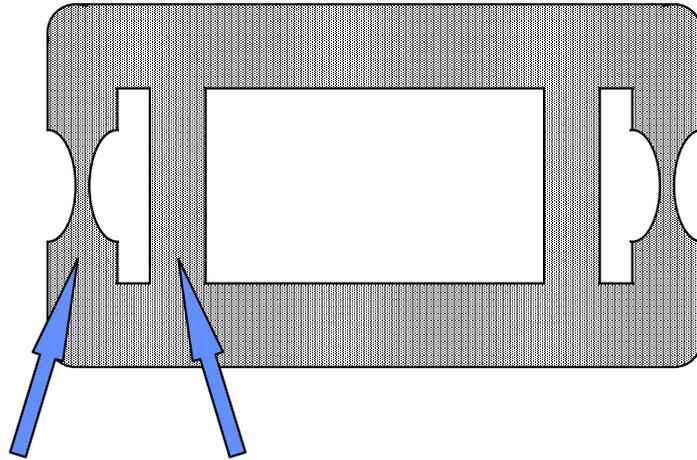


Synthesised Clockwise BH Loop

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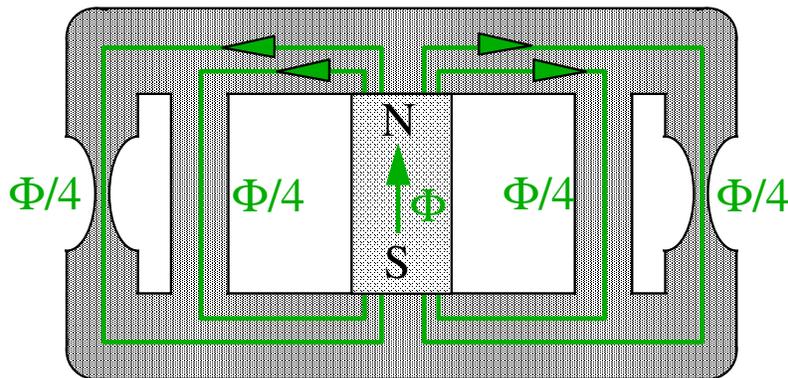
Take a ferromagnetic core having a plurality of paths as in the following figure.



Same initial reluctance but different saturation levels.

Each limb connecting top to bottom has the same initial reluctance, but the outer limbs saturate at a lower flux than the inner limbs.

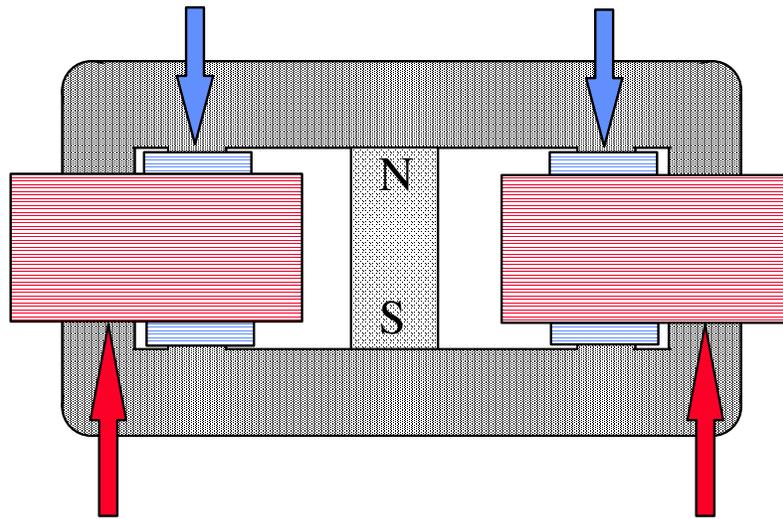
Now place a magnet across the center of the core, whose flux takes the outer limbs just to the verge of saturation.



The flux from the magnet splits equally between each path, to be just below saturation in the outer paths.

