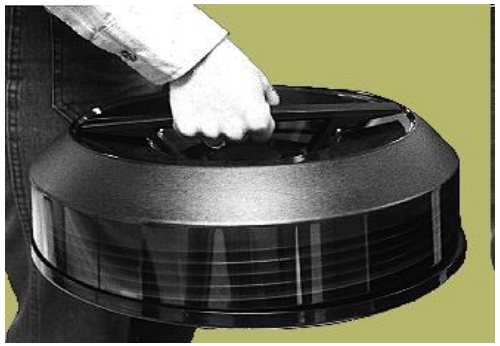
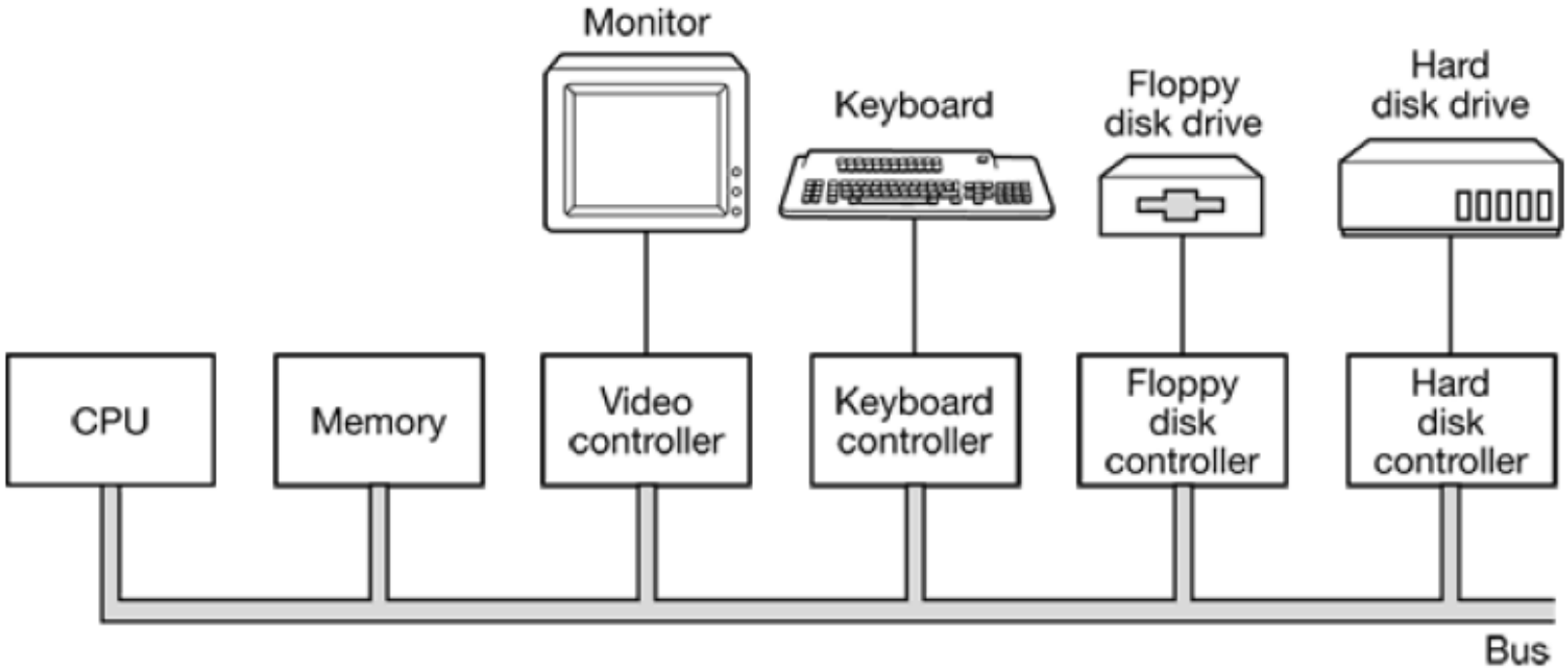
Architectures des Systèmes de Bases de Données

Hard Disk Drive Storage



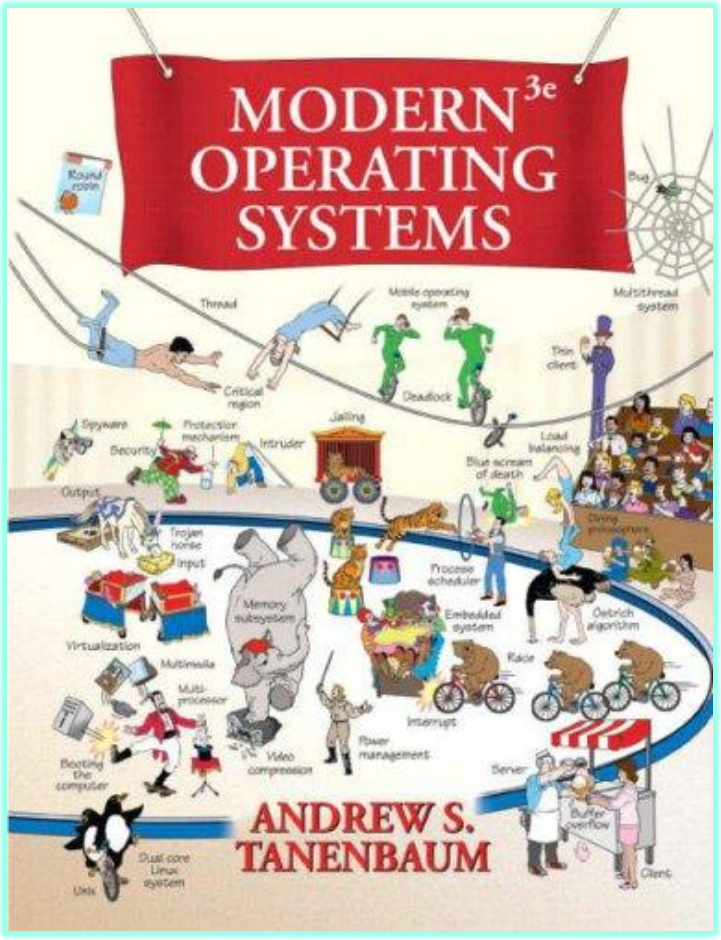
Traduction en cours

Computer Physical Architecture



Source MOS : MODERN OPERATING SYSTEMS ANDREW S. TANENBAUM (A.S.T)

ANDREW S. TANENBAUM (AST)



MODERN OPERATING SYSTEMS (MOS) (1987)

http://www.cs.vu.nl/~ast/

http://www.ittelkom.ac.id/stafmhd/MateriKuliah/Sistem%20Operasi/Modern%20Operating%20Systems.pdf

Why hard disk drive ?

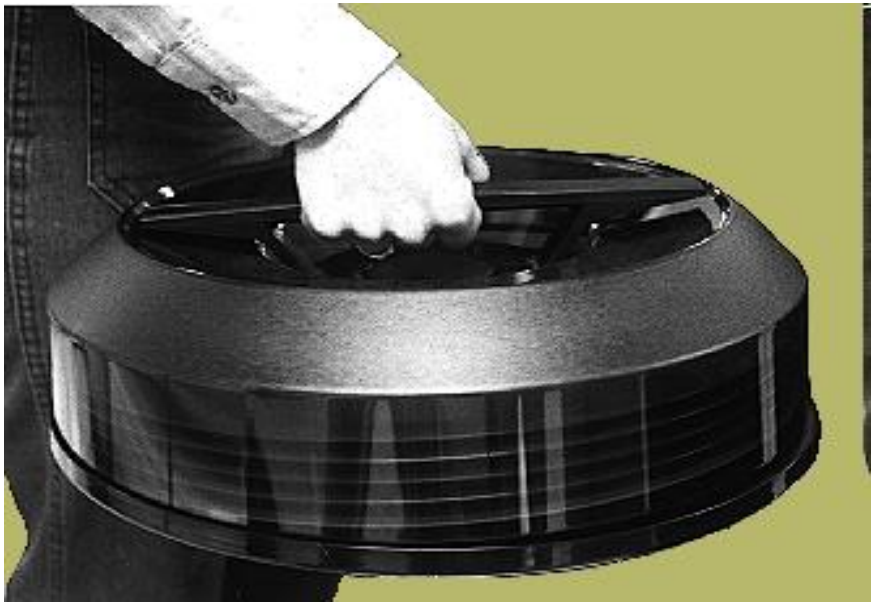
- Hard drives were invented at IBM as a way to give computers a rapidly accessible "random-access" data persistency.
- Other computer persistency devices, like punched cards and reels of magnetic tape, is that they can only be accessed serially, in order, from beginning to end, so if the bit of data to retrieve is somewhere in the middle of the tape, it implies to read or scan through the entire reel.
- Hard drive can move its read-write head from one part of the disk to another.

