



# SNS COLLEGE OF ENGINEERING

Kurumbapalayam (Po), Coimbatore – 641 107

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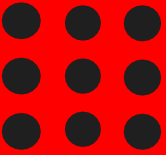
## DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

COURSE NAME : 19EC309 ELECTRICAL MACHINES AND POWER SYSTEMS

II YEAR / 03 SEMESTER MECH & MCT

Unit 1 – DC Machines

**DC Motor Starters**





# Can You Guess?





# Starting Methods

## Functions:

- To Limit the starting current
- Starting and stopping the motor quickly, safely & repeatable if required
- Automatic control of the motor
- Protection from the over load



➤ Since the armature in DC motor is stationary before starting, the  $E_b \propto N$  which is Zero. So  $E_b=0$ .

$$\begin{aligned} \text{➤ } I_a &= (V - E_b) / R_a \\ &= (V - 0) / R_a \quad \text{if } E_b = 0 \\ &= (200 - 0) / 0.5 \quad V = 200\text{v} \ \& \ R_a = 0.5\Omega \\ &= 400\text{A} \end{aligned}$$

➤ Hence at starting  $I_a$  is very large.

➤ This current will burn out the armature.

➤ So limiting the current to a safe value by inserting the resistance in series with armature.

➤ As the motor gains in speed,  $E_b$  is builds up and Starting resistance could be gradually cut off.



# Importance (or) Necessity

- It may damage the rotating parts of the motor and the load.
- Damage to the armature winding.
- Failure of insulation due to over heating.
- It produces high sparking in the commutator surface.
- Large amount of dips in supply voltage

