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**D E C I S I O N**  
**of 14 December 1994**

**Case Number:** T 0743/92 - 3.5.2

**Application Number:** 84100307.2

**Publication Number:** 0121649

**IPC:** G08B 13/24

**Language of the proceedings:** EN

**Title of invention:**  
Amorphous antipilferage marker

**Patentee:**  
ALLIED CORPORATION

**Opponent:**  
VACUUMSCHMELZE GMBH, Hanau

**Headword:**  
-

**Relevant legal provisions:**  
EPC Art. 54, 56

**Keyword:**  
"Novelty and inventive step (yes)"

**Decisions cited:**  
T 0068/85

**Catchword:**  
-

**Case Number:** T 0743/92 - 3.5.2

**D E C I S I O N**  
**of the Technical Board of Appeal 3.5.2**  
**of 14 December 1994**

**Appellant:** ALLIED CORPORATION  
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**Respondent:** VACUUMSCHMELZE GMBH, Hanau  
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**Representative:** -

**Decision under appeal:** Decision of the Opposition Division of the European Patent Office dated 29 June 1992 revoking European patent No. 0 121 649 pursuant to Article 102(1) EPC.

**Composition of the Board:**

**Chairman:** R. E. Persson  
**Members:** A. G. Hagenbucher  
W. J. L. Wheeler

## Summary of Facts and Submissions

I. The Appellant contests the decision of the Opposition Division to revoke European patent No. 0 121 649 on the ground that the subject-matter of Claim 1 (as granted) lacked novelty and that certain claims according to some auxiliary requests then on file did not involve an inventive step.

II. The following pre-published documents were referred to in the appeal proceedings:

D1: EP-A-0 017 801

D6: Firmenschrift VC 001 Vitrovac, May 1982

D7: DE-A-3 021 536

D8: EP-A-0 021 101

D9: Hilzinger, Mager, Warlimont in "Journal Of Magnetism and Magnetic Materials", 9, 1978, pages 191 to 199

D10: US-A-4 150 981

D11: Proceedings 4th International Conference on Rapidly Quenched Metals (Sendai, 1981), pages 1167 to 1172 and

D12: DE-C-2 709 522.

The parties referred also briefly to the prior use alleged during the opposition proceedings based on

D2: Letter to Fa. Systems Development and Engineering, Inc., Richardson, Texas (USA) of 5 July 1982

D3: Letter from Fa. Shin International, Lathrup Village, Michigan (USA) of 20 September 1982

D4: VAC-Laborbericht 85/82 of 20 October 1982 and

D5: VAC-Fertigungsbuch "Amorphe Metalle", June 1982.

III. In the course of the appeal proceedings the following document was additionally cited:

D14: Phys. stat sol. (a) 55 (1979), pages 763 to 769, Hilzinger, Hillmann, Mager "Magnetostriction Measurements on Co-Base Amorphous Alloys".

Experimental results according to

D15: a statement by Dr Herzer and Dr Polak dated 7 September 1993 and

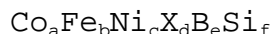
D16: a declaration by Dr Smith and Dr Hasegawa dated 5 January 1994

were filed.

IV. Oral proceedings were held on 14 December 1994, at which the Appellant performed a demonstration of several strips with alleged different composition in untwisted and twisted condition in order to show the character of the claimed characteristics of Claim 1 as granted. This claim is worded as follows:

"1. For use in a magnetic theft detection system, a marker (16) adapted to generate magnetic fields at frequencies that are harmonically related to an incident magnetic field applied within an interrogation zone (12) and have selected tones that provide said marker (16) with signal identity, said marker comprising an elongated, ductile strip (18) of amorphous ferromagnetic material, characterized in that the amorphous ferromagnetic material has a value of magnetostriction ranging from  $+ 2 \times 10^{-6}$  to  $- 2 \times 10^{-6}$ , and a B-H loop as square as possible; that a test strip

of the material having length = 10 cm, width = 0.3 cm, and thickness 35 µm retains at least 70% of its original harmonic amplitude during stress imposed by flexing the strip 1.5 turns; and that the material is a composition consisting essentially of the formula



where X is at least one of Cr, Mo and Nb a-f are in atom percent and the following provisos are applicable:

- (i) when  $14 \leq (e+f) \leq 17$ , with  $10 \leq e \leq 17$  and  $0 \leq f \leq 7$ , then
- (a) if  $2 \leq d \leq 4$ , the values for a, b and c are grouped as follows,

$$\begin{array}{ll} 44 \leq a \leq 84 & 31 \leq a \leq 64 \\ 0 \leq b \leq 10 & \text{or} \quad 10 \leq b \leq 18 \\ 0 \leq c \leq 10 & 10 \leq c \leq 30 \end{array}$$

- (b) if  $4 \leq d \leq 6$ , the values for a, b and c are grouped as follows,

$$\begin{array}{ll} 57 \leq a \leq 87 & 41 \leq a \leq 62 \\ 0 \leq b \leq 10 & \text{or} \quad 10 \leq b \leq 16 \quad 0 \leq c \leq 10 \quad 10 \leq c \leq 20 \end{array}$$

- (c) if  $6 \leq d \leq 8$ , the values for a, b and c are grouped as follows,

$$\begin{array}{ll} 61 \leq a \leq 80 & 46 \leq a \leq 66 \\ 0 \leq b \leq 10 & \text{or} \quad 10 \leq b \leq 14 \\ 0 \leq c \leq 4 & 4 \leq c \leq 15 \end{array}$$

- (ii) when  $17 \leq (e+f) \leq 20$ , with  $12 \leq e \leq 20$  and  $0 \leq f \leq 8$ , then
- (a) if  $0 \leq d \leq 2$ , the values for a, b and c are grouped as follows,

$$\begin{array}{ll} 58 \leq a \leq 83 & 30 \leq a \leq 63 \\ 0 \leq b \leq 10 & \text{or} \quad 10 \leq b \leq 17 \end{array}$$

$$0 \leq c \leq 10 \qquad 10 \leq c \leq 38$$

(b) if  $2 \leq d \leq 4$ , the values for a, b and c are grouped as follows,

$$\begin{array}{ll} 56 \leq a \leq 81 & 41 \leq a \leq 61 \\ 0 \leq b \leq 10 & \text{or} \quad 10 \leq b \leq 15 \\ 0 \leq c \leq 10 & 10 \leq c \leq 20 \end{array}$$

(c) if  $4 \leq d \leq 6$ , the values for a, b and c are grouped as follows,

$$\begin{array}{ll} 59 \leq a \leq 79 & 51 \leq a \leq 64 \\ 0 \leq b \leq 10 & \text{or} \quad 10 \leq b \leq 13 \\ 0 \leq c \leq 5 & 5 \leq c \leq 10 \end{array}$$

(iii) when  $20 \leq (e+f) \leq 23$ , with  $8 \leq e \leq 23$  and  $0 \leq f \leq 15$ , then

(a) if  $0 \leq d \leq 2$ , the values for a, b and c are grouped as follows,

$$\begin{array}{ll} 55 \leq a \leq 78 & 40 \leq a \leq 58 \\ 0 \leq b \leq 10 & \text{or} \quad 10 \leq b \leq 15 \\ 0 \leq c \leq 10 & 10 \leq c \leq 20 \end{array}$$

(b) if  $2 \leq d \leq 4$ , the values for a, b and c are grouped as follows,

$$\begin{array}{ll} 57 \leq a \leq 76 & 45 \leq a \leq 60 \\ 0 \leq b \leq 10 & \text{or} \quad 10 \leq b \leq 13 \\ 0 \leq c \leq 6 & 6 \leq c \leq 15 \end{array}$$

(iv) when  $23 \leq (e+f) \leq 26$ , with  $5 \leq e \leq 26$  and  $0 \leq f \leq 20$ , then

(a) if  $0 \leq d \leq 2$ , the values for a, b and c are grouped as follows,

$$\begin{array}{l} 54 \leq a \leq 75 \\ 0 \leq b \leq 10 \\ 0 \leq c \leq 8 \end{array}$$

- (v) up to 6 atom percent of the Ni and X component present being, optionally, replaced by Mn; and
- (vi) up to 2 atom percent of the combined B and Si present being, optionally, replaced by at least one of C, Ge and Al.

