

Internal distribution code:

- (A) Publication in OJ
(B) To Chairmen and Members
(C) To Chairmen
(D) No distribution

**Datasheet for the decision
of 22 July 2010**

Case Number: T 1289/07 - 3.5.04

Application Number: 04007841.2

Publication Number: 1465435

IPC: H04N 9/31

Language of the proceedings: EN

Title of invention:

Cooling fan for a liquid crystal projector

Patentee:

SANYO ELECTRIC CO., LTD.

Opponent:

-

Headword:

-

Relevant legal provisions:

EPC Art. 123(2)

Relevant legal provisions (EPC 1973):

EPC Art. 56

Keyword:

"Main request: Inventive step - no"

"Auxiliary request: Amendments - added subject-matter (yes)"

Decisions cited:

-

Catchword:

-



Case Number: T 1289/07 - 3.5.04

D E C I S I O N
of the Technical Board of Appeal 3.5.04
of 22 July 2010

Appellant: SANYO ELECTRIC CO., LTD.
5-5, Keihan-Hondori 2-chome
Moriguchi-shi, Osaka 570-8677 (JP)

Representative: Glawe, Delfs, Moll
Patent- und Rechtsanwälte
Postfach 26 01 62
D-80058 München (DE)

Decision under appeal: Decision of the Examining Division of the
European Patent Office posted 19 February 2007
refusing European patent application
No. 04007841.2 pursuant to Article 97(1) EPC
1973.

Composition of the Board:

Chairman: F. Edlinger
Members: C. Kunzelmann
C. Vallet

Summary of Facts and Submissions

- I. The appeal is against the decision of the examining division to refuse European patent application No. 04 007 841.2.

- II. The application was refused on the grounds of lack of novelty (Article 54(1), (2) EPC 1973) and lack of inventive step (Article 56 EPC 1973) over cooling fan startup control devices disclosed in

D3: US 5 621 159 A.

- III. The applicant appealed and requested that the decision under appeal be set aside and a patent granted. With the statement of grounds of appeal the appellant filed a new sole claim (claim 1) and arguments supporting the appellant's view that the claimed subject-matter was new and involved an inventive step.

- IV. The board issued a communication pursuant to Article 15(1) of the Rules of Procedure of the Boards of Appeal (RPBA) annexed to a summons to oral proceedings and dated 12 May 2010. In this communication the board gave its provisional opinion that the claimed subject-matter was new. However the board expressed doubts whether the claimed subject-matter involved an inventive step.

- V. With a letter dated 22 June 2010 the appellant filed a sole claim (claim 1) according to an auxiliary request.

VI. Oral proceedings were held on 22 July 2010. The appellant's final requests were that the decision under appeal be set aside and that a patent be granted on the basis of claim 1 filed with the statement of grounds of appeal, as a main request, and on the basis of claim 1 filed with the letter dated 22 June 2010, as an auxiliary request. At the end of the oral proceedings the chairman announced the board's decision.

VII. Claim 1 of the main request reads as follows.

"A cooling fan startup control device for a liquid crystal projector, comprising:
detection means (10) for detecting whether a cooling fan (3) is stopped or is being rotated; characterized by
first control means (1) for gradually raising a voltage to be applied to the cooling fan (3) from a state where the cooling fan (3) is stopped, when starting the cooling fan (3); and
second control means (1) for setting the voltage to be applied to the cooling fan (3) to a predetermined normal operating voltage when the detection means (10) detects that the cooling fan (3) starts rotating, in the process of gradually raising the voltage to be applied to the cooling fan (3) by the first control means (1), wherein the predetermined normal operating voltage is lower than a minimum voltage for fan starting which is defined by a specification of the cooling fan (3)."

VIII. Claim 1 of the auxiliary request reads as follows.

"A cooling fan startup control device for a liquid crystal projector, comprising:
detection means (10) for detecting whether a cooling fan (3) is stopped or is being rotated; characterized by
first control means (1) for raising a voltage to be applied to the cooling fan (3) by one step for each predetermined time interval from a state where the cooling fan (3) is stopped, without decreasing the applied voltage, when starting the cooling fan (3);
determination means for determining whether the cooling fan (3) starts rotating, using an output from the detection means (10) every time the voltage to be applied to the cooling fan (3) is raised by one step by the first control means (1), and
second control means (1) for setting the voltage to be applied to the cooling fan (3) to a predetermined normal operating voltage when the determination means detects that the cooling fan (3) starts rotating, wherein the predetermined normal operating voltage is lower than a minimum voltage for fan starting which is defined by a specification of the cooling fan (3)."

