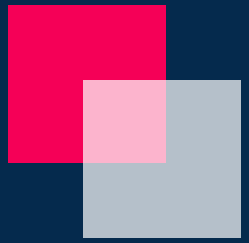

Reluctance Motor

Introduction

- It is a single phase unexcited synchronous motor.
- It operates on single phase supply.
- The stator rotating magnetic field rotates at synchronous speed.
- It does not require DC Excitation.
- It is self starting.

Principle

- When a magnetic material is placed in the magnetic material, it always aligns in the minimum reluctance path.

Construction

Stator

- The stator of the reluctance motor is similar to that stator of the single phase induction motor.
- It consists of starting and running winding in the stator slots.
- This type of motor is also called as Split phase reluctance motor.

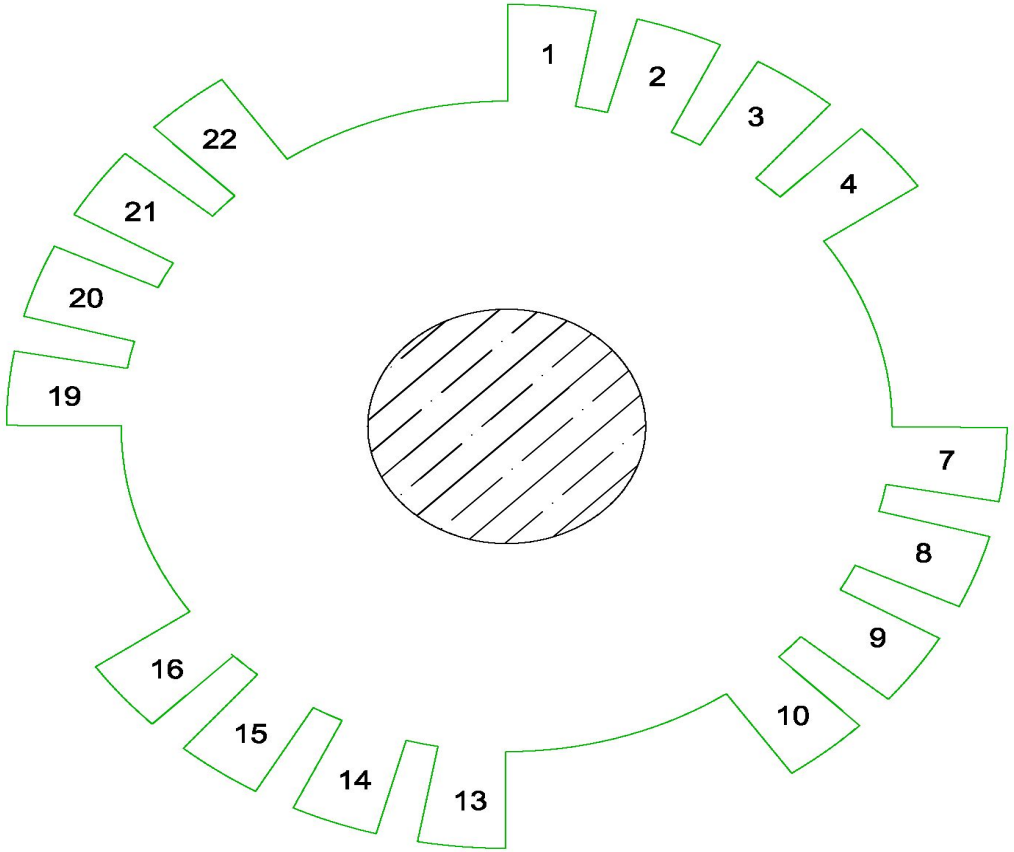

FIG A : ROTOR OF THE RELUCTANCE MOTOR

Rotor

- The rotor of the reluctance motor is of salient or projecting poles.
- Let us consider that the rotor of the squirrel cage induction motor consists of 24 copper bars.
- If the rotor bar 5, 6, 11, 12,17,18, 23 and 24 are cut, it is similar to 4 salient poles.

Working

- When a single phase supply is given to the stator winding, a rotating magnetic field is produced in the stator.
- When a salient poles rotor cut this magnetic field, rotor aligns in the minimum reluctance path due to reluctance torque.
- The reluctance depends upon air – gap between stator and rotor.

- Figure A shows 4 pole salient pole rotor in which direction of four high permeance and four low permeance is shown.
- High permeance means higher magnetic conductivity and higher inductance, similarly low permeance means lower magnetic conductivity and lower inductance
- The reluctance is inverse of permeance. Low reluctance means higher inductance and vice versa.

$L \alpha N^2 / S$

Where L = Inductance and S = Reluctance of magnetic path

- Low air – gap means low reluctance and vice versa

$S = L / \mu_0 \mu_r a$

Where L = Length of air – gap

μ_0 = Absolute permeability = $4\pi \times 10^{-7}$ Henry / meter

μ_r = Absolute permeability and a = Area

- There is low reluctance path between stator and salient poles due to small air – gap whereas high reluctance path between stator and inter – polar axis due to large air – gap.
- The reluctance motor starts as an induction motor.
- When the rotor rotates at its maximum speed, it aligns with the stator synchronous magnetic field due to reluctance torque.
- The angle between stator poles and rotor poles of opposite polarity is called as torque angle.

- As the torque angle increases, the reluctance torque also increases.
- The maximum reluctance torque attains at torque angle of 45^0.
- The load taken by the reluctance motor is only fraction of the load taken by the three phase inductance motor.

Advantages

- Low maintenance
- DC supply not necessary
- Simple construction
- Constant speed characteristic

Disadvantages

- Low efficiency
- Low power factor
- Only fraction of load taken as compared to three phase induction motor

Applications

- Automatic regulator
- Signaling devices
- Recording instruments
- Tele printer
- Timer circuits
- Gramophone

Thank You
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