can be rotated to induce the rotation of said rotor shaft at a greater rate of rotation.

3. The electric generator of claim **1** that further comprises a bearing plate placed within said rear end cap, having a plurality of bearings against which said rotor cylinder rests so as to facilitate rotation of said rotor shaft.

4. The electric generator of claim **1** that further comprises a plurality of fan blades attached to said rotor cylinder so as to induce air flow within said shell as said rotor cylinder rotates.

5. The electric generator of claim **1** further comprising a plurality of heat fins attached to said shell such that heat within said shell is dissipated.

6. The electric generator of claim **1** further comprising a plurality of venting holes throughout said shell and said rotor cylinder such that air flow is facilitated within said housing.

7. The electric generator of claim **1** further comprising a plurality of fins attached to an outer surface of said housing so as to induce heat dissipation and promote structural rigidity.

8. An electric generator that comprises:
- a housing attached to a base;
- a rear end cap;
- a plurality of outer coils attached to a coils shaft that is centrally attached to said rear end cap;
- a plurality of inner coils attached to an inner surface of said housing that is attached to said rear end cap and concentric to said coil shaft;
- a plurality of magnets attached to a rotor cylinder that is rotatably placed between said housing and said coil shaft; and
- wherein rotation of said rotor cylinder rotatably displaces said magnets in between said inner coils and outer coils so at to generate electrical energy by magnetic induction.

9. The electric generator of claim **8** that further comprises a gear box attached to said rotor cylinder and having a generator shaft that can be rotated to induce the rotation of said rotor cylinder at a greater rate of rotation.

10. The electric generator of claim **8** that further comprises a bearing plate placed within said rear end cap, having a plurality of bearings against which said rotor cylinder rests so as to facilitate rotation.

11. The electric generator of claim **8** that further comprises a plurality of fan blades attached to said rotor cylinder so as to induce air flow within said housing as said rotor cylinder rotates.

12. The electric generator of claim **8** that further comprises a plurality of venting holes throughout said rotor cylinder such that air flow is facilitated within said housing.

13. The electric generator of claim **8** further comprising a plurality of fins attached to an outer surface of said housing so as to induce heat dissipation and promote structural rigidity.

14. An electric generator comprising:

a plurality of outer coils attached to a coil shaft that is centrally attached to a rear end cap;

a plurality of inner coils attached to a housing that is attached to said rear end cap and concentric to said coil shaft;

a plurality of magnets attached to a rotor cylinder that is rotatably placed between said housing and said coil shaft; and

wherein rotation of said rotor cylinder displaces said magnets in between said inner coils and outer coils so as to generate electrical energy.

15. The electric generator of claim **14** that further comprises a gear box attached to said rotor cylinder and having a generator shaft that can be rotated to induce the rotation of said rotor cylinder at a greater rate of rotation.

16. The electric generator of claim **14** that further comprises a bearing plate placed within said rear end cap, having a plurality of bearings against which said rotor cylinder rests so as to facilitate rotation.

17. The electric generator of claim **14** that further comprises a plurality of fan blades attached to said rotor cylinder so as to induce air flow within said housing as said rotor cylinder rotates.

18. The electric generator of claim **14** that further comprises a plurality of venting holes throughout said rotor cylinder such that air flow is facilitated within said housing.

19. The electric generator of claim **14** further comprising a plurality of fins attached to an outer surface of said housing so as to induce heat dissipation and promote structural rigidity.

* * * * *