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D E C I S I O N
of 22 October 1997

Case Number: T 0893/95 - 3.2.5

Application Number: 89907297.9

Publication Number: 0396756

IPC: D05B 69/10

Language of the proceedings: EN

Title of invention:
Sewing machine drive device

Patentee:
Matsushita Electric Industrial Co., Ltd.

Opponent:
Frankl & Kirchner GmbH & Co. KG Fabrik für Elektromotoren u.
elektrische Apparate

Headword:

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Relevant legal provisions:
EPC Art. 56

Keyword:
"Inventive step (yes)"

Decisions cited:

-

Catchword:

-



Case Number: T 0893/95 - 3.2.5

D E C I S I O N
of the Technical Board of Appeal 3.2.5
of 22 October 1997

Appellant:
(Opponent)

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Respondent:

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Decision under appeal:

**Decision of the Opposition Division of the
European Patent Office posted 19 October 1995
rejecting the opposition filed against European
patent No. 0 396 756 pursuant to Article 102(2)
EPC.**

Composition of the Board:

Chairman: G. O. J. Gall

Members: A. Burkhart
H. P. Ostertag

Summary of Facts and Submissions

I. The appellant (opponent) lodged an appeal against the decision of the Opposition Division rejecting the opposition against the patent No. 0 396 756.

Opposition was filed against the patent as a whole and based on Article 100(a) EPC (lack of inventive step).

The Opposition Division held that the grounds for opposition mentioned in Article 100(a) EPC did not prejudice the maintenance of the patent unamended, having regard to the following documents

D1: DE-C-2 732 512,

D2: EP-A-0 081 684 and

D3: "Power Linear Actuators, 2nd edn., January 1984, SGS Technology and Service, 61-82.

II. Oral proceedings before the Board of Appeal were held on 22 October 1997.

(i) The appellant requested that the decision under appeal be set aside and the patent be revoked.

(ii) The respondent (proprietor of the patent) requested that the appeal be dismissed.

(iii) Claims 1 and 2 of the granted patent read as follows:

"1. Sewing machine drive apparatus comprising a motor drive circuit (3) for driving a motor and a solenoid drive circuit (9) for driving a solenoid, **characterised by:**
a first rectifying-smoothing circuit (2) which is connected to an AC power source (1), a second rectifying-smoothing circuit (7) which is connected to the AC power source (1) and a DC/DC converter solenoid power source circuit (8) which takes an output voltage of the second rectifying-smoothing circuit (7) as input, wherein the motor drive circuit (3) takes an output voltage of the first rectifying-smoothing - circuit (2) as an input and the solenoid drive circuit (9) takes the output voltage of the power source circuit (8) as input and receives solenoid drive signals from a sewing machine control circuit (6) for controlling the sewing machine."

"2. Sewing machine drive apparatus comprising a motor drive circuit (3) for driving a motor and a solenoid drive circuit (9) for driving a solenoid, **characterised by:**
a rectifying-smoothing circuit (2) which is connected to an AC power source (1), and a DC/DC converter solenoid power source circuit (8) which takes an output voltage of the rectifying-smoothing circuit (2) as input, wherein the motor drive circuit (3) takes an output voltage of the rectifying-smoothing circuit (2) as an input and the solenoid

drive circuit (9) takes the output voltage of the power source circuit (8) as input and receives solenoid drive signals from a sewing machine control circuit (6), whereto output voltage for driving the DC/DC-converter (8) of solenoid (SIC) is inputted, for controlling the sewing machine."

(iv) The appellant argued essentially as follows:

Document D2 (cf. Figures 1 and 6) disclosed a sewing machine drive apparatus comprising a DC motor drive circuit and a control circuit for controlling actuating means, like a pressure foot, a cutter, a stitch setter etc., which actuating means were normally electromagnetically driven by a solenoid. Although not shown in D2, it was self-evident to the person skilled in the art that the DC motor took an output voltage from a rectifying-smoothing circuit connected to a AC power source. Moreover, D2 mentioned that the DC circuit for the motor should be controlled by a pulse generator operated at a high-frequency of about 9 kHz, in order to avoid acoustic noise.

The person skilled in the art confronted with a problem of providing for the solenoid driving means a power source circuit which produced a high voltage in an initial phase and a low voltage in a holding phase and which avoided acoustic noise would consider the use of a DC/DC converter power source circuit, as was for example described in the handbook D3 on pages 61

to 64 as "L294 solenoid driver", the switching frequency of which lay in the range of 10 to 30 kHz, i.e. above the audible frequency.

The provision of one (according to claim 2) or two (according to claim 1) rectifying-smoothing circuit(s) was at the discretion of the person skilled in the art and had nothing to do with the avoidance of acoustic noise.

Therefore, the subject-matter of claims 1 and 2 of the patent in suit did not involve an inventive step.

