

Innovating High Sensitivity Guitar Pickups

Malcolm Moore
23-Jan-2003

(2003)

Introduction

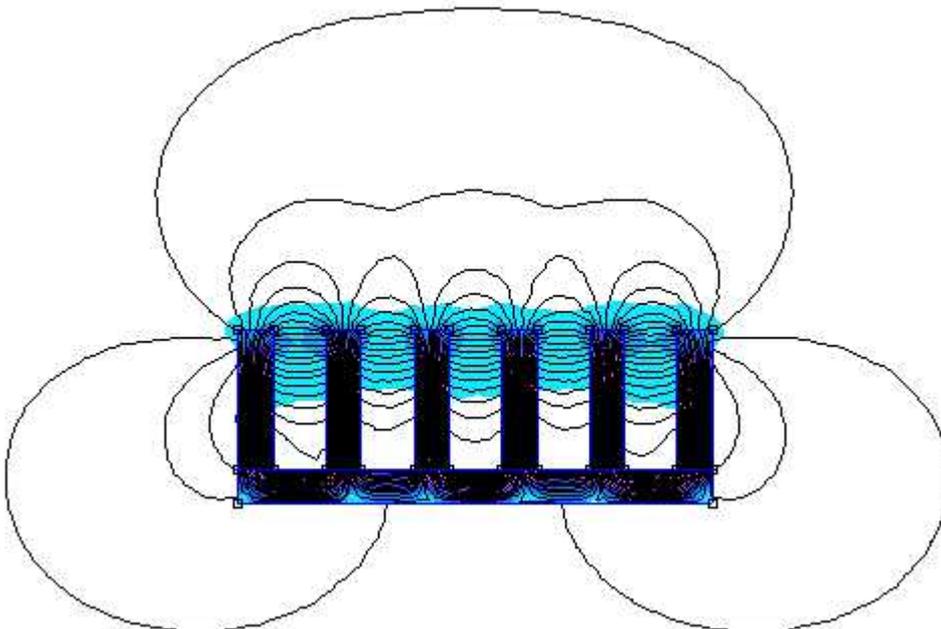
Since the popularity of the electric guitar in the early 1950s, there have been a few pickup designs and very little variation on these in general. This part of this Website looks at the possibilities of changing the structure of pickups so that the magnetic field is made more effective and the need for windings is reduced.

The planned result is to come up with a range of pickups that are easy to manufacture, easy to install and provide a low impedance high sensitivity output such that the tonal responses can be changed at will to provide a wide spectrum of timbre

Seven Coil, Seven Rod Magnet, Alternate Inversions - Magnetic Field

In this case, each consecutive magnet rod is inverted and fixed to a medium thickness ferrite plate forming a number of "U" shaped (or horseshoe shaped) magnetic paths.

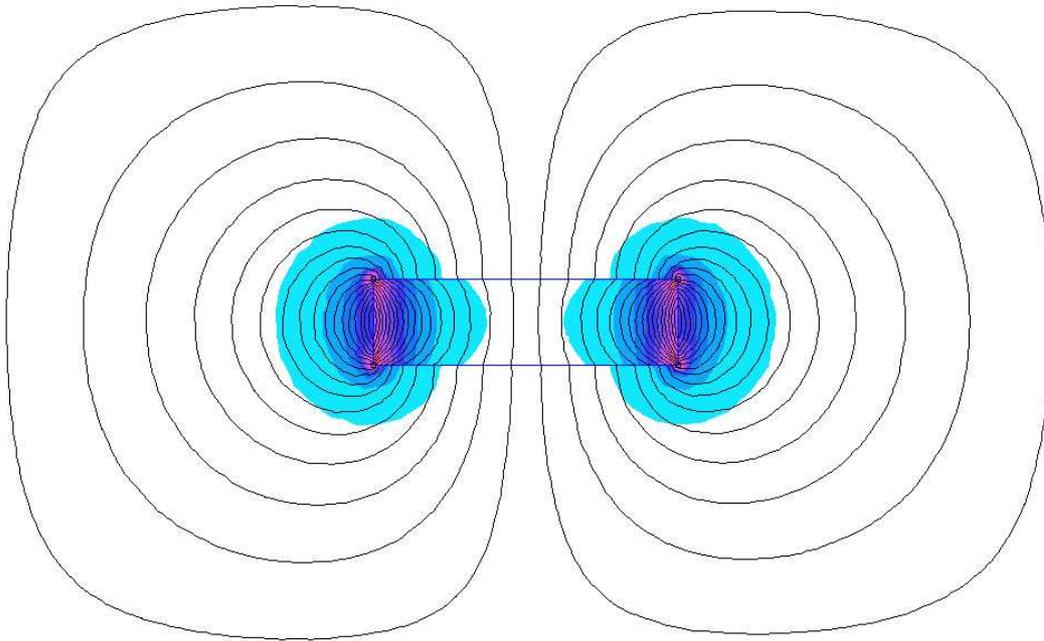
Although the picture shows six poles this would have to be increased to seven poles because the strings would have to sit over the gap between the poles / rods.