V. The examination of the appeal focused on the characteristics (A)-(D) of the subject-matter as referred to by the Appellant and considered in the decision of the Opposition Division. These characteristics are:

- (A) a special composition (cf. general formula in Claim 1 and ranges i, ii, iii, iv, v, vi)
- (B) small magnetostriction within the claimed range of  $2 \times 10^{-6}$  to  $- 2 \times 10^{-6}$
- (C) a B-H-loop as square as possible and
- (D) maintenance of at least 70% of the original harmonic amplitude during stress of a test strip of selected material having length 10 cm, width = 0.3 cm and thickness = 35  $\mu$ m imposed by twisting it 1,5 turns.

VI. The Appellant, accepting that D1 was to be considered as the closest prior art, submitted that the Opposition Division wrongly concluded from the closeness of the specific composition of an alloy used in D1 (Co<sub>67.5</sub> etc.) to an alloy used in one of the examples in the patent in suit (Co<sub>67.1</sub> etc.) and from the assumed presence of characteristic (C) in D1, that the alloy used in D1 had the same properties as the material claimed in the patent in suit.

D1 suggested a test for signal retention of the markers by bending them to a small radius and measuring the response signal again, after the markers were allowed to restraighthen. Markers tested in this way were not sufficiently reliable because they may be glued to goods and had, as a consequence, to pass interrogation zones under stress due to shrinkage of the adhesive. In order to further improve the reliability of markers to be used in this context, the present patent suggested the further stress selection characteristic (D) for the amorphous ferromagnetic materials defined by characteristics (A) to (C). Already characteristic (A) was an inventive selection from the group of alloys defined by the general formula on page 5, line 2 of D1. Characteristic (D) was neither known from D1 nor derivable from any of the available prior art documents or the alleged public prior use markers. The public prior use was not proven. Moreover, it was only concerned with the influence of marker geometry and annealing temperature but not with the test criteria as defined by characteristic (D). Hence, the claimed subject-matter was not only novel but also inventive over the prior art.

VII. The Respondent argued that characteristic (D) amounted to the definition of an arbitrary and not inventive problem. Everybody could work out new test conditions. The attenuation of the original harmonic amplitude depended strongly on the manner in which the markers were stressed and their geometry. The real stress situation in practice could not be foreseen. No expert could see from the final markers whether characteristic (D) was met or not. The Board should therefore take care and not maintain a patent without making sure that



characteristic (D) was not present in the markers disclosed in the prior art. The definition of characteristic (C), namely the term "as square as possible" was not sufficiently clear for the distinction from less square B-H-loops. D1 and D8 disclosed alloys with the characteristic (A), the alloys of D8 (cf. Table II) additionally had also characteristic (B). Characteristic (B) was also known from D7. It was not clear whether these alloys met the characteristic (D) or not. The markers known from D1 were exposed to stress situations. One had tried to diminish this influence by the use of amorphous materials. With respect to characteristic (C) reference was made to D12, Claim 31. Prior use was alleged in view of tags produced by the Opponent and sent to clients without secrecy obligations (cf. D2 to D5). Hence, the subject-matter of Claim 1 was either not new or at least not inventive.

VIII. The Appellant finally requested that the decision under appeal be set aside and the patent be maintained as granted subject only to the replacement of the word "flexing" by the word "twisting" in Claim 1 as more precisely reflecting what was meant.

IX. The Respondent requested that the appeal be dismissed.

### **Reasons for the Decision**

1. The appeal is admissible.
2. As to the requested replacement of the word "flexing" in Claim 1 by "twisting", the application as filed

shows in Table VI that the claimed signal retention characteristic (D) serves as a selection feature when stress is imposed by twisting. Twisting is a specific form of flexing. Hence, the requested amendment complies with Articles 123(2) and (3) EPC.

3. *Interpretation of Claim 1*

3.1 The patent in suit is directed to a marker for a magnetic theft detection system. The marker is made of an elongated, ductile strip of amorphous ferromagnetic material and generates a magnetic field at frequencies that are harmonically related to an incident magnetic field applied within the interrogation zone. The marker is designed to have selected tones that provide the marker with signal identity. The patent claims such a marker made of amorphous ferromagnetic material selected according to the above characteristics (A)-(D) in combination.

