Commutation and Commutation Period
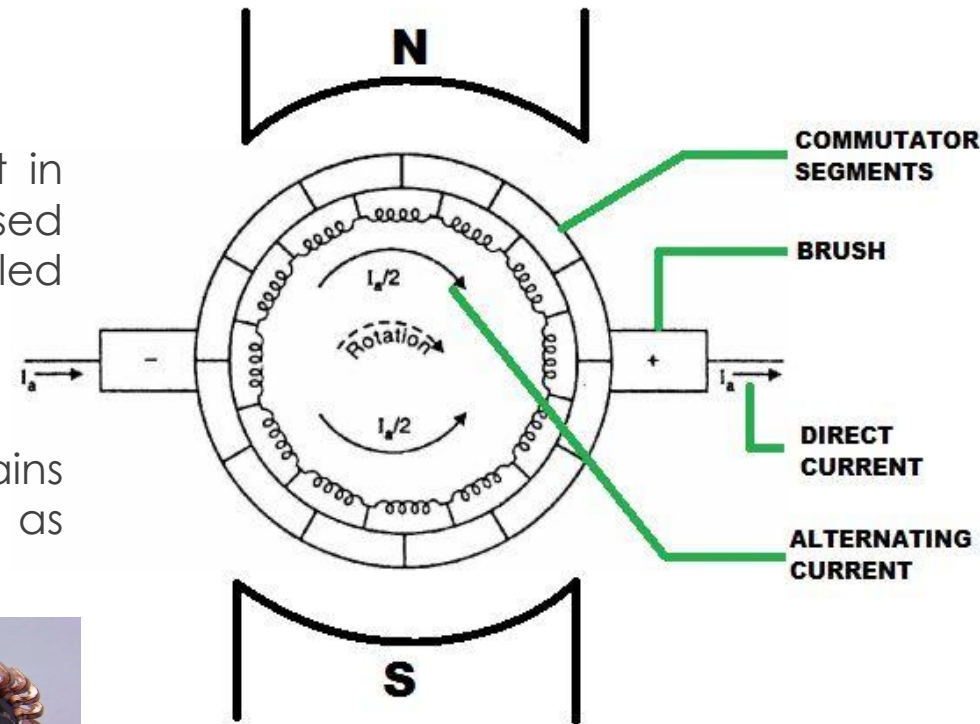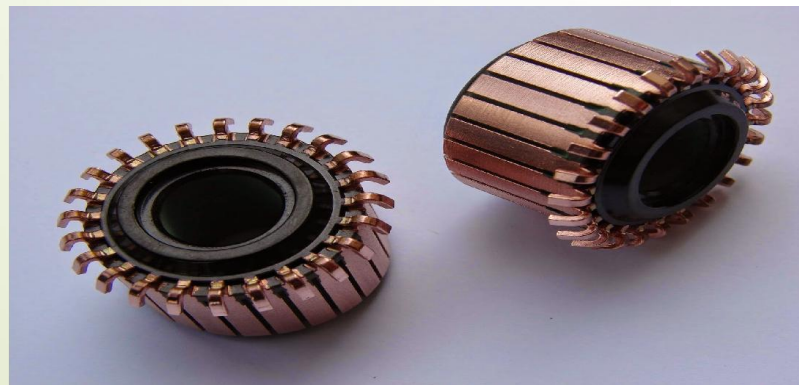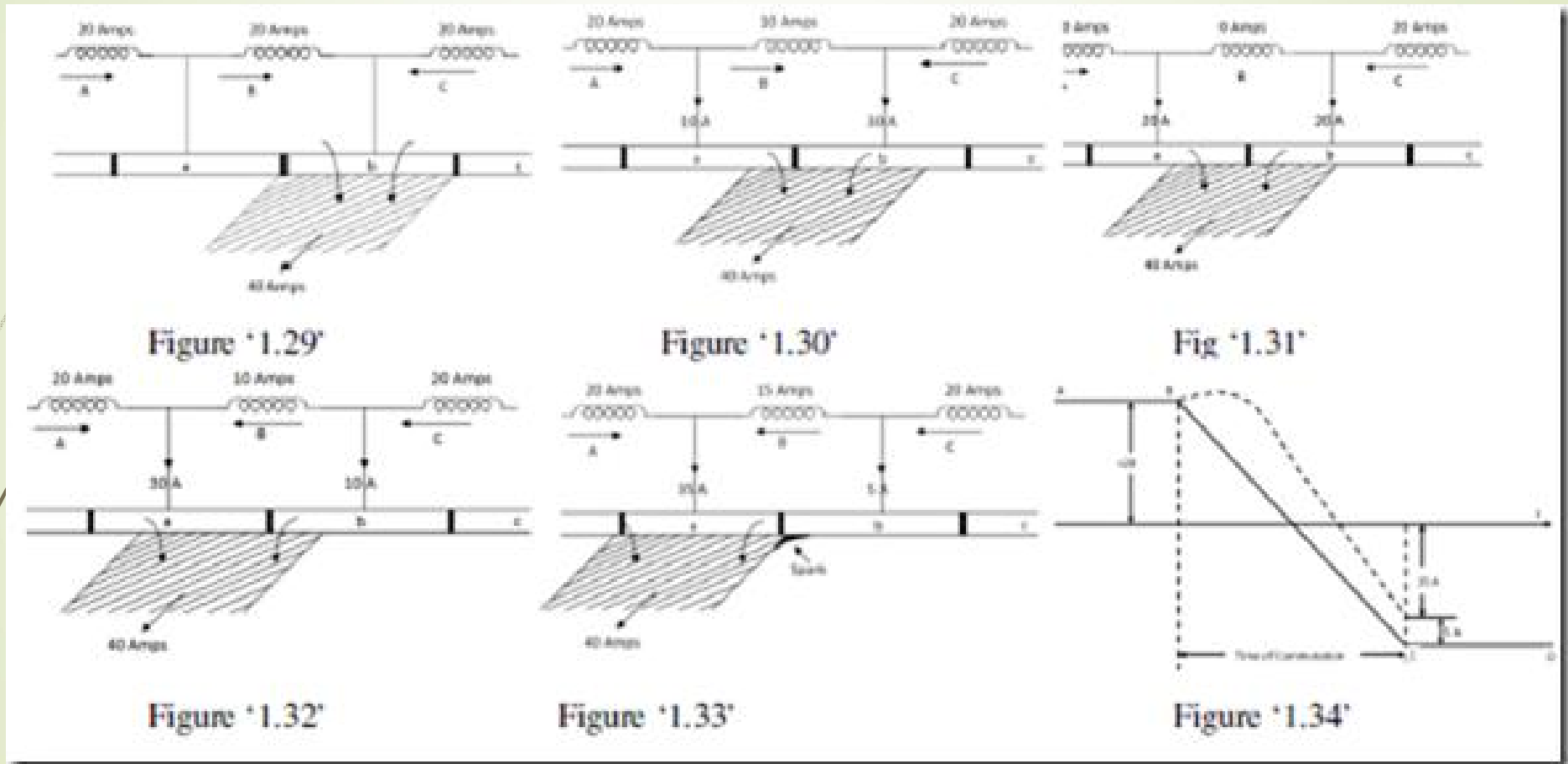
- The process by which the current in the short-circuited coil is reversed while it crosses the M.N.A is called **Commutation**.

