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D E C I S I O N
of 26 April 1995

Case Number: T 0925/93 - 3.5.2

Application Number: 86103846.1

Publication Number: 0197391

IPC: H01H 51/22

Language of the proceedings: EN

Title of invention:
Polarized electromagnetic relay

Patentee:
EURO-Matsushita Electric Works Aktiengesellschaft

Opponent:
Siemens AG
Fujitsu Limited

Headword:
-

Relevant legal provisions:
EPC Art. 56

Keyword:
"Inventive step - yes"
"Combination of features considered as a whole"

Decisions cited:
-

Catchword:
-



Case Number: T 0925/93 - 3.5.2

D E C I S I O N
of the Technical Board of Appeal 3.5.2
of 26 April 1995

Appellant:
(Proprietor of the patent)

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Decision under appeal:

Decision of the Opposition Division of the
European Patent Office dated 15 October 1993
revoking European patent No. 0 197 391 pursuant to
Article 102(1) EPC.

Composition of the Board:

Chairman: W. J. L. Wheeler
Members: R. G. O'Connell
C. Holtz

Summary of Facts and Submissions

I. The Appellant contests the decision of the Opposition Division to revoke European patent No. 0 197 391. The reason given for the revocation was that the subject-matter of Claim 1 did not involve an inventive step, having regard to the following prior art:

- D1: JP-A-54-93439
- D2: JP-A-59-75532
- D4: US-A-2 491 140
- D5: US-A-2 443 784.

II. The following document was also cited in support of the opposition:

- D3: EP-A-0 096 350.

III. Oral proceedings were held before the Board on 26 April 1995. Opponent II did not attend. The Appellant filed amended Claims 1 to 7 and an adapted description.

Claim 1 is now worded as follows:

"1. A polarised electromagnetic relay, including a casing (60),

an elongate armature (10) having its centre pivotally supported about a centre pivot axis (11) for angular movement between two contact operating positions,

an electromagnet (20) received in the casing (60) and having a core (24), exciter coil means (25) wound about the core (24) and a pair of pole members (22, 23) extending from the ends of the core towards the ends of the armature (10) on either side of the pivot axis (11),

a bar-shaped permanent magnet (30) disposed between the free ends of the pole members (22, 23) in closely adjacent relationship to the armature (10), said permanent magnet (30) being three-pole magnetised to have the same poles at its lengthwise ends and an opposite pole intermediate its ends, and

a pair of movable contact springs (41) fixedly connected to the armature (10) at their centre portions so as to be movable together with the armature (10) into and out of contact with corresponding fixed contacts (75) mounted on the casing (60), each contact spring (41) being formed at its side with an integral arm (43),

characterised in

that the contact springs (41) are embedded at their centre portions in the ends of a plastic moulding piece (12) connected to the armature (10) to provide a one-piece armature unit (40) with one contact spring (41) extending along and spaced from each lateral side of, and within the same plane as, the armature (10),

that each arm (43) extends perpendicularly from the centre of the contact spring (41) and is fixedly joined with a portion (64) formed at the centre of a respective side wall (61) of the casing (60), and

that each arm (43) is a resilient pivot arm element of limited torsional deformability which permits the armature (10) to pivot about the axis of the pivot arms (43) for movement between said two contact operating positions."

Claims 2 to 7 are dependent on Claim 1.

IV. The Appellant argued essentially as follows:

The technical problem solved by the invention was to improve the D1 relay in respect of (i) shock sensitivity (ii) ease of manufacture (iii) freedom to set contact force and armature response independently whilst (iv) maintaining armature to contact spring electrical insulation.

Improvement (i) was ensured by the "taut band" suspension and the symmetrical construction and suspension of the armature, a measure which was admittedly known per se - albeit from an old document (D5) relating to an outdated bulky relay which would not be looked at by a skilled person seeking to improve a modern subminiature relay of the D1 type. Furthermore, in the opposed patent, the taut band suspension of the armature assembly was implemented with the help of a plastic moulding piece which was also instrumental in achieving the other three improvements. Embedding the armature and pair of spring contacts in the plastic moulding piece contributed to ease of manufacture compared to D1, decoupled the contact springs from the pivot arm to meet objective (iii) and enabled good electrical insulation to be maintained to meet objective (iv).