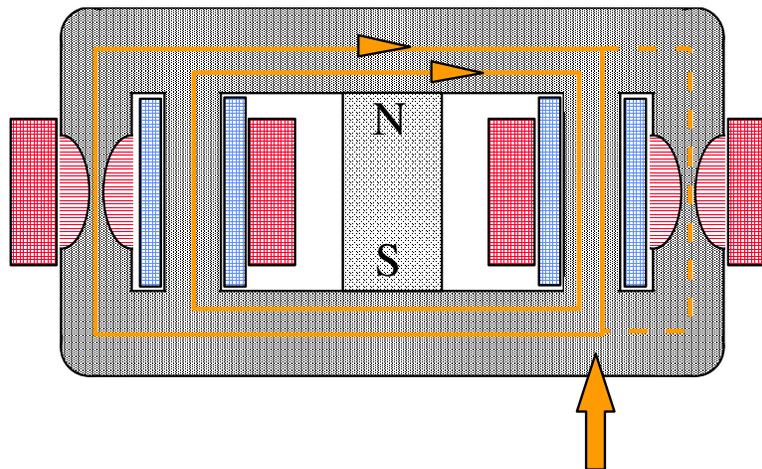
We now wind exciter coils on the inner limbs, and output coils around both inner and outer limbs.

The inner paths are wound with “exciter” coils which are alternately shorted each half cycle.



Output coils are wound over both paths.

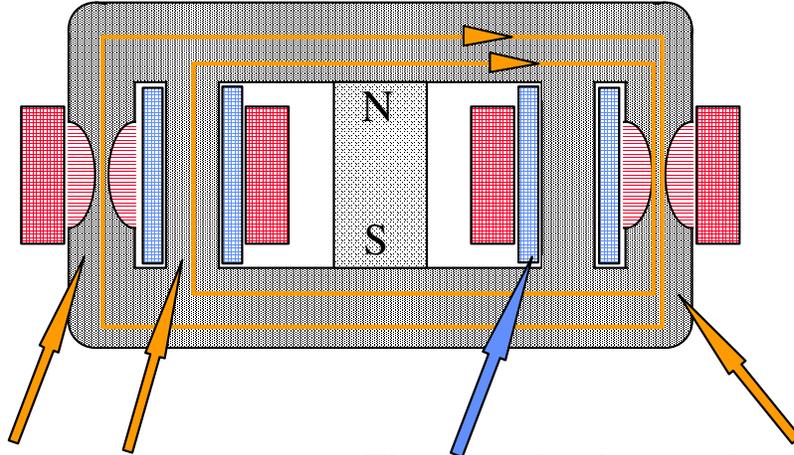
The two output coils are connected in series across a capacitor to form a resonant circuit, then the two exciter coils are alternately shorted on alternate half cycles of the resonance. The AC resonant flux flowing around the core combines with the magnet flux so that on one side the core is taken further towards saturation while on the other side it goes away from saturation. In the absence of the excitation short circuits, the AC flux would take the easy path through the non-saturated limb, as shown below.



In the absence of switching, the flux due to the resonant output coils tries to travel through all outer limbs, but it takes the easier path through the non-saturated limb.

The short circuit coil prevents this flux flow, thus forcing the rising flux to pass through the saturating outer limb.

Rising flux

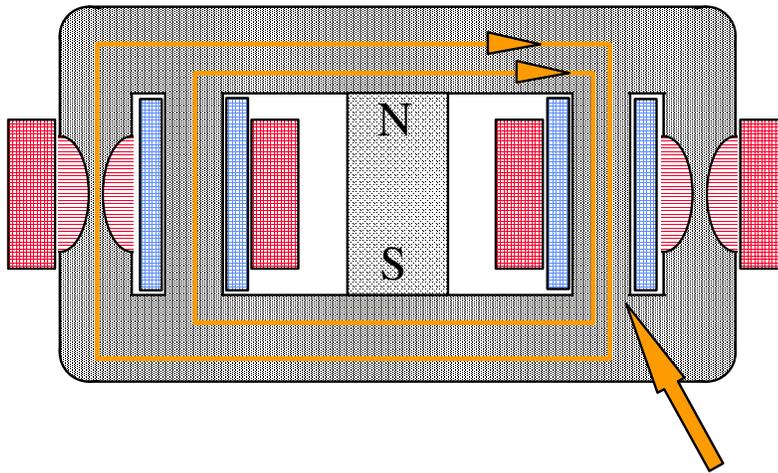


The total flux here is actually reducing in magnitude.