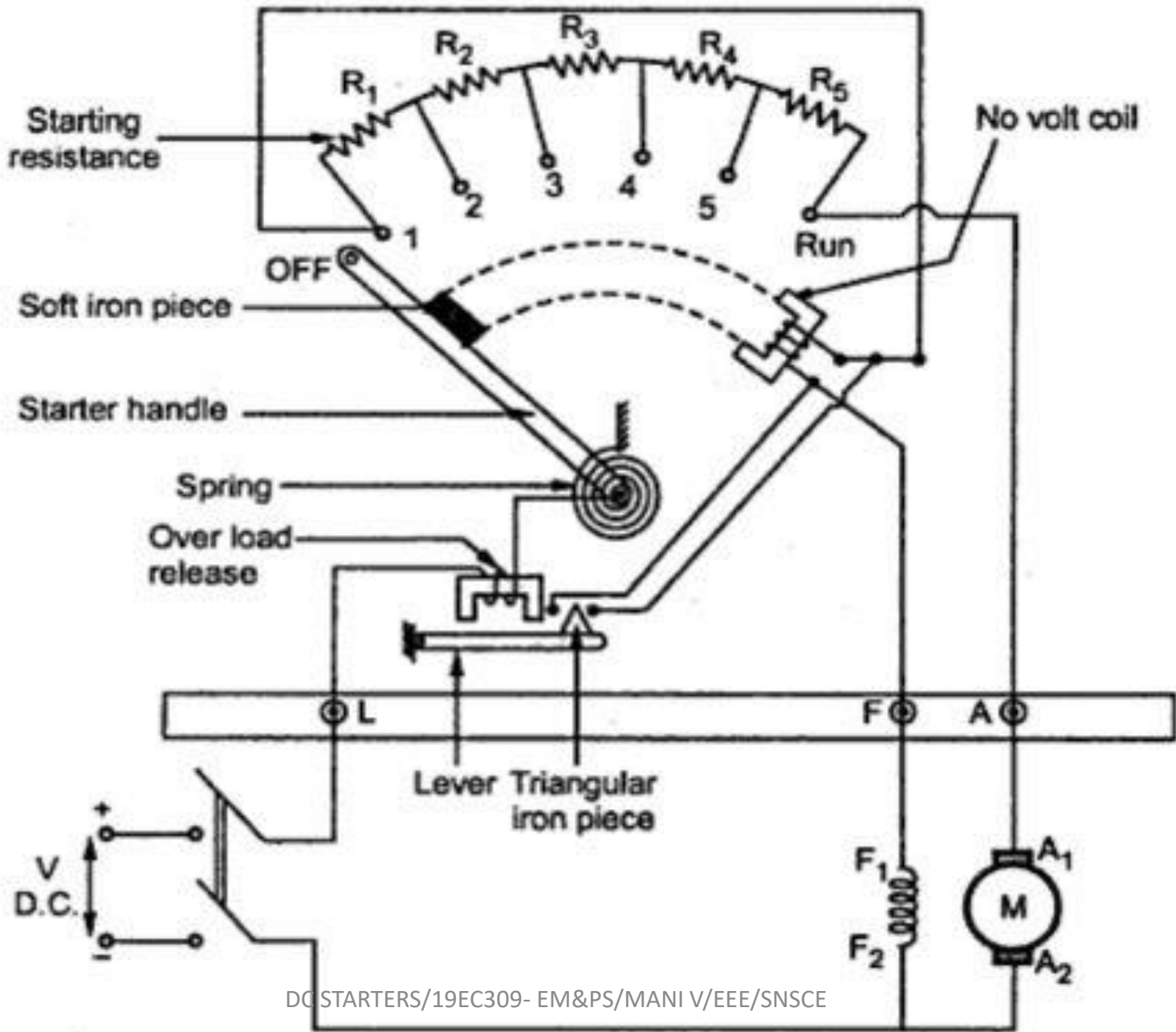


# TYPES OF STARTERS

- 2 Point starter - Used for DC Series Motor
- 3 Point starter - Used for DC Shunt & Compound Motor
- 4 Point starter - Used for DC Shunt & Compound Motor



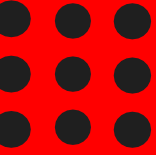
# 3 Point Starter





## Construction:

- Starting Resistance is connected in series with the armature
- NVR Coil is connected in series with the field winding.
- OLR Coil is connected in series with armature..