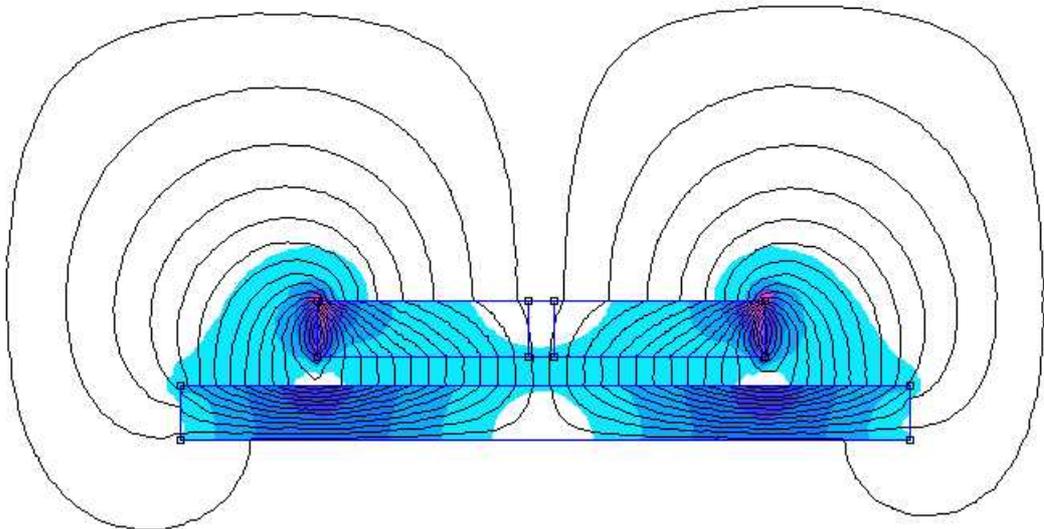
Alternately every second rod could be ferrite or soft iron and simply carry the magnetic flux instead of driving the magnetic flux.

Single Coil, Shielded Single Bar Magnet - Magnetic Field

This is a variation on a single slab ferrite magnet in a single coil, where the underside of the pickup has a thick iron plate as a magnetic shield and focus for the magnetic field from the ferrite bar magnet.