The shorted coil forces the rising resonant flux to pass through the saturating region.

When the AC flux reaches its peak value, the short is removed, so the flux now jumps into the non-saturating limb.

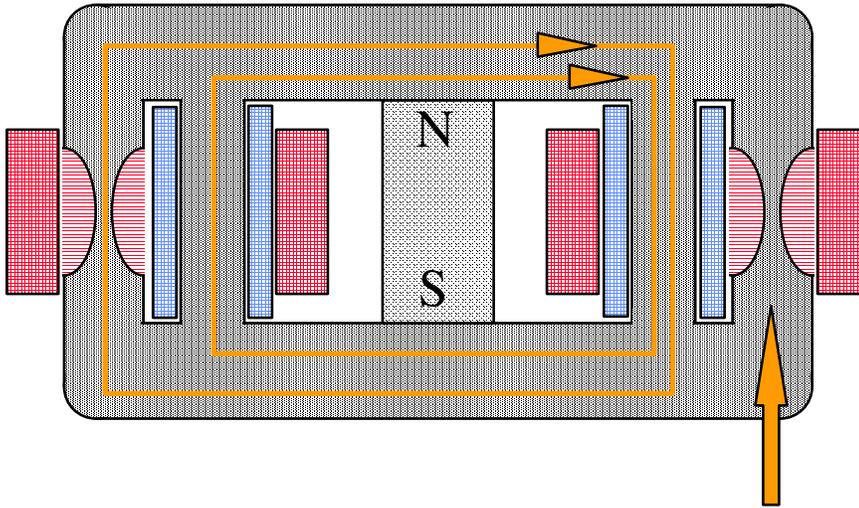
Peak flux



The short is removed so the flux here now jumps to the easy path through the non-saturating limb.

Now as the AC flux falls from its peak value it is not influenced by the non-linear region.

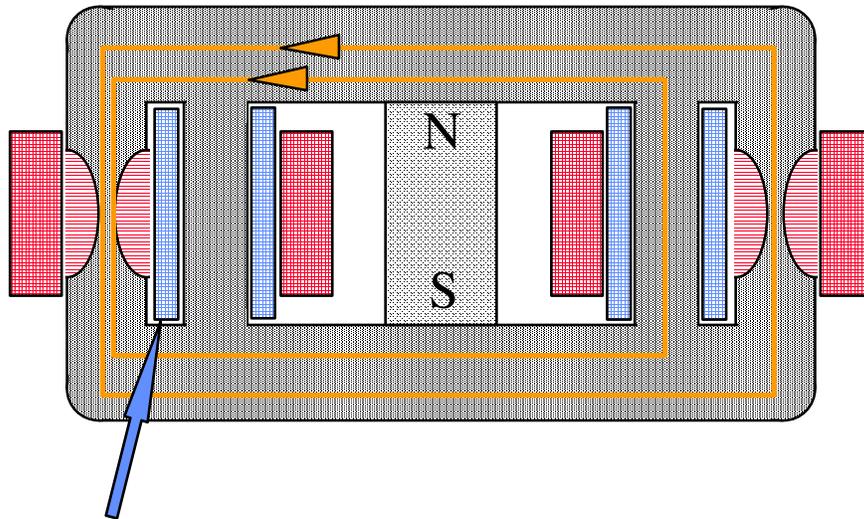
Falling flux



The falling flux does not now “see” this non linear region.

