PRINCIPLE OF EMAGNETODYNAMICS FOR COMPOSITE MAGNETIC POLE

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ABSTRACT.

It is shown in this paper that geometry provides the key to the emagnetodynamics principle of operation of the machine (invented by Dr. Ezekiel Izuogu) which has an unexpected feature of driving a motor with static magnetic field. Essentially, because an array of like magnetic poles of the machine is arranged in a half circular array of a cylindrical geometry, the array creates a non-pointlike magnet pole that may be represented by a "magnetic current loop" at the position of the pivot of the movable arm. As a result, in three-dimensional space, it is possible to characterize the symmetry of the stator magnetic field **B** and the magnetic current loop **J** as a geno-dual (cube-hexagon) system by a 6-vector **(J,B)** (with **J**.**B** =6 **0**) comprising a 4x4 antisymmetric tensor analogous to the conventional electric and magnetic 6-vector (**E**,**B**) (with **E**.**B** =6 **0**) comprising the 4x4 antisymmetric tensor of classical electrodynamics. The implications are discussed.

1. STATEMENT OF THE PROBLEM

The conventional electric motor works on the principle that force is exerted on a current-carrying conductor in a magnetic field This is the Lorentz force on a moving electric charge which together with Maxwell's electromagnetic field equations constitute the laws of classical electrodynamics [1]. However, Ezekiel Izuogu [2] has invented a motor made up of an array of magnets and a vane (see, Fig. 1 below) with unexpected principle of operation, named emagnetodynamics and described in the following words

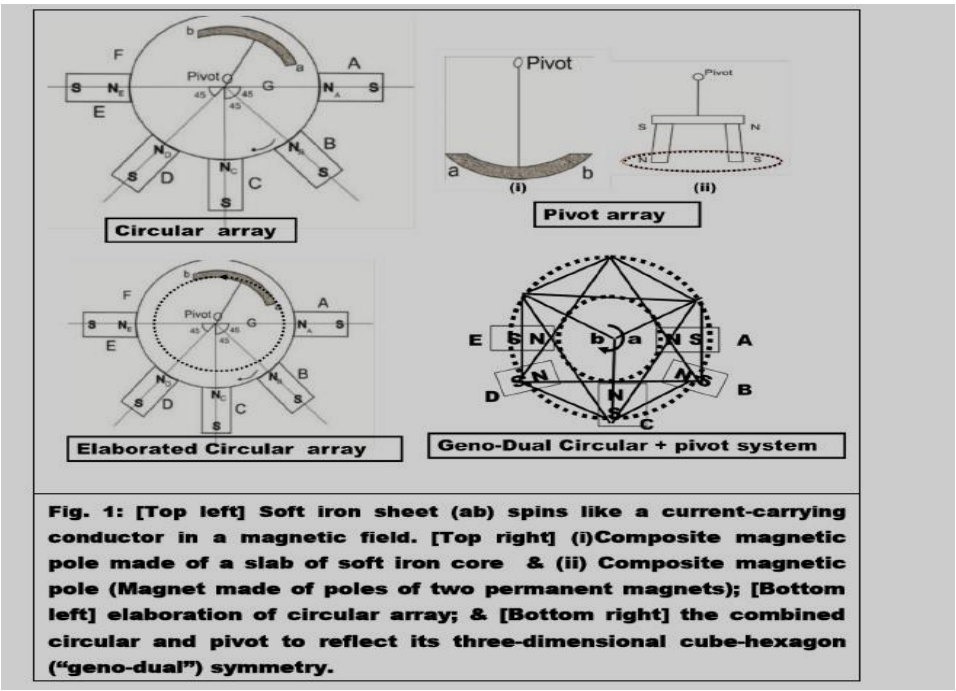

Fig. 1: [Top left] Soft iron sheet (ab) spins like a current-carrying conductor in a magnetic field. [Top right] (i)Composite magnetic pole made of a slab of soft iron core & (ii) Composite magnetic pole (Magnet made of poles of two permanent magnets); [Bottom left] elaboration of circular array; & [Bottom right] the combined circular and pivot to reflect its three-dimensional cube-hexagon ("geno-dual") symmetry.

"A certain force is exerted on a composite magnetic pole when it is placed under the influence of an array of like magnetic poles".