- A period during which coil remains short circuited is known as **commutation period** T_C .

Commutation Process

Figure '1.29'　　　Figure '1.30'　　　Fig '1.31'

Figure '1.32'　　　Figure '1.33'　　　Figure '1.34'

Electric Machinery

Use below link for wave winding based commutation process example
https://commonelectricaldoubts.blogspot.com/2014/05/commutation-process.html

Ideal and Bad Commutation

- If the current reversal (e.g. +I to zero and then –I) is completed by the end of short-circuit or commutation period, Then the commutation is ideal.

- If current reversal is not complete by that time, sparking is produced between brushes and commutator surface then its called bad commutation.

- The bad commutation may be caused by mechanical or electrical conditions. The mechanical conditions include uneven commutator surface, non uniform brush pressure, vibration of brushes in the brush holders etc. the electrical condition include armature reaction and Ldi/dt effect.

- Bed commutation results progressive damage to brush and commutator.

Ldi/dt Effect or Reactance Voltage

- The direction of <u>current</u> changes from +i to –i or vice versa in a small span of time. This induces a very high magnitude of reactance <u>voltage</u> (L × di/dt) in the coil which emerges out in the form of heat energy along with sparking, thus damaging the brushes and commutator segment. To reduce the adverse effects mentioned above and to improve the machine's performance, following methods are used:

1. Brush Shifting

2. Commutating poles or Interpoles

3. Compensating Windings

Pop Up Questions

- Inter-poles overcomes which effect?

Arc/spark and Reactance voltage

- Compensating winding overcomes which effect?

Cross magnetizing effect of the armature reaction

- Armature reaction mean?

Effect of magnetic field set up by armature current on the distribution of flux under main poles

- What is an Ideal Commutation?

If the current reversal (e.g. +I to zero and then –I) is completed by the end of short-circuit or commutation period

- What is Reactance Voltage effect?

The direction of current changes from +i to –i or vice versa in a small span of time induces a very high magnitude of reactance voltage (L × di/dt) in the coil