Hard Disk Drive

A removable 14 inch disk pack for a disk drive

http://en.wikipedia.org/wiki/History_of_IBM_magnetic_disk_drives

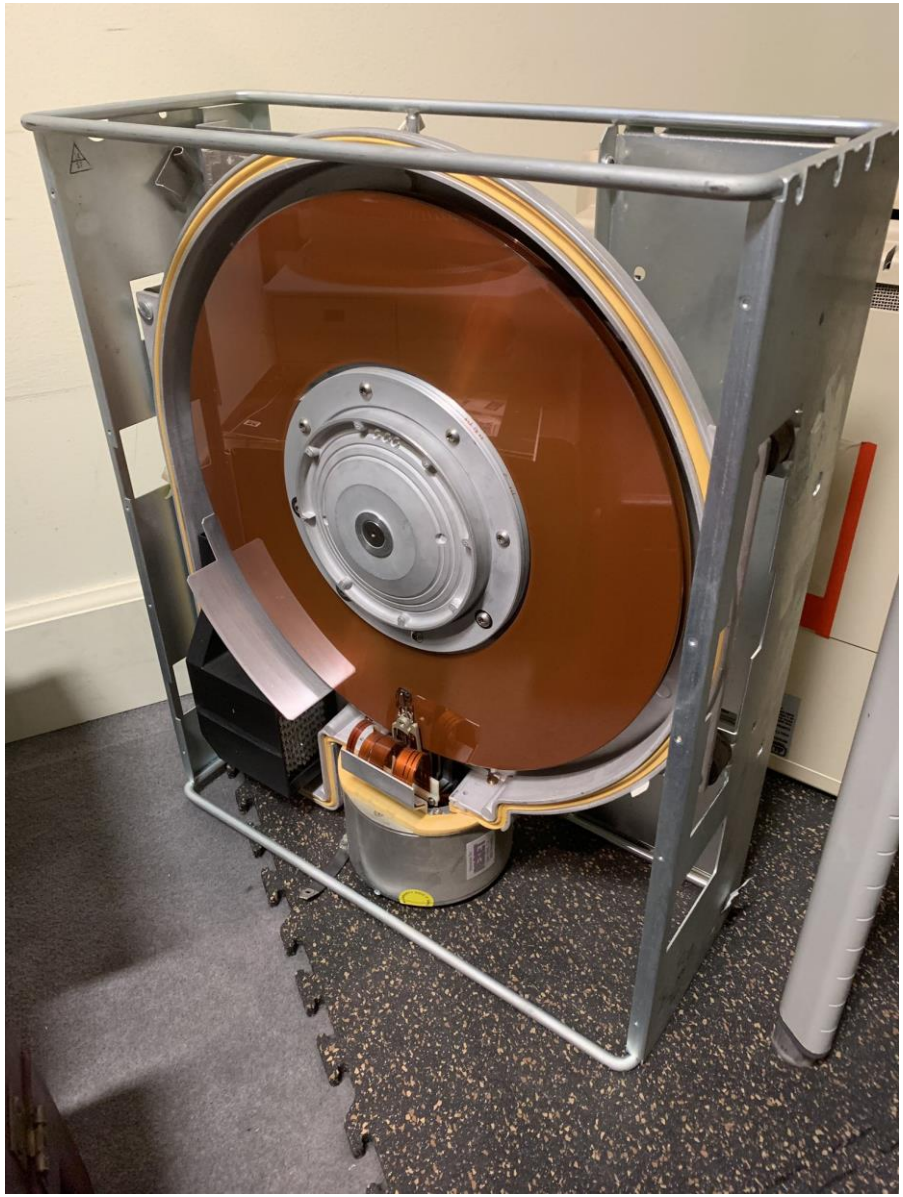
PLATTERS



A removable 14 inch disk pack for a disk drive

http://www.tpub.com/neets/book23/103a.htm

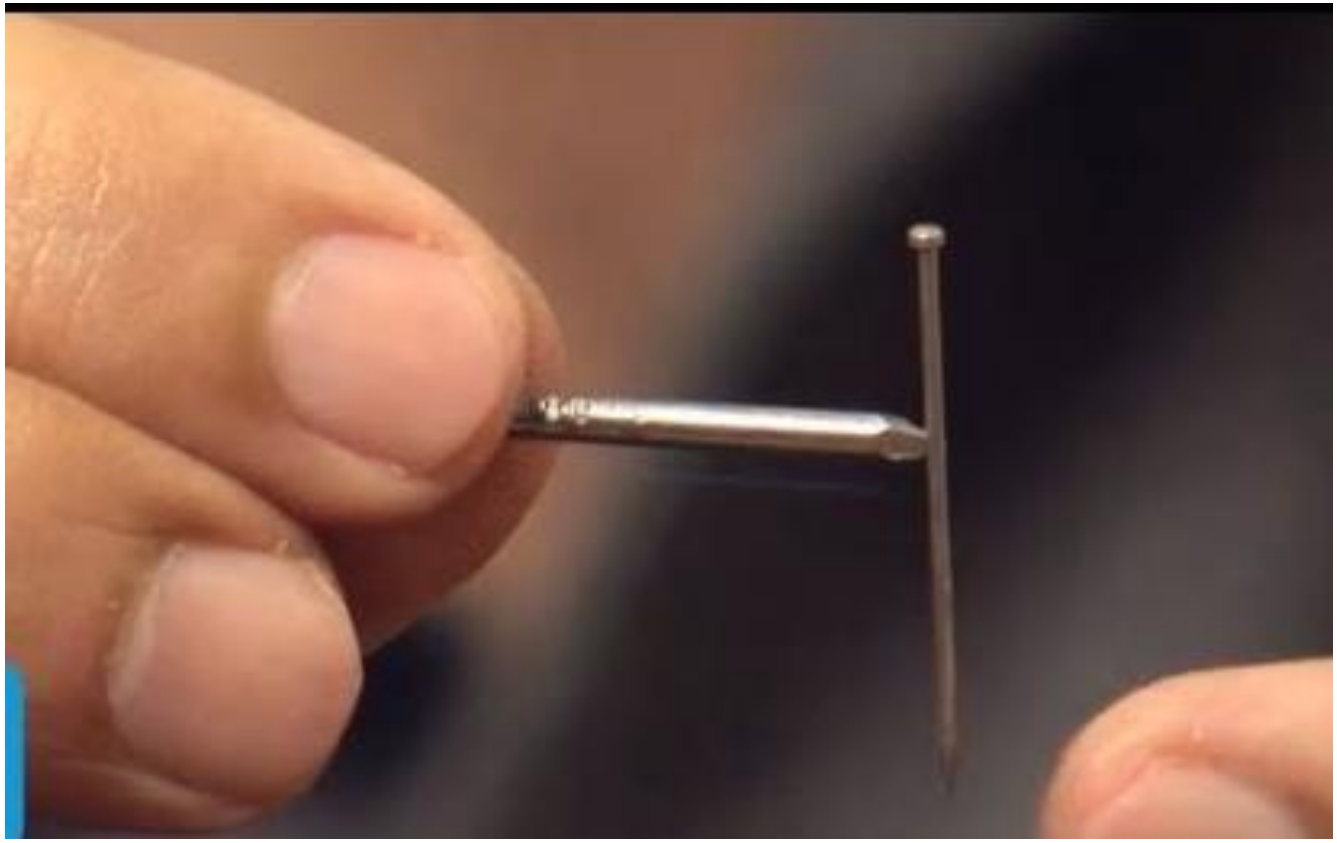
HDD



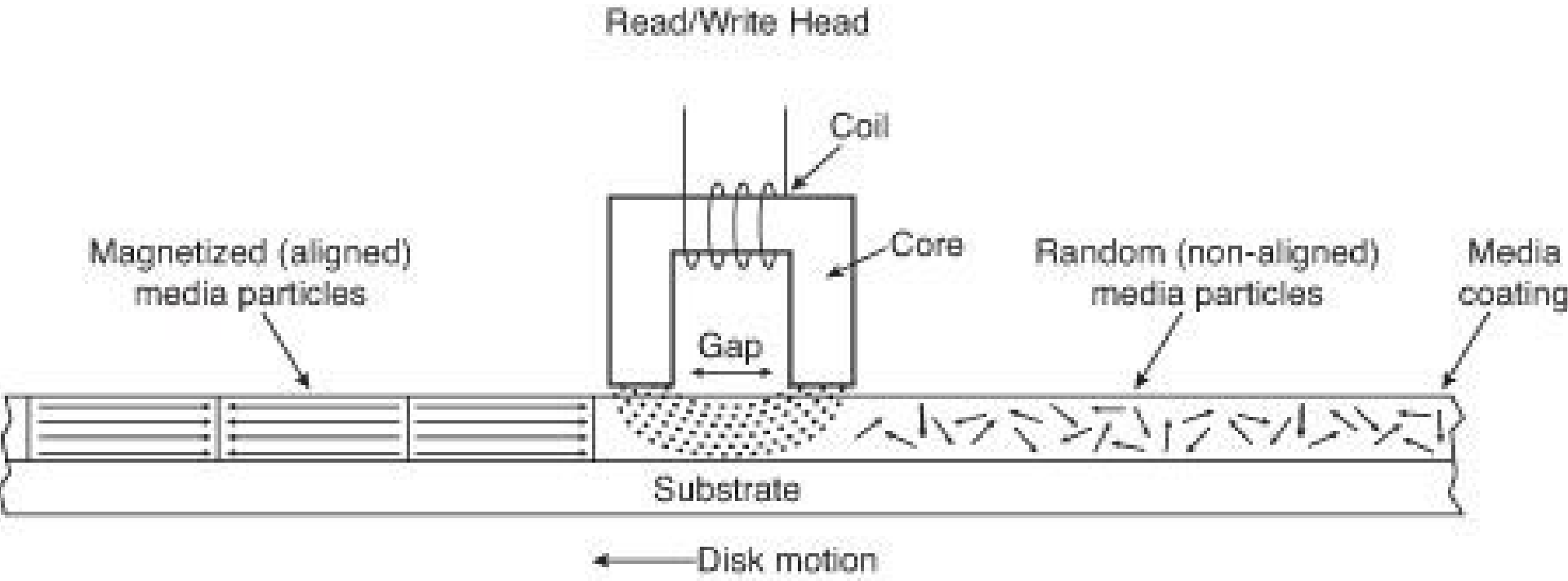
Magnetism

- Magnetism is used in computer storage because it goes on storing information even when the power is switched off.