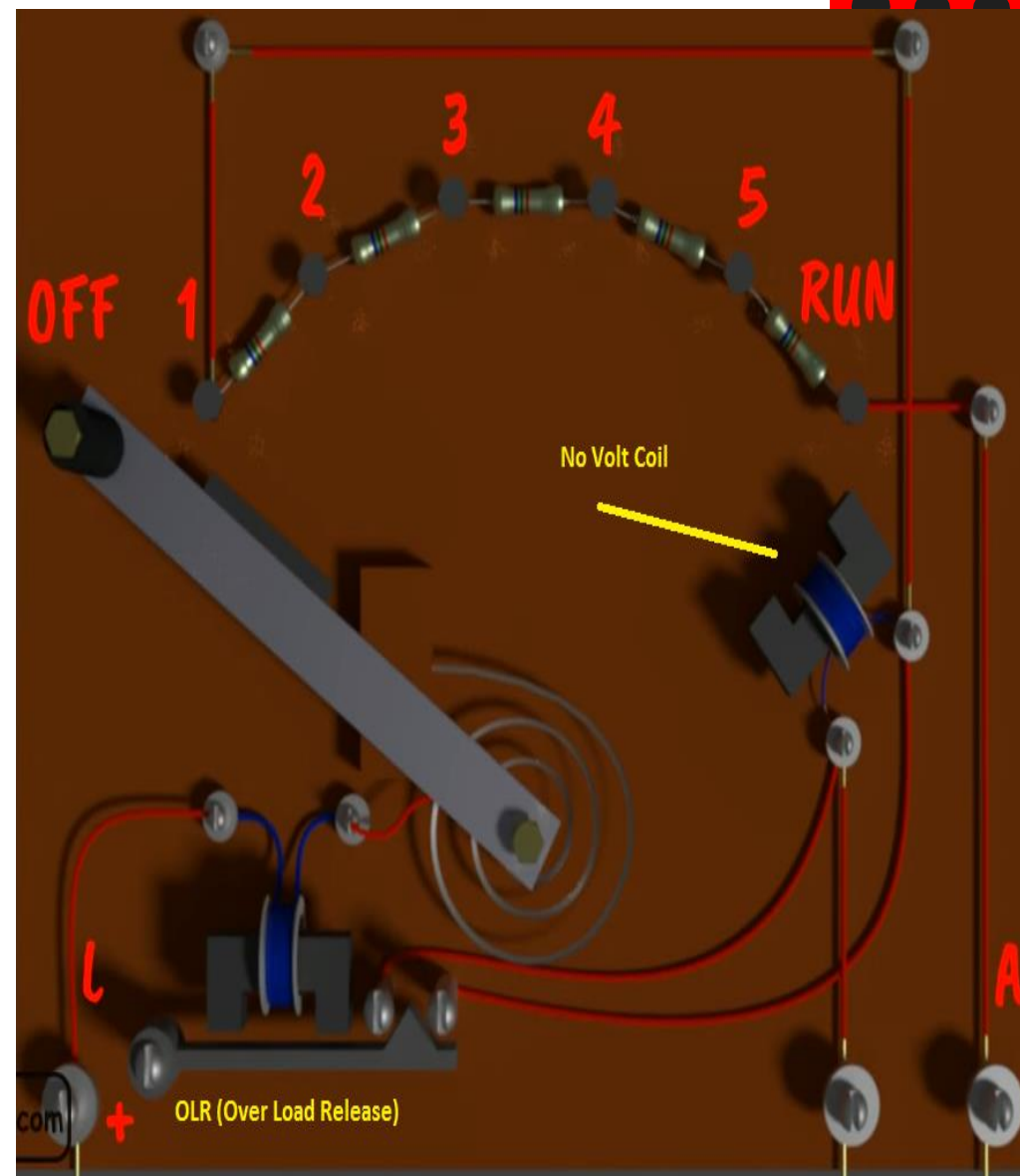




# Protective Devices

## No-Volt Release (NVR) Coil:

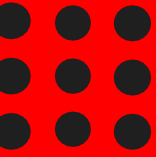
- Its an electromagnet.
- When the handle is in ON position, the NVR gets magnetized and attracts the soft iron.
- In case of failure (or) disconnection of the supply (or) break in the field circuit, the NVR coil is de-energised there by releasing the arm..
- Which is pulled back by the spring to the off position.





## Over Load Release (OLR) Coil:

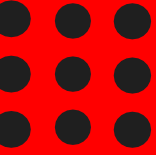
- If the motor becomes over – loaded beyond a certain pre-determined value,  $I_L$  or  $I_a$  increases.
- Hence attracting power of electro magnet increases.
- Then movable arm is lifted and short circuits the electromagnet (NVR).
- Hence arm is released and returns to OFF position.