IX. The reasons given in the decision under appeal can be summarised as follows.

Document D3 (see the embodiment in figure 4) disclosed a cooling fan startup control device comprising all the features of claim 1 then on file. The fan disclosed in D3 was used for a PC, but it was also suitable for a liquid crystal projector. Furthermore it was implicit that the PC disclosed in D3 comprised a normal fan

operation mode and applied the respective normal operating voltage to the cooling fan after termination of the fan startup process. If the expression "predetermined normal operating voltage" were interpreted so as to represent a value for the operating voltage stored in the startup control device in advance so as to apply this constant voltage after the startup process then the subject-matter of claim 1 would not involve an inventive step because D3 disclosed another embodiment of a cooling fan which comprised a control circuit applying a constant voltage of 12 V to the cooling fan as the normal operating voltage.

X. The appellant's arguments can be summarised as follows.

D3 related to a test system for periodically examining whether the bearing performance of the cooling fan was degraded. The test system of D3 was not a startup control device. According to D3 the voltage applied to the cooling fan was gradually increased during a periodical test, but not in normal operation. The test according to D3 would reasonably be carried out on a weekly or monthly basis, but not every time the cooling fan was started. During the test individual voltage pulses of stepwise increasing height were applied to the cooling fan, but between the pulses the voltage was zero.

D3 addressed the problem of monitoring the bearing friction of a cooling fan, but it did not disclose or address the problem underlying the present invention, which was to reduce noise at the time of starting the cooling fan.

Hence an ex post facto analysis had been made in the decision under appeal. A person skilled in the art could have used the test system of D3 at the time of starting the cooling fan, but would not have done it since D3 did not disclose the use of the test system at the time of starting the cooling fan and since, to solve the problem of monitoring bearing friction, it would not be reasonable to carry out the test every time the cooling fan was started.

Furthermore the test system of D3 did not have a second control means for setting the voltage to be applied to the cooling fan to a predetermined normal operating voltage which was lower than a minimum voltage for fan starting defined by a specification of the cooling fan.

Reasons for the Decision

1. The appeal is admissible.
2. *Main request: inventive step (Article 56 EPC 1973)*
 - 2.1 The closest prior art

It is undisputed that the embodiment of figures 4 and 5 of D3 has the most features in common with the detection and control means of the cooling fan startup control device according to claim 1. However it is disputed whether D3 discloses a cooling fan startup control device, and whether D3 may be considered as the closest prior art even though it concerns a different

problem to be solved from that of the present application.

2.1.1 It is established case law that the closest prior art for assessing inventive step is normally a prior art document disclosing subject-matter conceived for the same purpose or aiming at the same objective as the claimed invention and having the most relevant technical features in common, i.e. requiring the minimum of structural modifications. A further criterion for the selection of the most promising starting point is the similarity of the technical problem (see Case Law of the Boards of Appeal of the European Patent Office, 6th edition, July 2010, I.D.3.1 to I.D.3.3).

2.1.2 D3 discloses a cooling fan test system for measuring the bearing friction of a fan (see column 1, lines 6 to 9 and claim 1). Rotation timing or startup voltage values are collected periodically over time and stored in a memory for determining the status or the mean time to failure of the fan (see column 1, lines 58 to 61 and column 3, lines 32 to 41). In the embodiment of figures 4 and 5, the operation of the fan test system is as follows. A control circuit initially opens a switch (404) to completely turn off the fan. The control circuit then controls a variable power source to apply an incremental voltage to the fan. The voltage is increased to a sufficient voltage to start the fan (see column 7, line 49 to column 8, line 2). Hence the test system is specifically arranged to control the voltage applied to the fan so that initially zero voltage is applied and subsequently the voltage is increased incrementally until it is detected that the

fan has started rotating. Thus the board finds that the fan test system of D3 includes a cooling fan startup control device and is conceived for the purpose of controlling the startup of a cooling fan.

Furthermore D3 concerns cooling fans for use in electronic devices such as personal computers. The board agrees with the decision under appeal that this device is also suitable for controlling the cooling fan of a liquid crystal projector. The power requirements and dimensions in both cases are similar and the control means for raising and setting the voltage according to claim 1 do not imply any other adaptation of parameters (e.g. voltage and current) than those which also vary for different projectors. Thus the board finds that the fan test system of D3 includes a cooling fan startup control device for a liquid crystal projector.

In this context the board notes that claim 1 of the present application does not specify features of the liquid crystal projector or of the cooling fan which would imply features of the cooling fan startup control device beyond that of its being suitable for controlling the startup of a cooling fan of an unspecified liquid crystal projector.

- 2.1.3 It is undisputed that D3 addresses the technical problem of monitoring fan bearing wear-out during operation (see point 2.1.2 above). The problem of noise reduction is not addressed in D3. It is, however, implicit that fan noise does not occur during the test until a voltage level sufficient to start the cooling

fan is reached (see column 7, line 49 to column 8, line 9 and figure 5).

