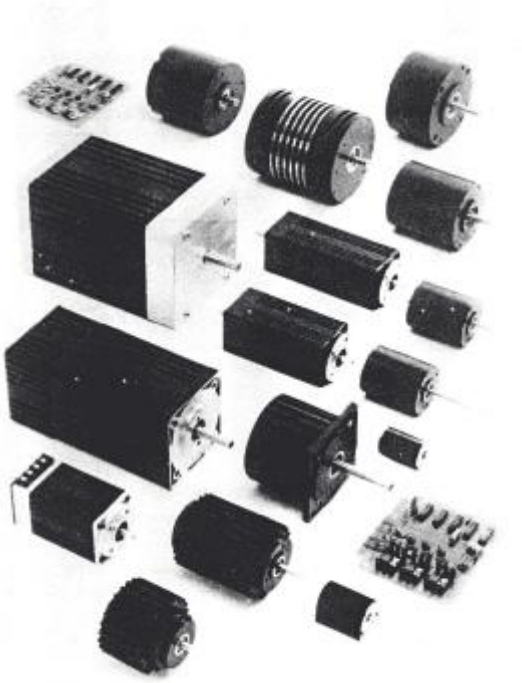
電工實驗(五) – 步進馬達驅動控制實驗

Classification of stepping motors

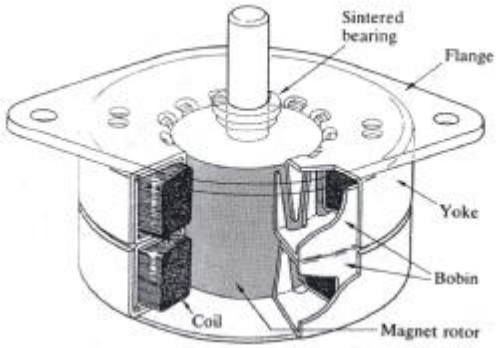
- Permanent-magnet (PM) stepping motors
- Variable-reluctance (VR) stepping motors
- Hybrid stepping motors (HSM)