3.2 D16 (especially Tables 1 and 2) and the tests carried out during the oral proceedings confirm the finding in the impugned decision that characteristics (A) to (D) have an independent character. This means that especially characteristic (D) does not automatically follow from the presence of characteristics (A) to (C) but additionally limits the range of amorphous ferromagnetic materials suggested for a reliable marker. The functional definition of characteristic (D) enables an expert to reduce the class of alloys without undue burden by routine experiments in order to obtain appropriate marker materials to be used under stress. This definition is therefore not objectionable (cf. T 68/85, OJ 1987, 228). It is a test of suitability,

even though the markers may have different sizes and be subject to different forms of stressing when in use. The Appellant further confirmed the Opponent's test results in D15 but showed that characteristic (D) in the patent in suit contributes additionally to an appropriate selection of reliable markers which pass the interrogation zone in a stressed condition due to adhesive on the marker which may exert a considerable stress on the marker attached therewith even if the marker appears to be in a perfectly straight undeformed condition.

3.3 Although characteristic (C) appears to be somewhat subjective, the Board is of the opinion that a person skilled in the art knows how to anneal ferromagnetic materials in order to achieve a B-H-loop as square as possible.

#### 4. *Novelty*

##### 4.1 Document D1

The Opposition Division denied novelty of the subject-matter of Claim 1 as granted in view of D1. D1 which stems from the Appellant discloses an anti-theft marker made in accordance with the general formula  $(Ta_xTb_{1-x})_M Ba_{1-M}$  wherein Ta is at least one of iron or cobalt, Tb is selected from the group consisting of nickel, molybdenum, vanadium, chromium and copper and mixtures thereof. Ba is at least one of boron, phosphorus, carbon, silicon, nitrogen, germanium and aluminium, x ranges from about 20 to 100 atom %, and M ranges from about 70 to 85 atom %. D1 mentions also particular compositions, especially one containing  $Co_{67.5}$  (cf.

para. VI above). The Appellant accepts that such alloy falls within the range (iv) of characteristic (A) of Claim 1. However, D1 does not show characteristic (B). Nor does it explicitly suggest characteristic (C), although it gives on page 9, last paragraph a certain hint in this direction. Regarding characteristic (D), D1 mentions that the marker retains its signal identity when flexed or bent or after being flexed or bent. Even when flexed to produce a degraded condition it appears that the strips should pass through the interrogation zone "as before", i.e. in an unbent state. In view of the general wording "when flexed or bent" in D1 the Opposition Division did not accept the Appellant's conclusion that D1 required restraightening after bending before the strip passes the interrogation zone. Considering also the additional statement "after being flexed or bent" in D1, it cannot clearly be said that the Appellant's interpretation of this document is wrong. Moreover, the more specific test conditions according to characteristic (D) have never been said to be known from D1. Hence, the subject-matter of Claim 1 is new with respect to D1.

#### 4.2 Alleged public prior use

The Respondent alleged also lack of novelty in view of prior use based on D2 to D5. It was said that the alloy  $\text{Co}_{71}\text{Fe}_1\text{Mo}_1\text{Mn}_4\text{Si}_{14}\text{B}_9$  meeting the characteristic (A) of Claim 1 of the patent in suit had been sold to clients for the use in anti-theft markers without secrecy obligations. The composition of this alloy had also characteristics (B) and (C) (cf. D4, Table 1 and page 5). During the opposition proceedings the Appellant expressed doubts whether documents D2 to D5

would prove public prior use because it was not clear whether the material was actually sent and, if so, it was not clear whether there were any secrecy conditions or not. On the other hand, during the appeal proceedings the Appellant (cf. Statement of Grounds, page 3) referred to this alleged prior use as evidence in support of some of his arguments. However, the question whether the said alloy and its properties as described in documents D2 to D5 are prior art within the meaning of Article 54(2) EPC can be left undecided, because these documents are irrelevant with respect to characteristic (D). The Respondent has not shown that his material also exhibits characteristic (D). It furthermore appears from D3 (sample 16) and D2 that the alleged prior use solutions concern only the height of the signals produced by several markers. It follows that the subject-matter of Claim 1 is not identical with the alleged prior use material.

