$2\pi \times 0{\cdot}15$

3.04. HYSTERESIS

To explain the term hysteresis, suppose a bar of iron is magnetised slowly. The intensity of magnetisation (M) increases with increase in the magnetic induction (B) along OA [Fig. 3.09]. At A, any further increase in B does not produce any increase in M and therefore corresponding to point A, the bar has acquired a state of magnetic saturation. If the magnetic induction is now decreased slowly, the intensity of magnetisation also

decreases but corresponding to point B (when B becomes zero), the intensity of magnetisation does not become zero.

The value of intensity of magnetisation of the magnetic material, even when the magnetisation field is reduced to zero is called its retentivity or remanent magnetism or residual magnetism.

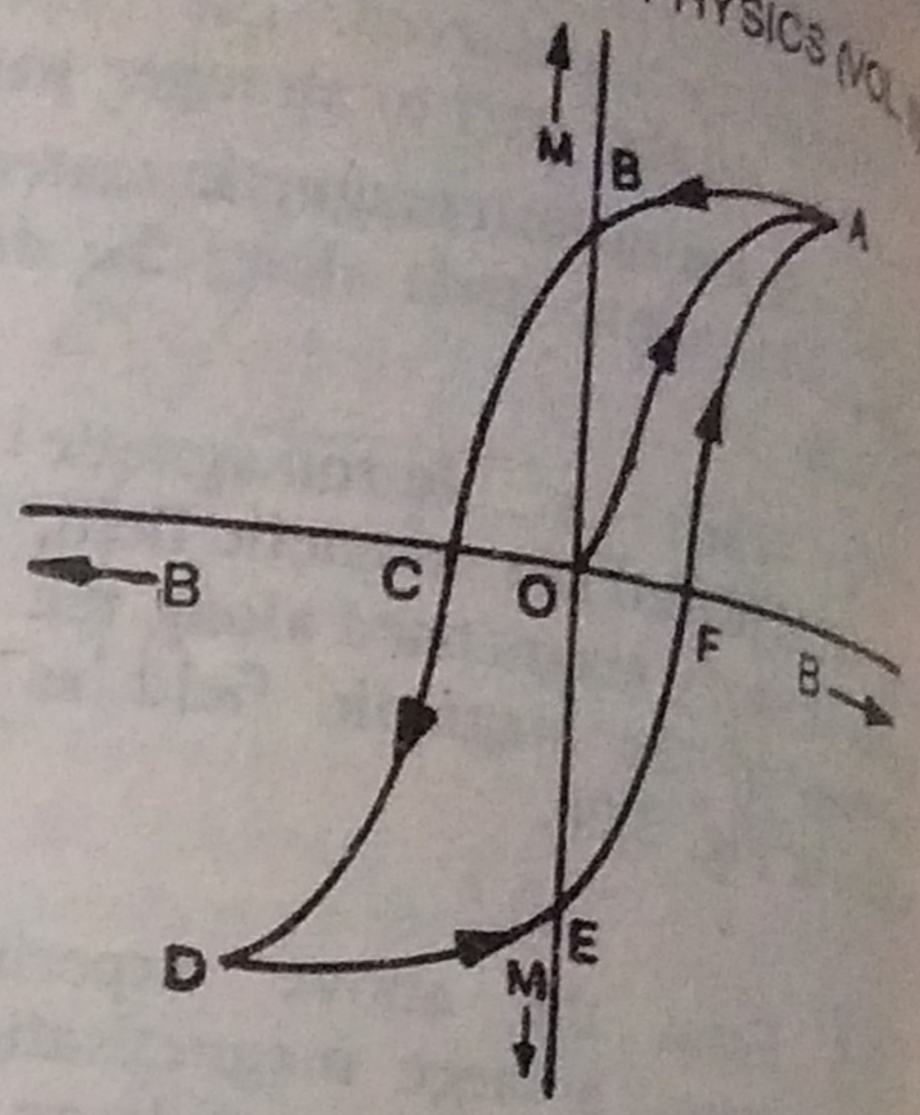

Fig. 3.09.

Thus, OB represents the retentivity of the material under study. If now the direction of magnetising field is reversed, the intensity of magnetisation decreases along BC till it becomes zero at C. Thus, to reduce the residual magnetism to zero, magnetising field equal to OC has to be applied in reverse direction.

The value of the reverse magnetising field which has to be applied to the magnetic material so as to reduce the residual magnetism to zero is called its coercivity.

When the magnetising field is further increased in reverse direction, the intensity of magnetisation increases along CD till corresponding to point D, it again acquires saturation value symmetrical to point A. On increasing the field again, the intensity of magnetisation follows the path DEFA and the closed curve ABCDEFA is obtained for complete cycle of magnetisation. This closed curve is known as hysteresis loop. On repeating the process, the same closed curve is traced again and again but the portion OA is never obtained.

The dictionary meaning of the word hysteresis is 'coming late'. As stated above, corresponding to point B, H is zero but M has still some finite value and becomes zero after increasing H in reverse direction. Therefore, intensity of magnetisation does not become zero on making magnetising field zero but does so a little late and this effect is called hysteresis.

The lag of intensity of magnetisation behind the magnetising field is called hysteresis.

Some important points. 1. When a fe