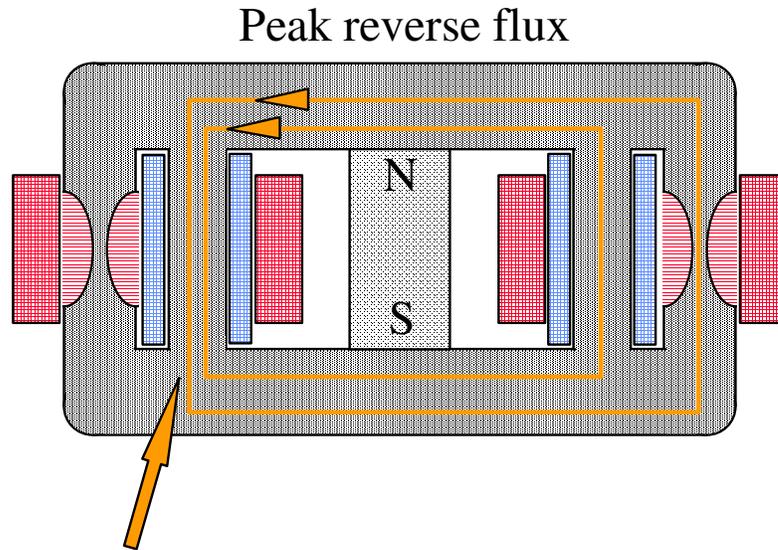
When the AC flux rises again in the reverse direction, the other exciter coil is shorted, forcing the flux to flow through the other saturating region.

Reverse rising flux



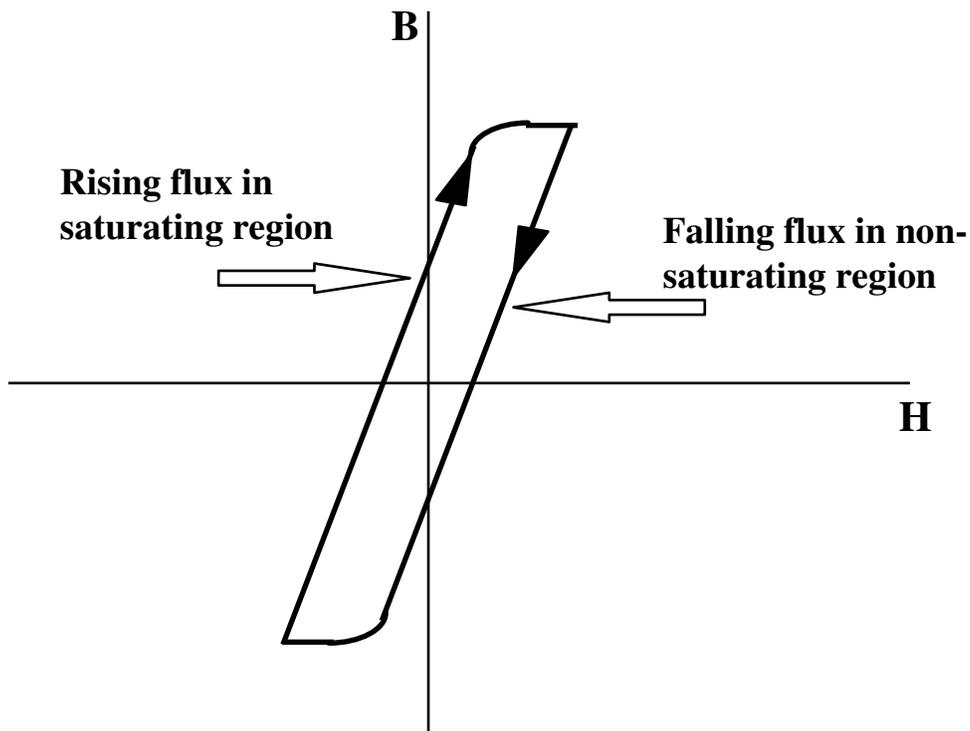
The shorted coil forces the rising resonant flux to pass through the saturating region.

Then at peak flux the short is removed, and so on.



The short is removed so the flux here now jumps to the easy path through the non-saturating limb.

The overall result of the switching action is to cause the output coils to “see” a clockwise BH loop.



A CW loop represents power gain so the LC circuit, consisting of the output coils connected across a resonating capacitor, could self oscillate. Of course the switching of the short circuits across the exciter coils has to be synchronized to the oscillations so it may be necessary to start the oscillation by feeding with an initiation pulse of RF energy.