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RESEARCH ON THE IMPROVEMENT OF THE TECHNICAL CHARACTERISTICS OF HIGH POWER AUDIO SPEAKER

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Astract: *This paper presents the research on the improvement of the technical characteristics of highaudio speaker using new materials and a new manufacturing technology.*
The end result is a smaller gap between the magnet and coil which together with unique manufacturing technology and a new material render a net increase in efficiency in excess of 10%.
The new material used in the manufacturing audio speaker magnets is Neodymium (NdFeBa).
Keywords:*audio speaker, permanent magnet, air gap.*

1. INRODUCTION

This paper presents a new material and manufacturing technologyfor high power permanent magnet audio speaker capable of redering a 10% net increase in speaker efficiency.
The technology used by the authors pertains to special permanent magnet manufacturing techniques utilizing NdFeB material.
Constructive solutions based on information on studies were conducted several sets of simulations in which magnetic material is used NdFeB magnets with different shapes.
For each case was studied and how the magnetic induction depends on the size of the air gap.

2. THE SIMULATION FOR A MAGNETIC CIRCUIT WITH PERMANENT MAGNET NdFeB

Three constructive forms of permanent magnets were simulated.
In the first case ,the magnetic circuit is made with NdFeB located in central.

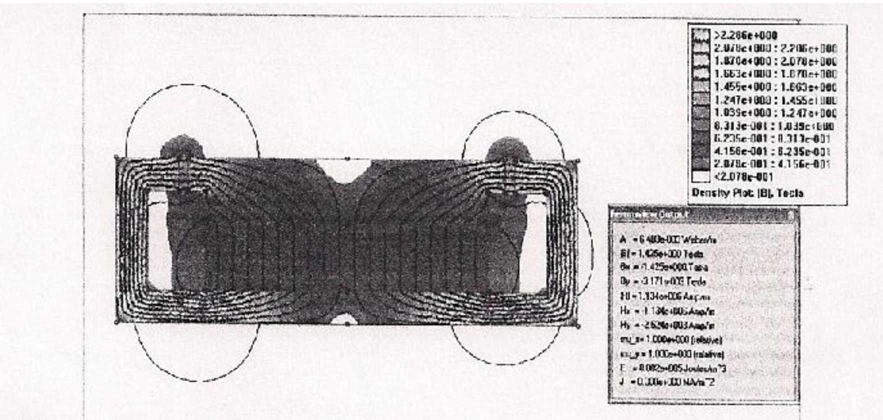

Figure 1. Simulation for a magnetic circuit with NdFeB located in central.

Considered the air gap is 1.5 mm. The maximum value of magnetic induction in air gap, in this case is 1.425 T. The circuit model can be considered only theoretically, in it does not allow for dissipation of heat generated greater efficiency in operation. This white areas in center of upper and lower surfaces of the magnet suggests that it can be used to form ring magnet.

The variation of magnetic induction air gap size shows a good uniformity with increasing air gap (figure 2):

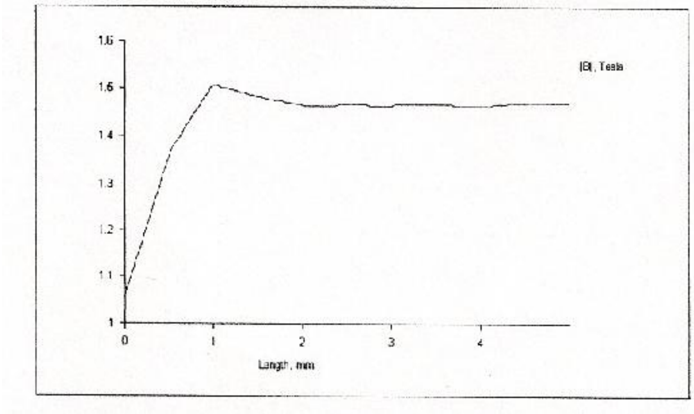

Figure 2. Magnetic flux density dependence of the air gap size

The simulation of a magnetic circuit equipped with a toroidal magnet NdFeB is used in the second case.(figure 3.)