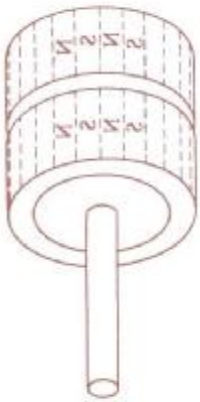
Stepping motors：

- 外 觀：

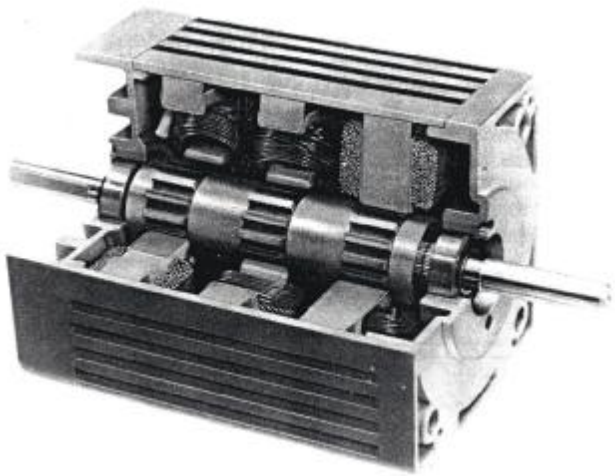


Claw-pole（爪極式）permanent-magnet stepping motor

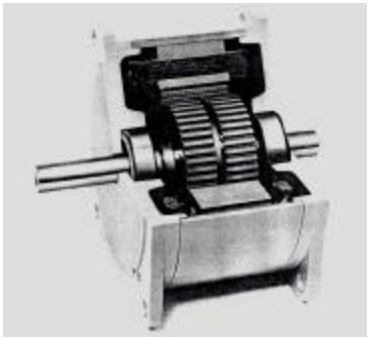


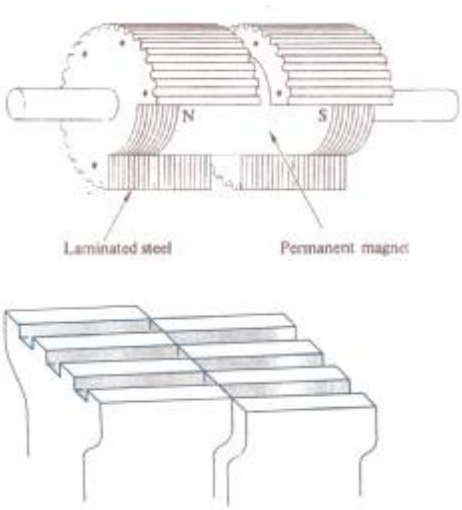


Three-stacks hybrid stepping motor

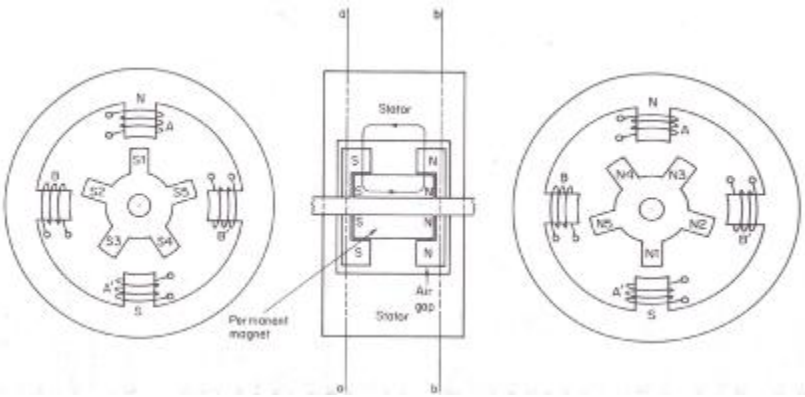


Single-stack hybrid stepping motor

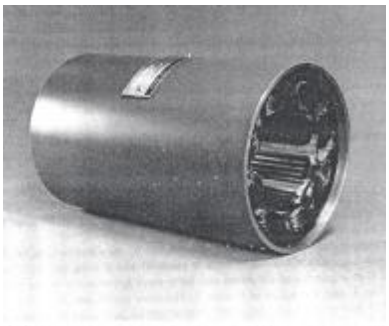


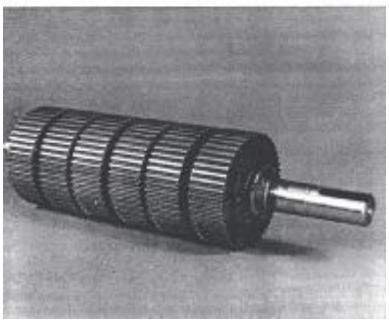


Single-stack hybrid stepping motor



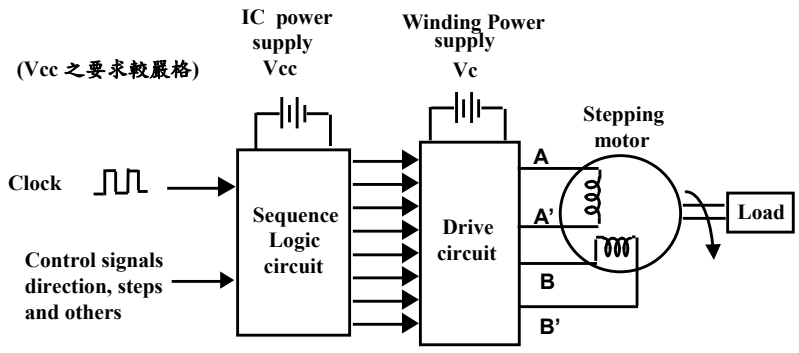
Three-stacks hybrid stepping motor



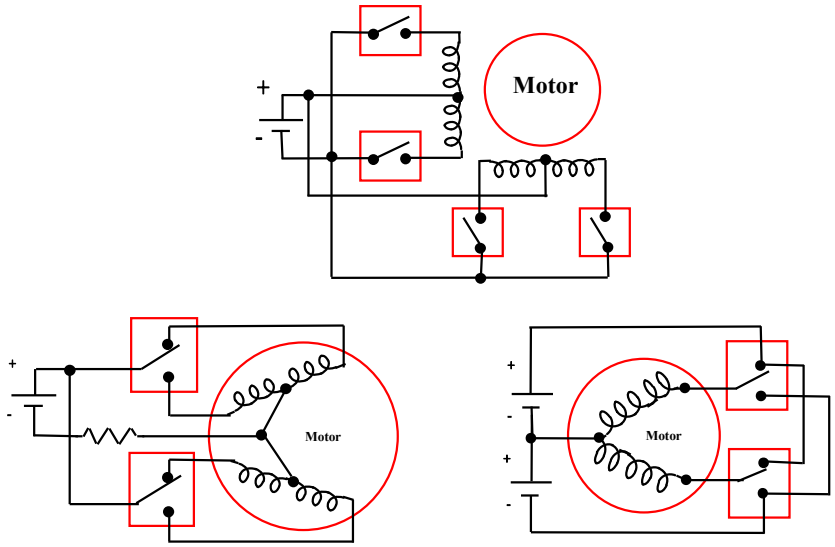


電工實驗(五) – 步進馬達驅動控制實驗

■ 驅動系統組成

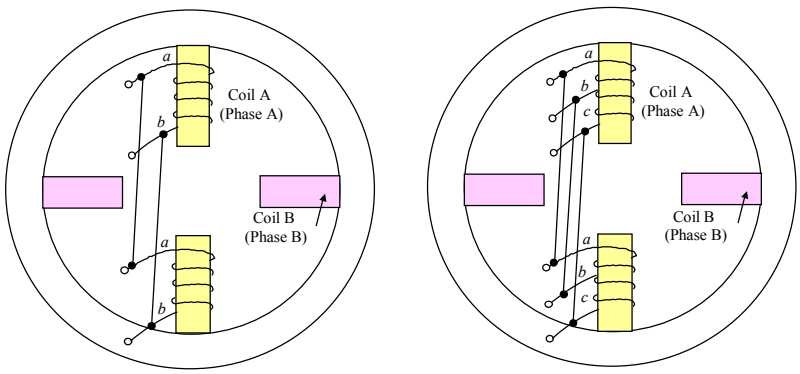


線圈與驅動電路之搭配



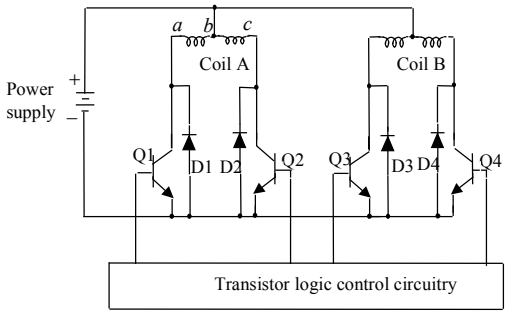
