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Aktenzeichen / Case Number / N° du recours : T 219/88 - 3.2.1

Anmeldenummer / Filing No / N° de la demande : 84 103 228.7

Veröffentlichungs-Nr. / Publication No / N° de la publication : 0 122 510

Bezeichnung der Erfindung: Dot matrix print actuator
Title of invention:
Titre de l'invention :

Klassifikation / Classification / Classement : B41J 9/02, B41J 3/10, B41J 7/70, B41J 9/42

ENTSCHEIDUNG / DECISION

vom / of / du 9 August 1989

Anmelder / Applicant / Demandeur : DATA PRODUCTS CORPORATION

Patentinhaber / Proprietor of the patent / Titulaire du brevet : -

Einsprechender / Opponent / Opposant : -

Stichwort / Headword / Référence :

EPÜ / EPC / CBE Article 56

Schlagwort / Keyword / Mot clé : Inventive step (yes)

Leitsatz / Headnote / Sommaire

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Case Number : T 219/88 - 3.2.1

D E C I S I O N
of the Technical Board of Appeal
of 9 August 1989

Appellant : DATA PRODUCTS CORPORATION
6200 Canoga Avenue
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Representative : Selting, Günther, Dipl.-Ing. et al,
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Decision under appeal : Decision of Examining Division of the European Patent Office dated 29 December 1987 refusing European patent application No. 84 103 228.7 pursuant to Article 97(1) EPC

Composition of the Board :

Chairman : F. Gumbel
Members : P. Alting van Geusau
O. Bossung

Summary of Facts and Submissions

I. European patent application No. 84 103 228.7 filed on 23 March 1984 and published on 24 October 1984 was refused by a decision of the Examining Division dated 29 December 1987.

II. The decision was based on Claims 1 to 16 filed on 4 July 1987 with letter of 1 July 1987.

The reason given for the refusal was that the subject-matter of Claim 1 included added subject-matter contrary to Art. 123(2) EPC.

III. An appeal was lodged against this decision on 27 February 1988 together with the appeal fee. The Statement of Grounds of Appeal was submitted on 27 April 1988 together with new Claims 1 and 2. Claims 3 to 16 as filed on 4 July 1987 were maintained.

IV. By letter of 29 June 1989, received on 19 July 1989, the Appellant filed a new set of Claims 1 to 15 and pages of the description 2, 2b, 3 and 13. He apparently requests the grant of a patent on the basis of these new documents together with page 1 received on 4 July 1987, page 2a received on 18 August 1987, original pages 4-12, original drawing pages 1/3, 2/3 and drawing page 3/3 filed on 24 January 1987.

V. Subsisting Claim 1 reads as follows:

"1. A stored energy type dot matrix print actuator assembly, comprising:
a mounting assembly (10);

a first plurality of elongated flat spring hammer elements (16) of which at least a portion is flexible, each hammer element (16) having a fixed end (16a) secured to the mounting assembly (10) and a movable end (16b) opposed to the fixed end (16a), which is movable relative to the mounting assembly (10) in a back and forth motion, wherein the hammer elements (16) are arranged in a spaced apart parallel relationship, and

a first group of magnetic circuits secured to the mounting assembly (10), each magnetic circuit including first and second spaced apart pole elements (26,28) having respective first and second pole faces (26a, 28a) which face a hammer element (16), a permanent magnet (30) magnetically coupled to the pole elements (26,28) to generate a magnetic field which flexes the hammer element (16) toward the pole faces (26a,28a), and coil means (32,34) for generating an electromagnetic field to overcome the magnetic field of the permanent magnet (30) to thereby release the flexed hammer element (16), characterized in
that the faces (26a,28a) of the pole elements (26,28) are positioned relative to the fixed and movable ends (16a,16b) of an associated hammer element (16) at locations near or at the anti-nodal points of the fundamental and second vibrational modes such that they interfere at least with the fundamental and second vibrational modes of the associated hammer element (16) when the associated hammer element (16) is flexed back to contact the pole faces (26a,28a) thereby reducing the resonance time of the hammer elements (16)."

Reasons for the Decision

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

2. Concerning formal aspects of Claim 1 the following is noted.

2.1 The present text of Claim 1, which no longer includes the definition of the position of the pole elements objected to by the Examining Division for reason of Art. 123(2) EPC, relates to a generalisation of the particular embodiment discussed on original page 11 with respect to Figs. 5a to 5c in which the first, second and third mode of vibration is dampened. In this embodiment the first pole element (26) is positioned near the free end of the hammer to dampen the first fundamental mode of vibration and the second pole element (28) is positioned adjacent an anti-nodal point of the second mode of vibration to thereby dampen the second mode of vibration. (As can be seen from Fig. 5c also the third mode of vibration is dampened). Further, according to a general statement on original page 3, lines 26-28 the pole elements are positioned so that they contact the hammer at points corresponding to anti-nodes of various modes of vibration of the hammer.