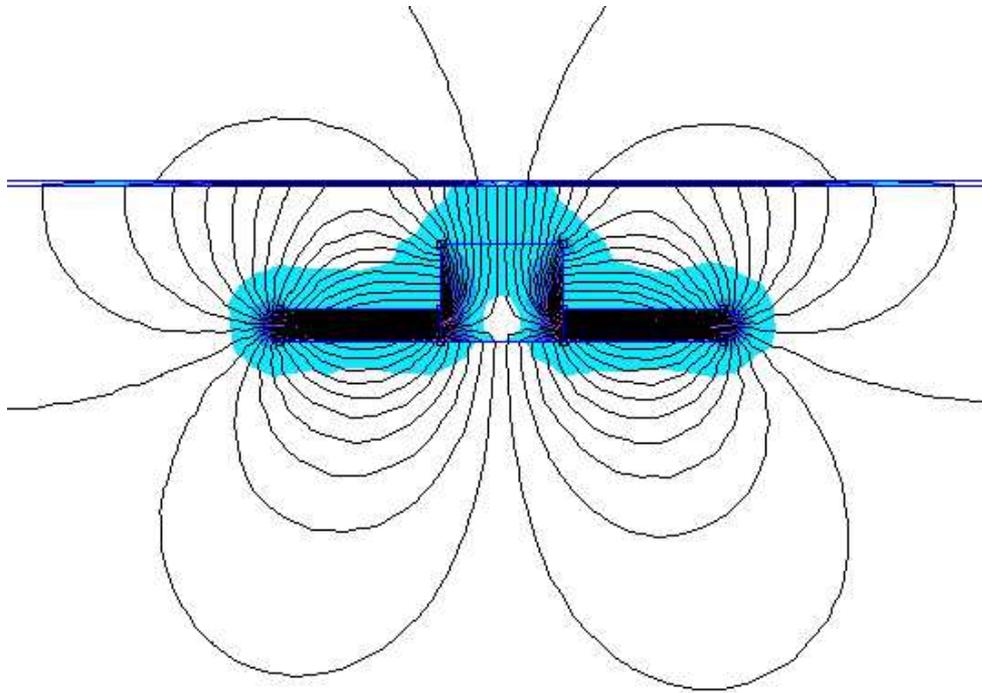
Without the underside shield, the typical magnetic field would look something like the above picture.



Although much of the underside magnetic field of the bar magnet will sink directly into the magnetic shield, also much of the top side will find its way - via the strings to the backing shield plate to narrow down or focus the magnetic field and thus forms a hum bucking effect.

Modified P90 Structure, Fat Ferrite Centre - Magnetic Field

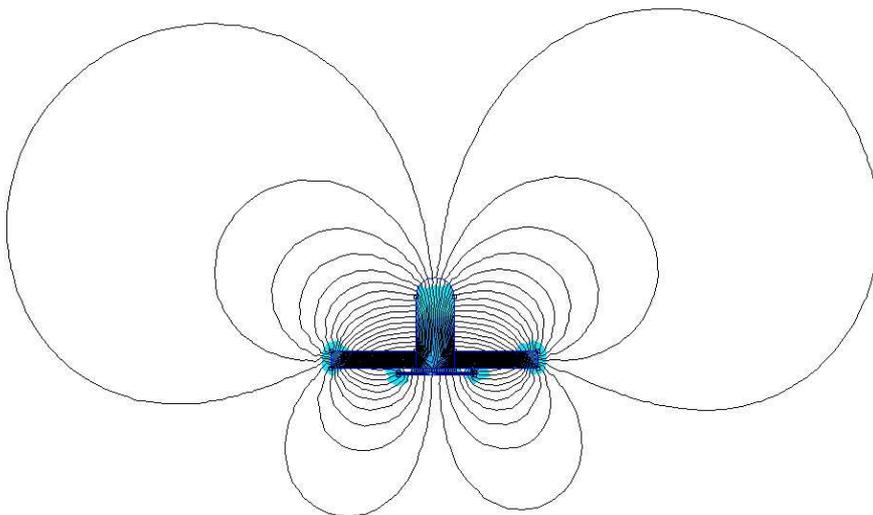
Although the P90 structure is rather awkward, it lends itself to many variations that could prove rather effective. The first variation was to radically increase the core that would hold the bobbin for the coil, and construct this with ferrite such that the two magnets would sit flat under the bobbin:



What becomes immediately obvious is that a metal shield should be included here like the one described above to catch and minimise the lost / stray magnetic fields on the under-side of this pickup

