THE MOTIVE POWER GENERATOR WITH A MAGNETIC POTENTIAL ENERGY OF MAGNITUDE

\[
\lim_{K \to \infty} \left( \frac{2K\pi rA_mB_rB_\theta}{\mu_0} \right) \text{ JOURLES}
\]

WHERE:

- \( r \) - TORQUE ARM
- \( A_m \) - POLE AREA
- \( B_r \) - RADIAL FLUX DENSITY
- \( B_\theta \) - TANGENTIAL FLUX DENSITY
- \( \mu_0 = 4\pi \times 10^{-7} \text{ H/m} \)
ABSTRACT

A motive power generator having a magnetic potential energy of magnitude “\( \lim_{k \to \infty} (\tau * 2k\pi) \)” Joules, where \( \tau \) is the torque and “\( 2k\pi \)” is the angular displacement, the generator converting the magnetic potential energy into kinetic energy at the rate of \( (\tau^2 * \sigma \rho^{-1} r^{-2})^{1/2} \) Joules per second, where \( r, \rho, \) and \( \sigma \) are respectively the average radius, the density, and the maximum tensile strength of the generator-rotor. The generator includes three concentric ring magnets positioned so that there are magnetic interactions among them, one of the ring magnets being pivoted to rotate about its axis of symmetry. First and second pluralities of oblique magnets are positioned in gaps between the ring magnets to incline the magnetic fields therein. The oblique magnets interact magnetically with the ring magnets, making them to exert magnetic shear forces on one another; the moment of the shear forces causes the pivoted ring magnet to rotate continuously.
BACKGROUND OF THE DISCLOSURE

Field of the Invention

The present invention relates to a method and means for utilizing magnetism in a manner that will achieve continuous rotation of a drive shaft. More particularly, the present invention relates to a magnetic motor or a motor-like device whose action is based on the principle that when a magnetic field is inclined at an angle \( \phi \) to the vertical, the magnetic field produces a force that is inclined at an angle \( 2\phi \) to the vertical, the magnitude of the force per unit area being \( (B^2/2\mu_0) \) Newton per meter squared; where \( B \) is the flux density and \( \mu_0 = 4 \times 10^{-7} \text{H/m} \).

Description of the Prior Art

A variety of prior art magnetic motors have been developed based on the forces created by the interaction of magnetic poles of permanent magnets. Generally, magnetic motors have “sticky spots” where their rotors encounter magnetic forces that oppose their motion and that prevent them from completing a full rotation. Therefore some form of input power is always required to enable the rotors overcome the sticky spots. As a result, magnetic motors are inefficient and their coefficients of performances are less than unity.

SUMMARY OF THE INVENTION

In view of the above described problem, it is an object of the present invention to provide a magnetic motor or a motor-like device that has no sticky spots.

It is another object of the present invention to provide a motor or a motor-like device that operates on magnetic principles and can be constructed using permanent magnets or electromagnets.

It is another object of the present invention to provide an economical method and means for causing the rotation of a drive shaft.

It is another object of the present invention to provide methods and means for imparting rotational movement to a drive shaft which require no energy input while achieving substantial energy output.

It is another object of the present invention to provide a motor-like device that can be both efficiently and economically operated for providing power.

It is another object of the present invention to provide a motor-like device that has only accelerating magnetomotive forces between its rotor and stator.

It is another object of the present invention to provide a motor-like device that has a coefficient of performance that tends to infinity.

It is another object of the present invention to provide a motor-like device in which magnetic fields can be harnessed efficiently.
It is another object of the present invention to provide a motor-like device that is compatible with various forms of engines.

It is another object of the present invention to provide a motor-like device that converts stored magnetic energy into kinetic energy.

It is still a further object of the present invention to provide a motor-like device whose magnetic potential energy tends to infinity.

These and other objects and advantages of the present invention will become apparent after considering the following detailed specification in conjunction with the accompanying drawings which form parts thereof.