This information is considered sufficient for the skilled engineer to realise immediately, that there is a small range including the anti-nodal position at which an effective dampening could be achieved. In the present case the Appellant has tried in Claim 1 to define this small range by stating that the faces of the pole elements are positioned at locations near or at the anti-nodal points of the fundamental and second vibrational modes which is

considered to represent a clear and, in view of Art. 123(2) EPC, acceptable definition of such a small range.

It is noted that in the embodiment described on page 11 the pole element is located so that it is adjacent an anti-node of the second mode of vibration, however both terms near or adjacent indicate essentially the same in the present case e.g. that the pole elements are located at a close distance to said anti-nodes.

2.2 The present formulation of the position of the pole element is also considered to be sufficiently clear (Art. 84 EPC) in view of the reference to the anti-nodal points of the fundamental and second vibrational modes which points can easily be determined on the hammer element itself.

2.3 The nearest prior art is considered to be disclosed in US-A-4 258 623, which discloses a stored energy type dot matrix print actuator comprising all the features of the precharacterising part of Claim 1.

In view of the fact that the matrix print actuator according to US-A-4 258 623 comprises a hammer element which is essentially a flat spring the feature concerning the flexibility of the hammer element being such that the back and forth motion can include a fundamental, second and third mode is considered to be inherently included in this prior art hammer element (US-A-4 258 623, hammer element 30) and also in the subject-matter of present Claim 1.

Consequently, present Claim 1 no longer contains a reference to these modes of vibration in its characterising part and is now correctly divided into

preamble and characterising part in accordance with Rule 29(1) EPC having regard to the prior art assembly reflected by US-A-4 258 623.

3. As a result of the conclusions in paragraph 2.3 above the subject-matter of Claim 1 is novel over the available prior art. Since novelty has never been disputed no detailed substantiation of this matter is needed.

4. Regarding the requirement of an inventive step the following is observed:

4.1 The subject-matter of present Claim 1 differs from the prior art assembly disclosed in US-A-4 258 623 in that the faces (26a,28a) of the pole elements (26,28) are positioned relative to the fixed and movable ends (16a,16b) of an associated hammer element (16) at locations near or at the anti-nodal points of the fundamental and second vibrational modes such that they interfere at least with the fundamental and second vibrational modes of the associated hammer element (16) when the associated hammer element (16) is flexed back to contact the pole faces (26a,28a) thereby reducing the resonance time of the hammer elements (16).

These features have the effect of dampening the vibrations of the flexible hammer elements thereby enabling faster cycling times to be achieved.

4.2 The objective problem which underlies the actuator defined in the present Claim 1 relates therefore to an improvement of the known actuators to enable faster cycling times. The problem itself cannot be considered inventive since it is a well known desire to improve the speed of printer actuators.

Indeed, the cited prior art shows a variety of solutions to improve printing speed in stored energy actuators. Some of them relate to an increase of the resonant frequency and/or the amount of energy stored in the hammer element to improve the hammer release and retract abilities (US-A-4 233 894), improved magnetic switching (US A 4 273 039, column 1, lines 20-50; US-A-4 258 623, Abstract) or refer to shorter strokes of the hammer element (US-A-4 280 404, column 2, lines 20-25).

Other documents refer to avoidance of inertia and deformation problems to improve printing speed (US-A-4 136 978, column 1, lines 29-39, column 2, lines 9-15).

Although not directly disclosed as a solution to improve printing speed, the prior art disclosed in US_A-3 941 051 and US-A-4 044 668, which also relates to stored energy actuators, further refers to a resilient damping element (92) respectively (108) disposed between the base of the hammer and the facing portion of the hammer.

4.3 However none of the cited documents refers to dampening of the fundamental and second vibrational modes of hammer actuators by contacting the hammer elements at selected positions with the pole elements nor show these documents embodiments upon which it could be said that, merely by coincidence, the poles are in the defined positions of Claim 1.

Hence, no lead to the subject-matter of Claim 1 can be derived from the cited documents. The actuator according to Claim 1 is therefore considered to include an inventive activity.

5. It follows that Claim 1 is acceptable under Art. 52(1) EPC. The same applies to dependent Claims 2 to 15 which concern particular embodiments of the invention according to independent Claim 1 (Rule 29(3) EPC).

6. The description and the drawings are in agreement with the actual wording and scope of the claims. The description also complies with Rule 27(1)(c) and 27(1)(d) EPC. Hence those documents appear to be suitable for the grant of a patent.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.

2. The case is remitted to the first instance with the order to grant the patent on the basis of the following documents

Claims: 1 to 15 filed on 19 July 1989

Description: page 1 filed on 4 July 1987,
pages 2, 2b, 3, 13 filed on 19 July 1989,
page 2a filed on 18 August 1987,
pages 4-12 as originally filed,

Drawings: pages 1/3, 2/3 as originally filed,
page 3/3 filed on 24 January 1987.

The Registrar: The Chairman:

F. Klein F. Gumbel