相線圈之完全繞線情況

- Unifilar (單繞式)
- Bifilar (雙繞式)

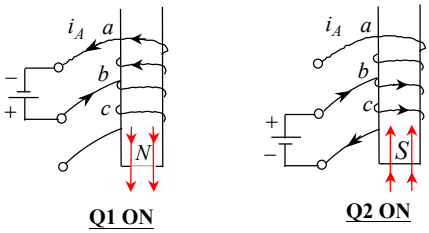


☒ 單極驅動電路及雙繞線圈間之連接組態

Unipolar drive circuits and bifilar windings

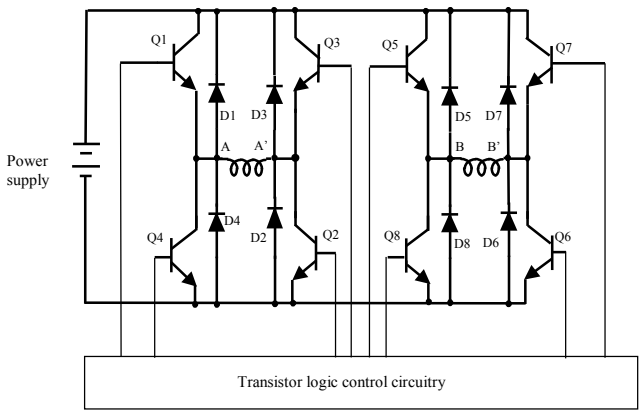


☒ 以A相為例 Bifilar winding 之激勵情形



Bipolar(雙極式) drive + Unifilar(單繞式) winding

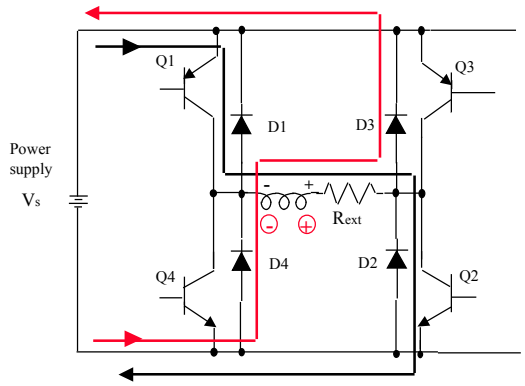
- D3,D4 保護 Q1,Q2，餘此類推。
- 常於線圈與電源間串以一forcing resistor以加速線圈電流之建立速度.



雙極驅動電路(具能量回送)

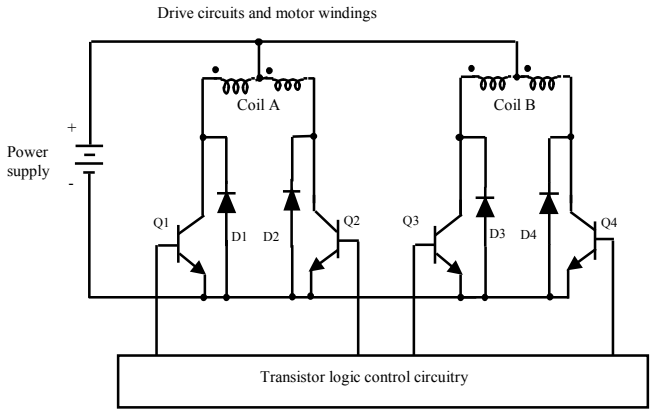
- 應用於HSM步進馬達驅動電路中之一相電路如下圖，Q1,Q2 ON 時之
- 電流路徑如實線所示；Q1,Q2 OFF 時之電流路徑如虛線所示。設
- R=Rext+Rw代表總電阻，***能量回送之情形如下例***。

- D3,D4 保護 Q1,Q2； D1,D2 保護 Q3,Q4



Unipolar (單極式) drive + Bifilar (雙繞式) winding

- D2 保護 Q1，餘此類推
- 常於線圈與電源間串以一forcing resistor 以加速線圈電流之建立速度.



步進馬達驅動實驗方塊圖