(v) The respondent argued essentially as follows:

Document D2 was silent about solenoids and solenoid driving means, and therefore, the problem of acoustic noise created by solenoid driving means did not arise in the sewing machine drive apparatus disclosed in this document.

The closest prior art was disclosed in document D1. This document disclosed a sewing machine drive apparatus comprising a solenoid drive circuit for driving a solenoid. This solenoid drive circuit comprised a chopping control circuit for holding the solenoid during the control thereof, the chopping sound of which generated unpleasant acoustic noise.

The person skilled in the art had no incentive to consider the document D3, which did not relate to

sewing machine drives but which was concerned with computer peripherals, like needle printers, and which did not address the problem of avoiding acoustic noise during the control operation of a solenoid.

Therefore, it was not obvious to the person skilled in the art to replace in the drive apparatus according to document D1 the chopping control circuit by a DC/DC converter circuit, and consequently, the subject-matter of claims 1 and 2 of the patent in suit involved an inventive step.

Reasons for the Decision

1. *Novelty*

The sewing machine drive apparatus according to claims 1 and 2 of the patent in suit is novel, since none of the documents cited by the appellant discloses an apparatus comprising all the features of claim 1 or claim 2, respectively.

Novelty, in fact, has not been in dispute in these proceedings.

2. *Inventive step*

2.1 Closest prior art

The closest prior art is represented by document D1.

This document discloses a sewing machine drive apparatus comprising a solenoid drive circuit for driving a solenoid. This circuit is a chopping control circuit by which the output voltage for holding the solenoid is controlled by chopping the input DC power source voltage.

2.2 Problem

During holding of the solenoid this chopping control circuit generates a chopping sound (frequency of the chopping signal), i.e. an acoustic noise which gives an unpleasant feeling to the operator of this sewing machine.

Therefore, the problem underlying the invention consists in improving the sewing machine drive apparatus known from document D1 in the sense that acoustic noise during the holding of the solenoid is eliminated.

2.3 Solution

This problem is solved according to the invention of the patent in suit by modifying the sewing machine drive apparatus according to D1 by the features of the characterising portion of claim 1 of the patent in suit, in particular by using for the control of the solenoid a DC/DC converter power source circuit instead of a chopping control circuit.

The use of such a DC/DC converter power circuit does not generate an acoustic noise during the holding of the solenoid.

2.4 The Board does not agree with the contention of the appellant that the aforementioned solution is rendered obvious to the person skilled in the art by the disclosures of the documents D2 and D3, for the following reasons:

Document D2 (cf. Figures 1 and 6) discloses a sewing machine drive apparatus comprising a DC motor drive circuit which is controlled by a pulse generator operated at a frequency of above 9 kHz, in order to avoid acoustic noise (see page 3, first paragraph). The sewing machine drive according to D2 comprises also a control circuit for controlling actuating means, like a pressure foot, a cutter or a stitch setter. Document D2 is concerned with the design of a specific DC motor drive circuit comprising a security control circuit to prevent damage of the DC motor drive of the sewing machine in case of current overload.

However, document D2 is totally silent about the means by which the actuating elements for the pressure foot, the cutter or the stitch setter are driven. D2 does not disclose a solenoid, let alone, a solenoid drive circuit.

Therefore, the problem of eliminating noise generated in a solenoid drive circuit does not arise in the apparatus of D2, and, consequently, this document cannot assist the person skilled in the art looking for a solution to the problem underlying the invention.

Document D3 is a handbook describing various switch-mode solenoid drivers which are said to be suitable for applications in computer peripherals, like needle printers. The so-called "L294" and "L295" circuits described therein and referred to by the appellant act as DC/DC converter solenoid power source circuits.

However, document D3 does not relate to sewing machine drives and does not address the problem of eliminating acoustic noise generated by a solenoid drive circuit.

Therefore, the person skilled in the art confronted with the problem underlying the invention was by no means incited to consult the document D3, let alone, to focus his interest on this specific DC/DC converter circuits L294 or L295 disclosed therein and to use those specific solenoid drive circuits in the sewing machine drive apparatus according to document D1 instead of the chopper control circuit.

Since none of the documents cited by the appellant gives any hint that the use of a DC/DC converter power source circuit for driving a solenoid eliminates acoustic noise, the use of such a DC/DC converter circuit according to the solution of claim 1 is not obvious to the person skilled in the art.

- 2.5 Therefore, the subject-matter of claim 1 involves an inventive step in the meaning of Article 56 EPC.
3. The same applies to the subject-matter of claim 2, which comprises also the essential feature "DC/DC converter solenoid power source circuit" and which

differs from the subject-matter of claim 1 only in that a single rectifying-smoothing circuit is used for both the motor and the solenoid drive.

4. Consequently, the subject-matter of claims 1 and 2, as well as the subject-matter of the dependent claim 3, of the patent in suit constitutes a patentable invention in the meaning of Article 52(1) EPC.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar:

The Chairman:

A. Townend

G. Gall