BRIEF DESCRIPTION OF THE DRAWINGS

FIGURE 1 is an exploded view of a motor-like device according to an embodiment of the invention;

FIGURE 2A is a sectional view of the present invention;

FIGURE 2B is a perspective view, partly in section, of the present invention;

FIGURE 3A is a perspective view, partly in section, of the present invention, with a frame and a cylindrical support omitted, "plus" and "minus" signs representing north and south poles, respectively;

FIGURE 3B is a perspective view of the present invention, with the frame, cylindrical support, shaft and ball bearings not shown;

FIGURE 4 is a perspective view showing a second ring permanent magnet;

FIGURE 5 is a perspective view showing a first ring permanent magnet with a first plurality of permanent magnets affixed to it;

FIGURE 6 is a perspective view showing a third ring permanent magnet with a second plurality of permanent magnets affixed to it;

FIGURE 7 is a sectional view showing the frame;

FIGURE 8 is a perspective view showing the cylindrical support;

FIGURE 9 is a perspective view showing two pairs of bearings fitted over a rotatable shaft, and a support plate affixed to the shaft;

FIGURE 10A is a top plan view of the present invention shown in FIGURE 3B, blue lines representing magnetic flux between the magnets, a dotted line representing magnetomotive force path;

FIGURES 10B is a view similar to FIGURE 2A, but showing a magnetomotive force (mmf) path represented by a broken line;
FIGURE 10C is an equivalent magnetic circuit of the mmf path shown in FIGURES 10A and 10B;

FIGURES 11 to 16 are simulation results obtained when the present invention was modelled and analysed with Ansys Maxwell 3D, version 14.

DETAILED DESCRIPTION OF THE INVENTION

The preferred embodiment of the current invention will be explained in detail below along with reference to the accompanying drawings in which like numerals represent like components.

According to an embodiment 10 of the present invention, a suitable frame 14 has a rotatable rotating shaft 12 mounted thereto via a pair of ball bearings 12b. The frame 14 includes a cylindrical support 14a, an inner surface 14b, a hollow support 14c, and a base 14d. One of the ball bearings 12b is fitted into a bore in the cylindrical support 14a, while the second ball bearing 12b is fitted into a bore in the base 14d.

The shaft 12 includes a support plate 12a which is fixedly mounted to the shaft 12 for rotation therewith, the pair of bearings 12b, and a brake assembly 12c (not shown) for controlling the speed of the shaft 12. The shaft 12 extends through the hollow support 14c.

Mounted to the hollow support 14c is a first ring permanent magnet 16, radially magnetized, which has its South pole adjacent the surface thereof and its North pole spaced from the hollow support 14c.

A second ring magnet 18, which is radially magnetized, is disposed around the first ring magnet 16 and fixedly mounted to the support plate 12a for rotation therewith. The second ring magnet 18 is shown having its South pole disposed in close enough proximity to the North pole of the first ring magnet 16 to produce magnetic interaction therebetween.

In an annular gap between the first and second ring magnets 16 and 18, a first plurality of magnets 16a are obliquely disposed in attraction mode relative to one another along the direction of rotation, such that their magnetic axes are at right angles to the magnetic axes of the first and second ring magnets 16 & 18. The magnets 16a are shown having the shape of a polyhedron with a concave base. Each of the magnets 16a has its North pole inclined toward the North pole of the first ring magnet 16 and its South pole inclined toward the South pole of the second ring magnet 18. The magnets 16a are equidistantly and fixedly disposed along the direction of rotation.

A third ring magnet 20, radially magnetized, is fixedly mounted to the inner surface 14b of the frame 14. The third ring magnet is disposed with its North pole adjacent the inner surface 14b of the frame 14, and its South pole in close enough proximity to the North pole of the second ring magnet 18 to produce magnetic interaction therebetween.

In an annular gap between the second and third ring magnets 18 & 20, a second plurality of magnet 20a are disposed in attraction mode relative to one another along the direction of rotation, such that their magnetic axes are at right angles to the magnetic axes of the second and third ring magnets 18 & 20. The magnets 20a are shown having the shape of a polyhedron with a convex base. Each of the magnets 20a has its North pole inclined toward the North pole of the second ring magnet 18 and its South pole inclined toward the South...
pole of the third ring magnet 20. The magnets 20a are equidistantly and fixedly disposed along the direction of rotation.

The magnets 16a & 20a incline the magnetic fields B1 & B2 of the ring magnets, 16, 18, 20, in a manner shown in FIG. 10A. According to Maxwell’s theory of electrodynamics, a magnetic field B inclined at an angle $\phi$ to the vertical has an accompanying magnetic force F which is inclined at an angle 20$\phi$ to the vertical, the magnetic force F having a vertical component $FCos2\phi$ and a horizontal component $FSin2\phi$. Accordingly, the inclined magnetic fields B1 & B2 cause the first and third ring magnets 16 & 20 to continuously exert radial and tangential magnetic forces on the second ring magnet 18; and the moment $\tau$ of the tangential magnetic forces (i.e. magnetic shear forces) causes the second ring magnet 18 to rotate continuously with the shaft 12 in the clockwise direction.