Each of the individual partial problems was known per se but the invention solved all four in a neat and elegant fashion. The fact that the plastic moulding piece contributed on each improvement demonstrated the interdependence of the features of Claim 1; on this point the Appellant strongly contested the finding of the Opposition Division to the contrary.

It should also be noted that D1 showed only a single bridging contact as in D5, not a pair of laterally symmetrically disposed contact springs as in Claim 1.

The "moulding-in" technique could not be applied directly to the D1 design; the armature assembly could not be released from the mould.

Furthermore the D1 design suffered from the disadvantage that the armature was free to bounce up away from the bearing 22. In the embodiment of the opposed patent the bearing support provided by groove 31 was merely ancillary.

- V. The Respondents endorsed the reasoning of the Opposition Division in the impugned decision and submitted further arguments which can be summarised as follows:

The "embedding in plastic" or "moulding-in" feature, although not to be expected in 1947, at the date of D4, was a natural development from D1 or D2; at page 6 of D2 the description of Figure 3 referred to the "mold 30" and D3 showed "moulding-in" of a plurality of parts in a relay armature assembly. In D1 the plastic body designated 2 carried the armature 1 and contact springs 9; this body had studs which achieved the same effect as the "moulding-in" in the opposed patent, including insulation between 1 and 9; similarly for D2.

D4 could be disregarded as being too old only if there was evidence of a long-felt want; in the present case the want existed only when D1 and D2 appeared.

The shock-proof symmetric suspension was also found in D1 (reference signs 3A and 22) and D2, Figure 4, where the pivot arm was centrally disposed with respect to the contact springs. It should also be noted that in the opposed patent the armature pivoted in the groove 31 as shown in Figures 4 and 5. The suspension in D1 and D2 was effectively a taut band suspension; in D2 the U-shaped portions of the side arm springs produced a

resilient torque at the centre of the spring contacts as did the straight side arm springs in D1; in D2 the central axial portion at the junction of the side arms with the contact springs was "of limited torsional flexibility". Additionally, the axial torque was adjustable to set the armature response independently of the setting of the flexural response of the contact springs.

It was also argued that the claimed relay was obvious in view of D1 and D3 in combination.

VI. The Appellant requested that the decision under appeal be set aside and the patent be maintained on the basis of the following documents:

Claims: 1 to 7 filed in the oral proceedings held on 26 April 1995;

Description: column 1 as filed in the oral proceedings held on 26 April 1995, otherwise as granted;

Drawings: as granted.

VII. The Respondents requested that the appeal be dismissed.

Reasons for the Decision

1. The appeal is admissible.
2. The main issue to be considered in the present appeal is whether the subject-matter of Claim 1 involves an inventive step within the meaning of Article 56 EPC.

3. Claim 1 is delimited with respect to D1, the undisputed closest prior art. The technical problem solved by the invention, the subject of the opposed patent, is to improve the D1 relay in respect of (i) shock sensitivity (ii) ease of manufacture (iii) freedom to set contact force and armature response independently whilst (iv) maintaining armature to contact spring electrical insulation. These advantages are plausibly achieved by adapting the known relay as specified in the characterising portion of Claim 1.

3.1 D5 addresses inter alia the problem of shock sensitivity in polarised relays (cf. column 5, lines 19 to 23) and teaches as a solution the mounting of the armature by means of a torsionally resilient pivot arm extending perpendicularly from the centre of a contact member which in turn carries the armature, the pivot arm being clamped at its distal end between pole pieces of the stator frame (cf. Figure 5 and column 4, line 36 to column 5, line 37). This eliminates bearing friction and ensures a balanced smoothly resilient rotation about a well-defined central axis with no translational motion. To the extent that the contact member of D5 can be identified with the contact springs of Claim 1 of the present application (cf. point 3.3 below) the last two paragraphs of the claim can be read onto the armature mounting taught in D5 except that in the latter the relay stator frame rather than the side wall of the casing provides the fixed distal support.

