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Magnetic Gear Drive

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Abstract — *The mechanism used in the magnetic gear drive is where the permanent magnets transmit the motion from one gear to another gear. Maximum efficiency is achieved by using the principle compare to other traditional gear drive. Magnetic gear drive has huge range of future application like renewable energy, wind &marine energy, automotive application. The engineers & designers are keen interested to use this technology in future. The magnetic gear researchers has developed a new breed of permanent magnet machine. These magnetic geared permanent magnet machines are fully incorporate the concept of magnetic gearing in to the permanent magnet machine, achieve low speed high torque direct drive operation. The quantitative comparison of three viable magnetic gear permanent magnet machines is rusty performed, so revealing their key features, merits, demerits &applications. Initially the development of magnetic gears, including the converted topologies & end modulated topologies, is reviewed. Then the permanent magnetic machines are indented and discussed. Consequently, the performances are analyzed & quantitatively compared. The result & discussion form an important foundation for research in low-speed high torque direct-drive system.*

Keywords *-Magnet, Gear, Torque, Drive, Renewable energy.*

I. INTRODUCTION

The gear is power transmitting element that transmits rotary motion from one shaft to another by means of engaging teeth. The gear mechanism or gear train is the collection of two or more meshing gear which is used in mechanical devices and machine now a day. However there are localized problems such as vibration, noise, abrasion & the necessity of lubrication due to contact force and friction. Recently the use of non contact magnetic gear that utilizes permanent magnets in order to solve these problems has been developed. It transmits torque from non contact magnetic coupling rather than meshed mechanical gear teeth. Compare with conventional gear mechanism the non contact magnetic gear mechanism posses unique attributes like: no need for lubricants, low mechanical energy losses, over load protection & tolerance of misalignment between the input and output shafts.

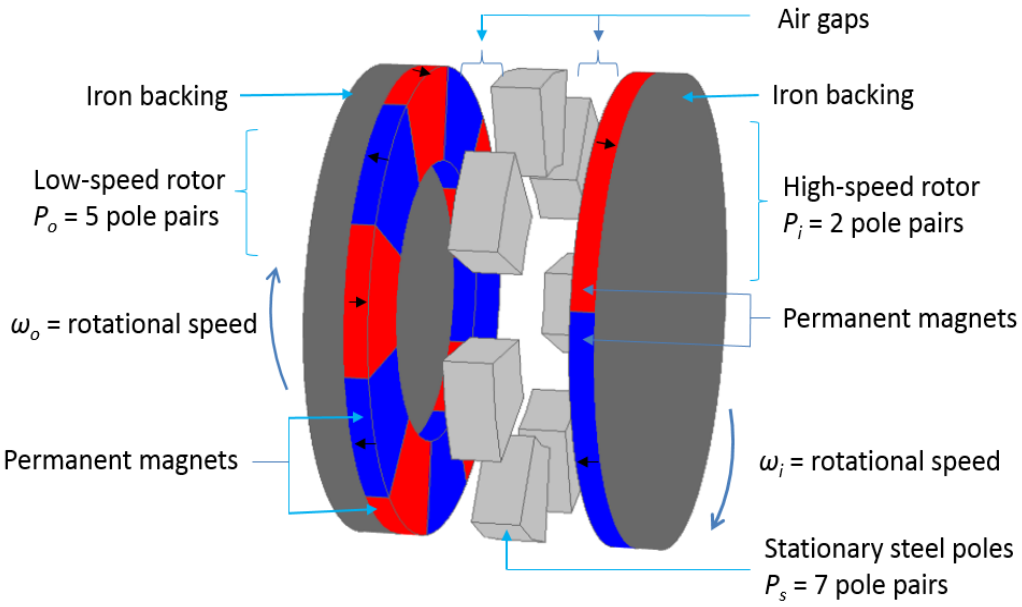

Fig.No. (1) Schematic Diagram Of Axial Magnetic Gear

II. MAGNETIC GEAR DRIVE MATERIALS

1. *Fiber glass*
2. *Aluminum rod*
3. *Permanent magnet*
4. *Motor*
5. *Battery*
6. *Bearing*
7. *Wood*

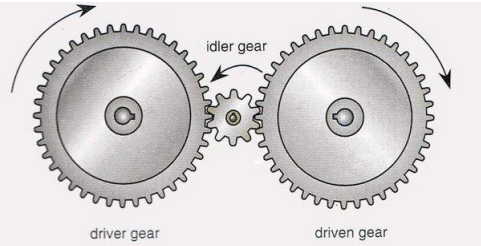

Fig.no. (2) Gear Mechanism

III. CONSTRUCTION & WORKING CONCEPT MAGNETIC GEAR DRIVE

Magnetic gear uses permanent magnet to transmit torque between an input and output shaft without mechanical contact. Magnetic gears can achieve high efficiency at full load and with much higher part load efficiencies than a mechanical gear.

The working is fairly simple with the magnetic poles "pulling" the poles present in the other rotor .each rotor is made up of permanent magnets with a radial field.