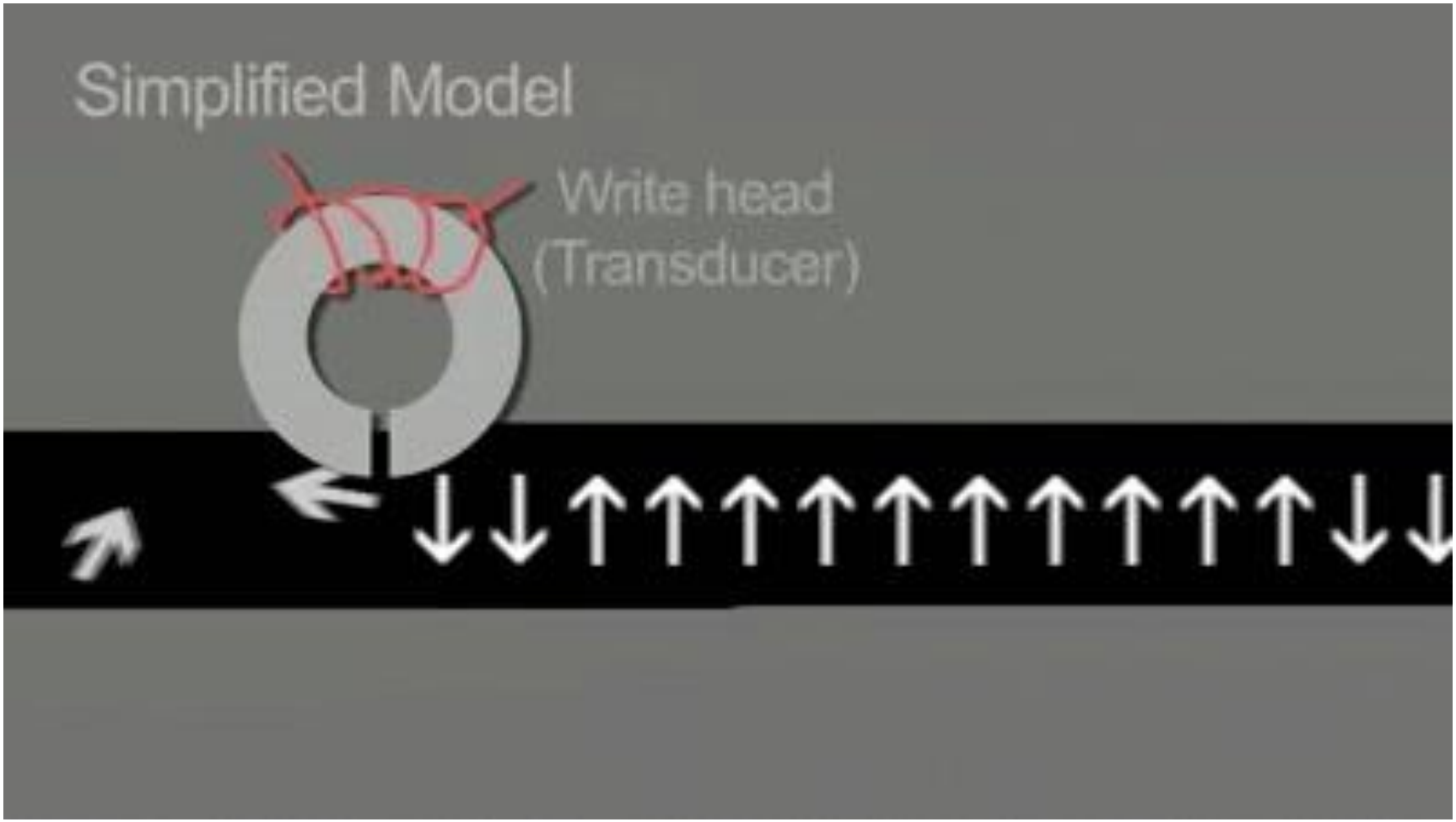
Magnetism



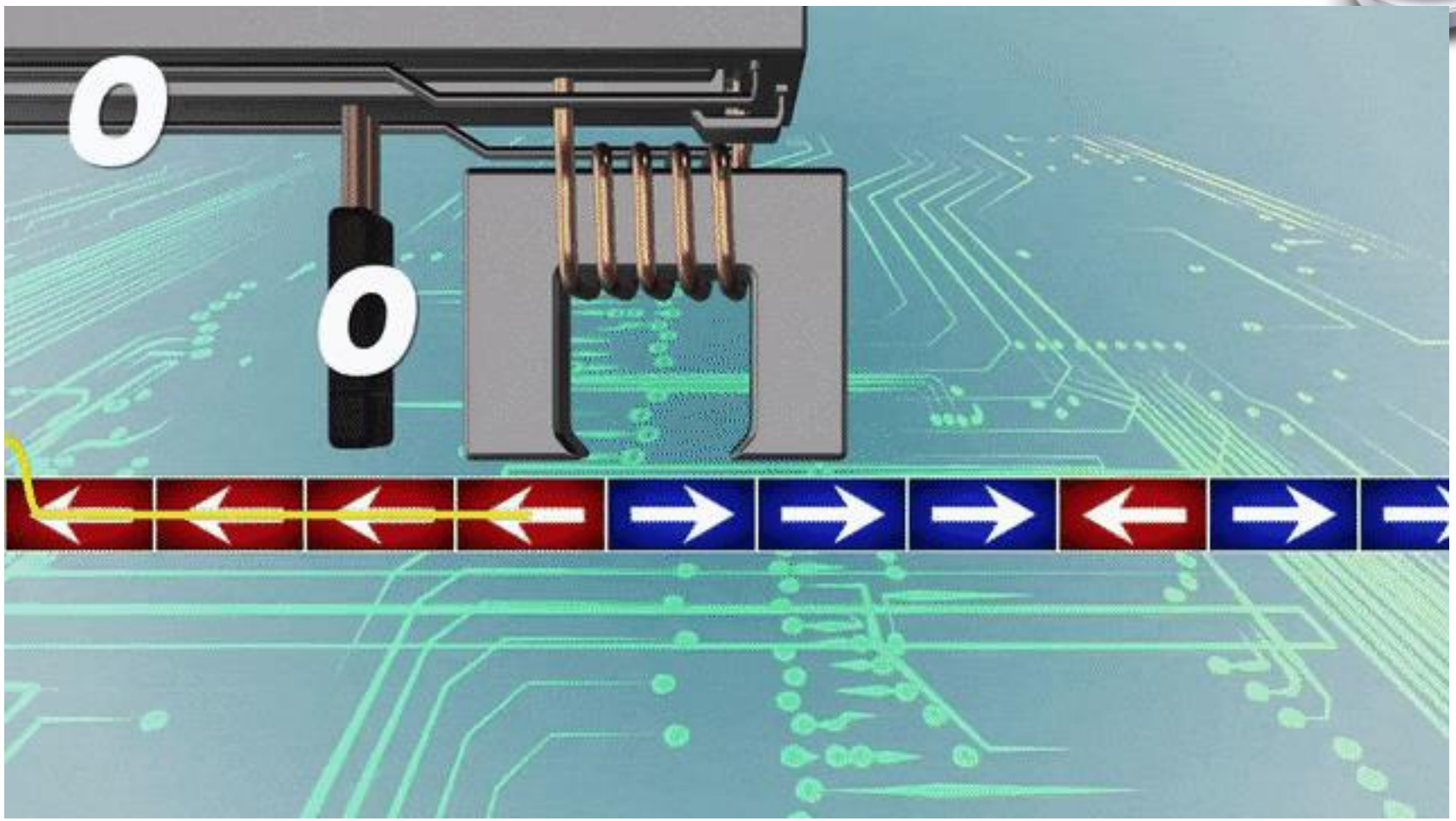
Magnetic Head



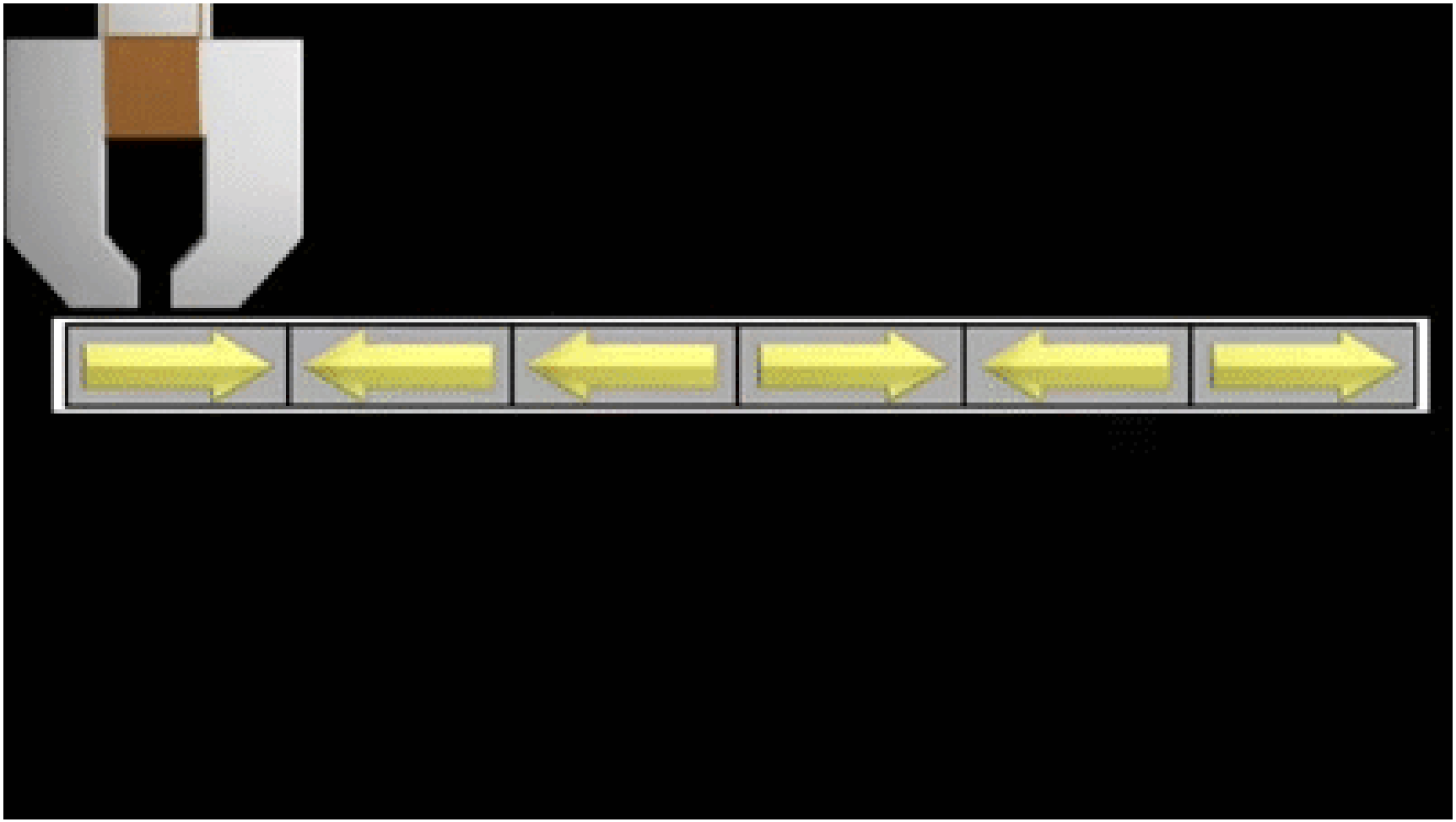
Magnetic Head : Write



Magnetic Head : read

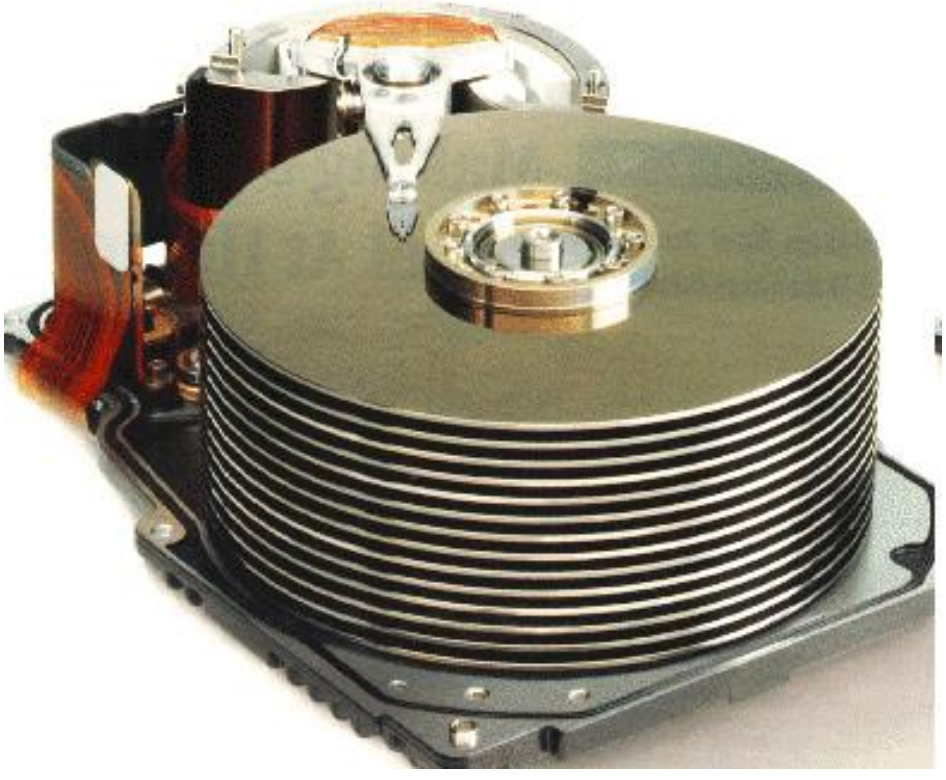


Magnetic Head



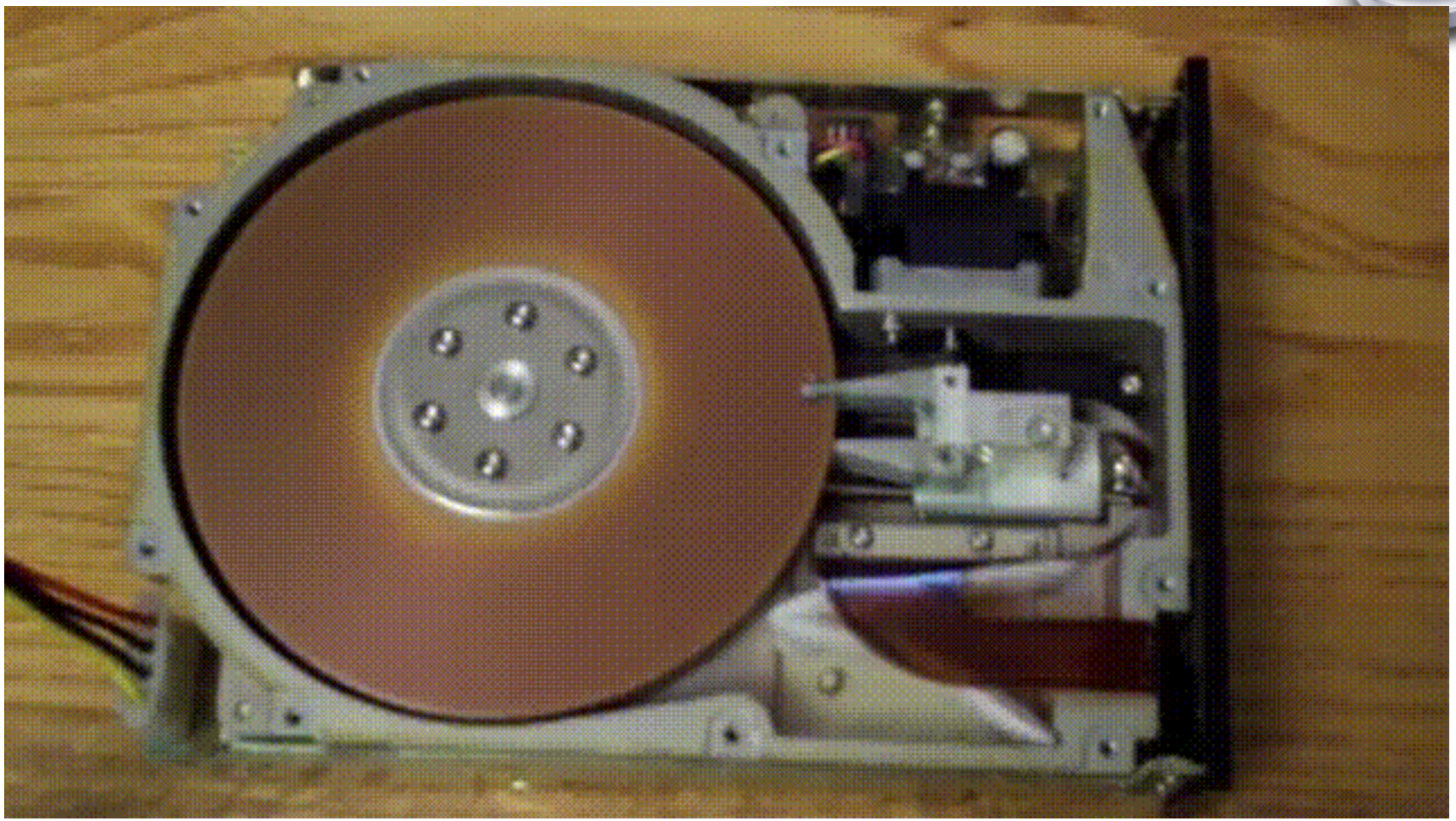
Platters

- Large shiny, circular "plate" of magnetic material called a platter.
- divided into billions of tiny areas.