The frame 14, the cylindrical support 14a, and the shaft 12 can be constructed of non-magnetic materials, the only requirement being that sufficient structure be provided to support the magnets during rotation.

If the polarity of the first, second, and third ring magnets, 16, 18, 20, were reversed; the second ring magnet 18 would rotate continuously in the counter-clockwise direction. If the polarity of the second ring magnet 18 were reversed, the second ring magnet 18 would rotate continuously in the counter-clockwise direction.

If the polarity of the magnets 16a were reversed, the second ring magnet 18 would rotate continuously in the clockwise direction. If the polarity of the magnets 20a were reversed, the second ring magnet 18 would rotate continuously in the counter-clockwise direction.

If the polarity of the first ring magnet 16 were reversed, the second ring magnet 18 would rotate continuously in the clockwise direction. If the polarity of the first and third ring magnets 16 & 20 were reversed, the second ring magnet 18 would rotate continuously in the clockwise direction. If the polarity of any of the permanent magnets in the invention were reversed, the second ring magnet would rotate continuously.

If the first ring magnet 16 and the first plurality of magnets 16a were removed from the invention 10, the second ring magnet 18 would rotate continuously in the clockwise direction. If the third ring magnet 20 and the second plurality of magnets 20a were removed from the invention 10, the second ring magnet 18 would rotate continuously in the clockwise direction.

MATHEMATICAL ANALYSIS AND PROOF OF THE INVENTION

The magnitude of the magnetic shear forces F (i.e. $FSin2\phi$) is given by equation 1a, where n is the total number of gaps among the magnets 16a & 20a, $B_{r1}$ and $B_{r2}$ are the radial components, and $B_{\theta1}$ and $B_{\theta2}$ are the tangential components, of the inclined magnetic flux densities $B_1$ and $B_2$; $A_{m1}$ is the magnetic-pole area between any two oblique magnets 16a; $A_{m2}$ is the magnetic-pole area between any two magnets 20a; $\mu_0=4\pi \times 10^{-7}$ H/m.

$$F = \left(\frac{nA_{m1}B_{r1}B_{\theta1}}{\mu_0}\right) + \left(\frac{nA_{m2}B_{r2}B_{\theta2}}{\mu_0}\right) \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot (1a)$$
The magnitudes of $B_{\theta 1}$, $B_{\theta 2}$, $B_{r1}$, and $B_{r2}$ are given by equation 1b, where $\theta_1$ and $\theta_2$ are the inclination angles of the inclined magnetic fields $B_1$ and $B_2$.

$$B_{\theta 1} = B_1 \sin \theta_1$$  

$$B_{\theta 2} = B_2 \sin \theta_2$$  

$$B_{r1} = B_1 \cos \theta_1$$  

$$B_{r2} = B_2 \cos \theta_2$$

Substituting the right hand sides of equations 1b to 1f for $B_{\theta 1}$, $B_{\theta 2}$, $B_{r1}$, and $B_{r2}$ in equation 1a, we obtain

$$F = \left( \frac{nA_1 B_1^2 \sin \theta_1 \cos \theta_1}{\mu_0} \right) + \left( \frac{nA_2 B_2^2 \sin \theta_2 \cos \theta_2}{\mu_0} \right)$$  

The magnitude of the torque $\tau$ due to the tangential magnetic forces $F$ is given by equation 2, where $r_1$ and $r_2$ are the torque arms.

$$\tau = \left( \frac{nA_1 B_1^2 r_1 \sin \theta_1 \cos \theta_1}{\mu_0} \right) + \left( \frac{nA_2 B_2^2 r_2 \sin \theta_2 \cos \theta_2}{\mu_0} \right)$$

From trigonometry,

$$\sin \theta \cos \theta = \frac{\sin 2\theta}{2}$$

With the help of equation 3, we simplify equations 1 & 2 and obtain equations 4 & 5.

$$F = \left( \frac{nA_1 B_1^2 \sin 2\theta_1}{2\mu_0} \right) + \left( \frac{nA_2 B_2^2 \sin 2\theta_2}{2\mu_0} \right)$$

$$\tau = \left( \frac{nA_1 B_1^2 r_1 \sin 2\theta_1}{2\mu_0} \right) + \left( \frac{nA_2 B_2^2 r_2 \sin 2\theta_2}{2\mu_0} \right)$$

