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Bezeichnung der Erfindung: Infrared radiation source arrangement.
Title of invention:
Titre de l'invention :

Klassifikation / Classification / Classement : G01J 3/10; H05B 3/26

ENTSCHEIDUNG / DECISION

vom / of / du 7 September 1989

Anmelder / Applicant / Demandeur : Nordal, Per-Erik and
Kanstad, Svein Otto

Patentinhaber / Proprietor of the patent /
Titulaire du brevet :

Einsprechender / Opponent / Opposant :

Stichwort / Headword / Référence :

EPÜ / EPC / CBE Articles 56 and 84

Schlagwort / Keyword / Mot clé : "Inventive step (No)"; "Claim lacking clarity and Support (Yes)"

Leitsatz / Headnote / Sommaire

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Case Number : T 511/88 - 3.4.1

D E C I S I O N
of the Technical Board of Appeal 3.4.1
of 7 September 1989

Appellants : Nordal, Per-Erik
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and

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Decision under appeal : Decision of Examining Division 040 of the European Patent Office dated 20 May 1988 refusing European patent application No. 83 900 664.0 pursuant to Article 97(1) EPC

Composition of the Board :

Chairman : K. Lederer
Members : J. Roscoe
C. Payraudeau

Summary of Facts and Submissions

I. European patent application No. 83 900 664.0 (international publication number W 83/03001) was refused by decision of the Examining Division.

II. The reason given for the refusal was that the independent Claim 1 filed with the Applicants' letter dated 19 January 1988 was not clear, since it attempted to define the invention by the result to be achieved rather than clear technical features, and that the application did not therefore comply with the requirements of Article 84 EPC. In support of its opinion the Examining Division referred to the Guidelines for Examination C-III, 4.7. It was also stated in the decision that as far as the claim could be understood its subject matter would be obvious to the skilled person having a knowledge of US-A-3 961 155 (D4).

III. Claims 1 and 2, the only independent claims of the application at the time of refusal read as follows:

"1. An infrared radiation source arrangement for use in producing a pulsating beam of infrared radiation, comprising

(a) an electrically insulating substrate (2),

(b) at least one resistive element (2a, 2b) comprising an electrically conducting film carried on one surface of said substrate,

(c) electrical circuit means (1; 11, 19) for energising and controlling the emission of infrared radiation from said resistive element,

characterised in that:

said electrical circuit means is arranged to energise said resistive element with a pulsating current having a frequency f, the period of each cycle being divided approximately into a first time interval in which the energising current has a value substantially greater than zero and a second time interval in which the current is zero or close to zero, such that the resistive element emits a pulsating beam of thermal infrared radiation and wherein the thickness of the substrate is chosen within a range having a minimum value such that heat generated in each said first time interval is retained by the substrate within the first time interval and having a maximum value related to the frequency f so that the substrate does not retain a substantial amount of heat generated within said first time interval for a time greater than one said period of each cycle in order to adequately resolve the pulsating radiation.

2. An infrared radiation source arrangement for use in producing a pulsed beam of infrared radiation, comprising:

(a) an electrically insulating substrate (2),

(b) at least one resistive element (2a, 2b) comprising an electrically conducting film carried on one surface of said substrate,

(c) electrical circuit means (1; 11, 19) for energising and controlling the emission of infrared radiation from said resistive element,

characterised in that

said electrical circuit means is a pulse circuit to energise said resistive element with pulses such that the resistive element emits pulses of thermal infrared radiation and in that the thickness (L) of the substrate is so chosen in relation to the thermal conductivity (k), specific heat capacity (C) and density (ρ) of the substrate material, that the following relationship is satisfied:

$$\left[\frac{k\tau_1}{\pi\rho c}\right]^{\frac{1}{2}} < L < \left[\frac{k\tau_2}{\pi\rho c}\right]^{\frac{1}{2}}$$

where

τ_1 is the pulse length of the pulses provided by said electrical circuit means, and

τ_2 is the spacing between said pulses."

IV. The Appellants lodged an appeal against this decision.

V. In the Statement of Grounds of Appeal the Appellants presented arguments in defence of Claim 1 and requested oral proceedings in the event that the Board felt unable to reverse the appealed decision and order grant of a patent including this claim. In the event of Claim 1 being finally rejected the Appellants would wish to pursue the application further with Claim 2 as the main independent claim.

VI. (a) In a communication pursuant to Article 11(2) of the Rules of Procedure of the Boards of Appeal, accompanying the summons to oral proceedings, the Rapporteur, on behalf of the Board, informed the Appellants that, although in the present case there

would appear to be no objection in principle to claims with functional limitations, such claims like all other claims had to be clear, and that Claim 1 in its present form was lacking in clarity because of the use of certain vague expressions and also in support in the description.

Thus, the requirements that "the substrate does not retain a substantial amount of heat generated within the first time interval for a time greater than one said period of each cycle" was rendered vague by the use of the word "substantial", and the additional qualification" in order to adequately resolve the pulsating radiation" did not help to clarify the requirement since what was adequate was a subjective matter and whether the pulsations could be resolved depended on the sensitivity and resolution of the detector, which was not specified in the claim and may vary (cf. last four lines on page 6 of the specification). Moreover, it would seem that how much of the generated heat was lost in the period in question varied with time, that is to say would be greater during the first cycles, when the substrate was cold, than in subsequent cycles when it had reached a stable temperature.