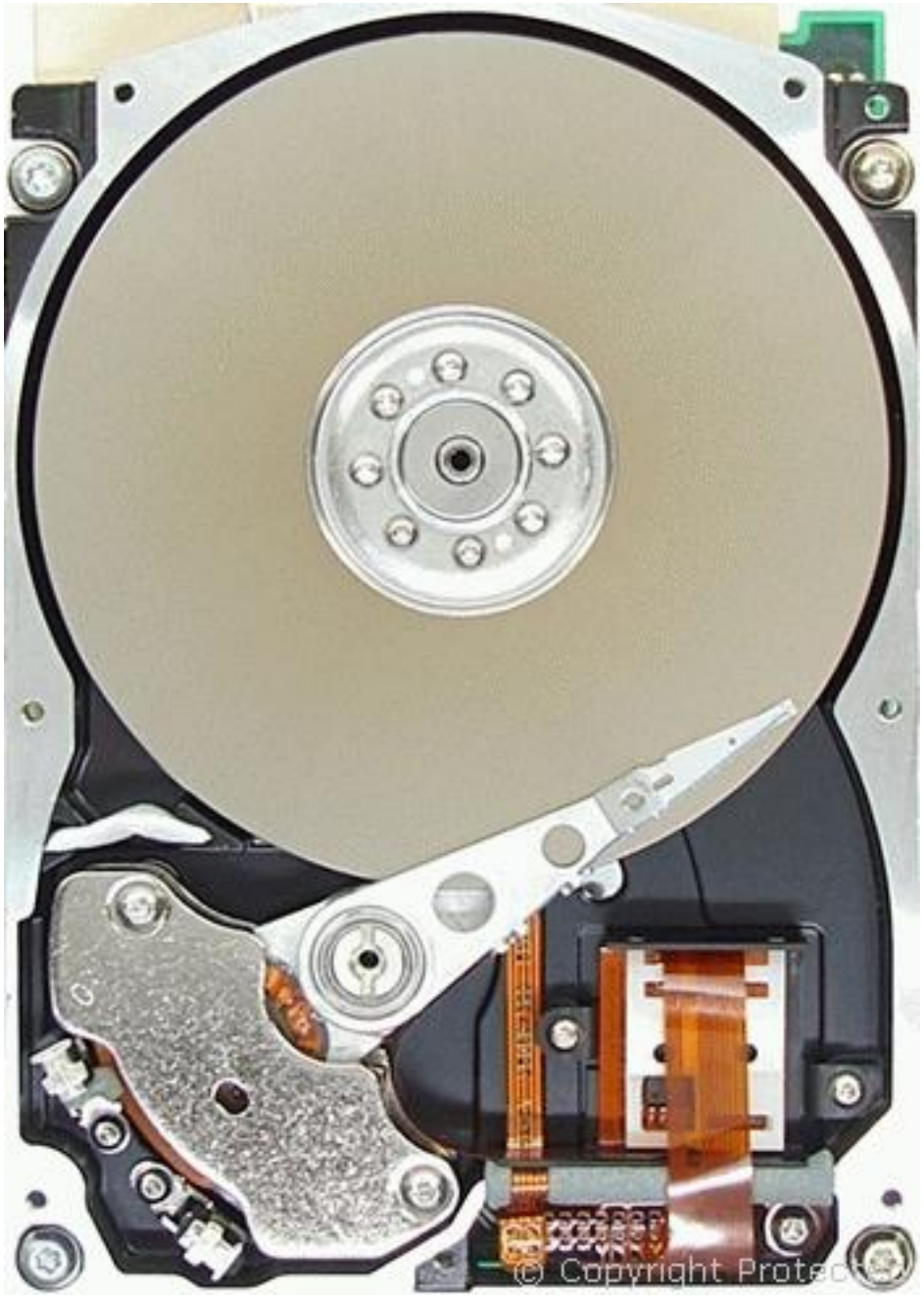


HDD : Platter

HDD : Platter



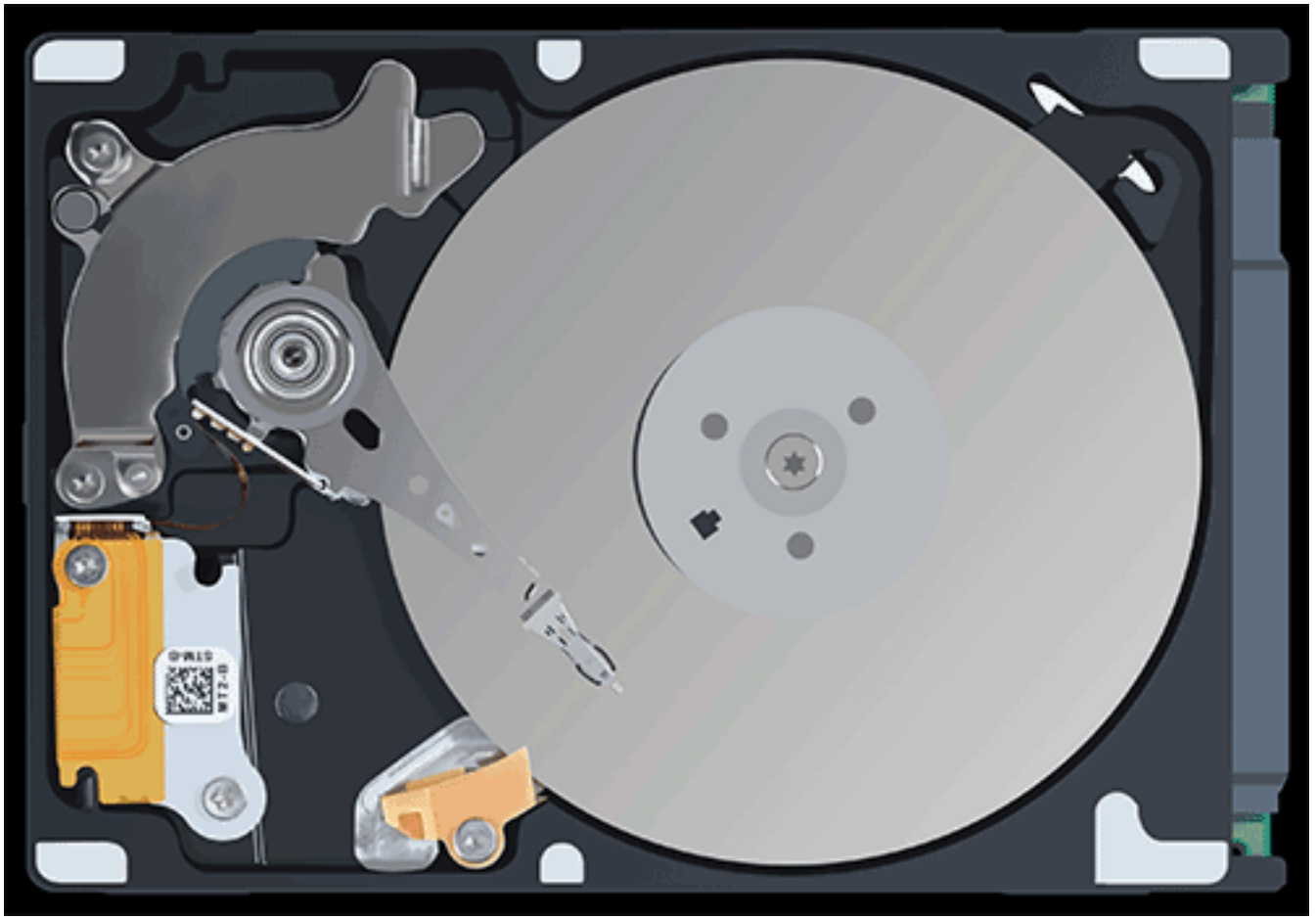
HDD : Platter



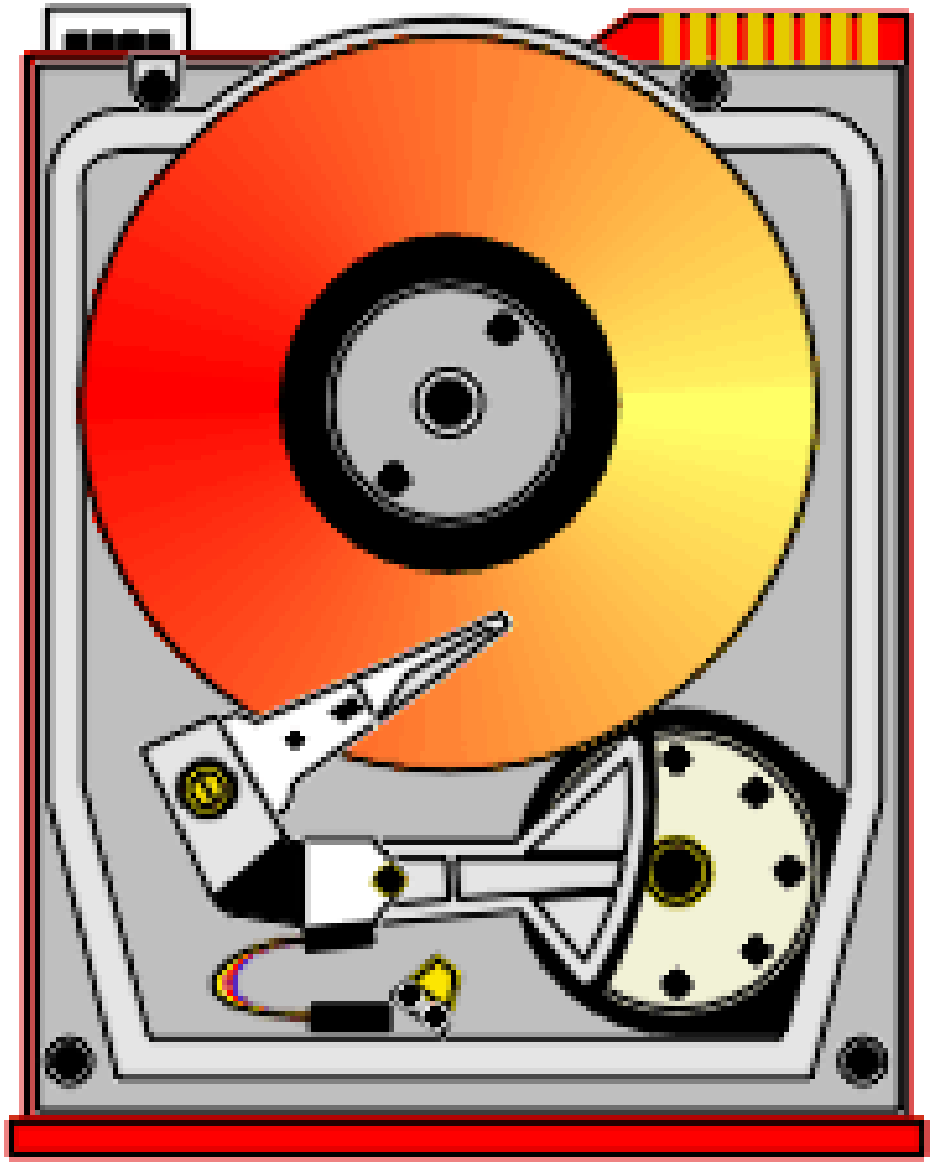
HDD : head

HDD : head

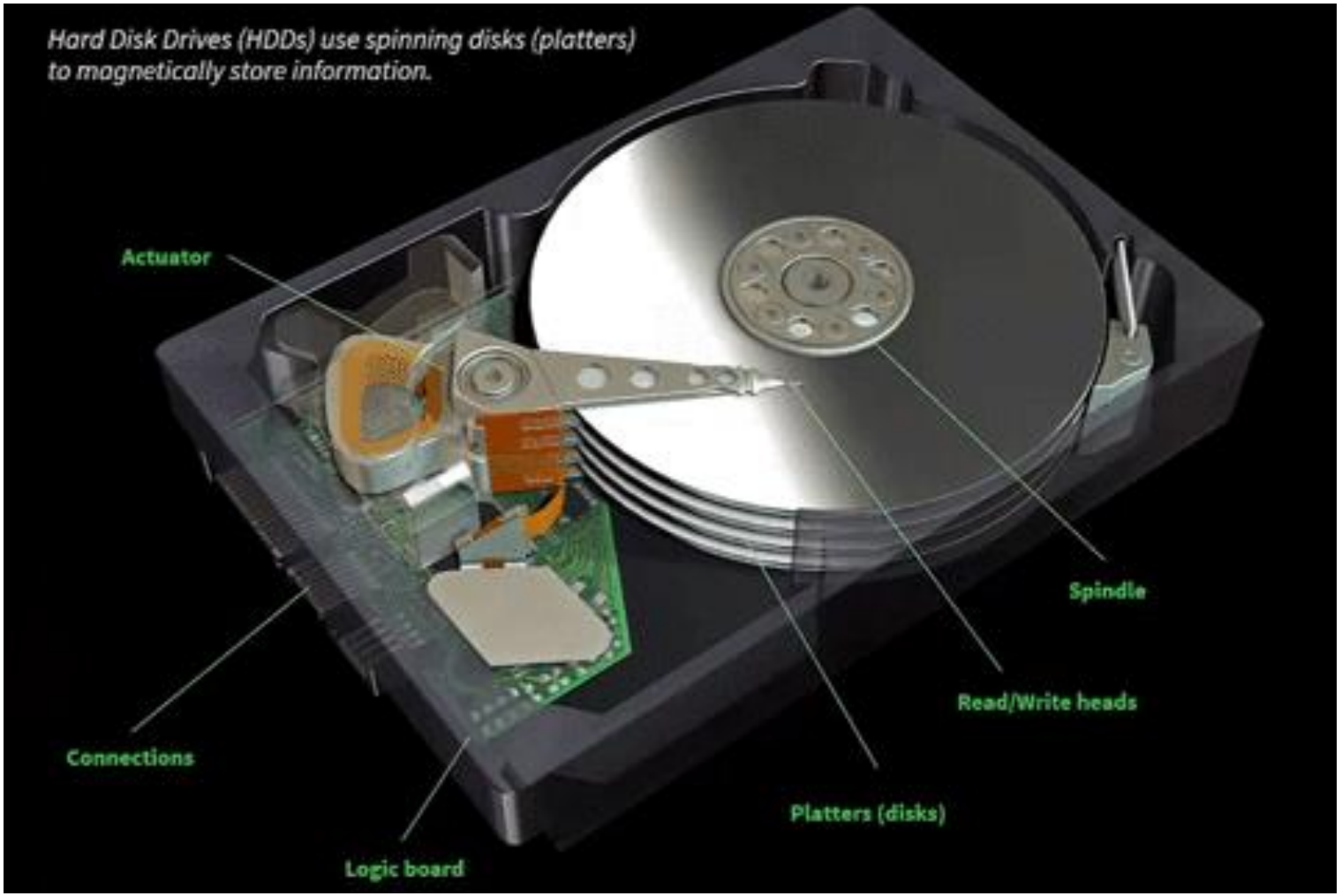
HDD : flying head



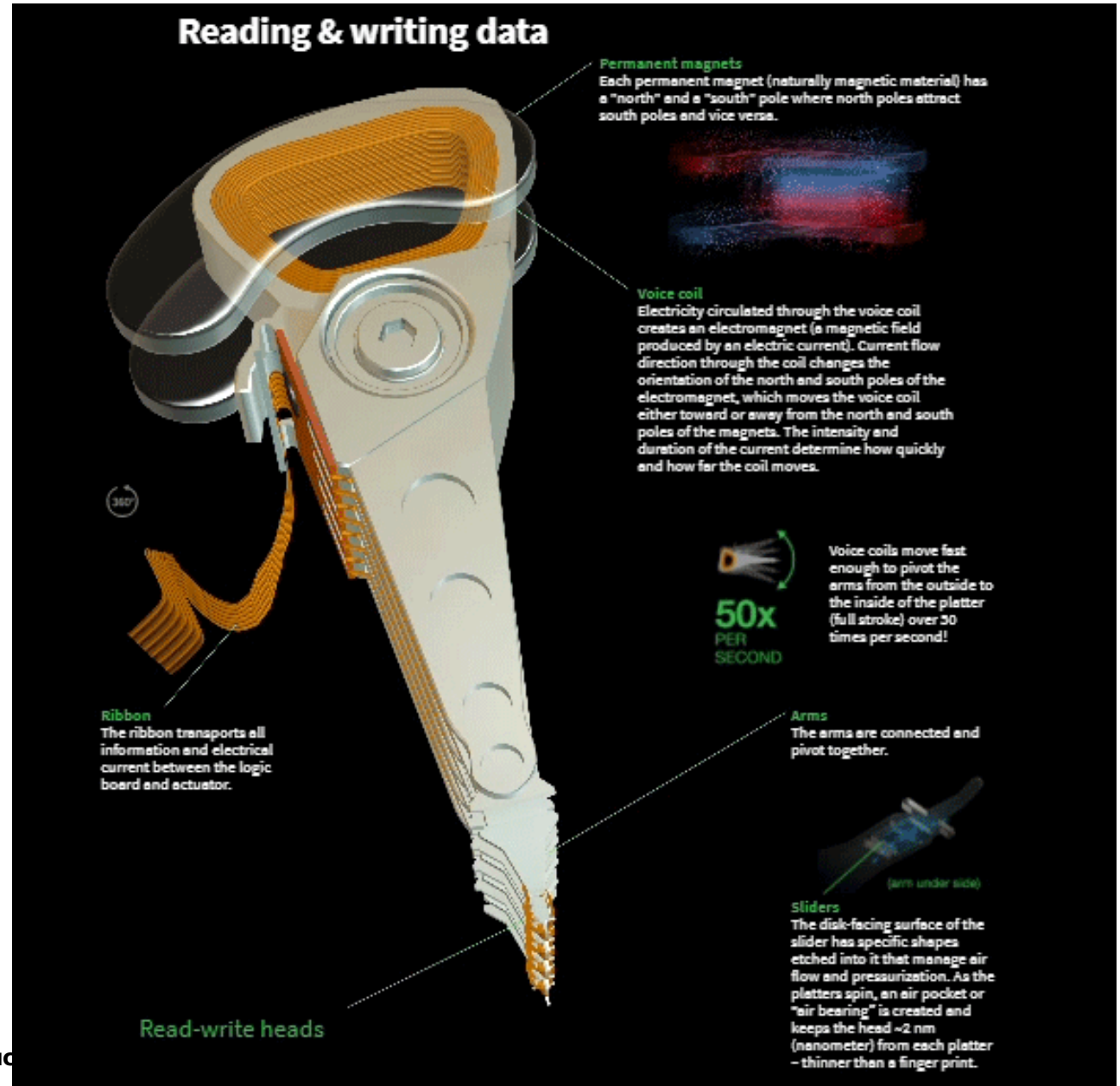
HDD : head



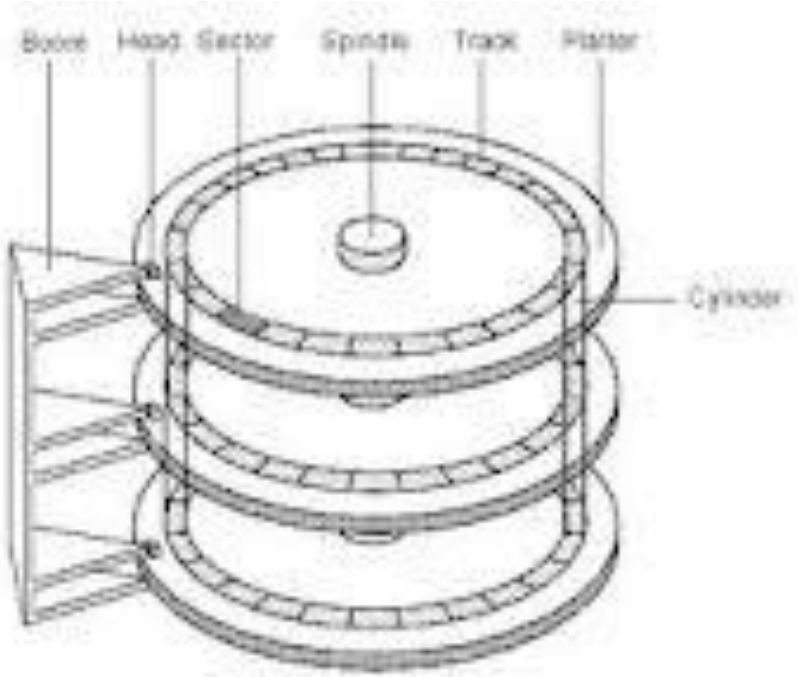
Head Arm

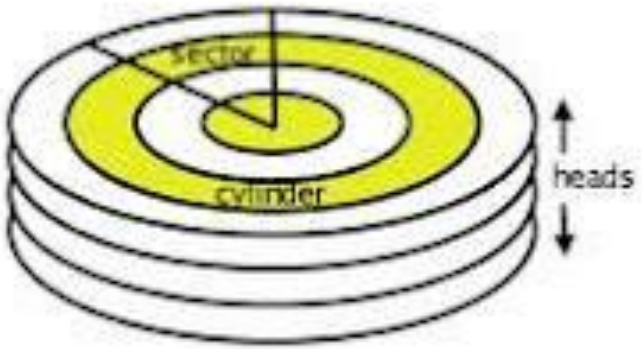

Hard Disk Drives (HDDs) use spinning disks (platters)
to magnetically store information.
Actuator
Spindle
Read/Write heads
Connections
Platters (disks)
Logic board