The magnitudes of the magnetic flux densities $B_1$ and $B_2$ are obtained as follows. In FIGURES 10A & 10B, the dotted lines represent a magnetomotive force (mmf) loop. The equivalent magnetic circuit of the mmf loop is shown in FIGURE 10C, where $\Phi_g$ is the airgap flux, $H_c$ is the coercivity of the ring magnets, $L_m$ is the magnet length, and $R_{m1}$, $R_{m2}$, $R_{m3}$ are the internal magnet reluctances. $R_{g1}$ and $R_{g2}$ are the reluctances due to the airgaps; $R_{f1}$, and $R_{f2}$ are the reluctances due to fringing fields; $R_{l1}$, $R_{l2}$, and $R_{l3}$ are the leakage reluctances; and $R_{fe}$ is the reluctance of the metallic frame. Applying Kirchhoff's voltage law to the equivalent magnetic circuit, we obtain equation 6, where $\delta$ is the flux leakage coefficient.

$$3H_c L_m = \delta \Phi_g (R_{m1} + R_{m2} + R_{m3} + R_{g1} + R_{g2})$$
Making $\Phi_g$ the subject of the formula, we obtain equation 7:

$$\Phi_g = \frac{3H_1L_m\delta^{-1}}{(R_{m1} + R_{m2} + R_{m3} + R_{g1} + R_{g2})}$$  \hspace{1cm} (7)

The magnitudes of the reluctances are given by equations 8-12:

$$R_{m1} = \log_e \left[ 1 + \left( \frac{R_2 - R_1}{R_1} \right) \left( \mu c \mu_0 H \right)^{-1} \right]$$  \hspace{1cm} (8)

$$R_{m2} = \log_e \left[ 1 + \left( \frac{R_4 - R_3}{R_3} \right) \left( \mu c \mu_0 H \right)^{-1} \right]$$  \hspace{1cm} (9)

$$R_{m3} = \log_e \left[ 1 + \left( \frac{R_6 - R_5}{R_5} \right) \left( \mu c \mu_0 H \right)^{-1} \right]$$  \hspace{1cm} (10)

$$R_{g1} = \log_e \left[ 1 + \left( \frac{R_2 - R_1}{R_1} \right) \left( \varphi \mu_0 \left( H + L_g \right) \right)^{-1} \right]$$  \hspace{1cm} (11)

$$R_{g2} = \log_e \left[ 1 + \left( \frac{R_2 - R_1}{R_1} \right) \left( \varphi \mu_0 \left( H + L_g \right) \right)^{-1} \right]$$  \hspace{1cm} (12)

On substituting the right hand sides of equations 8-12 for $R_{m1}, R_{m2}, R_{m3}, R_{g1},$ and $R_{g2}$ in equation 7, the magnitude of the airgap flux $\Phi_g$ takes on the form shown in equation 13:

$$\Phi_g = \left( \begin{array}{c}
3H_1L_m\delta^{-1} \\
\mu c \mu_0 H \end{array} \right)^{-1} \left( \begin{array}{c}
\varphi \mu_0 \left( H + L_g \right) \end{array} \right)^{-1} \log_e \left[ 1 + \left( \frac{R_2 - R_1}{R_1} \right) \right] + \log_e \left[ 1 + \left( \frac{R_4 - R_3}{R_3} \right) \right] + \log_e \left[ 1 + \left( \frac{R_6 - R_5}{R_5} \right) \right]$$

$$+ \left( \varphi \mu_0 \left( H + L_g \right) \right)^{-1} \log_e \left[ 1 + \left( \frac{R_2 - R_1}{R_1} \right) \right] + \log_e \left[ 1 + \left( \frac{R_4 - R_3}{R_3} \right) \right]$$  \hspace{1cm} (13)

$$\therefore B_1 = \frac{\Phi_g}{A_{m1}}$$  \hspace{1cm} (14)

where $A_{m1} = \varphi H R_2$  \hspace{1cm} (14b)

Substituting the right hand sides of equations 13 and 14b for $\Phi_g$ and $A_{m1}$ in equation 14, we obtain equation
\[
B_1 = \left[ \frac{3H L_m \delta}{\varphi HR_2} \right] \left\{ \left[ \mu_0 \mu H \varphi \right]^{-1} \left[ \log_e \left[ 1 + \frac{R_2 - R_1}{R_1} \right] + \log_e \left[ 1 + \frac{R_4 - R_3}{R_3} \right] + \log_e \left[ 1 + \frac{R_6 - R_5}{R_5} \right] \right] \right\}^{-1} 
+ \left[ \varphi \mu_0 \left[ H + L_g \right]^{-1} \left[ \log_e \left[ 1 + \left( \frac{R_2 - R_1}{R_1} \right) \right] + \log_e \left[ 1 + \left( \frac{R_4 - R_3}{R_3} \right) \right] \right] \right\}^{-1} \cdot (15)
\]

\[
B_2 = \Phi g / \varphi H R_4 \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot 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Substituting the right hands sides of equations 14b, 15, 16b, and 17 for \(A_{m1}, A_{m2}, B_1,\) and \(B_2\) in equation 5, we obtain equation 19.