3.2 The above facts do not justify a conclusion that the claimed relay results in an obvious manner from a combination of D1 and D5. Although D5 addresses the same problem of shock sensitivity and even proposes the same solution of torsionally resilient pivot mounting it does so in a context which would not lead the skilled person to adopt this solution without involving an inventive

step. A person skilled in the art, addressing in 1985 the problem of improving the D1 relay, in the respects indicated at point 3 above, would not expect to find a relevant teaching in a document relating to a relay developed in 1943. Since that date relays have undergone several generations of development, above all in the direction of miniaturisation, speed and sensitivity and compatibility with manufacture of equipment on printed circuit boards using integrated circuit components. This does not mean that old ideas do not sometimes find an application in a new context, but, for perfectly sound reasons, the person skilled in this art does not as a matter of routine seek inspiration in designs made over forty years previously when material options e.g. magnetic materials and plastics and performance and assembly requirements were radically different.

3.3 Even if, for the sake of argument, it were conceded that the skilled person might consider the D5 document, he would not readily see how the spring pivot idea taught therein could be implemented in the D1 relay since in the latter the spring contacts do not carry the armature. On the face of it the presence of the spring receptor 2 in D1 as the pivoting member carrying the armature below and the spring contacts above is incompatible with adopting the D5 teaching with its relatively massive unitary contact member carrying the armature. The key to combining the teachings of D1 and D5 is the modification of the D1 armature and contact assembly specified in the first paragraph of the characterising portion of Claim 1. Embedding the contact springs at their centre portions in the ends of a plastic moulding piece connected to the armature to provide a one-piece armature unit enables the pair of elongate flexible spring contacts to support the armature on a central torsionally resilient pivot axis, while the spaced lateral coplanar disposition of the

spring contacts both enhances the symmetry and hence dynamic balance of the moving unit and permits freedom of movement and independent adjustment of contact force of the spring contacts. At the same time the number of piece parts and assembly steps is reduced over D1 while the armature to contact spring insulation is maintained. There is, thus, a close interdependence of all the features recited in the claim, which therefore have to be considered in combination and not piecemeal as was done in the decision under appeal.

3.4 The one-piece armature unit specified in the first paragraph of the characterising portion of Claim 1 is the key to the confluent provision of the four advantages sought. Its structure is radically different to that of the armature units of D1 and of D5 and is in fact per se novel relative to all the available prior art (including D3, cf. point 4. below), leading to the conclusion that the person skilled in the art, starting from D1, would not arrive at the claimed relay structure without an inventive step being involved even if he took the step of considering the rather old document. The Respondents argued that the short transverse arms linking the spring contacts to laterally disposed elongate parallel flexure arms in D1 and in D2 were comparable with the torsionally resilient pivot axis of the present invention. However, there is no suggestion in either D1 or D2 that the transverse links act as torsional pivots and, as shown in D1, the axes of the links are offset on opposite sides of the middle of the armature.

4. For the sake of completeness, it is pointed out that D4 discloses an armature assembly similar to that of D5 but is less relevant to the problem solved by the present invention and therefore needs no further consideration. Nor does the relay according to Claim 1 result from a

combination of the prior art according to D1 with D3, because a torsion pivot in accordance with the last paragraph of the claim is not disclosed in either of these documents.

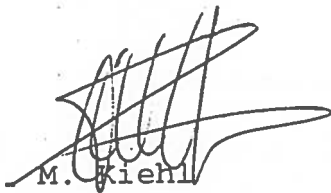
5. The Board therefore concludes that the relay of Claim 1 involves an inventive step over the cited prior art. In the view of the Board, the patent, as amended, and the invention to which it relates meet the requirements of the EPC.

Order

For these reasons it is decided that:

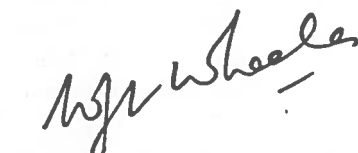
1. The decision under appeal is set aside.
2. The case is remitted to the department of first instance with the order to maintain the patent in the amended form requested by the Appellant (see paragraph VI above).

The Registrar:



M. Kiehl

The Chairman:



W. J. L. Wheeler