Head Arm

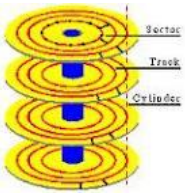

Reading & writing data
Permanent magnets
Each permanent magnet (naturally magnetic material) has a "north" and a "south" pole where north poles attract south poles and vice versa.
Voice coil
Electricity circulated through the voice coil creates an electromagnet (a magnetic field produced by an electric current). Current flow direction through the coil changes the orientation of the north and south poles of the electromagnet, which moves the voice coil either toward or away from the north and south poles of the magnets. The intensity and duration of the current determine how quickly and how far the coil moves.
50x PER SECOND
Voice coils move fast enough to pivot the arms from the outside to the inside of the platter (full stroke) over 50 times per second!
Ribbon
The ribbon transports all information and electrical current between the logic board and actuator.
Arms
The arms are connected and pivot together.
(arm under side)
Sliders
The disk-facing surface of the slider has specific shapes etched into it that manage air flow and pressurization. As the platters spin, an air pocket or "air bearing" is created and keeps the head ~2 nm (nanometer) from each platter – thinner than a finger print.
Read-write heads

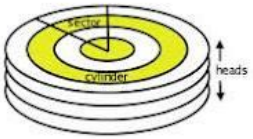
PLATTERS

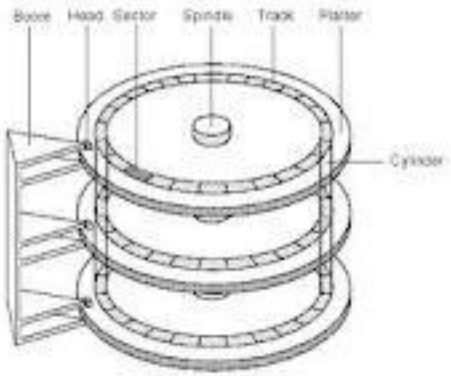

Head
Sector
Spindle
Track
Platter
Cylinder

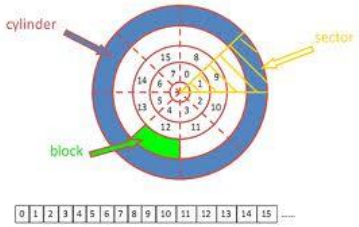

Sector
cylinder
heads

Disk physical structure

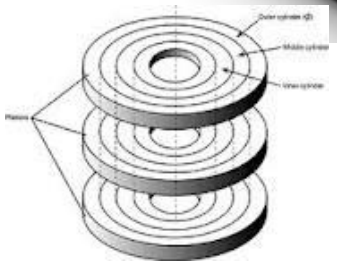


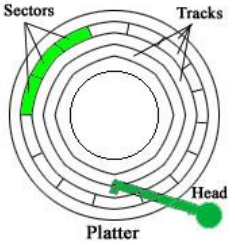






A cylinder is the set of the same tracks across all platters.





IBM Disk Storage Unit

- Like many innovations in 20th-century computing, hard drives were invented at IBM as a way to give computers a rapidly accessible "random-access" data storage.
- The first hard drive was developed by IBM's Reynold B. Johnson and announced on September 4, 1956 as the IBM 350 Disk Storage Unit.

IBM Disk Storage Unit Patent

March 24, 1970 W. A. GODDARD ET AL 3,503,060

DIRECT ACCESS MAGNETIC DISC STORAGE DEVICE

Original Filed Dec. 24, 1954 35 Sheets-Sheet 1

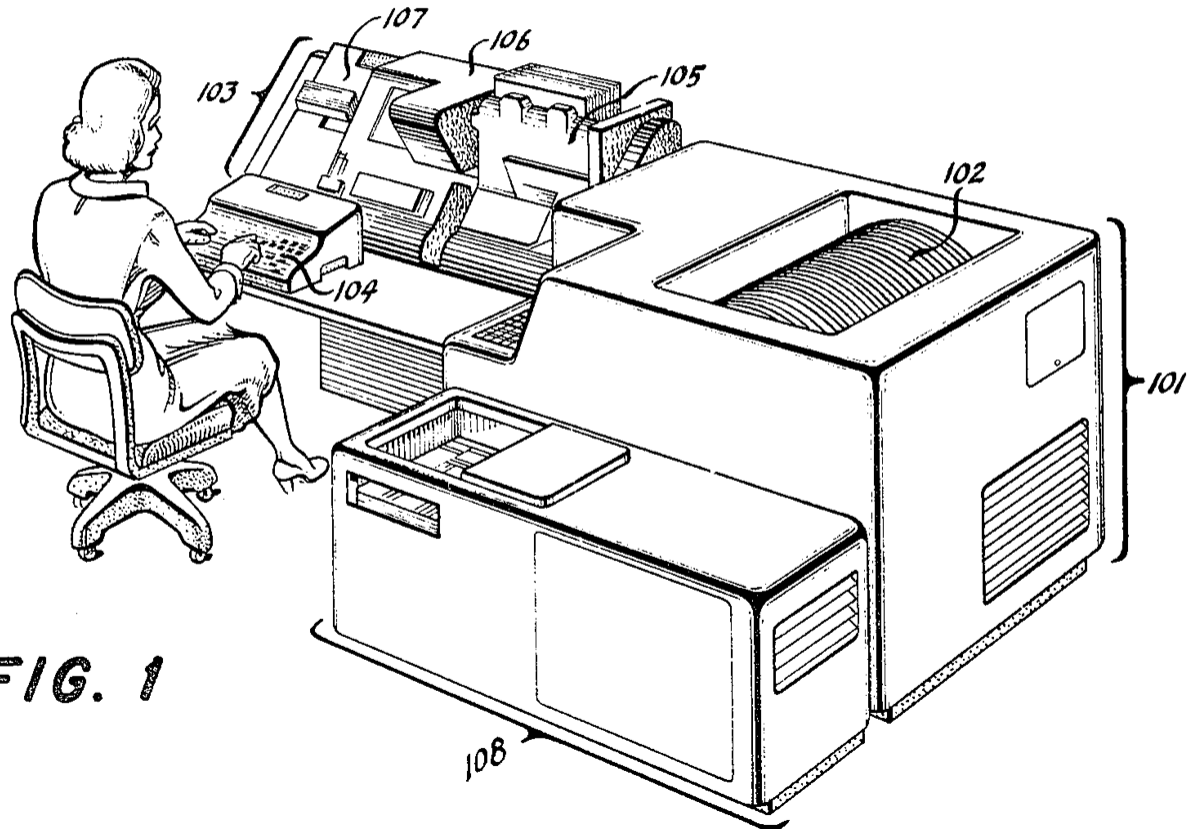


FIG. 1

IBM Disk Storage Unit Patent

March 24, 1970 W. A. GODDARD ET AL 3,503,060

DIRECT ACCESS MAGNETIC DISC STORAGE DEVICE

Original Filed Dec. 24, 1954 35 Sheets-Sheet

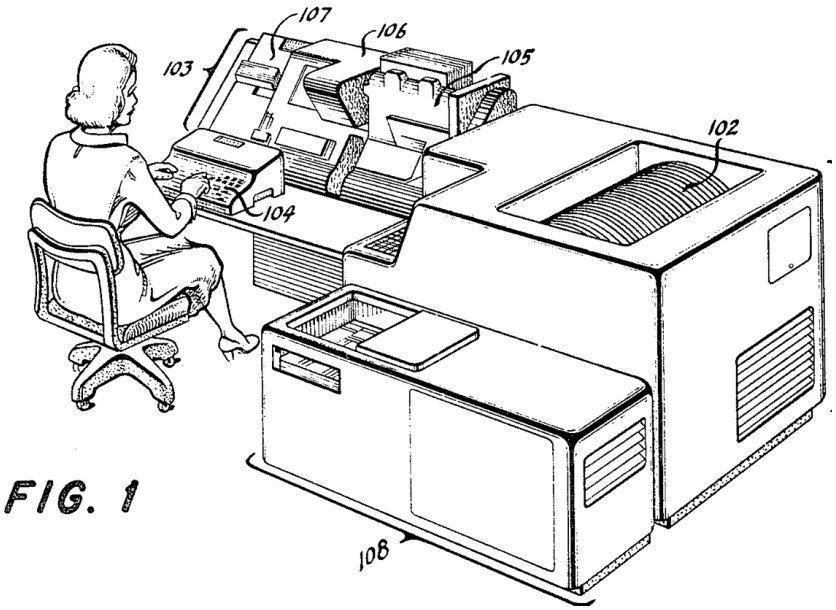
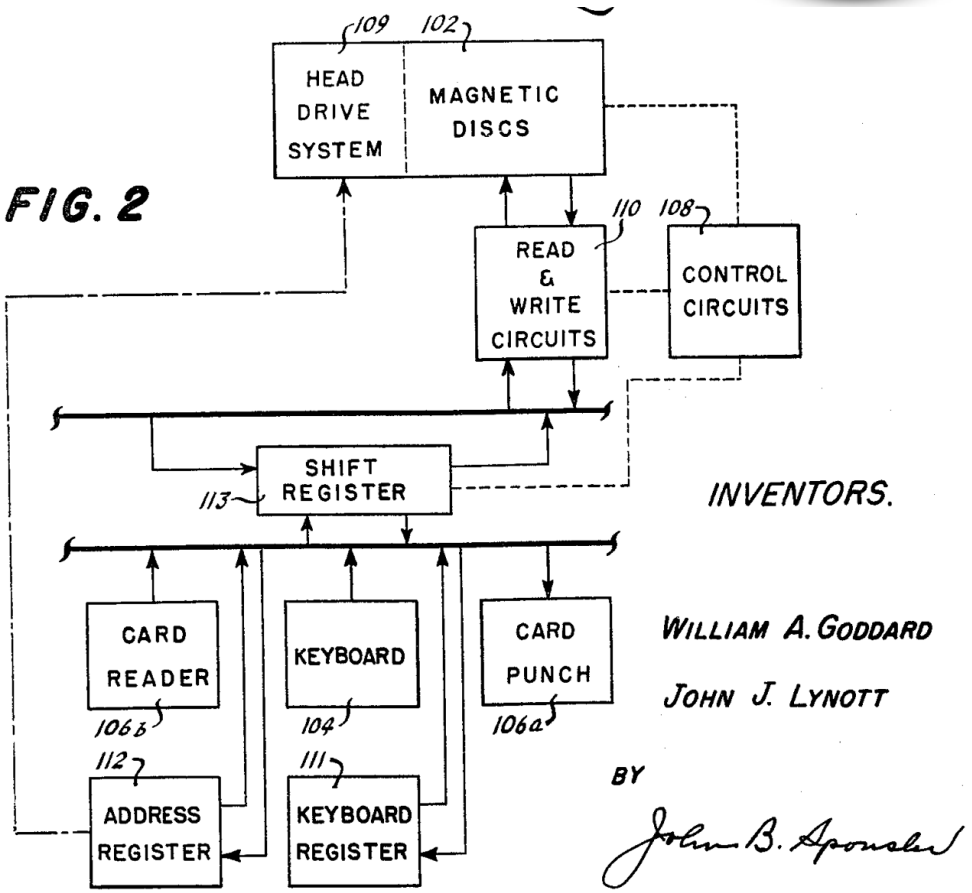


FIG. 1

FIG. 2



INVENTORS.

