Magnetic Storage Devices

Magnetic Bubble Memories

Magnetic bubble memories use small magnetized areas, called bubbles to represent data bits. An alternating electric field causes the bubbles to shift down the register. A constant magnetic field must also be supplied by an external magnet. Magnetic bubble memories are non-volatile, i.e. the magnetic bubbles do not disappear when power is turned off. CCD memories must include a battery if data is to be retained after power is is turned off. Most magnetic bubble memories require an external magnet. The CCD's are completely monolithic and can be manufactured with out the additional mechanical fabrication of magnetic assembly. Bubble memories are rapidly being introduced and size up to 10-20 million bits would make them more cost effective compared to magnetic disks.

Floppy Disk Storage

The floppy disk is a flexible plastic base disk. The floppy disk comes in an envelop as shown in figure 2 and it can be easily plugged in the drive mechanism as a tape cassette. The disk is interred in the drive with the envelope in place. This is because the envelope provides protection to the recording surface which is about 100µ in thick layer of magnetic oxide. The read/write head assembly comes in actual contact with the recording material. There is an index hole of about 0.1 inch diameter about 4 cm from the center of the disk to indicate the start of the track. A written track is 0.012 inch wide and standard track spacing is 48 inch. The number of tracks is 77. Most floppy disk use an address system like hard disks, where the disk drive track and sector are given. The normal capacity of a floppy disk is 1.4 MB. The speed of rotation is approximately 360 R.P.M.
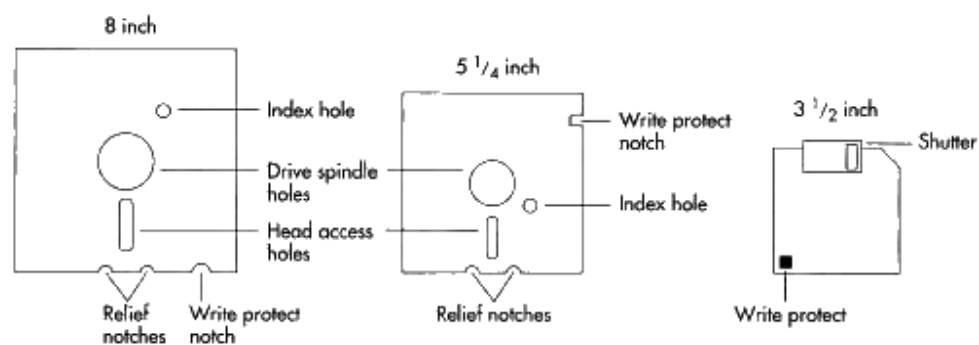

Figure 2: Floppy Disk Dimensions

Magnetic Disk Storage

Magnetic disk storage is based on the same physical phenomena as that of magnetic drum. Their external characters as seen by the system designer are essentially the same. They differ in mechanical structure.

The basic structure of a small storage is as shown in figure 3. The metal disk coated with ferromagnetic material rotates under one or more read/write heads. The speed of rotation is typically 1800 or 3600 R.P.M. The latest magnetic disk storages have speed up to 7200 R.P.M.
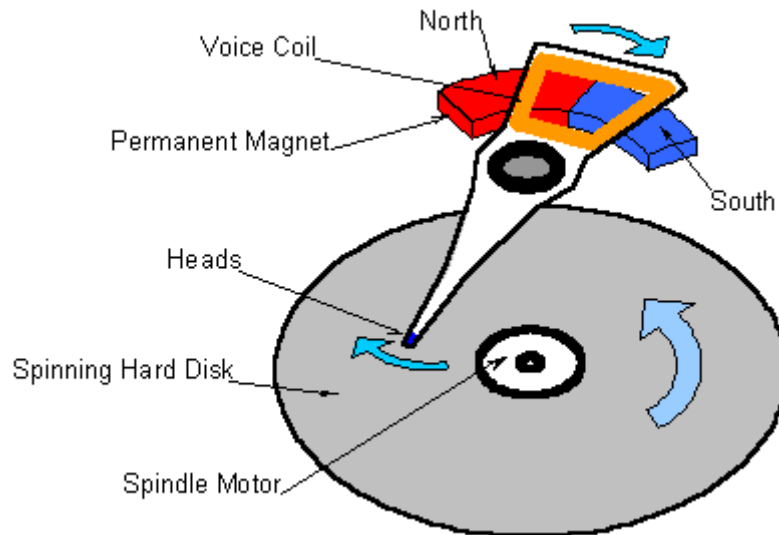

Figure 3: Basic Disk Storage

The read/write heads work on the same principle.

