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Case Number: T 159 / 82

T 159/82

DECISION
of the Technical Board of Appeal 3.5.1
of 15 May 1984

Appellant: N.V. Philips' Gloeilampenfabrieken
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Decision under appeal: Decision of Examining Division 059 of the European Patent Office dated 21.06.82 refusing European patent application No 80201043.9 pursuant to Article 97(1) EPC

Composition of the Board:
Chairman: G. Korsakoff
Member: J. van Voorthuizen
Member: L. Gotti Porcinari

Summary of facts and submissions

I. European Patent Application 80 201 043.9 filed on 04.11.80 (Publicaton No. 0 029 266) claiming a priority of 20.11.79 (NL) was refused by a decision of the Examining Division 059 of the European Patent Office of 21.06.82. That decision was based on Claim 1 filed on 08.04.82, and original Claims 2 to 6.

II. The reason given for the refusal was that the subject-matter of the claims did not involve an inventive step having regard to US-A-3 922 504 and FR-A-1 156 815 (or NL-A-6 700 284).

III. The applicant lodged an appeal against this decision on 11.08.82, which was accompanied by the Statement of Grounds. The appeal fee was paid on the same date. Amended claims 3, 5 and 6 were also filed on 11.08.82.

IV. In a communication of 05.03.84 the Rapporteur of the Board of Appeal drew the applicant's attention to a further document, DE-B-1 234 266 cited in the search report.

V. In his Statement of Grounds and during the oral proceedings held on 15.05.84 the applicant argued essentially as follows: FR-A-1 156 815 shows an auxiliary magnet (4) lying between a core (3) and a pole piece (5) both of a soft magnetic material and NL-A-6 700 284 shows an auxiliary magnet (such as 8 in Fig. 4) lying between a permanent magnet (1) and a pole piece (4,5) of soft magnetic material. Because of the presence of this soft material a large stray field will exist outside the airgap.

However, none of these publications indicates or suggests that when permanent magnetic zones (or permanent magnets) are placed side by side in an isophase loudspeaker in a manner as shown in US-A-3 922 504, a stray field which adversely affects the efficiency of said isophase loudspeaker will exist between these permanent magnetic zones. Moreover, as this specific problem is not even indicated, surely none of these publications suggests the placing of auxiliary magnets at the boundary area of said permanent magnetic zones in order to effectively concentrate the magnetic flux in the region of the conductors.

DE-B-1 234 266 describes a transducer according to the introductory part of claim 1, but has for its object an improved frequency response. To this purpose so called "distance elements" are provided between the permanent magnets and the diaphragm is positioned very near the magnet system. The passage in the description of this document corresponding to Fig. 7 and 8 (which were referred to in particular by the Rapporteur in his communication) states that because of the large air gap between two neighbouring magnets a large spreading of the field lines occurs. This makes it possible that the conductors cooperate with the "Streufeld" (English: strayfield) in a plane beneath the plane of the pole faces. The applicant submits that although the text uses the expression "Streufeld", this is misleading and that in reality "magnetic field" is meant. Normally this expression is used to designate the non-efficient part of the magnetic field and this meaning is clearly not applicable to the situation in the transducer according to DE-B-1 234 266. On the contrary, its inventor deliberately proposed the configuration of the magnetic field shown in Fig. 7 and 8 in order that a magnetic field is present at the location of the conductors. According to the applicant this interpretation finds also support in column 5, lines 43, 44 of the DE document.

Therefore, DE-B-1 234 266 does not indicate or suggest that in the transducer according to the introductory part of claim 1 a stray field exists between permanent magnetic zones which adversely affects the efficiency of said isophase loudspeaker, which stray field needs to be compensated for.

VI. The applicant requested that a European patent be granted on the basis of Claim 1 as filed on 08.04.82, Claims 2 and 4 as originally filed and Claims 3, 5 and 6 as filed on 11.08.82.

These claims read as follows:

1. An electroacoustic transducer comprising a diaphragm, at least one side of which is provided with conductors, and a magnet system for, at least at one side of the diaphragm, defining a plurality of adjacent permanent magnetic zones, adjacent permanent magnetic zones having substantially opposed directions of magnetization and being so positioned, relative to the conductors on the diaphragm, that at the location of the conductors energizing magnetic fields are produced which extend substantially parallel to the diaphragm plane and transversely of the longitudinal direction of the conductors at this location, characterized in that the magnetic system further comprises magnetizing means

for the generation of auxiliary magnetic fields at the location of the boundary areas of the permanent magnetic zones, which auxiliary magnetic fields have a direction of magnetization which is substantially opposed to the direction of the energizing magnetic field at the location of the nearest conductor.

