



SNS COLLEGE OF TECHNOLOGY

(An Autonomous Institution)

COIMBATORE-35.



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DEPARTMENT OF AUTOMOBILE ENGINEERING

COURSE NAME : 19AUB204 – AUTOMOTIVE ELECTRICAL AND ELECTRONICS ENGINEERING

II YEAR / IV SEMESTER

Unit 3 – Charging System

Topic : Armature Reaction and Third Brush Regulation



ARMATURE REACTION



- ❖ Armature reaction refers to the effect of the magnetic field produced by the armature current on the main magnetic field of a DC machine, such as a generator or motor.
- ❖ It's a significant phenomenon in DC machines that can affect their performance and operation.



ARMATURE REACTION



- ❖ When current flows through the armature winding of a DC machine, it creates a magnetic field around the armature conductors.
- ❖ This magnetic field interacts with the main magnetic field produced by the field winding or permanent magnets.
- ❖ The magnetic field produced by the armature current distorts the main magnetic field of the machine.
- ❖ This distortion occurs because the armature current creates its own magnetic field, which adds to or subtracts from the main magnetic field depending on the direction of the armature current.



ARMATURE REACTION



- ❖ Due to the distortion caused by armature reaction, the neutral plane of the machine shifts from its original position.
- ❖ The neutral plane is the plane where the magnetic field produced by the armature current has no effect on the main magnetic field.
- ❖ In a generator, the neutral plane is where the generated voltage is maximum.
- ❖ Armature reaction affects the process of commutation, which is the reversal of current in the armature conductors as they pass from the north to the south pole of the machine.
- ❖ The shifting of the neutral plane can cause sparking at the brushes during commutation, leading to poor commutation and increased brush wear.



ARMATURE REACTION



- ❖ Armature reaction also affects the voltage regulation of the generator.
- ❖ Since the neutral plane shifts, the effective air gap between the armature and field poles changes, which alters the generated voltage.
- ❖ This can lead to variations in terminal voltage with changes in load.
- ❖ To mitigate the effects of armature reaction, various compensation techniques are employed.
- ❖ These include pole-face winding, interpoles, and compensating windings, which help to restore the neutral plane to its original position and improve commutation and voltage regulation.



THIRD BRUSH REGULATION



- ❖ Third brush regulation is a method used in early automotive electrical systems to control the output voltage of a generator, which charges the vehicle's battery.
- ❖ It was commonly employed in vehicles before the introduction of more advanced voltage regulation systems.
- ❖ In addition to the armature and field coil, a third brush is introduced into the system. This third brush is adjustable and connected to the field coil circuit.
- ❖ By adjusting the position of the third brush, the amount of current flowing through the field coil circuit can be controlled.
- ❖ This, in turn, adjusts the strength of the magnetic field generated by the field coil.



THIRD BRUSH REGULATION



- ❖ The strength of the magnetic field affects the output voltage of the generator.
- ❖ When the magnetic field is stronger, the generator produces a higher voltage, and when it's weaker, the voltage decreases.
- ❖ By adjusting the position of the third brush, the voltage output of the generator can be finely tuned.
- ❖ The purpose of third brush regulation is to regulate the charging of the vehicle's battery.
- ❖ By adjusting the output voltage of the generator, the charging rate of the battery can be controlled.



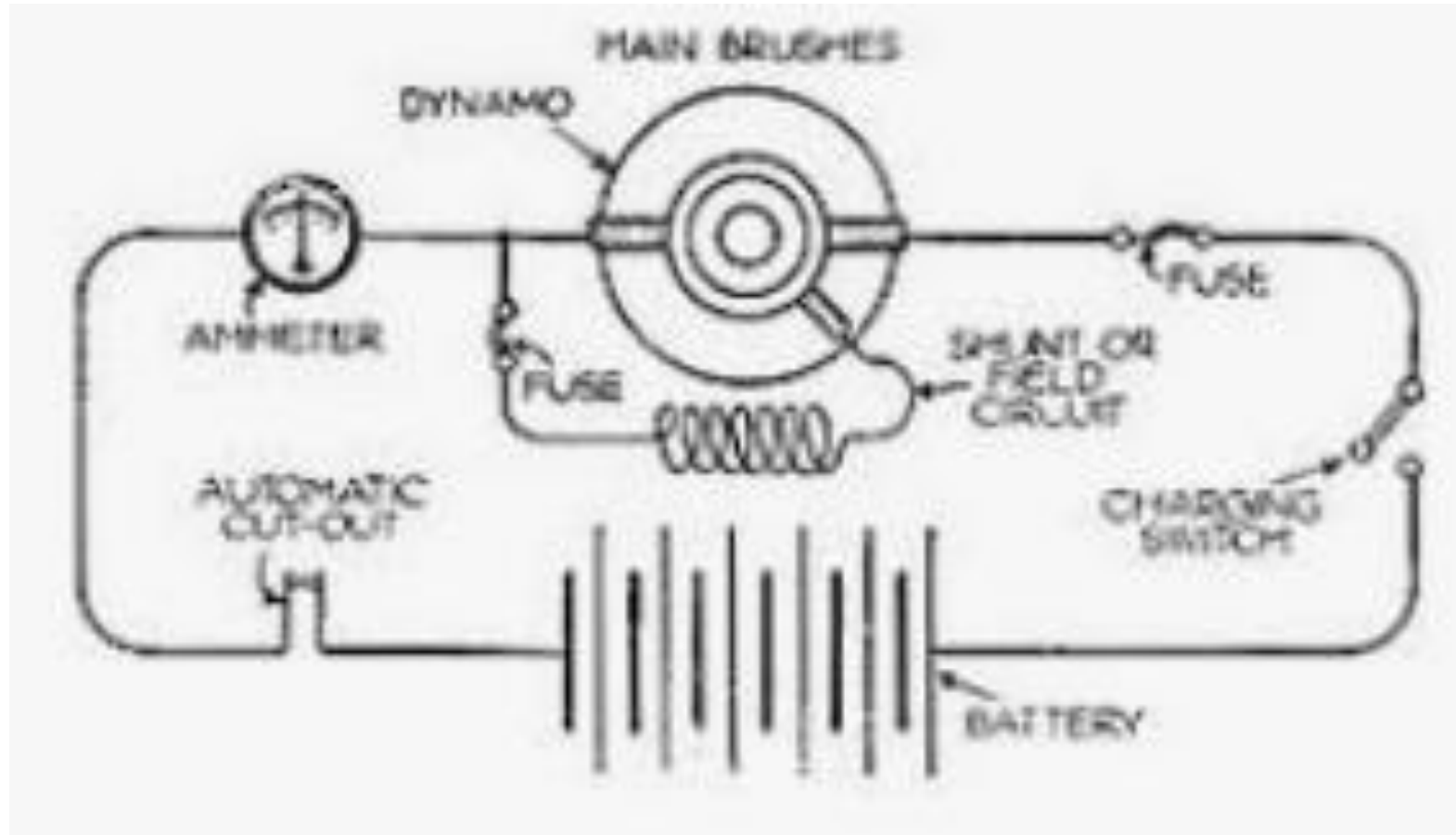
THIRD BRUSH REGULATION



- ❖ This helps prevent overcharging or undercharging, ensuring optimal battery health and performance.
- ❖ While third brush regulation provided some degree of control over the charging system, it was not as precise or efficient as later voltage regulation systems, such as electromechanical or solid-state voltage regulators.
- ❖ Third brush regulation required manual adjustment, which could be cumbersome and less reliable than automatic regulation methods.



THIRD BRUSH REGULATION





THANK YOU !!!