WILLIAM A. GODDARD

JOHN J. LYNOTT

BY

John B. Apostolos

IBM Disk Storage Unit Patent

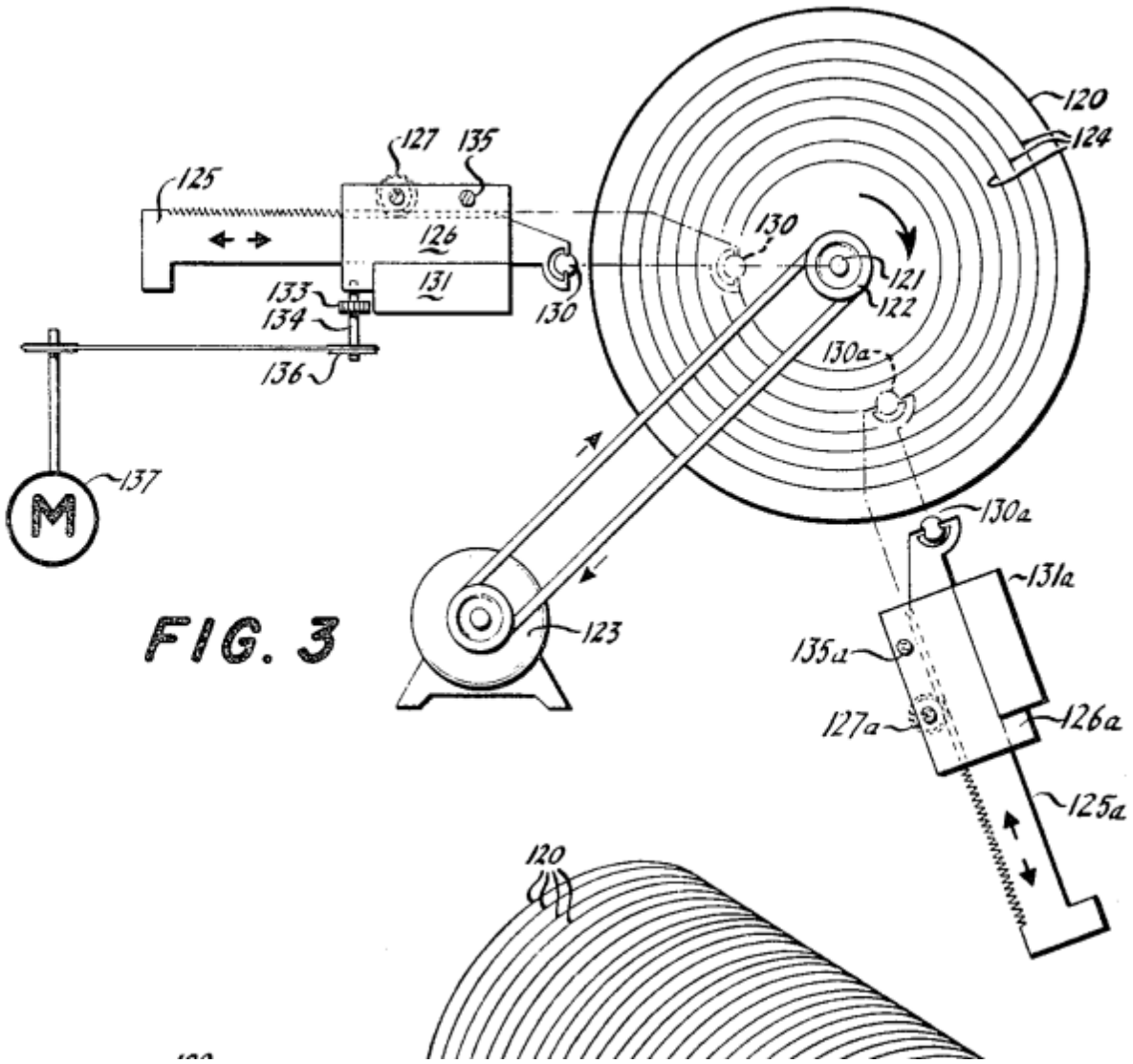


FIG. 3

IBM Disk Storage Unit Patent

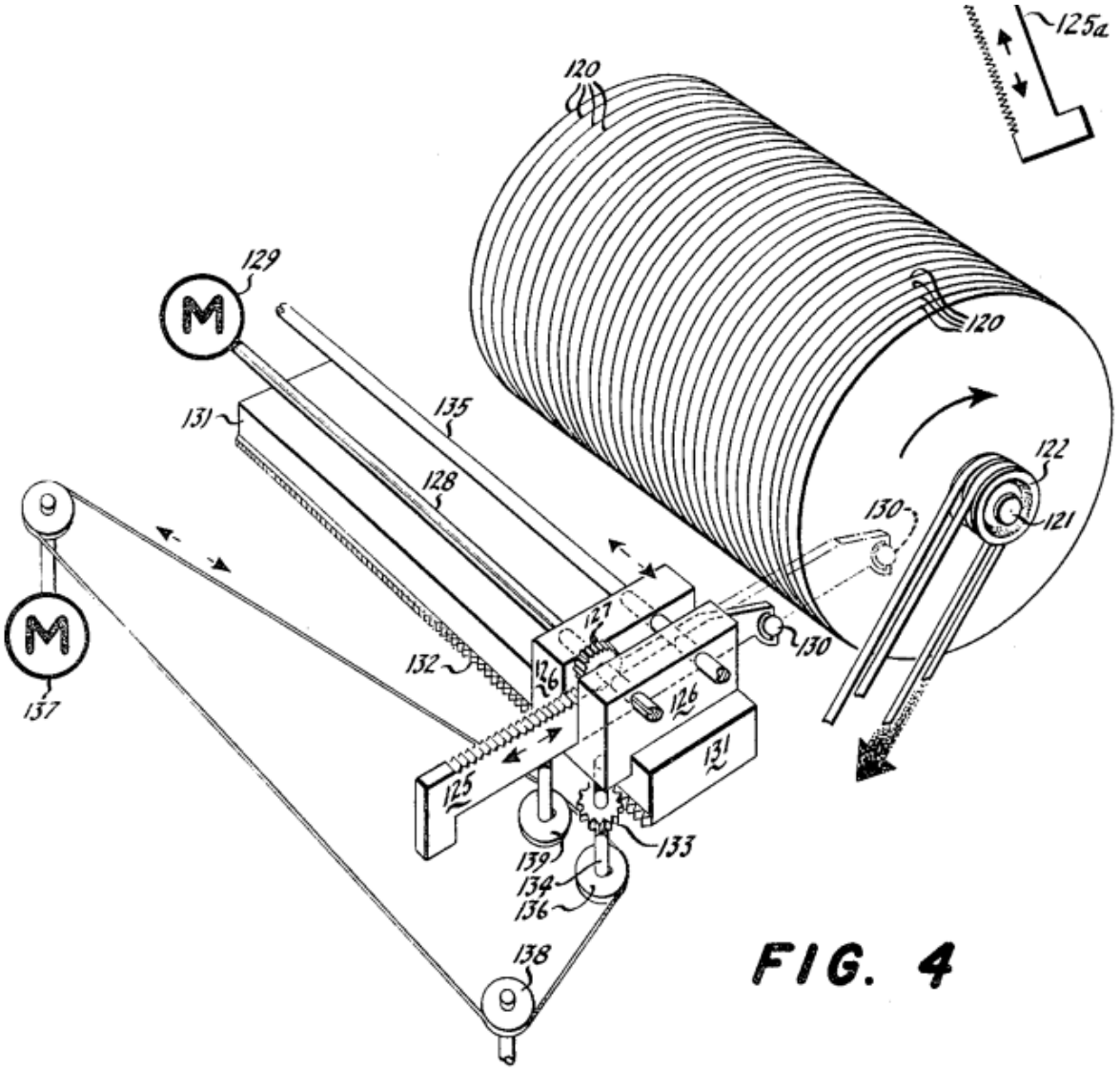
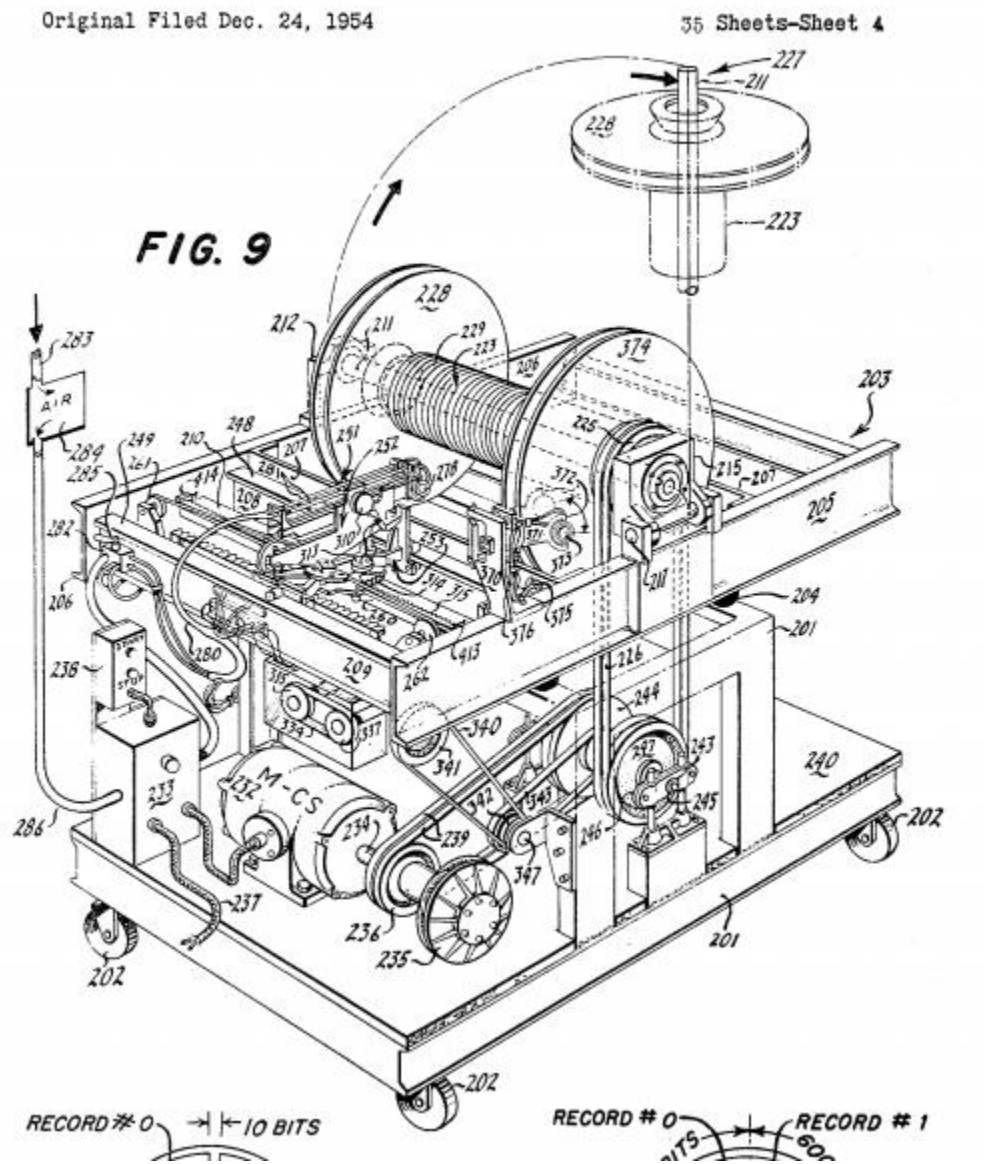


FIG. 4

IBM Disk Storage Unit Patent



IBM Disk Storage Unit Patent

ABSTRACT OF THE DISCLOSURE

A magnetic disc drive for positioning a magnetic transducer in cooperative relationship with a selected one of a plurality of concentric circular recording tracks of a magnetic surface of a disc in response to an externally supplied track address signal. A motor rotates the disc about an axis at a constant speed. A loading means resiliently urges the transducer into transducing relationship with said surface. A positioner responds to the track address signal for selectively positioning the transducer at the track designated by the track address signal by movement along a line extending radially of the axis and parallel to the magnetic surface of the disc.

IBM Disk Storage Unit Patent

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IBM 350 disk storage unit

Next →

IBM 350

- Model 1 announced September 14, 1956
- Model 2 announced May 5, 1958
- Models 3 & 4 announced September 15, 1958

Related links

- Interactive history of progress
- A tradition of service

Portable HDD

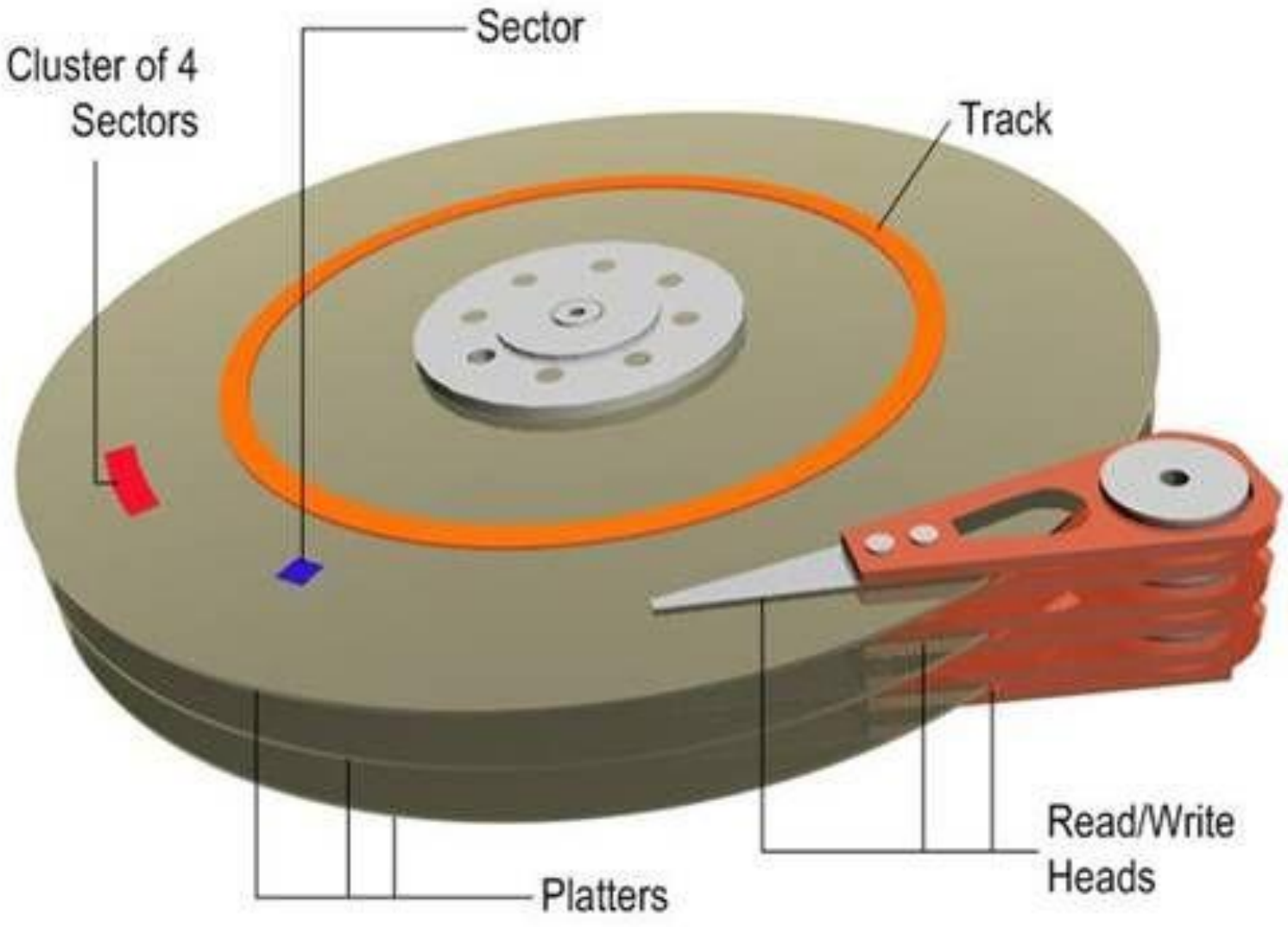
Write and read data

- When the computer wants to store new information it instructs the read-write head to move across the platter to exactly the right location and store the data there.
- To read information, the same process runs in reverse.

