Electrical Machines 1

Hour 7

DC Motor Starter (sect. 4.4.3)

From Fig.4.57(a), the starting armature current is:

$$I_a = \frac{V_t - E_a}{R_a}$$

When a d.c motor is stationary, the back emf, $E_a=0$, and the armature current is then:

$$I_a\,|_{start} = \frac{V_t}{R_a}$$

Since R_a is small, the starting current is very large.

DC Motor Starter

The in rush current on starting a d.c. machine must be limited to about 1 – 2 times the full load current, so as to prevent excessive temperature rise and mechanical vibration.

DC Motor Starter

Starting current can be limited to a safe value by:

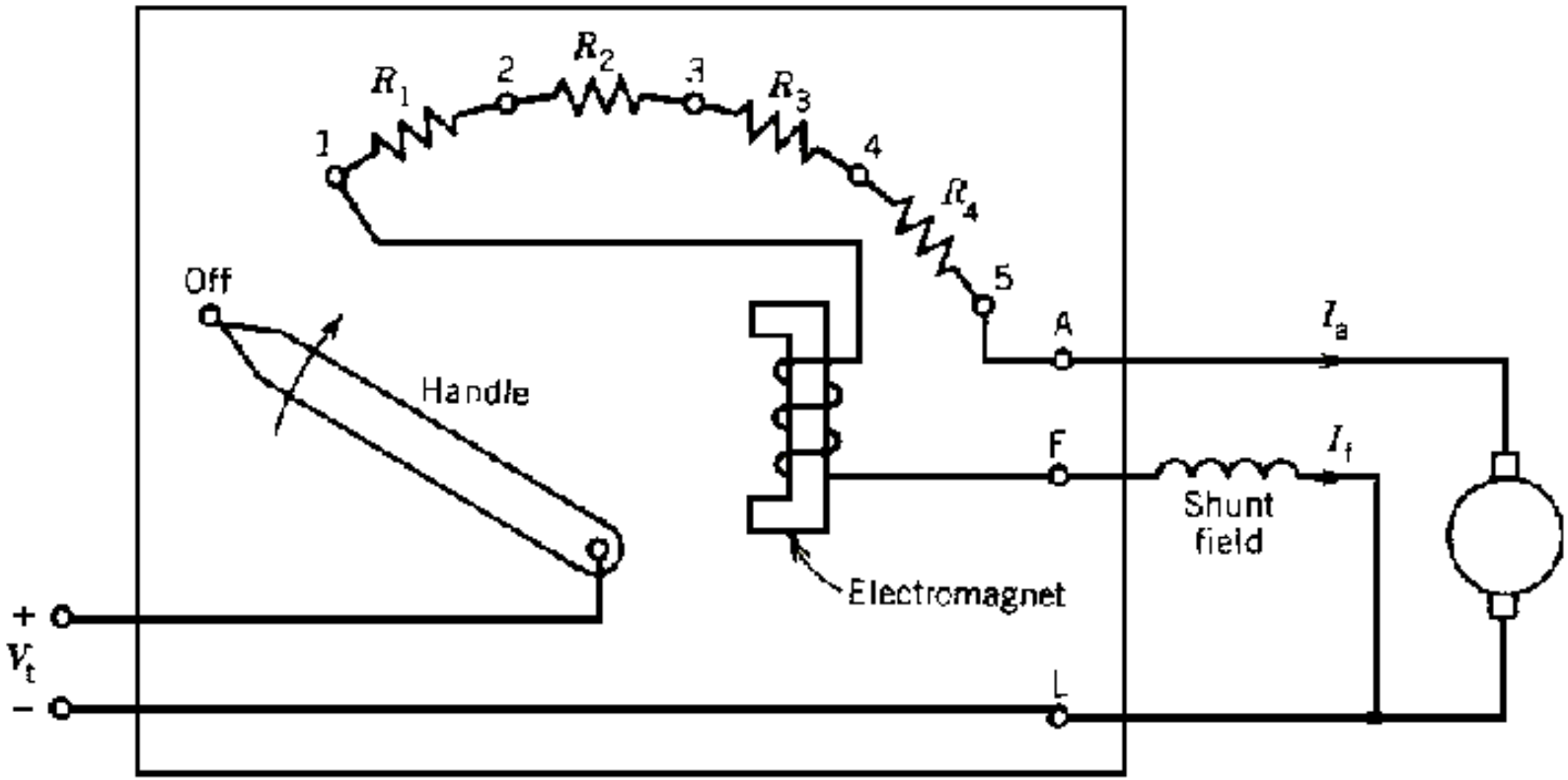
1. Use a low d.c. applied voltage at starting, and hence requires a variable-voltage supply. The variable voltage is gradually increased from zero to the machine normal voltage. As the back emf builds up, the current will come down to its normal level even with an increase of input voltage.

DC Motor Starter

2. Insert an external resistance, Rae, in series with the armature at starting [Fig. 4.57(b)].The resistance is then gradually cut down when the back emf builds up.

$$I_a = \frac{V_t - E_a}{R_a + R_{ae}}$$

DC Motor Starter



DC Motor Speed Control (sect. 4.5.1)

- DC motors are susceptible to adjustment of their operating speed over wide ranges and by a variety of methods.

- Speed control can be done by
  - » adjustment of field current
    - i.e. field diverter and field regulator
  - » adjustment of armature resistance
  - » adjustment of input voltage
    - i.e. MG set and Chopper