Following different arrangements are possible.

One Head Per Track System:

The disk is divided into several concentric tracks which store information. Both sides of the disk are used. The number of heads is mounted on the both sides of the disk, one for each track. This system is most widely used in single disk systems.

Comb Type Head Assembly:

This arrangement is generally used for multi disk systems. Multi disk systems have a number of disks arranged in a stack. the heads are moved on the arms of a comb which moves in or out radically to position the heads over selected track (figure 4) both sides of the disk are used.
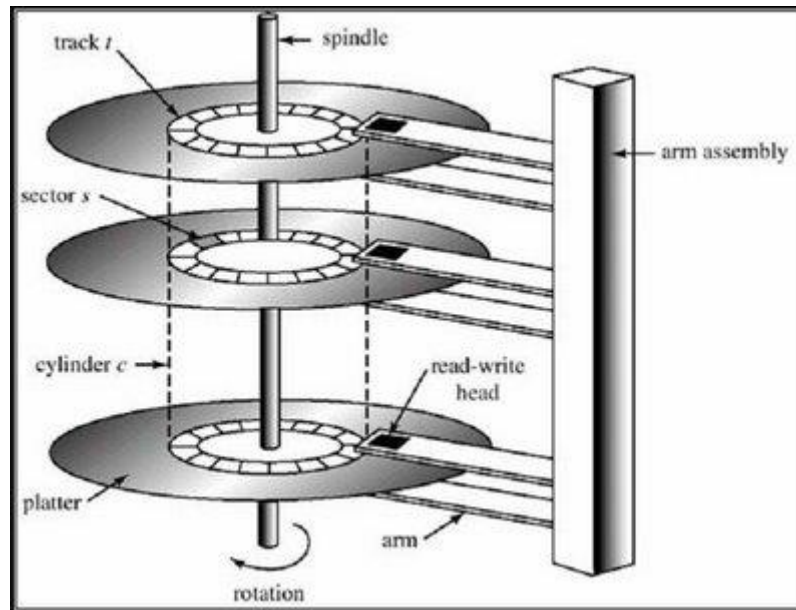
Figure 4: Magnetic Disk Storage

The data transfer in disk memories is sequential. The word however can be transferred either serial or parallel. In one head per track system, the transfer is serial since one head is alerted at a time, which reads the data bit by bit. In case number of heads are selected the whole word may be accessed in parallel. In this case bits of the same word are on different tracks. In a multi disk system a given head is selected by mechanically position the heads. Once the track has been selected, a single head may be selected to provide serial transfer or a number of heads may be selected to provide parallel data transfer.

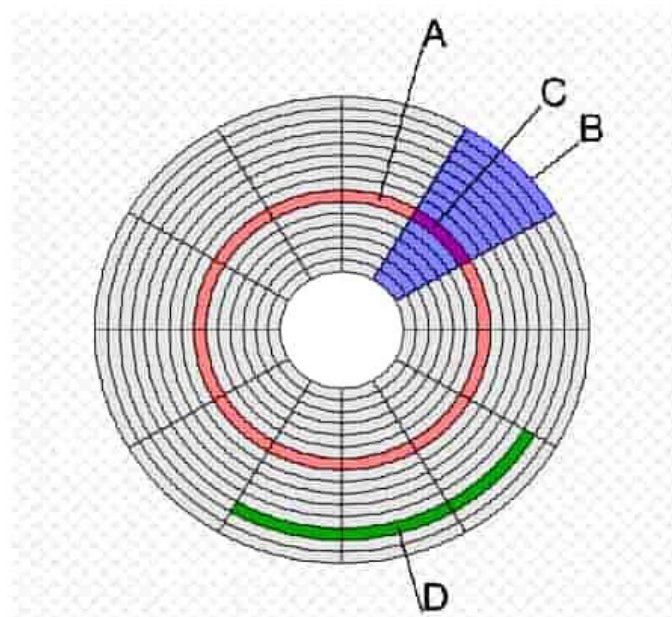A : Track

B : Geometrical Sector

C: Track Sector

D: Cluster

Figure 5: Data Arrangement on DIsk

The data arrangement on a typical disk is as shown in figure 5. The timing gap is used to reset the timing and addressing circuits one each revolution. The timing tracks provide clock pulses used for synchronizing and write operations. These are provided by the manufacturer.