2. PROOF OF THE STATEMENT

In order to prove this statement, we begin by elaborating the geometrical arrangement of the circular array of magnetic poles in combination with the pivot in the machine to enable us visualize the three-dimensional cube-hexagon ("geno- dual") symmetry of the material components of the machine as shown in Fig. 1. Next, we pose the question: What is the energy/driving force for such a geno-dual system? To answer this question, we introduce a six-vector **(J, B)** system which may be represented by 4x4 antisymmetric tensor analogous to the sixvector **(E, B)** system of Maxwells electromagnetic field as follows:

$$||G_{\mu v}|| \equiv \begin{pmatrix} 0 & J_1 & J_2 & J_3 \\ -J_1 & 0 & B_3 & -B_2 \\ -J_2 & -B_3 & 0 & B_1 \\ -J_3 & B_2 & -B_1 & 0 \end{pmatrix} \sim ||F_{\mu v}|| \equiv \begin{pmatrix} 0 & E_1 & E_2 & E_3 \\ -E_1 & 0 & B_3 & -B_2 \\ -E_2 & -B_3 & 0 & B_1 \\ -E_3 & B_2 & -B_1 & 0 \end{pmatrix} \quad (1)$$

Now, the usual Maxwell's equation which are 3-vector equations, relating the electric field, **E**, magnetic field, **B**, and a conserved electric current $\mathbf{J^e}$, when rewritten in 4-vector notations takes the form

$$\partial^t F_{\mu v} = J^e_{\mu} \quad (2)$$

and has conventional dual symmetry with respect to interchange of electric and magnetic quantities, ($\mathbf{E \rightarrow B, B \rightarrow -E. J^e \rightarrow J^m}$) where J^m force is the magnetic analog of the electric current, while the usual Lorentz takes the form

$$\mathbf{f^e = eE + J^e \times B} \quad (3)$$

Finally, to include the effect of gravity, we incorporate the space-time metric and curvature, by introducing (in addition to Eq. (2)) the determinant equation [3]

$$Det||F_{\mu v} \quad \lambda\eta_{\mu v}|| \equiv \lambda^4 \quad (R_{\mu v\rho\sigma}F^{\mu\rho}F^{v\sigma})\lambda^2 + (\epsilon_{\mu v\rho\sigma}F^{\mu\rho}F^{v\sigma})^2 = 0, \quad (4)$$

where, with $||\eta\mu v|| \equiv diag\ (+1,-1,-1,-1), R\mu v\rho\sigma \equiv (\eta\mu\nu\eta\rho\sigma - \eta\mu\rho\eta\sigma\nu)$, we have

$$R_{\mu v\rho\sigma}F^{\mu\rho}F^{v\sigma} - 2\epsilon_{\mu v\rho\sigma}F^{\mu\rho}F^{v\sigma} = \begin{cases} E^2 \\ B^2 \end{cases} \Rightarrow \begin{cases} E^2 - B^2 \pm 2B.E = 0 \\ B^2 - E^2 \pm 2E.B = 0 \end{cases} \quad (5)$$

For the corresponding magnetic pole array, we have the analog of Eq. (4),

$$Det||G_{\mu v} - \lambda\eta_{\mu v}|| \equiv \lambda^4 - (R_{\mu v\rho\sigma}G^{\mu\rho}G^{v\sigma})\lambda^2 + (\epsilon_{\mu v\rho\sigma}G^{\mu\rho}G^{v\sigma})^2 = 0, \quad (6)$$

where

$$\begin{matrix} \mathbf{Jm2} \\ \mathbf{B^2} \end{matrix} \Rightarrow \begin{cases} \mathbf{J^{m2} - B^2 \pm 2B.J^m = 0} \\ \mathbf{B^2 - J^{m2} \pm 2J^m.B = 0} \end{cases} \quad (7)$$

under the dual transformation ($\mathbf{J^m \rightarrow B}$, $\mathbf{B \rightarrow -J^m}$). This is the result we are after. To complete our proof, we draw an analogy between our model of the array of magnetic poles with London's superfluid model of a superconductor (p.412-414 of [4]) in terms of Feynman's wave function (Anderson [5]) for a superfluid, for which an expression for the superfluid velocity $\mathbf{J^m}$ in the presence of an electromagnetic vector potential, **A**, is given by the London equation

$$\mathbf{J}^m = (2e\}/mc)\,\mathbf{A},\ \mathbf{B} = \mathrm{curl}\mathbf{A} = \mathrm{curl}(\zeta\mathbf{J}^{\mathbf{m}}),\ \zeta = (mc/2|e|\}) \qquad (8)$$

which leads to the Meissner effect in a superconductor (p. 412 of [4]). It shows how a magnetic current loop $\mathbf{J}^m$ could be associated with a magnetic field **B** in such a system.