Modified P90 Structure, Loose Shield - Magnetic Field

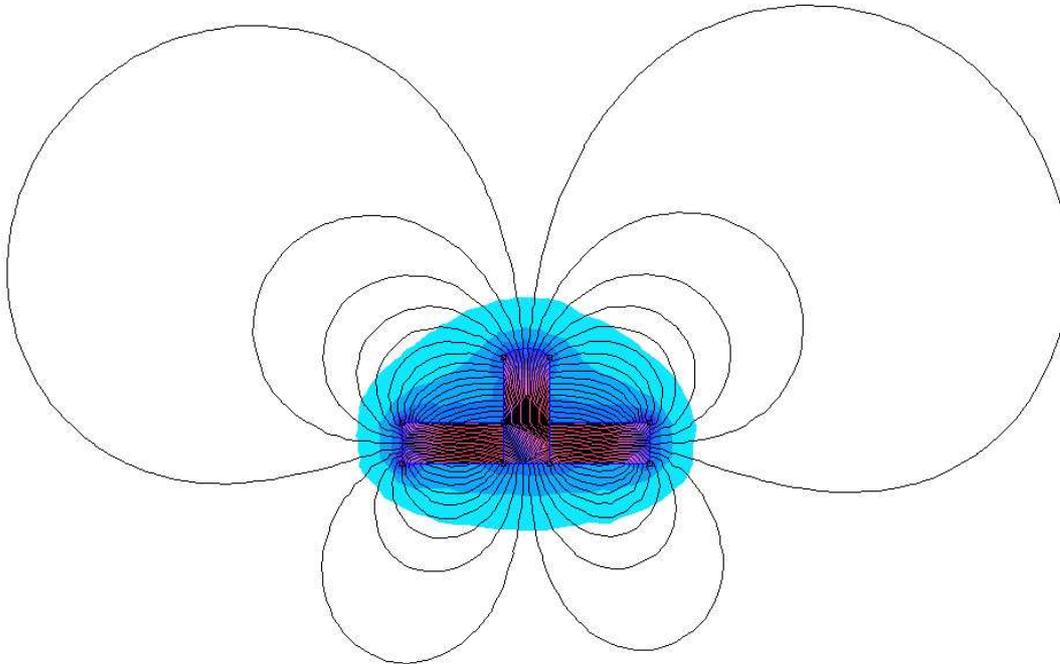
By adding a loose magnetic shield to the underside of the P90 modified structure, much of the stray magnetic field is absorbed.



Note the small short shield under the two bar magnets feeding to the Ferrite centre piece. The magnetic field is now substantially focussed above the magnetic assembly, but also note that the magnetic field is weaker as the short shield is absorbing a considerable amount of available flux.

Modified P90, Three Magnets - Magnetic Field

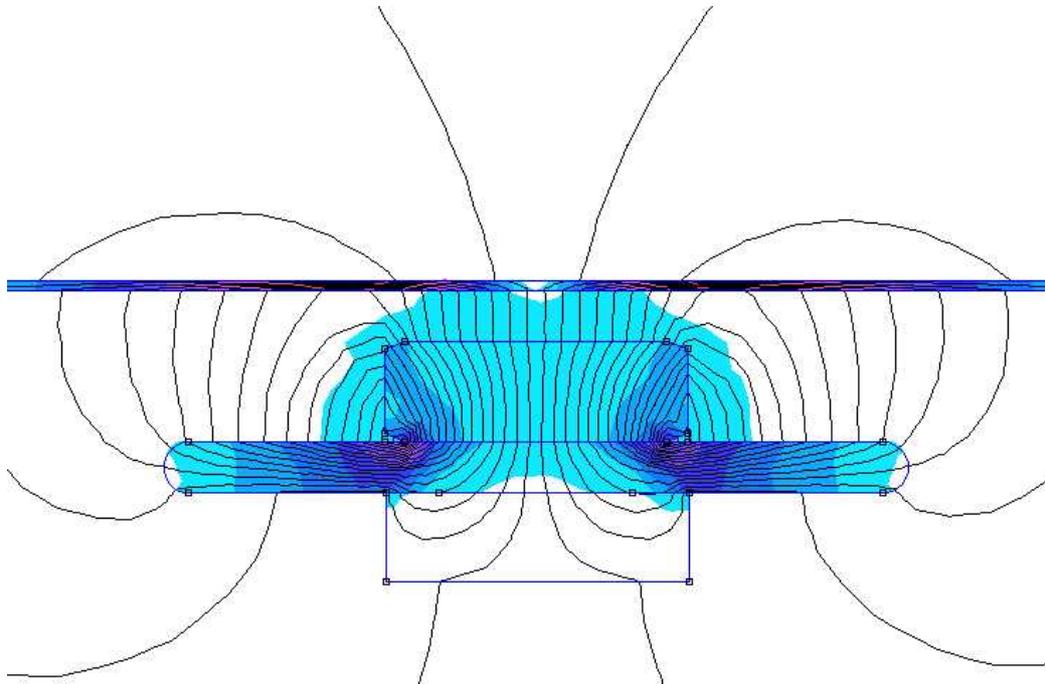
In this case the P90 structure is changed to a centre magnet with two flat magnets (thin long edges are the poles) feeding the centre magnet.