2.1.4 The present application explicitly states that "[a]n object of the present invention is to provide a liquid crystal projector capable of reducing noise at the time of starting a cooling fan" (see page 2, second but last paragraph, of the description filed with the letter dated 13 November 2006). This "object of the present invention" is formulated on the basis of a liquid crystal projector of the prior art in which a high level of noise is produced at the time of starting because a higher voltage is initially applied to make sure that the fan motor overcomes the higher initial torque (break away torque) and starts rotating (see the paragraph bridging pages 1 and 2 of the description filed with the letter dated 13 November 2006). When the fan starts rotating, and until the higher voltage V_h is switched to the normal operating voltage V_m after a predetermined period of time has elapsed (figure 3: lines b and a), a high level of noise is produced. This "object of the present invention", namely the reduction of noise between the start of fan rotation and the application of the normal operating voltage, is also achieved with the cooling fan startup control device of the embodiment of figures 4 and 5 of D3 if the power supply voltage is switched to the normal operating voltage when it is detected that the fan has started rotating (see point 2.1.3 above).

2.1.5 In view of the above the board finds that the embodiment of figures 4 and 5 of D3 (the third embodiment) may be considered as the closest prior art.

2.1.6 The appellant's argument that the decision under appeal was based on hindsight when selecting D3 as the closest prior art did not convince the board. Claim 1 seeks protection for a cooling fan startup control device for a liquid crystal projector irrespective of the circumstances under which the fan is started. For the assessment of inventive step it is irrelevant whether the device of the closest prior art controls the cooling fan startup during a periodic test or whenever a liquid crystal projector fan is turned on, since this is not specified in claim 1. At what intervals the device of the closest prior art controls the cooling fan startup is also irrelevant.

2.2 The objective technical problem

2.2.1 It is established case law that, when the "problem and solution approach" is used to assess inventive step, the technical problem to be formulated for this assessment is the objective technical problem as determined by assessing the technical results (or effects) achieved by the claimed invention when compared with the closest prior art. The objective technical problem may differ from the problem formulated in the application, in particular if the objective assessment of inventive step draws on newly introduced prior art which is closer to the invention than that cited in the original application (see Case Law of the Boards of Appeal of the European Patent Office, 6th edition, July 2010, I.D.2 and I.D.4.4).

2.2.2 D3 discloses in the context of its embodiment of figures 4 and 5 a cooling fan startup control device for a liquid crystal projector (see point 2.1.2 above)

comprising detection means for detecting whether a cooling fan has stopped or is being rotated (see column 7, lines 39 to 48). This embodiment also comprises first control means for gradually raising a voltage to be applied to the cooling fan, from a state where the cooling fan is stopped, when starting the cooling fan (see column 7, line 49 to column 8, line 9 and figure 5). However, the embodiment of figures 4 and 5 of D3 does not have a second control means for setting the voltage to be applied to the cooling fan to a predetermined normal operating voltage **when** the detection means detects that the cooling fan starts rotating, in the process of gradually raising the voltage to be applied to the cooling fan by the first control means, wherein the predetermined normal operating voltage is lower than a minimum voltage for fan starting defined by a specification of the cooling fan, as specified in present claim 1 (emphasis added by the board).

- 2.2.3 The second control means has the effect that the test in D3 can be carried out on a periodic basis (see D3, column 1, lines 58 to 61) without the need to switch off the fan (see D3, column 6, lines 47 to 54) at the beginning of the test. The problem set out in the present application is already solved with the cooling fan startup control device of the embodiment of figures 4 and 5 of D3, since the power supply voltage is gradually (incrementally, see D3, column 7, lines 62 to 65) increased until the fan starts rotating and no higher than normal operating voltage is applied (see point 2.1.4 above).

2.2.4 Hence the board finds that the objective technical problem may be formulated as follows: "How to modify the embodiment of figures 4 and 5 of D3 such that the test can be carried out on a periodic basis without the need to switch off the fan at the beginning of the test".