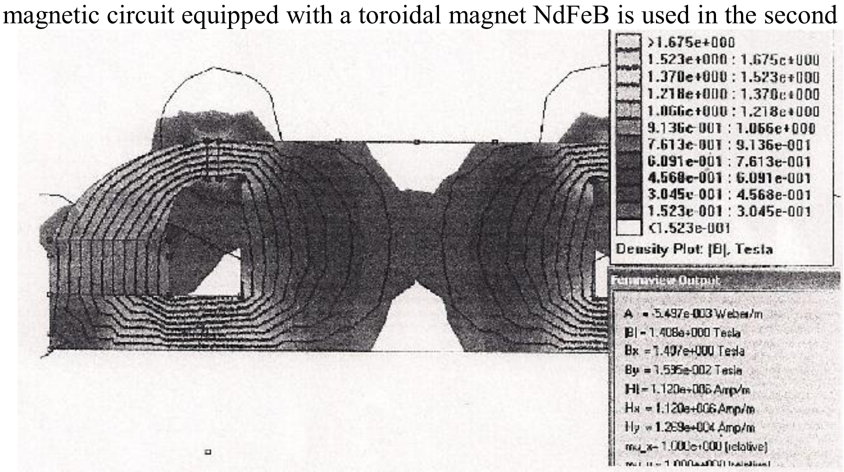

Figure 3. Simulation of a magnetic circuit equipped with a toroidal magnet NdFeB

Considered the air gap is also 1.5 mm. For such a case the maximum magnetic induction obtained is 1.408 T.
The magnetic flux density dependence of the air gap size is presented in figure 4:

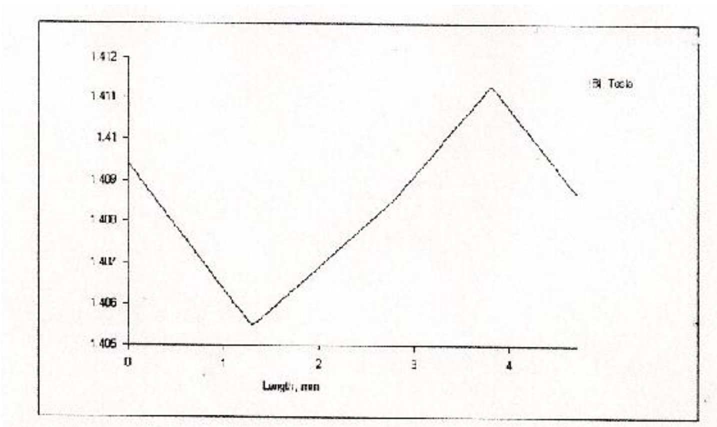

Figure 4. Magnetic flux density dependence of the air gap size

Constructive solution of the Figure 3., with large connection range with the upper surface side of the face is passed from the upper polar field lines distribution in the previous circuit in this area. Field lines in this area can be concentrated in the pole piece with condition that ferromagnetic material to be saturate at larger induction.
The analysis of simulation in Figure 3 results a very importance conclusion for constructive solutions. Central area of the magnetic circuit is unnecessary, the extremely low magnetic flux.
It has been made a simulation for the magnetic circuit where the edges are out at the bottom to try to eliminate non-uniform local magnetic field. The result was an increase in the magnetic induction in air gap at 1.438 T then by 2.1% higher.

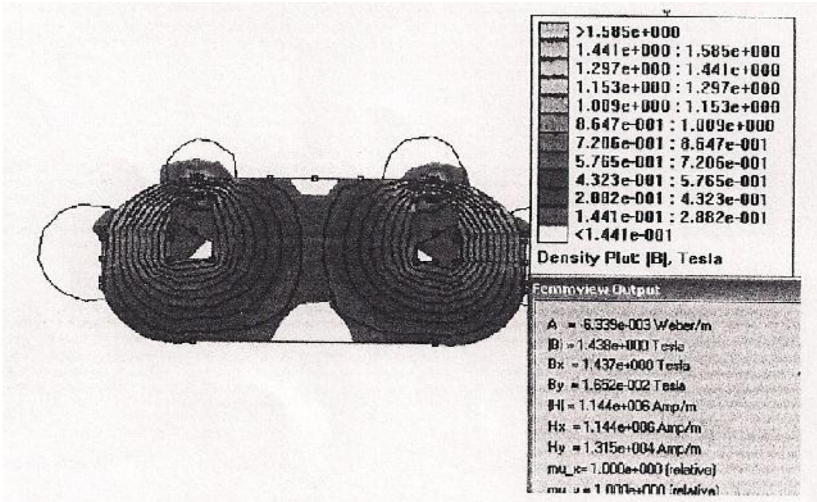

Figure 5. Simulation of a magnetic circuit equipped with bevelld edges

The results of these simulations show that in such a dimensional version of the circuit are close to maximum performance that can be obtained.

3. CONCLUSIONS

Losses are higher magnetic flux magnetic circuit as the magnetic permeability of soft magnetic materials is reduced and hence their saturation magnetic induction is small. It is very important that the construction of magnetic circuits to be used high magnetic permeability material, to prevent their magnetic saturation. The probes of potential are used for the determination of internal reluctance of permanent magnet. Differences between the same parameter values found for the three audio devices is very important.

A high power electromagnetic audio device equipped with magnetic materials (soft and hard) simulation performance must combine magnetic circuit performance used in practical implementation of circuits for testing, which would lead a better knowledge technological factors that influences all the condition is in production.

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