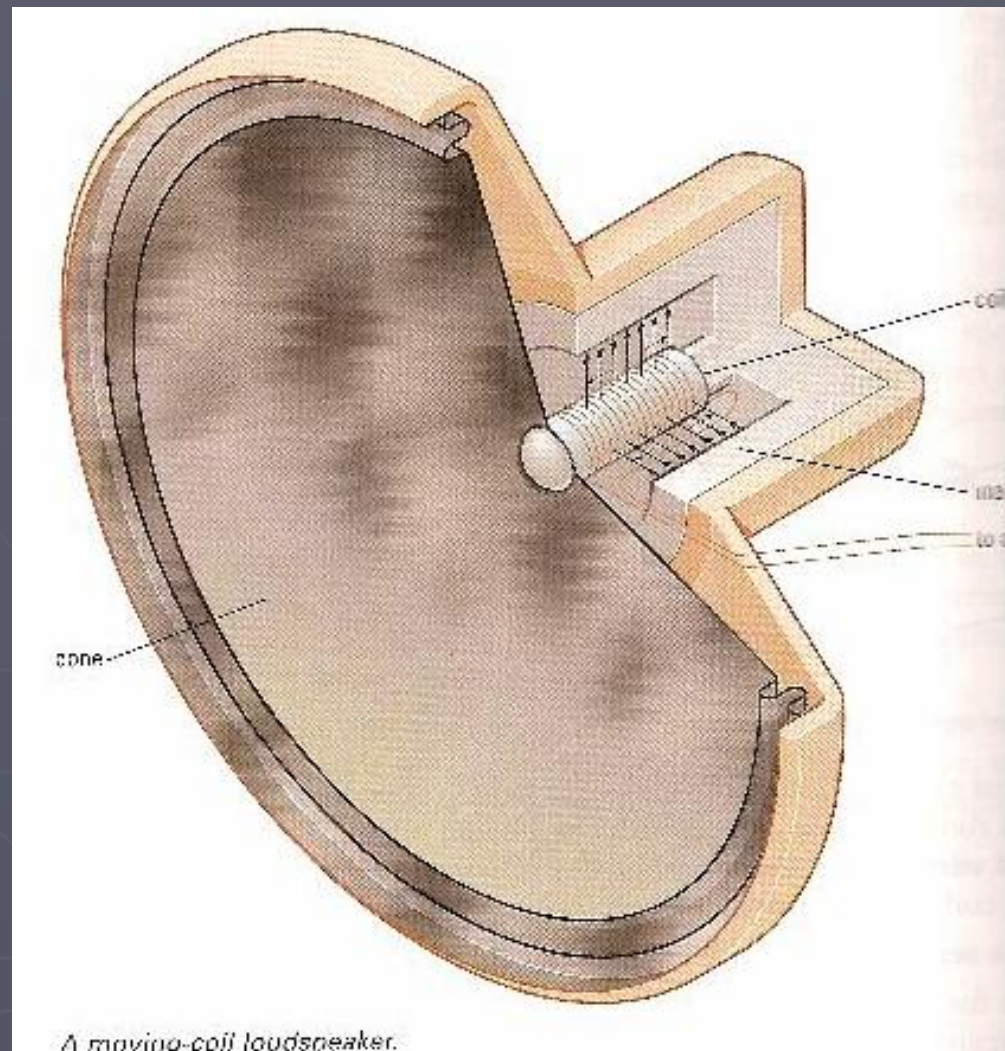


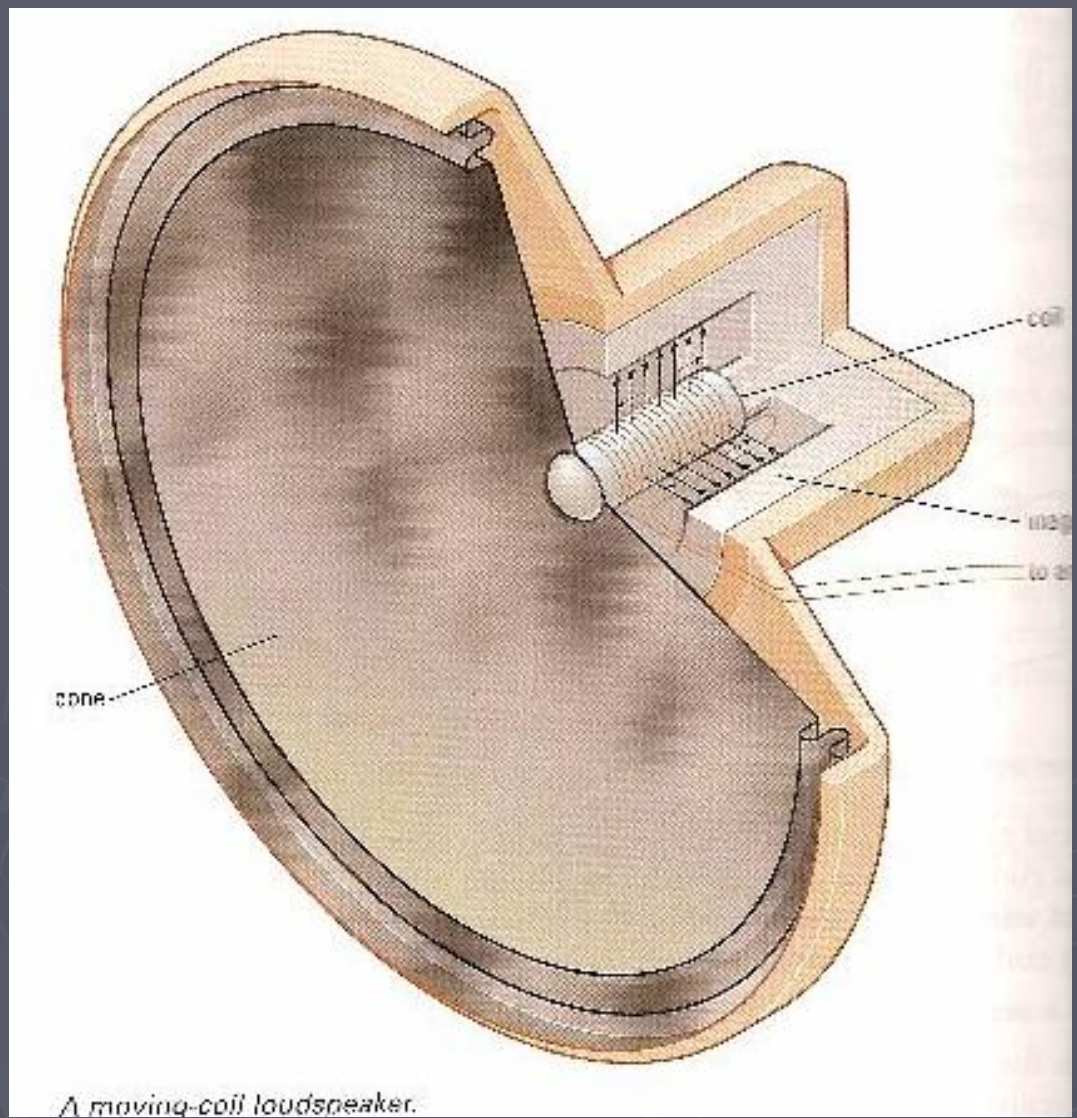
The moving coil loudspeaker





A moving-coil loudspeaker.

- The moving-coil loudspeaker remains the cheapest way of reproducing sound.
- The used magnet consists of a central cylindrical pole piece surrounded by an outer ring, on which there are other poles.
- A radial field that passes across the plain of the coil (forces acting on the coil's turns are at 90° to the plane of the coil).
- Current circulating in one direction – the coil is pushed out.
- Current's direction is reversed – the coil is pulled in.
- A continually reversing current will set the cone vibrating, so that a sound wave is generated.



A moving-coil loudspeaker.

Modern moving-coil loudspeakers have been designed very carefully to achieve the best sound quality:

- Thin plastic cones are used to achieve rigidity (to stop the cone resonating) and for lightness (so it can be started and stopped easily).
- Moulded cones are used with gently changing cross-sections, to control resonance.
- Cones are bonded to the frame with strong glue.
- Non-magnetic frames are used, to avoid interference with the coil.

The electrostatic loudspeaker. In speakers of this type, thin diaphragms are stretched between stator panels and charged to several thousand volts above the stator panels. There is no current flow, however, because the diaphragm is insulated from the stators. The audio signal drives a step-up transformer that increases the voltage of the signal by about 50 times. The output of the transformer is connected to the stator panels. Potential difference across the stators causes a linear electric field between them, and this causes the diaphragm to be pushed and pulled towards one or other of the stators by electrostatic force. Advantages are that the diaphragm is very light and therefore capable of reproducing the entire audio spectrum. It is also uniformly driven so that it moves in a very controlled linear fashion. Its spring constant is high, so it couples very well to the air and is therefore well damped. Disadvantages are that the audio signal passes through a transformer and cancellation effects that plague all dipoles mean that the panels must be large to produce any bass at all – hence the separate bass panels.



A typical hi-fi system loudspeaker system using two moving-coil 'drive units'.

A loudspeaker unit consists of two moving-coil loudspeaker (drivers). The larger driver (the woofer) produces low-frequency notes, while high-frequency notes are produced by the smaller unit (tweeter).

Smaller loudspeakers are used for the tweeter, to try to make the unit nearly the same size as the wavelength that it is producing.

If the cone's diameter was much bigger than the wavelength, the sound would only be beamed out directly in front of the unit, making it very hard to hear either side of the speaker.