It was clear from the passage at lines 34-39 of page 6 of the original description that in what seemed to be regarded as a satisfactory arrangement the top surface of the substrate eventually reached a temperature in the "cooling" interval between pulses of 950°K which could only be achieved by retention of a large amount of the generated heat at least at the beginning of the period of excitation of the heating resistor. If the limitation applied only to the

situation when a stable state had been reached it appeared to be requiring no more than that such a state was possible for one pulsing pattern, which would seem to be a very broad limitation.

Quite apart from the above, there was no indication in the description as to how a skilled person determined whether a particular construction-circuit combination satisfied both thermal requirements of the claim.

Finally, there was no explicit support in the description for the requirement concerning resolution of the radiation emitted, the nearest approach to this being at page 6, lines 36-39 of the description.

VI. (b) In the Board's communication, the following reasons were given why the subject-matter of Claims 1 and 2 was considered not to involve an inventive step.

(i) The closest prior art is considered to be not the thermal printing system of US-A-3 961 155 (D4) on which the Examining Division based its objection, but rather the infra-red generator referred to at column 4, lines 19-24 of DE-B-2 400 221 (D6) referred to on page 3 of the specification, since this is designed for the sole purpose of generating a modulated beam of IR radiation and achieves this by use of a pulsed current source, without the need to resort to mechanical or optical chopping.

(ii) Though D6 itself does not point to any shortcomings of the use of thin conductive ribbon in such an application, it is clear from

D2 (US-A-3 875 413), column 1, lines 16-45, that it is known in the art to have certain disadvantages which the skilled person would realise manifest themselves whether it is heated by direct or by pulsed current. It is proposed in D2 to avoid these problems by forming the heater of a film evaporated on an insulating substrate (support) and it is considered that it would be obvious for the average skilled person confronted with the same problem with a pulse heated device as described in D6 to substitute such a supported film for the unsupported ribbon.

(iii) In order to implement such a substitution he would have to decide inter alia on appropriate dimensions and other properties of the substrate. Since he is aware that the radiation intensity is approximately proportional to the fourth power of the heater (emitter) temperature he would appreciate the need for as large as possible a difference between the heater temperature during and between the pulses and thus to reduce as far as possible its thermal inertia and hence that of the substrate with which it is in direct thermal contact.

(iv) The question to be answered is whether the skilled person, aware of these facts and of the need for a particular frequency of beam modulation, would arrive at a substrate as set out in Claim 1 or Claim 2. In the Board's opinion the choice of material for the substrate would be largely determined by factors other than heat dissipation properties,

such as avoidance of damage due to differential thermal expansion of the contacting materials (see, for example, column 3, lines 42-46 of D4, referring to the application of what the skilled man knows to a similar situation in which rapid thermal cycling occurs). Once having decided on a suitable material, the skilled person can be expected to try various thicknesses in order to determine that which provides the deepest modulation of the emitted radiation.

Alternatively, the variation of surface temperature of the resistor could be measured using techniques such as those employed in investigating the thermal properties of thermal printer heads where there is also a requirement for rapid pulse heating and subsequent cooling (see e.g. the article Thermal Printer by J.R. Payne et al. at pages 71-78 of IEEE Journal of Solid-State Circuits, Vol. SC-8, No. 1 of February 1973).

Such experiments would appear to lead the skilled person inevitably to the subject-matter claimed if the relationships in the claims in fact lead to the result of deepest modulation.

VII. Oral proceedings were scheduled to take place on 7 September 1989 but in a letter received on 27 July 1989 from the Appellants' authorised representatives it was stated that the Applicants (Appellants) did not wish to be represented at the oral proceedings and that the representative would not therefore be attending. The letter contained no proposal to amend nor any new

arguments, stating simply that the representatives stood by the arguments already presented in the notice of appeal (by which it is assumed they mean the Statement of Grounds) and looked forward to a decision.

VIII. It is assumed from this, taken in conjunction with the Statement of Grounds, that the Appellants are requesting that the decision under appeal be set aside and that a patent be granted, either

(i) on the basis of the claims valid at the time of refusal (main request) or

(ii) on the basis of a so far unformulated set of claims of which the Claim 2 valid at the time of refusal would be the only independent claim (auxiliary request).

Reasons for the Decision

1. The appeal is admissible.

2. The Appellants by their withdrawal from the oral proceedings, their failure to submit new documents or comment on the reasoned comments in the Board's communication and the statement in the letter received on 27 July 1979 that a decision is looked forward to are assumed to have called for a decision on the state of the file. The Board therefore can see no valid reason which could justify continuing further with the proceedings.

3. The reasoned opinion given in the Board's communication has not been contested by the Appellants and the Board can see no reason for changing this opinion.

The Board therefore finds that, for the reasons set out in item VI(a) above, Claim 1 is lacking in clarity and in support by the description (Article 84 EPC). For this reason alone the main request has to be refused.

Furthermore, for the reasons set out in item VI(b) above, the subject-matter of Claims 1 and 2 is found to be lacking in inventive step.

Since Claim 2 forms an essential part of the auxiliary request this request also has to be refused.

It follows therefore that the appeal has to be dismissed.

Order

For these reasons, it is decided that:

The appeal is dismissed.

The Registrar: **The Chairman:**

M. Beer K. Lederer