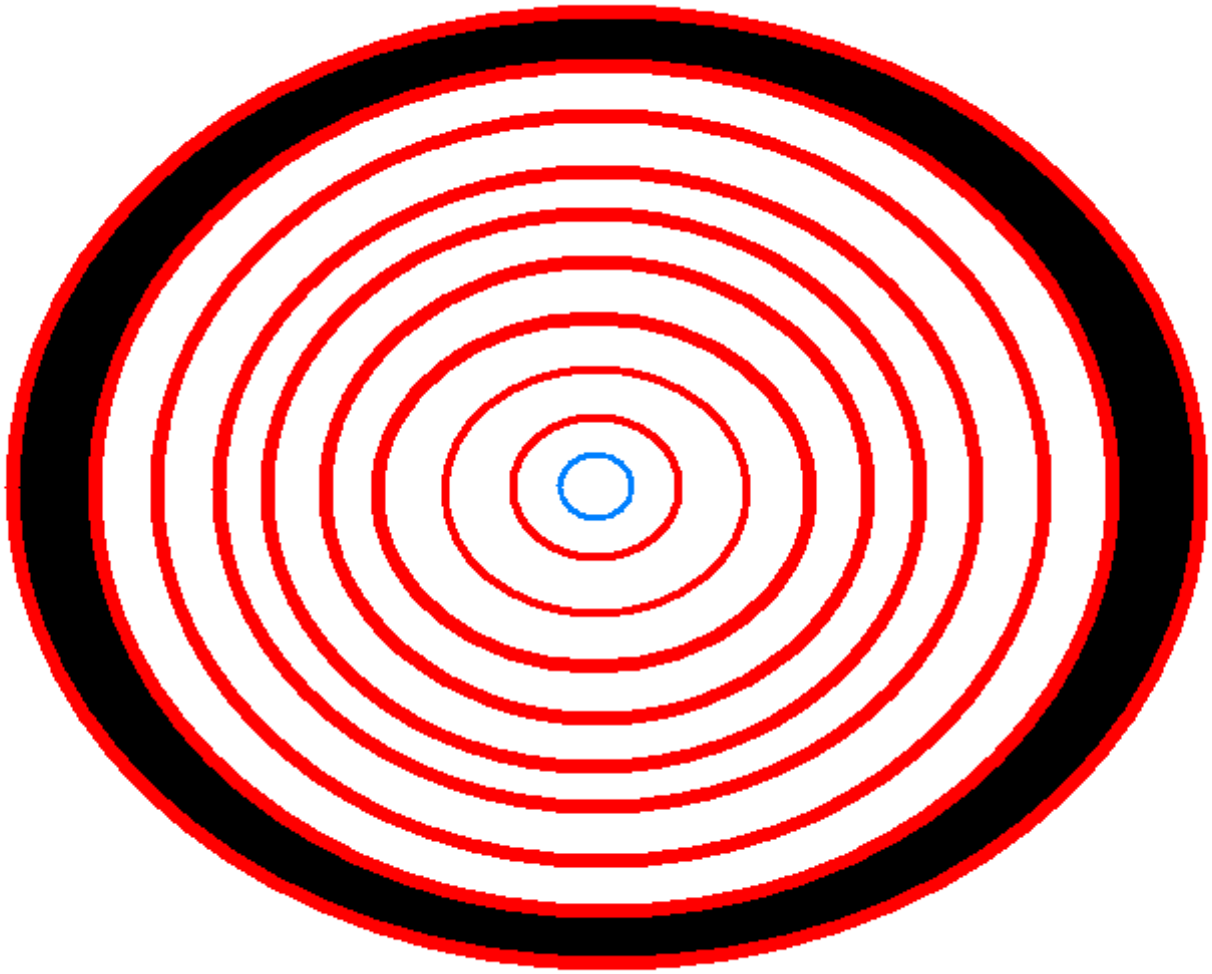
Tracks, Sectors, Cylinder

- The data is stored in a very orderly pattern on each platter.
- Bits of data are arranged in concentric, circular paths called **tracks**.
- Each track is broken up into smaller areas called **sectors**.
- Part of the hard drive stores a map of blocks that have already been used up and others that are still free.