4.3 Novelty of the claimed marker has not been contested on the basis of any of the other cited documents.

5. *Inventive step*

5.1 Problem underlying the present invention

D1, which is the closest prior art, discloses the use of markers with the features in the preamble of Claim 1. The markers known therefrom may have the general alloy composition  $(\text{Ta}_x\text{Tb}_{1-x})_M \text{Ba}_{1-M}$  as further explained in paragraph 4.1 above. The Board accepts the interpretation of the Appellant, that these known markers are subjected to mechanical stress before being passed through the interrogation zone, resulting in the

degradation of the marker in that its signal is substantially reduced after it has restraightened and appears to be in an unstressed condition. D1 therefore suggests a test for signal retention of the markers by bending them to a small radius and measuring the signal again, after the markers have been allowed to restraighten and resume an unstressed state. It was found, however, that even with markers passing this test, the detection system as a whole was still not as reliable as desired in practice because, in order to detect nearly all non deactivated markers passing through the interrogation zone, the sensitivity of the system had to be set so high that false alarms could not be excluded.

Thus, the problem to be solved by the present invention was an improvement of the markers' reliability.

## 5.2 Solution

5.2.1 In dealing with the afore-mentioned problem, it was recognized that the poor reliability of the known markers might not only be due to a stress situation before passing the interrogation zone but also due to a stress situation during passing the interrogation zone even though they appeared to be undeformed. If, for instance, the markers are attached to an article by means of an adhesive, the latter may dry and contract, thereby generating some stress at the markers' surface without bending the same or deforming the outer shape.

5.2.2 The patent in suit defines a class of alloys which, in contrast to the efforts made in the prior art, are not predominately selected on the basis of a large response

signal or their little sensitivity to stress applied **before** they have been passed through the interrogation zone but rather on the basis of their good performance **under** stress. This specific class of alloys is characterised by the characteristics (A)-(D) as referred to above.

5.2.3 In contrast to the general formula  $(Ta_xTb_{1-x})_M Ba_{1-M}$  (cf. paragraph 4.1 above) of D1, characteristic (A) defines narrower composition ranges of mainly cobalt based amorphous alloys wherein the compositions depend on particular relative and absolute amounts of boron and silicon and particular possible amounts of cobalt and iron further depend on the particular amount of chromium, molybdenum and niobium. Although some specified compositions according to characteristic (A) have overlapping ranges with the broad general formula in D1, which mentions specific compositions falling under one of the ranges defined by characteristic (A), D1 does not hint at the complete variety as covered by characteristic (A). The same is true with respect to the alleged prior use material and the materials known from D7, D8 and D9. Of the latter, only D9 mentions the use for anti-theft markers.

5.2.4 The prior art also deals with certain aspects of characteristics (B) and (C) in the claimed context. However, there is nothing in the prior art pointing in the direction of characteristic (D), which is essential for the selection of marker materials to be used under stress. Even in connection with the alleged prior use, the presence of feature (D) has never been referred to. Nor is it derivable from D2 to D5. In the context, it is also to be noted that, apart from the fact that

signal retention under stress is not taught by the prior art, the value of 70% signal retention under the specified stress conditions is not arbitrary. On the one hand, 70% amplitude corresponds to about one half of the power of the full signal and is enough for detection by an ordinary anti-pilferage system without setting the sensitivity so high that false alarms occur. On the other hand, such a feature does not provide an extreme limitation to samples complying therewith, which might make it difficult to find a reasonable number of species.

6. *Conclusion*

If follows from the above considerations, that the subject-matter of Claim 1 of the patent in suit contains a selective combination of features which is aimed at solving the problem of improving the reliability of anti-theft markers. The disclosed solution is new and involves in the Board's view also an inventive step. The same applies to the subject-matter of dependent Claims 2 to 15, covering special embodiments of Claim 1. The decision under appeal must therefore be set aside and the patent can be maintained as granted subject to the amendment of Claim 1 referred to in paragraph VIII above.

**Order**

**For these reasons it is decided that:**

1. The decision under appeal is set aside.



2. The patent is to be maintained as granted subject to the replacement of the word "flexing" by "twisting" in Claim 1.

The Registrar:

The Chairman:

M. Kiehl

E. Persson