\[
\tau = \left( \frac{3HcLm\delta^{-1}n}{(2\varphi H\mu_0)^{1/2}} \right)^2 \left[ \frac{r_1\sin2\varphi_1 + r_2\sin2\varphi_2}{R_2} \right] \left[ \frac{\mu_1\mu_0H\varphi}{R_4} \right]^{-1} \left\{ \log_e \left[ 1 + \frac{R_2 - R_1}{R_1} \right] + \log_e \left[ 1 + \frac{R_4 - R_3}{R_3} \right] \right\} \cdot (19)
\]

The magnetic potential energy \(E_p\) of the invention 10 is given by equation 20, where "\(2k\pi\)" is the angular displacement.

\[
E_p = \lim_{k \to \infty} \left( 2k\pi \cdot \tau \right) \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot 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SIMULATION OF THE INVENTION USING ANSYS MAXWELL 3D VERSION 14.0

Ansys Maxwell 3D, Version 14.0, was used to analyse the motive power generator. FIGS 11-16 show the results of the simulation. FIGS 15-16 show graphs of the output torque as a function of angular position. Each of the magnets in the simulation had a coercivity $H_c$ of 1120021 A/m. The dimensions of the rotor magnet 18 were OD90 x ID72 x H50mm; the dimensions of the stator magnets 16 and 20 were respectively OD60 x ID40 x H50mm and OD120 x ID104 x H50mm. The volume of the stator magnets 16a and 20a were respectively 1598.42mm$^3$ and 1613.02mm$^3$. From the graph shown in FIG 15, the average output torque $\tau$ is 3.1376 Nm; from its dimensions, the rotor magnet 18 had a moment of inertia $I$ equal to 1426.092 x $10^{-6}$ Kgm$^2$.

$\therefore \tau = 3.1376 \text{ Nm}$

$I = 1426.092 \times 10^{-6} \text{ Kgm}^2$

Angular acceleration is given by equation 21, where $\tau$ and $I$ are respectively the torque and the moment of inertia.

$$\alpha = \left( \frac{\tau}{I} \right)$$

(21)

Inserting the values of $\tau$ and $I$ into equation 21, we obtain

$$\alpha = 2103.65 \text{ rad/sec}^2$$

The maximum angular velocity $\omega$ of the rotor magnet is given by equation 22, where $r$, $\rho$, and $\sigma$ are respectively the average radius, the density, and the maximum tensile strength of the rotor magnet.

$$\omega = \left( \frac{\sigma}{\rho} \frac{1}{r^2} \right)^{1/2}$$

(22)

For the rotor magnet, $\sigma = 75\text{MPa}$, $\rho = 7500\text{Kg/m}^3$, and $r = 40.5\text{mm}$. Inserting the values of $\sigma$, $\rho$, and $r$ into equation 22, we obtain

$$\omega = 2469.1358 \text{ rad/sec or 392.975 rev/sec.}$$

The first equation of motion is given by equation 23, where $\omega_0$ and $\omega$ are respectively the initial and final angular velocities; $\alpha$ is the angular acceleration, and $t$ is the acceleration time.

$$\omega = \omega_0 + \alpha t$$

(23)

Since the rotor magnet accelerates from rest, the initial angular velocity $\omega_0$ equals zero; thus equation 23 reduces to the form

$$\omega = \alpha t$$

(24)

Making $t$ the subject of formula and inserting the values of $\omega$ and $\alpha$ into the resulting equation, we obtain $t = 1.1737 \text{ second}$.
Thus the rotor magnet takes about 1.17 second to accelerate and attain an angular velocity of 2469 rad/sec or 393 rev/sec.

The power $P$ of the rotor magnet is given by equation 25, where $\tau$ and $\omega$ are respectively the torque and the angular velocity of the rotor magnet.

$$P = \tau \omega \quad (25)$$

Inserting the values of $\tau$ and $\omega$ into equation 25, we have

$$P = 7407.4074 \text{ Watts or 9.929 Horse-power}$$

The rotor magnet produces 7.4 KiloWatt of mechanical power at 3Nm and 393 rev/sec.