SNS COLLEGE OF ENGINEERING

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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

COURSE NAME : 23EEB204 ELECTRICAL MACHINES AND POWER SYSTEMS

II YEAR /III SEMESTER

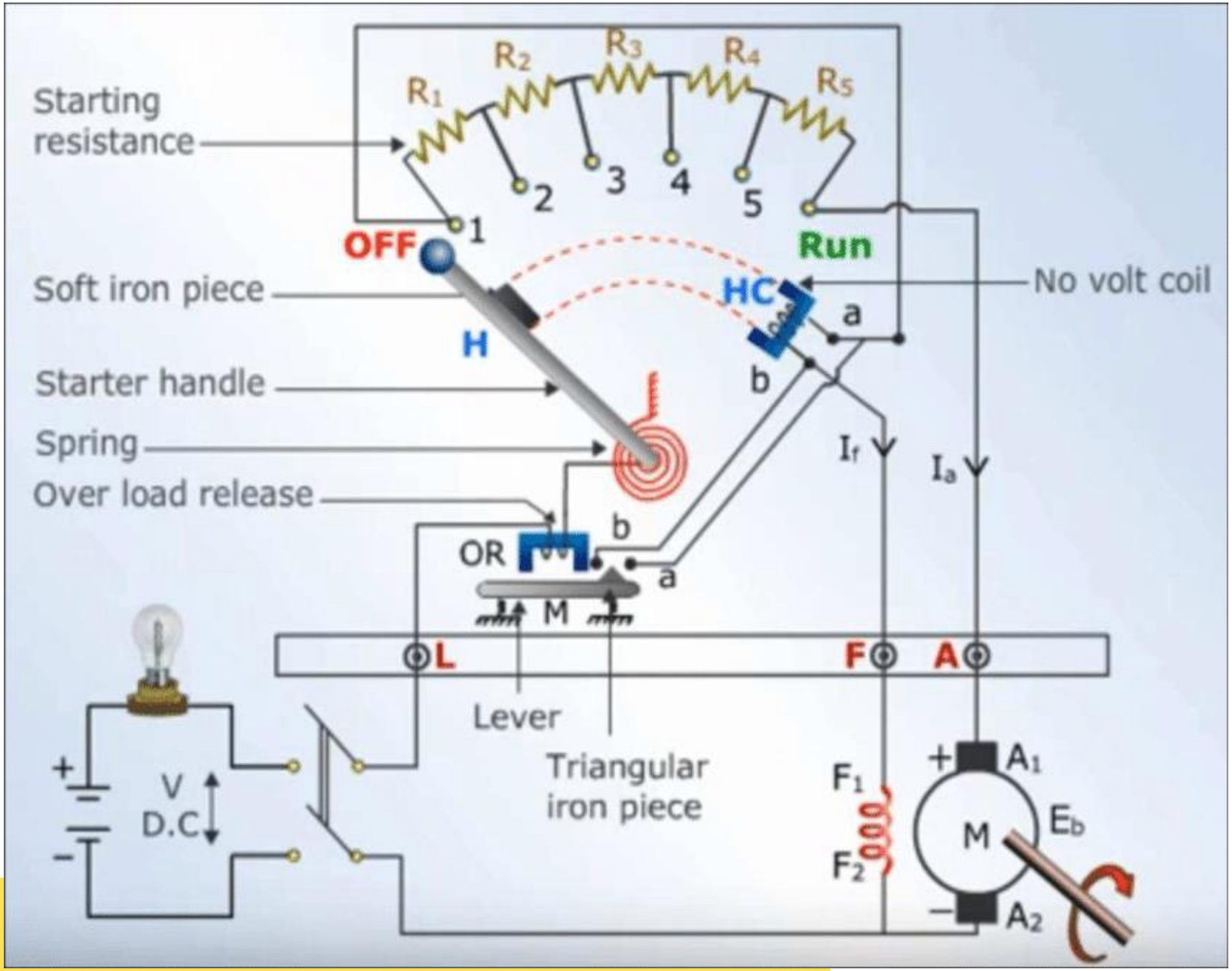
Unit 1- DC MACHINES

Topic : Three Point Starter

Three Point Starter

- ✓ A 3 point starter in simple words is a device that helps in the starting and running of a shunt and compound motor in a safe mode.
- ✓ The starter having 3 terminals so that it named as 3 point starter.

Circuit Diagram



Construction

- ✓ Construction wise a starter is a variable resistance, integrated into number of sections.
- ✓ The contact points of the these sections are called studs and are shown separately as

  OFF, 1,2,3,4,5, RUN.
- ✓ Other than there are 3 main points are L-Line, F-Field and A-Armature.
- ✓ Point “L” is connected to an electromagnet called Over Load Release (OLR) coil.
- ✓ The other end of “OLR” is connected to the lower end of conducting lever of starter handle where a spring is also attached with it, the handle contains soft iron piece.

Construction

- ✓ This handle is free to move to the other side RUN against the force of the spring.
- ✓ This spring brings back the handle to its original position.
- ✓ Another parallel path is derived the stud “1”, given to the another electromagnet called No-Volt Release (NVR) Coil which is further connected to the terminal “F”.
- ✓ The starting resistance at starting is entirely in series with the armature.
- ✓ The NVR and OLR acts as the two protecting devices.

Working of 3 Point Starter

- To start with the handle is in the OFF position when the supply to the DC motor is switched ON.
- Then handle is slowly moved against the spring force to make a contact with stud. 1.
- At this point, field winding gets supply through the parallel path provided to starting resistance, through NVR coil.
- While entire starting resistance comes in series with the armature.
- The high starting armature current thus gets limited.
- As the handle is moved further, it goes on making contact with studs 2,3,4 etc.
- Thus gradually cutting off the series resistance from the armature circuit as the motor gathers speed.

Working

- ✓ Finally when the starter handle is in “RUN” position, the entire starting resistance is eliminated and the motor runs with normal speed.
- ✓ So the external resistance is not required anymore, and is removed for optimum operation.

Assessment 1

1. The handle is moved manually from OFF to the RUN position with development of speed. Now the obvious question is once the handle is taken to the RUN position how is it supposed to stay there, as long as motor is running?_____

Working of NVR

- The supply to the field winding is derived through NVR.
- So when field current flows, the NVR is magnetized.
- Now when the handle is in the RUN position, soft iron piece connected to the handle and gets attracted by the magnetic force produced by NVR, because of flow of current through it.
- The NVR is designed in such a way that it holds the handle in “RUN” position against the force of the spring as long as supply is given to the motor.
- Thus NVR holds the handle in the RUN position and hence also called HOLD ON COIL.

Working of NVR

- ✓ Now when there is any kind of supply failure, the current flow through NVR is affected and it immediately looses its magnetic property and is unable to keep the soft iron piece on the handle, attracted.
- ✓ At this point under the action of the spring force, the handle comes back to OFF position, opening the circuit and thus switching off the motor.
- ✓ So due to the combination of NVR and the spring, the starter handle always comes back to OFF position.

Working of OLR

- If the motor is over loaded the OLR coil is gets magnetized so it attract the triangular prism.
- The triangular prism is connected across the NVR coil so this coil is gets demagnetized.
- Due to the demagnetization of NVR, the handle is released back to the OFF position.

Drawback

- ✓ To increase the speed of the motor field resistance can be increased.
- ✓ Therefore current through the shunt field is reduced.
- ✓ Field current becomes very low which results in holding electromagnet too weak to overcome the force exerted by the spring.

Assessment 2

1. Is it possible to increase the speed above the rated speed like 3000 rpm, 4000 rpm in DC motor?_____

References

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Thank You