This field is quite intense, as it is focussed forward (upward). The coil would sit around the vertical magnet.

Modified P91, One Magnet, One Coil - Magnetic Field

In this case the P90 is now the P91 with a flat ferrite magnet that would be the centre of the bobbin for the coil, and a ferrite plate as the under path feeding out the lower magnetic field so that it focuses on top.

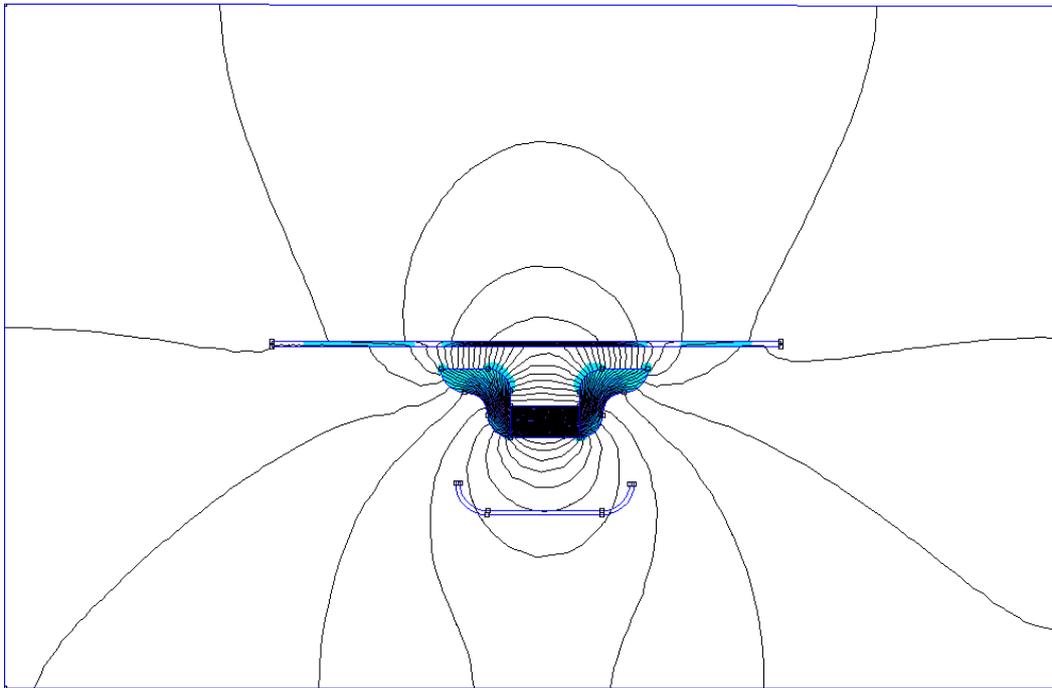


This drawing is slightly incorrect as the underside Ferrite block was inadvertently included under the ferrite plate. This extra block would not be necessary, as the ferrite plate would carry the magnetic flux with a minimum of stray fields.