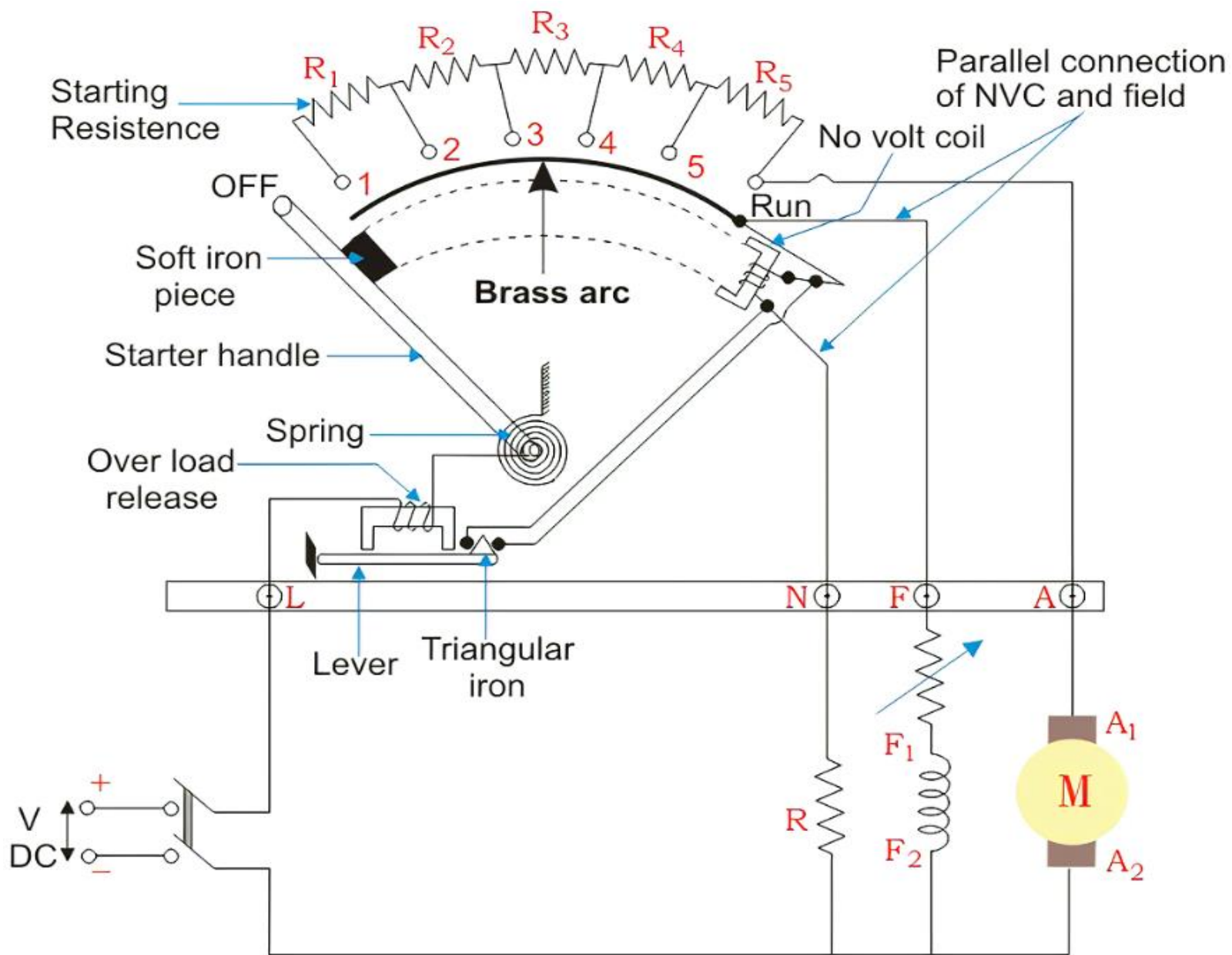
# Demerits

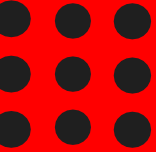
- Motor speed increases by weakening the flux, so that  $I_f$  to be decreased.
- Hence low value of  $I_f$  passes through NVR, which is unable to create enough electromagnetic pull to overcome the spring tension.
- So the arm is pulled back to OFF position.
- Its unsuitable for variable speed motors like very high speeds.





# 4 Point Starters





- In 3 point starter, the NVR is connected in series with field circuit but here, NVR does not carry field current.
- Its connected directly across the line through a protective resistance.
- NVR is independent of shunt field current, so proper speed control can be excited.
- The drawback of 3 point starter is never takes place in 4 point starter.



