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(54) Title: MAGNETOSTRICTIVE POWER SUPPLY FOR BOTTOM HOLE ASSEMBLY WITH ROTATION-RESISTANT HOUSING

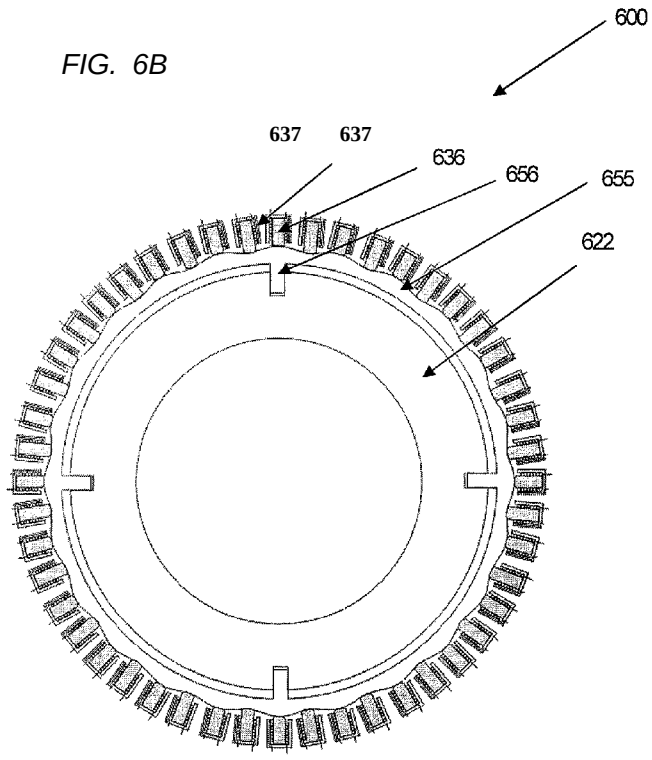

FIG. 6B

(57) Abstract: A power supply includes a rotor having an undulated surface (658, 858, 958, 10, 58) and a magneto-strictive material disposed adjacent to the undulated surface. The undulated surface alternatingly compresses the magneto - strictive material as the rotor rotates, inducing an electric current in a conductor coupled to the magneto strictive mater - ial.

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1. A power supply comprising:

a rotor comprising an undulated surface; and

a magnetostrictive array comprising a magnetostrictive material in a plurality of members disposed adjacent to the undulated surface;

wherein the undulated surface alternatingly compresses the magnetostrictive material as the rotor rotates, inducing an electric current in a conductor coupled to the magnetostrictive material.

2. The power supply of claim 1, wherein the rotor comprises:

a shaft rotatably coupled with a cam rotor, wherein the cam rotor comprises the undulated surface.

3. The power supply of claim 1,

wherein the rotor comprises a shaft, and the plurality of members is oriented along an axis of the shaft.

4. The power supply of claim 3, wherein the rotor comprises the undulated surface and a flat-faced member, and wherein the plurality of members is disposed between the undulated surface and the flat-faced member.

5. The power supply of claim 1,

wherein the rotor comprises a shaft, and the plurality of members is oriented radially with respect to an axis of the shaft.

6. The power supply of claim 1, wherein the undulated surface comprises a symmetrical pattern.

7. The power supply of claim 1, further comprising:

a conductor arrangement comprising the conductor and a winding around each of the plurality of members.

8. The power supply of claim 1, further comprising:

a conductor arrangement comprising the conductor and a winding around a group of two or more of the plurality of members.

9. The power supply of claim 1, wherein adjacent members of the plurality of members are approximately 180 degrees out of phase with respected to the undulated surface.

10. The power supply of claim 9, further comprising:

a two-phase conductor arrangement comprising the conductor and coupled to the plurality of members.

11. The power supply of claim 1, further comprising:

a conductor arrangement comprising the conductor and coupled to the plurality of members, wherein the undulated surface comprises a number of lobes, and wherein the power supply outputs a waveform at a frequency corresponding to a rotational speed of the times the number of lobes.

12. The power supply of claim 1, wherein the cam rotor is splined to and floats on the shaft.

13. A bottom hole assembly comprising:

a rotation-resistant housing;

a rotor coupled with a stator disposed within the rotation-resistant housing, wherein one of the rotor and the stator comprises an undulated surface; and

an array of members disposed adjacent to the undulated surface, each member comprising magnetostrictive material;

wherein the array of members is alternatingly compressed as the rotor rotates, inducing an electric current in a conductor coupled to the array.

14. The bottom hole assembly of claim 13, wherein:

the rotor comprises a shaft extending through a rotation-resistant housing; and

the plurality of members is oriented along an axis of the shaft.

15. The bottom hole assembly of claim 14, wherein:

the rotor comprises the undulated surface and a flat-faced member; and

the plurality of members is disposed between the undulated surface and the flat-faced member.

16. The bottom hole assembly of claim 13, wherein:

the rotor comprises a shaft extending through a rotation-resistant housing; and

the array of members is oriented radially with respect to an axis of the shaft.

17. The bottom hole assembly of claim 13, wherein:

the stator comprises the undulated surface; and

the array of members is rotatably coupled with the rotor.

18. The bottom hole assembly of claim 13, wherein the rotor is coupled to a positive displacement motor.

19. A method of supplying power, the method comprising:

providing a rotor coupled with a stator, wherein one of the rotor and the stator comprises an undulated surface;

providing a magnetostrictive array comprising a magnetostrictive material in a plurality of members disposed adjacent to the undulated surface; and

rotating the rotor to alternatingly compress the magnetostrictive material, inducing an electric current in a conductor coupled to the magnetostrictive material.