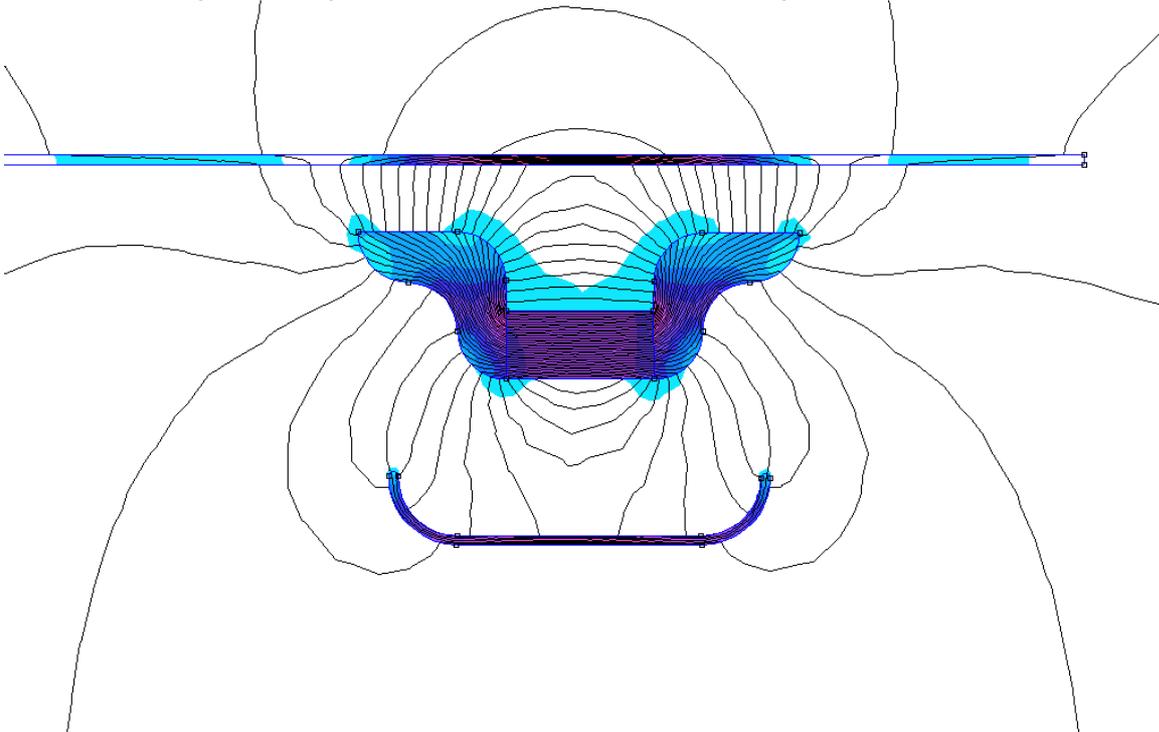
It is interesting to note that the field is rather intense right up to the strings and the strings have a considerable amount of flux associated with them, making this pickup assembly potentially a very high performer.

Single Coil, Lateral Magnet, Horn Pole-Pieces - Magnetic Fields

This is a variation on the standard Humbucker where the poles of the magnet is laid parallel to the strings and forms the structure for the bobbin to be positioned on here. Two Ferrite "L" channels form the "Horns" that would then provide excellent magnetic coupling to and through the strings.



This Humbucker would have a rather low amount of stray fields and to further minimise these a consideration was given to including a soft iron shield to catch and kill the back spill. The picture below shows a shield in place.



While this might look good - it must be remembered that if the shield moves then it too will become microphonic, so the screen would have to be an extension of the mounting and be very firmly attached to the magnetic body of the pickup.

Copyright © Malcolm Moore, 2003.
[Comments and Corrections are welcome](#)