2.3 The solution suggested in D3

2.3.1 According to D3, it is desired to periodically monitor the status of a fan during operation (see column 1, lines 58 to 61). In the context of personal computers, the fan is only in operation when the computer is in operation. Hence the status of the fan can only be monitored during operation of the personal computer. The (test) startup control of D3 could be carried out after the running fan has stopped (as disclosed in D3), or when the cooled device is started up. Since the third embodiment is based on the recognition that the minimum startup voltage of the fan increases over time due to increased bearing friction (see column 7, lines 9 to 12), a person skilled in the art would have chosen a suitable period for carrying out the test. In contrast to devices with continually running cooling fans, it is not uncommon for a personal computer to be switched on periodically, for instance daily in the morning. Therefore a person skilled in the art would have considered running the fan test system of the third embodiment upon starting the computer, thereby avoiding the disadvantage of having to wait until the fan has stopped (see column 6, lines 47 to 52). When running the fan test upon starting the computer, fan rotation is detected during the application of voltage pulses and there would be no reason why the switch (404)

should be opened again once the startup voltage has been detected, as there would be no reason to switch off the fan. In this situation there would also be no need to apply the (higher) minimum voltage for fan starting as defined in fan specifications, since the fan motor has already overcome the higher initial torque and has started rotating (see point 2.1.4 above). Instead, the person skilled in the art would have provided the power signal required for operating the fan in normal operating conditions, such as a 12 V power signal (see column 3, last line, to column 4, line 2), when the detection means detects that the cooling fan has started rotating.

2.3.2 By operating the fan test system of the third embodiment of D3 with this obvious modification, the fan would have been started with low noise production as a predictable advantage. Since there is no distinguishable difference in the startup control until fan rotation is detected, the startup control of D3 is also suitable for cooling fans of the type to which the last feature of claim 1 refers, namely "wherein the predetermined normal operating voltage is lower than a minimum voltage for fan starting which is defined by a specification of the cooling fan (3)".

2.3.3 The appellant's argument that this feature constituted a further difference over the prior art disclosed in D3 thus did not convince the board. For cooling fans of this type the normal operating voltage is lower than the minimum voltage for fan starting because friction at fan start is higher than friction during fan operation (see point 2.1.4 above). However, with a startup control device where the power supply voltage

is gradually increased until fan rotation is detected, there is no need to apply a higher voltage first as a safety measure. The actual voltage level at which the fan starts rotating - with respect to the normal operating voltage - is not relevant and is not specified in claim 1. The voltage would simply be increased until fan rotation is detected. Once the fan is rotating, normal operating voltage is sufficient to assure that the fan continues rotating ("operation assurance voltage"; see the paragraph bridging pages 1 and 2 of the description filed with the letter dated 13 November 2006). Although, starting from D3 under the conditions set out above, it would have been theoretically possible to stop the fan after carrying out the test and start it again (applying the higher minimum voltage defined by a specification) to start normal cooling operation, this would have been counter-intuitive for a person skilled in the art because it would be more complicated, take longer and cause more noise. Instead, a person skilled in the art would have set the predetermined normal operating voltage for the cooling fan in D3 when the fan has started rotating, at least as long as the cooling effect is sufficient to maintain the temperature within the desired limits.

- 2.4 Therefore the board has come to the conclusion that the subject-matter of claim 1 covers obvious modifications of the prior art disclosed in D3 and thus does not involve an inventive step (Article 56 EPC 1973).

3. *Auxiliary request: added subject-matter (Article 123(2) EPC)*

3.1 Claim 1 of the auxiliary request comprises "first control means (1) for raising a voltage to be applied to the cooling fan (3) by one step for each predetermined time interval from a state where the cooling fan (3) is stopped, **without decreasing the applied voltage, when starting the cooling fan (3)**" (emphasis by the board). According to the appellant this feature is disclosed in figure 3 of the application as filed.

3.2 Figure 3 is a drawing showing the change in voltage to be applied to the fan motor when starting the cooling fan. The corresponding description in the paragraph bridging pages 6 and 7 of the application as filed discloses that "a control value to the fan voltage control circuit 2 is increased by one step for each predetermined time interval such that the fan voltage is gradually raised". Hence the control value is stepwise increased, but there is no disclosure whether the consequential increased voltage applied to the fan motor is maintained during the entire predetermined time interval. It would be conceivable, for instance, that the stepwise increase of the control value changes the pulses of a pulse width modulated (PWM) voltage applied to the cooling fan's motor. Such a pulse width modulation was common for driving motors at the priority date of the present application. The resulting fan motor voltage would gradually increase on a large timescale, whereas it would be pulsed on a small timescale. Furthermore it is clear from the legend of the voltage axis in the voltage versus time chart in

figure 3 that the solid line a in figure 3 does not represent a curve of measured voltage values but instead a voltage to be applied to the fan (motor). Moreover the solid line a in figure 3 is coarsely drawn such that the effects of the stepwise increase of the control value on the voltage applied to the fan motor are not reflected in figure 3. Hence the board finds that the schematic drawing of figure 3 does not directly and unambiguously disclose that the applied voltage is stepwise increased and not decreased when starting the cooling fan.

- 3.3 Hence the board finds that claim 1 of the auxiliary request contains subject-matter extending beyond the content of the application as filed (Article 123(2) EPC).

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar:

The Chairman:

L. Fernández Gómez

F. Edlinger