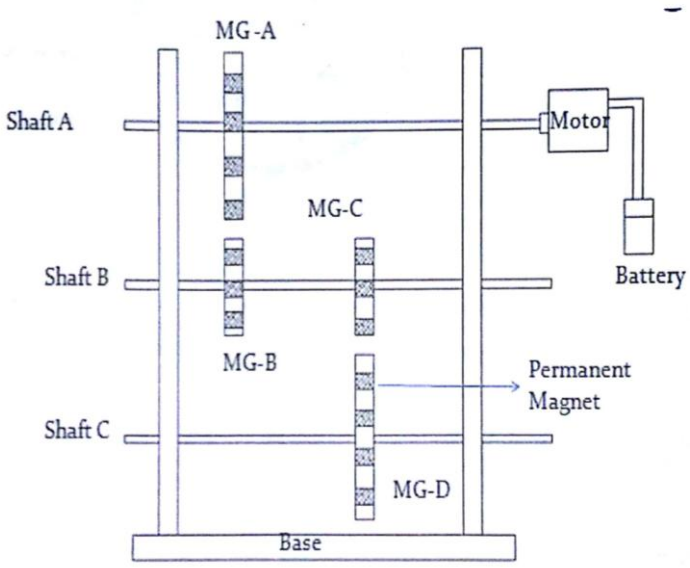

Fig.no. (3) Working concept Of Magnetic Gear Drive

Generally the pole ring is fixed. Gear ratio is common term used in terminology. In case of magnetic gears, the gears ratio is given as Gr =(NO)/(NI) where, NO and NI refers the no. of pole pairs in every ring for gear or the gear taken, in outlet and inlet, there are 10 and 4 pole pairs respectively and hence gear ratio will be 10/4=2.5 and given number of pole pieces in second ring is given by the sum of number of pole pairs in outer and inner rings (10+4=14 in the above figure).in above case.

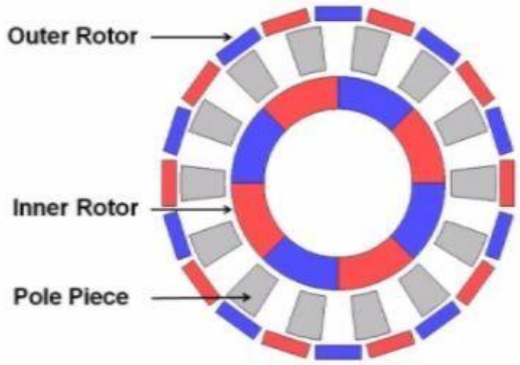

Fig.no. (4) Construction of Magnetic Gear Drive

When the electric power is supplied to the motor, the motor converts the electrical power into electrical work and shaft starts rotating due to which the gear on shaft also starts rotating.
A very strong magnetic flux is generated between the gap of gear B on shaft B and the previous one. Now another gear B also rotates with similar speed of gear A.
Similarly gear C and D rotates in similar direction. In this manner the whole system works without any type of contact and the frictionless power transmission is possible.

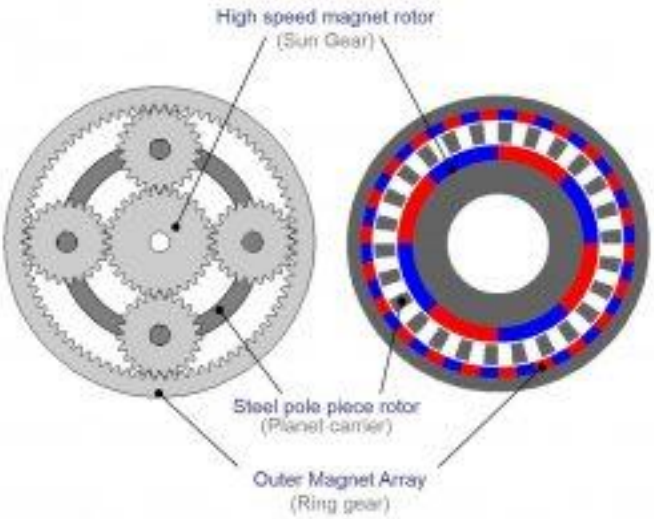

Fig.no. (5) Construction of Magnetic Gear Drive

IV. APPLICATIONS OF MAGNETIC GEARS

1) Turbine Generators.
2) Energy Storage Flywheels.
3) Gearing For Drilling Motors.
4) Oil Well Sub-Surface Safety Valve.
5) Robotics.
6) Aerospace.

V. ADVANTAGES & DISADVANTAGES

Advantages:

a) Increased efficiency
b) High reliability
c) Low maintenance
d) No transmission oil
e) Torque fused protection
f) Physically isolation between shafts.
g) Very low noise and vibration.

Disadvantages:

a) Large size.
b) Economically Costlier to produce strong permanent magnets.
c) Different related parts are needed.

Fig.no.(6)Eg. Aircraft Planetary Gearbox

VI. CONCLUSION

a) It is showed that the choice of design parameters have a significant influence on a torque transmission capability.
b) Cycloid gear profile was explained with its.
c) The magnetic gear drive has better efficiency than traditional gear drive and it has huge range of future application.

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