The importance of geno-dual symmetry of the magnetic pole array (and the consequential non-vanishing of the $\mathbf{J^m}.\mathbf{B}$ term in Eq.(7) above) is provided further by antiferromagnetic ordering of MnO below the Curie point (see p. 359 of [4], and also [6]), sketched in Fig. 2. The magnetic unit cell comprises eight chemical unit cells, and the antiferromagnetic coupling is between second nearest manganese neighbors, such as A and B, via the intervening oxygen, O. The array has geno-dual symmetry as explained in the caption. In this case, the analog of the $\mathbf{J^m}.\mathbf{B}$ term is the Heisenberg exchange (Eq.(10.29) of [4]) $H_{ex} \propto (\mathbf{S}_A.\mathbf{S}_B)$.

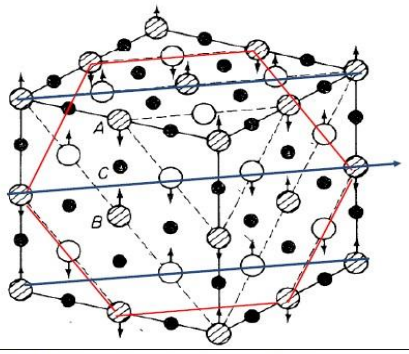

Fig. 2: Characterization of geno-dual symmetry of Antiferromagnetic Ordering in MnO by a cube(up-spin) & Hexagon(down-spin) magnetic unit cell[6]

3. DISCUSSION AND CONCLUSION

The puzzling aspect of Engr. Dr. Izuogu's observation of emagnetodynamics phenomenon stems from the fact that a pointlike magnetic monopole has not been observed. But Engr. Dr. Izuogu's array is nonpointlike and hence representable as a magnetic current loop, which follows from the correspondence principle [3]

points ⇔ particles, lines ⇔ fields, planes ⇔ currents,

between points, lines and planes of the tetrahedron of reference of projective 3D space and particles, fields and currents of Maxwell-type gauge field theories (as shown in Fig. 3) which was employed in Eq. (1) above. Another puzzling question has to do with energy conservation in

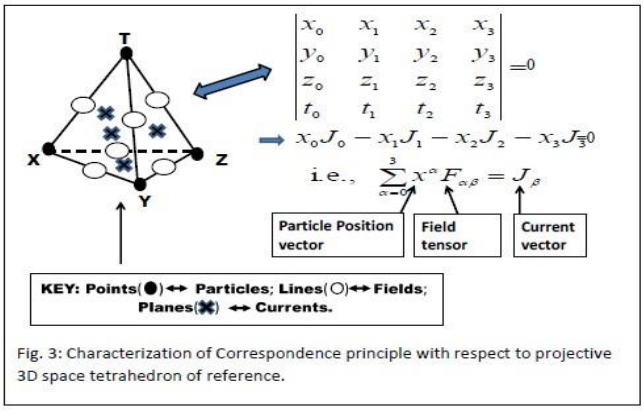

Fig. 3: Characterization of Correspondence principle with respect to projective 3D space tetrahedron of reference.

the new machine: Can the emagnetodynamic machine run perpetually, contrary to the 2^{nd} laws of thermodynamics that forbids the construction of a "perpetual motion machine"? The answer to this question is that the emagnetodynamic machine is not an isolated system insofar as gravity comes into play through the inertia of the pivoted vane and plays a role in crossing the "dead end" at each half-cycle of the vanes motion.

We are, therefore, led to the conclusion that emagnetodynamics phenomenon is allowed both theoretically and in practice, and should be incorporated into the body of knowledge of the physical universe.

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