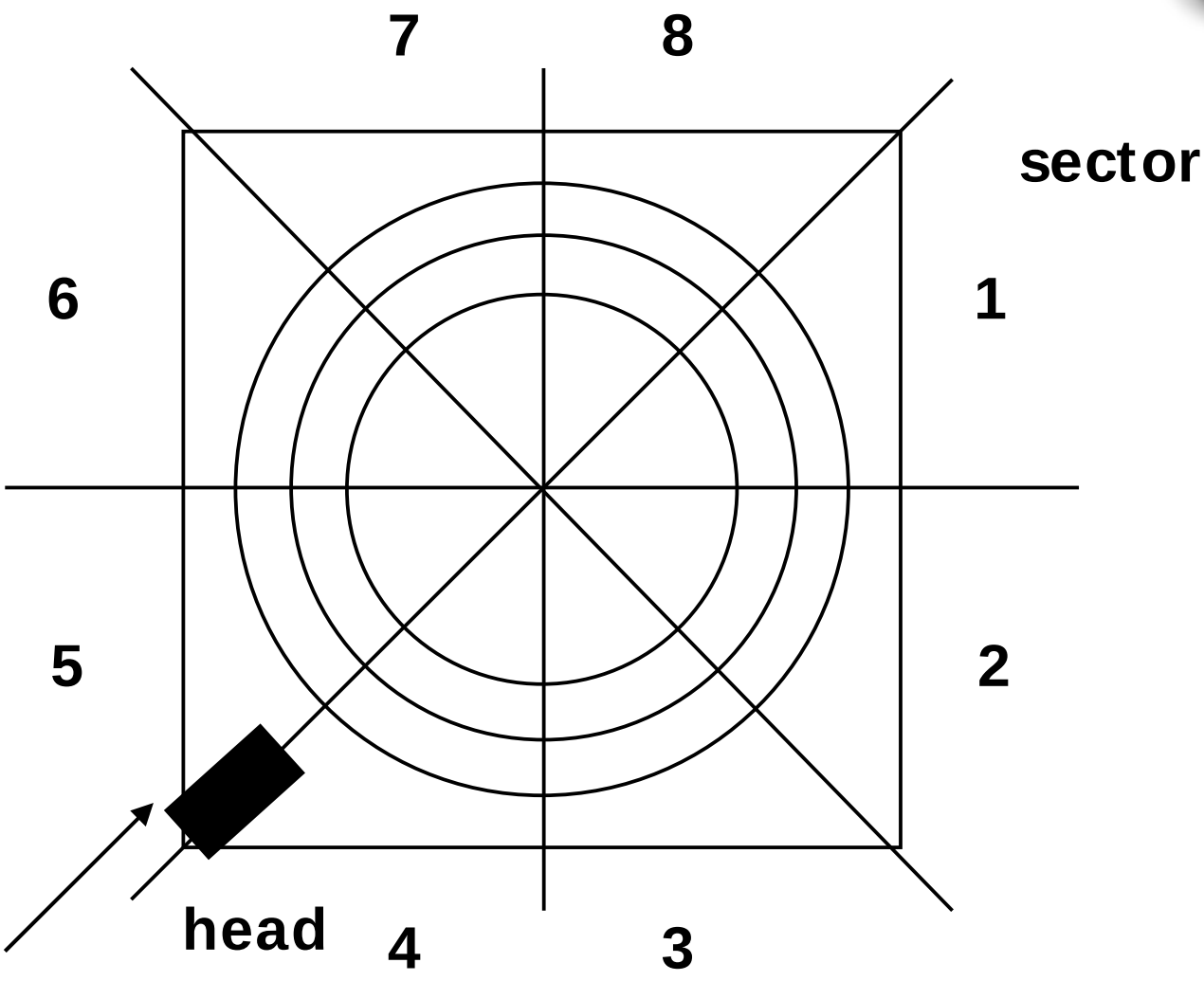
Tracks, Sectors, Cylinder

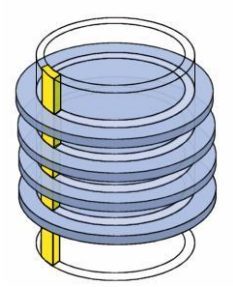


Tracks, Sectors, Cylinder

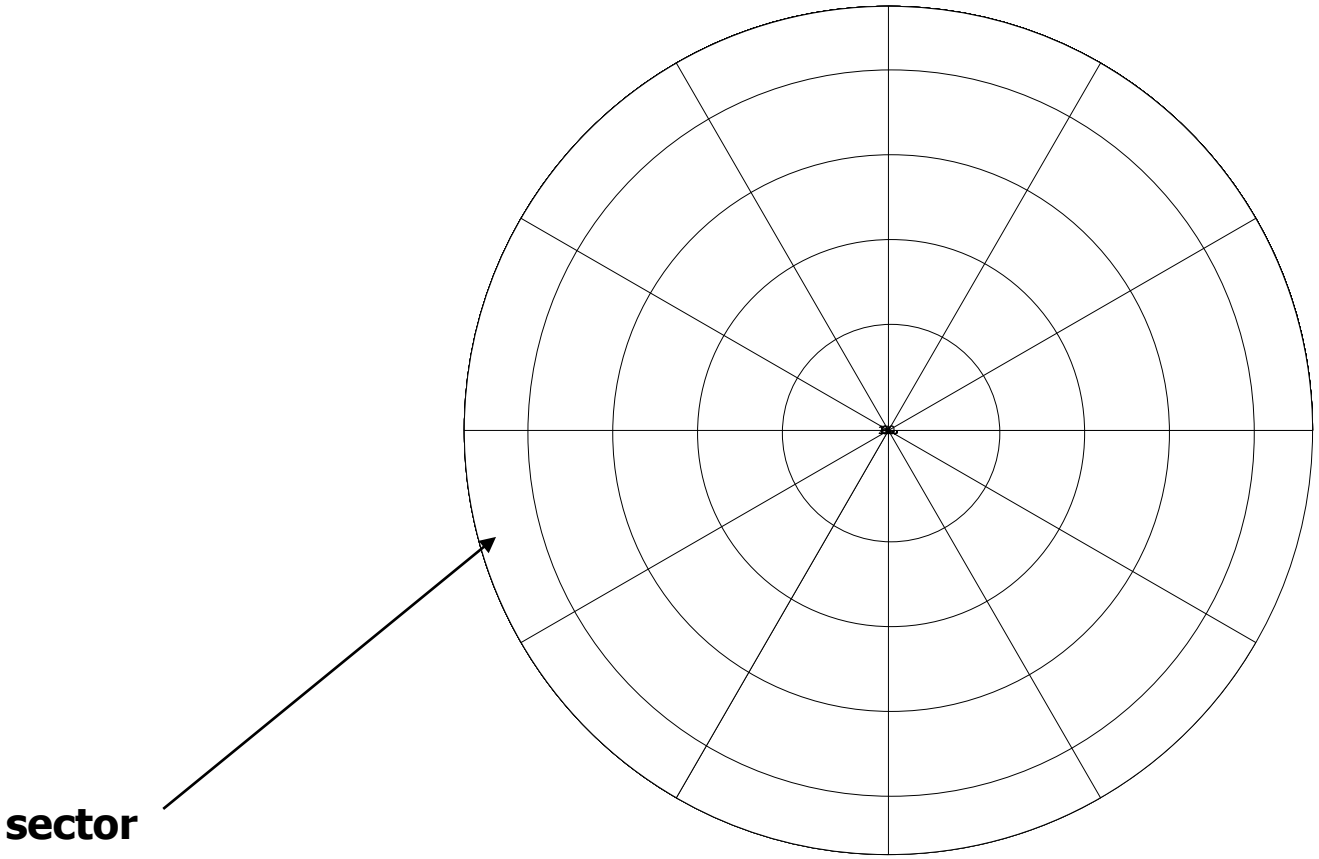


Tracks, Sectors, Cylinder

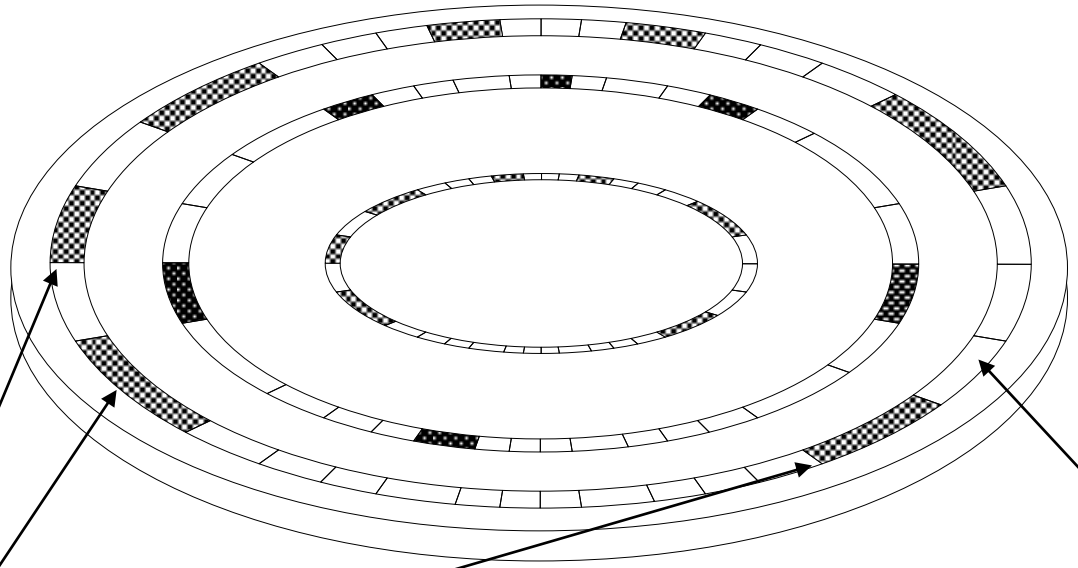




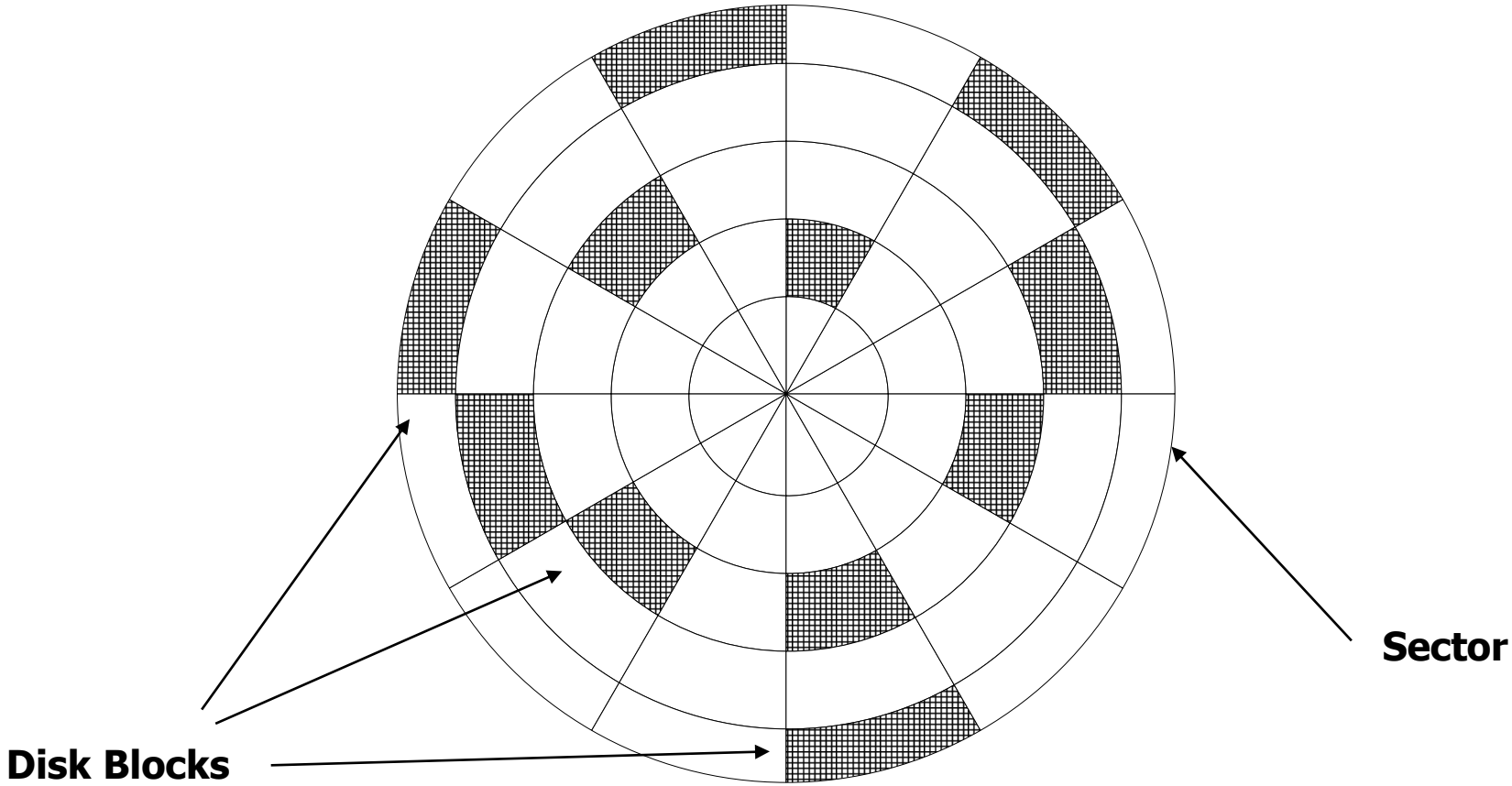
Disk Sector

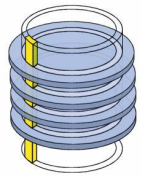


Block Disk

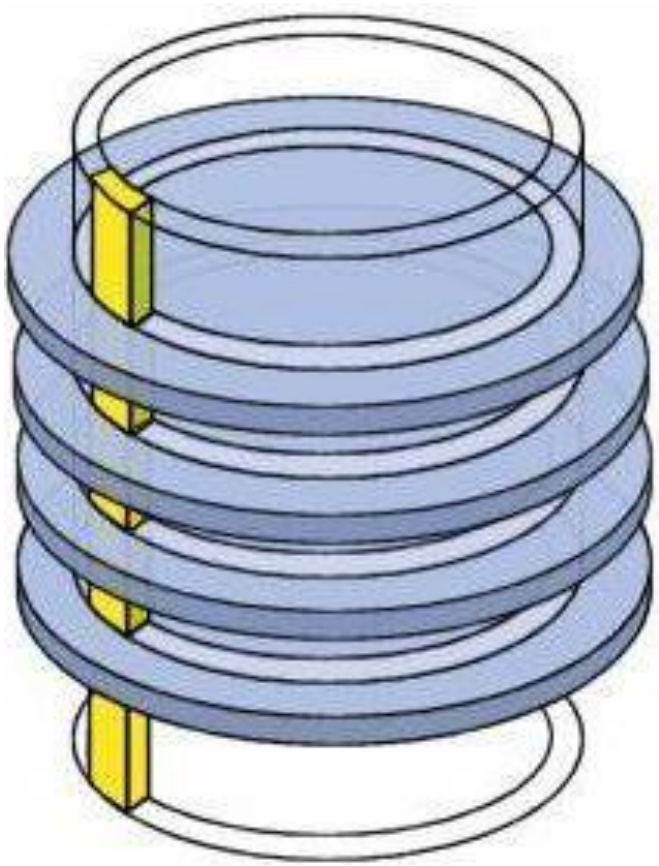


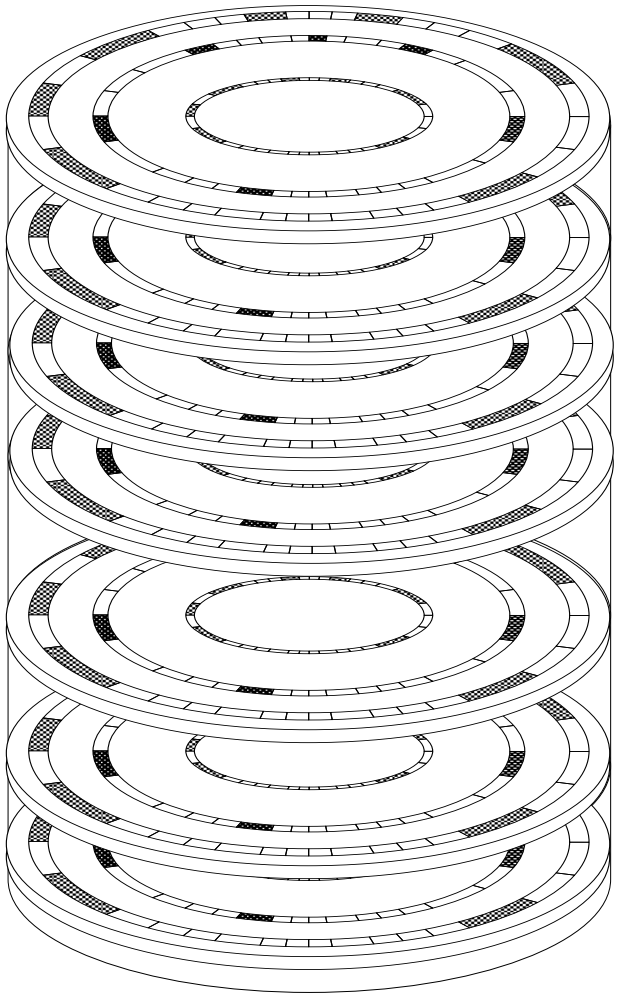
Block Disk



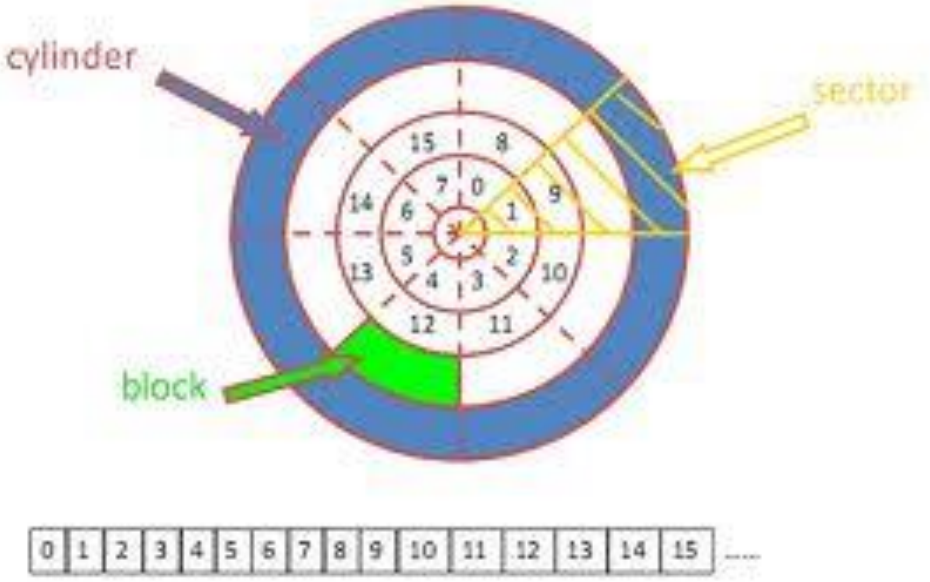


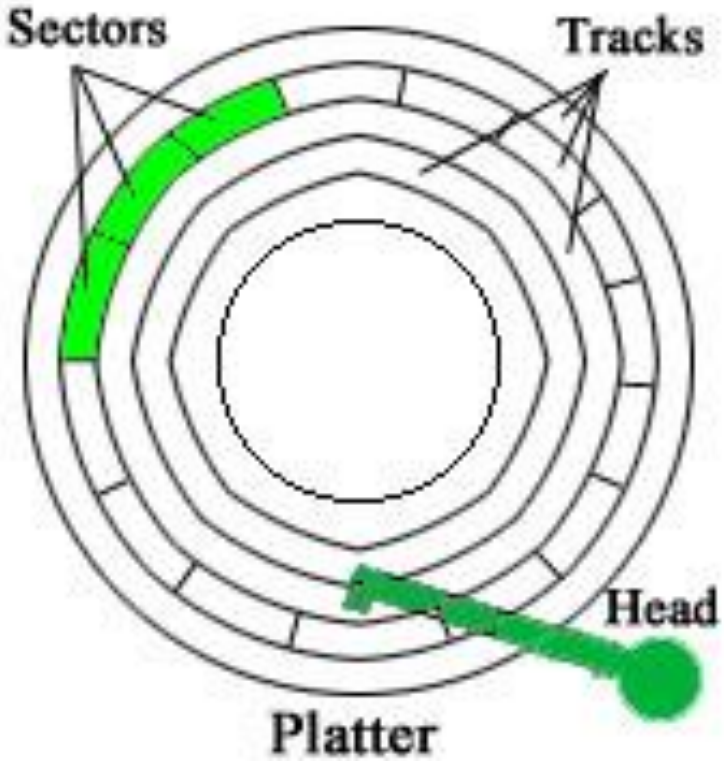
Disk Plates cylinders



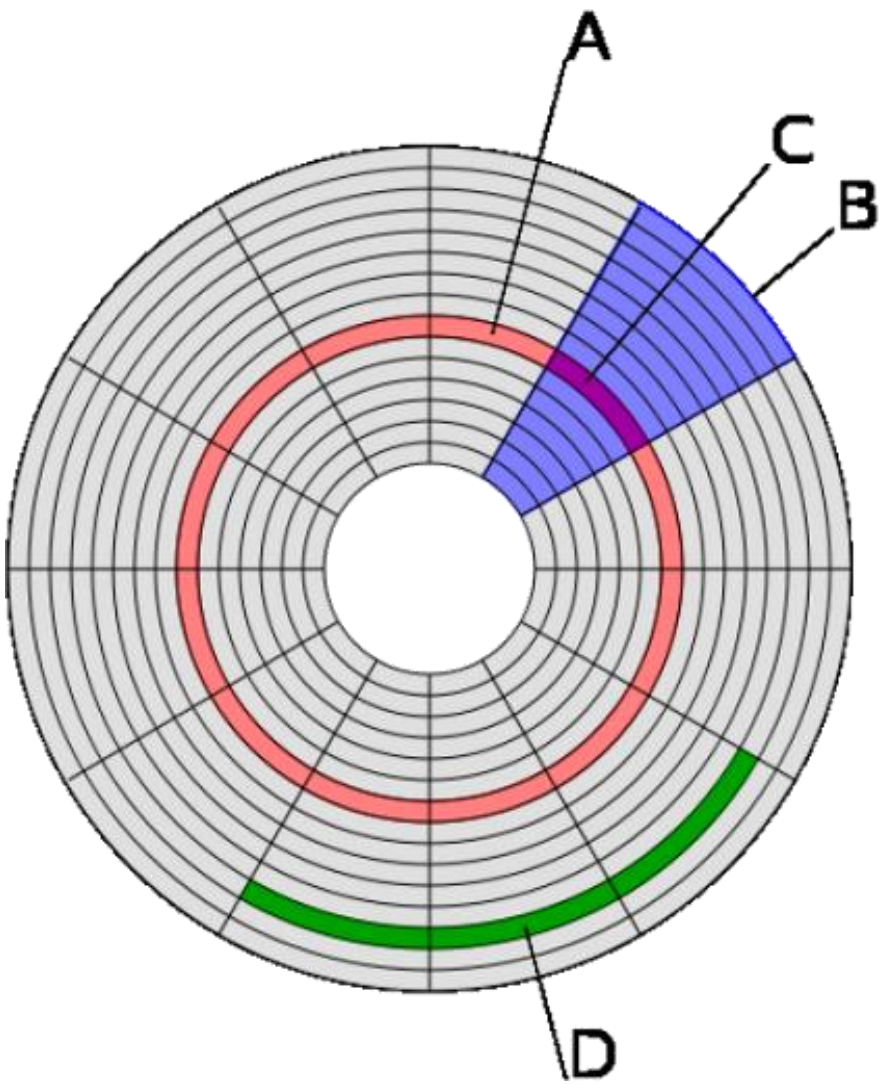


Tracks, Sectors, Cylinder





Tracks, Sectors, Cylinder



Hard Drive Structure:

A = track
B = sector
C = sector of a track
D = cluster

How to access data ?

- File
- File System