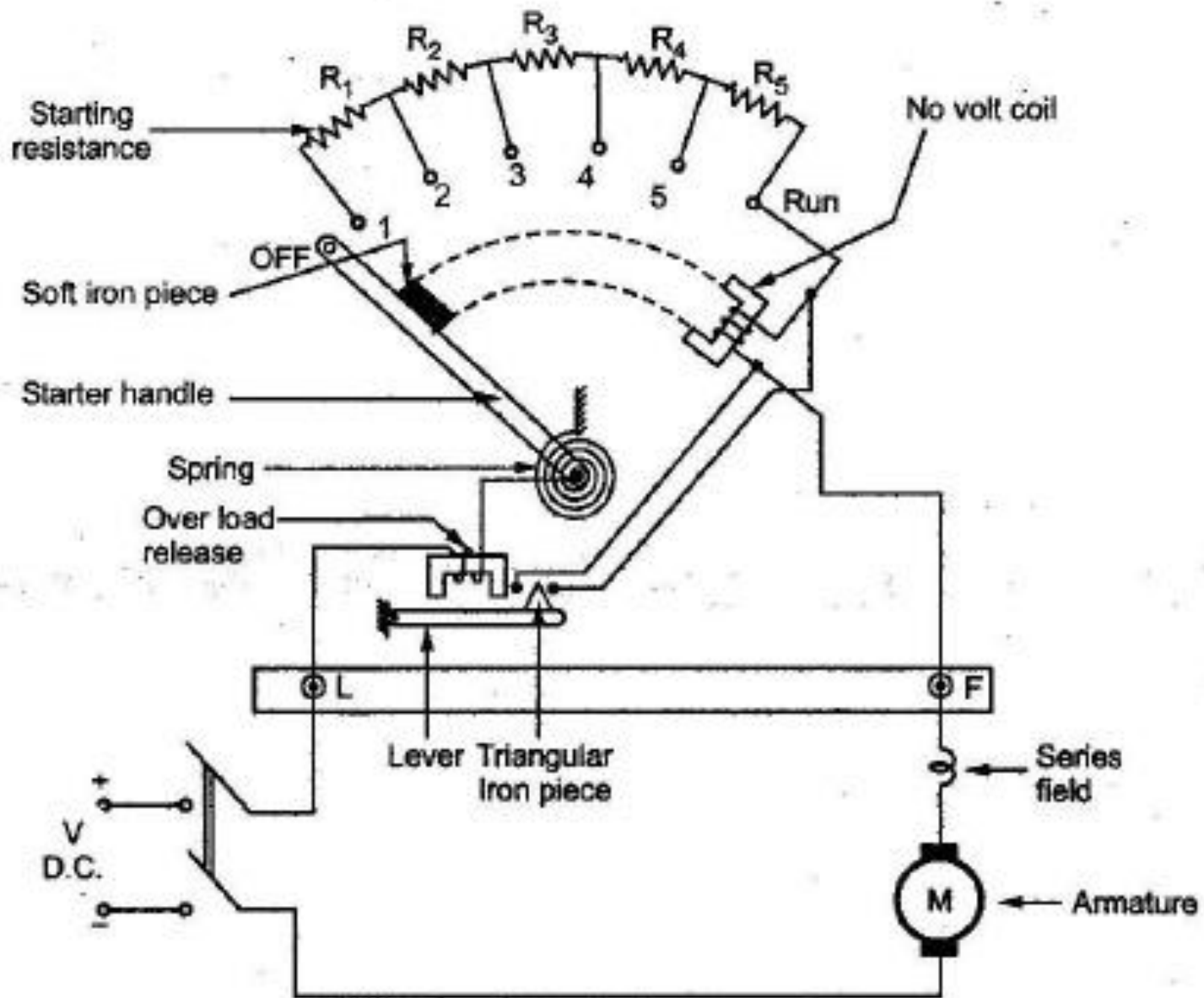


## Disadvantages:

- It will not protect the motor from high speed.
- During running condition, if field gets opened, the field current reduces then the speed will increase to dangerously high speed.

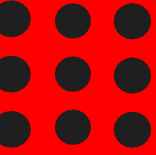


# 2 Point Starter





- The Starting resistance is connected in series with the armature.
- NVR is connected in series with the armature.
- Here over speeding action will occur when load is less so that can be prevented by using this starter







# REFERENCES

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**THANK YOU**