2. An electroacoustic transducer as claimed in Claim 1, characterised in that the magnetizing means are constituted by auxiliary magnets at the location of the boundary areas in the vicinity of the diaphragm, which auxiliary magnets have a direction of magnetization which is substantially opposed to the direction of the energizing magnetic field at the location of the nearest conductor, the coercive field strength of the magnetic induction of the auxiliary magnets being at least equal to that of the magnetic zones.

3. An electroacoustic transducer as claimed in Claim 1 or 2, characterised in that the auxiliary magnetic fields are obtained in said permanent magnetic zones which at the location of the boundary areas have a direction of magnetization which is substantially opposed to the direction of the energizing magnetic field at the location of the nearest conductor.

4. An electroacoustic transducer as claimed in Claim 2, characterised in that the auxiliary magnets are formed by an anisotropic magnetic material having a preferential direction of magnetization, the preferential direction of magnetization at any location in the magnetic material corresponding to the direction of magnetization at this location.

5. An electroacoustic transducer as claimed in any one of the preceding Claims, characterised in that the permanent magnetic zones are constituted by an anisotropic permanent magnetic material having a preferential direction of magnetization, the preferential direction of magnetization at any location in the magnetic material corresponding to the direction of magnetization at this location.

6. An electroacoustic transducer as claimed in any one of the preceding Claims, characterised in that the magnet system defines permanent magnetic zones at both sides of the diaphragm and that the magnetizing means also produce auxiliary magnetic fields at both sides of the diaphragm.

Reasons for the decision

1. The appeal complies with Articles 106-108 and Rule 64 EPC and is, therefore, admissible.

2. An electroacoustic transducer according to the introductory part of Claim 1 is known from US-A-3 922 504. A very similar transducer is known from DE-B-1 234 266, the main difference being that in all the embodiments described in the latter document there is some distance between neighbouring permanent magnets.

3. In basic physics and electrotechnics it is a generally known fact that the magnetic field lines of a permanent magnet do not leave or enter the magnet only at its end faces (pole faces) but also to some extent at its side faces, mainly in the vicinity of the pole faces. This part of the magnetic field is commonly called stray

field because in most technical applications it cannot be put to effective use and thus causes a loss of efficiency of the magnet system.

4. The person skilled in the art will, therefore, expect that such stray fields exist in the magnetic structures disclosed in both cited documents. Indeed Fig. 7 and 8 of DE-B-1 234 266 show the presence of such a field which is called "Streufeld". No special means are provided in the magnetic structure to promote its occurrence and in fact they are not needed. Although, of course, the distance between neighbouring magnets determines the strength and particular configuration of the stray field, there is no reason whatsoever to expect that there would be no stray field with adjacent magnets as shown in US-A-3 922 504.

5. Applicant's interpretation of the DE document leads him to believe that the configuration of the magnetic field shown in Fig. 7 and 9 was specifically adopted for the purposes of the DE document. This interpretation results (at least partly) from combining text passages referring to two sets of figures (7, 8 and 12, 13) representing essentially different magnetic structures.

However, considering the technical facts set out in paragraphs 3 and 4, the Board is unable to accept the applicant's reasoning on this point.

6. FR-A-1 156 815 discloses in general terms the principle of counteracting the stray field in a magnetic structure by means of a second magnet permanently magnetised in a direction opposed to that of the stray field, in order to concentrate the main field at the location of

the conductors with which it has to interact (cf. page 1 left column lines 9-25 and paragraph 1 of the Résumé on page 2). The document then describes the application of this principle in a particular case, namely a loudspeaker where part of the magnetic circuit consists of soft magnetic material but this does not detract from the general teaching contained in the document.

7. The Board considers it as obvious to the person skilled in the art to apply the teaching contained in FR-A-1 156 815 to the isophase loudspeaker known from US-A-3 922 504. Claim 1, therefore, does not involve an inventive step and is unallowable.

8. Claims 2-6 describe preferred embodiments of the transducer according to Claim 1. None of them contains features which in combination with those of claim 1 would involve an inventive step. This opinion already held by the Examining Division was not contested by the applicant.

Therefore these claims are also unallowable.

Order

It is decided that:

The appeal is dismissed.

The Registrar

The Chairman

G. Korsakoff