

PATENTS REVIEW...

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COBALT MAGNET ALTERNATIVES

There is now a serious world shortage of cobalt metal. This is largely due to the fact that cobalt is produced as a by-product of copper mining and most of the cobalt-copper ore mines are in Central Africa where the political situation is very unstable. The military and aerospace have first call on cobalt because it is an essential ingredient of high temperature alloys, as used for instance in jet engines. Loudspeaker manufacturers have for years used cobalt alloy magnets, for instance Alnico (aluminium-nickel-cobalt), because it offers high flux density. In turn this facilitates low leakage design by potting a compact magnet in a shield. In a colour TV set flux leakage sours the picture colours and hence potted cobalt magnets have been used almost exclusively in colour TV production. But the rising cost of cobalt has stimulated research into alternative approaches.

Two recent patents reflect this research and the worldwide trend away from cobalt as a magnetic material. UK patent application 2 031 247, filed under the New Laws by Hokuto Onkyo Co. Ltd. of Tokyo and dating from 3rd October 1978, contains a legally very broad claim to the basic concept of potting ferrite instead of cobalt. Figures 1 and 2 show known, but supposedly unsatisfactory, designs in which a ferrite magnet 10 is shielded by a pot or cup. Figure 3 shows the Onkyo design. Yoke 1 houses ferrite magnet 2. Pole 3 extends through a gap in the yoke 1 which also houses voice coil 5. The pole 3 has a cylindrical part 3a which merges into a tapered or frusto-conical part 3b. According to the rather vague wording of the patent this construction, along with the gap formed between pole cylinder 3a and yoke 1, decreases permeance between the pole and yoke. The greater the sectional area of the magnet the easier it is to keep the permeance low. The inventor claims that this decreased permeance reduces flux leakage, making the magnets suitable for use in a colour TV loudspeaker.

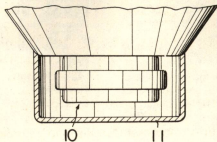


Fig. 1

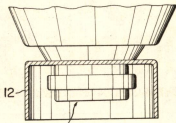


Fig. 2

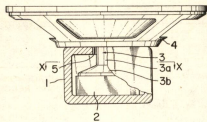


Fig. 3

A similar claim is made by a Danish inventor in UK patent application 2 034 154, (which was filed under the New Laws) and dates back to October 1978. Although the aim is the same the approach is different. Figure 4 shows a known Alnico design. Central rod 4 is a permanent Alnico magnet inside a cylindrical pot 6. The Alnico rod backs onto base disc 2 and pole disc 18. As the inventor points out, such a compact fully shielded design has been possible because the Alnico rod 4 can be small due to the high magnetic efficiency of cobalt-based materials. But ferrite is less efficient and this makes similarly compact designs of inadequate magnetic strength. The new design is shown in Figure 5. A large ring 4 of ferrite is housed in a pot 6 which is integrated with rear pole disc 2. Front pole piece 18 is slightly larger than the ring

magnet 4 and the whole combination is mounted in a cup 22. An alternative design, based on a solid disc magnet 4 is shown in Figure 6. The point of the invention is that the voice coil 12 is of much larger diameter than usual. This enables the large ferrite magnet to be used inside a pot rather than around the voice coil as an annular magnet. Again the claim is to a loudspeaker with significant flux leakage.

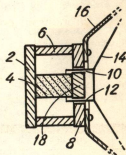


Fig. 4

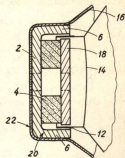


Fig. 5

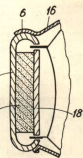


Fig. 6