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D E C I S I O N
of 6 December 2000

Case Number: T 0389/99 - 3.4.2

Application Number: 91105810.5

Publication Number: 0452818

IPC: G03G 15/00

Language of the proceedings: EN

Title of invention:
Electrostatic recorder and electrostatic latent image measuring instrument

Patentee:
Hitachi, Ltd.

Opponent:
Manfred Kirchhoff Technische Beratung

Headword:
-

Relevant legal provisions:
EPC Art. 56, 111

Keyword:
"Inventive step - main and first to third auxiliary request (no)"
"Remittal to first instance - fourth auxiliary request"

Decisions cited:
-

Catchword:
-

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Case Number: T 0389/99 - 3.4.2

D E C I S I O N
of the Technical Board of Appeal 3.4.2
of 6 December 2000

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Decision under appeal: **Interlocutory decision of the Opposition Division of the European Patent Office posted 16 February 1999 concerning maintenance of European patent No. 0 452 818 in amended form.**

Composition of the Board:

Chairman: E. Turrini
Members: M. A. Rayner
B. J. Schachenmann

Summary of Facts and Submissions

I. The appellant (opponent) has appealed against the decision of the opposition division concerning European patent No. 452 818 (application No. 91 105 810.5), that according to the third auxiliary request of the patentee, the patent and the invention to which it relates meet the requirements of the EPC. Reference was made during the opposition to, *inter alia*, the following documents. The board will use the same document numbering system as the opposition division and where an English language translation of a document was provided (indicated by an asterisk) will make reference to this.

D2: EP-A-0 338 962

D4*: Journal of Institute of Electrostatics Engineers, 1988, 12, pages 210 to 215, A. Shimada "Electrostatic Surface Potential M."

D5*: Journal of Institute of Electrostatics Engineers, 1988, 12, pages 217 to 224, M. Matsui "Infinitesimal Area Surface..."

In the decision under appeal, the opposition division considered that starting from document D2, the problem underlying the invention was to provide more precise values of latent image voltages to define more accurately printing process control factors. Higher accuracy is generally desired and as such not inventive. The skilled person was aware of small size electrometers (page 1, second sentence document D4 and page 27, document D5), use of such electrometers also having been suggested for the recording member in

electrophotography, for example in document D4, in order to achieve higher resolution of measurement. Therefore, the division considered the skilled person would have combined documents D2 and D4. Nevertheless, none of the available prior art documents disclose electrometers with distance control means, in the case of document D4 accurate setting of distance is made by an operator. The distance, i.e. the spacing between the charged surface and the and measuring unit, is critical for example as explained in document D5. Thus, it could even be said there was a prejudice in the art against arrangement of a small size electrode at an eccentric photosensitive drum or moving belt. Therefore, the division found that claim 1 of the third auxiliary request before it involved an inventive step because the skilled person would not have found it practicable to place a measuring electrode of a small-size electrometer in a required close vicinity of a vibrating surface.

II. During the appeal proceedings, the appellant filed two further documents:

D8*: JP-A-0264681 and

D9*: JP-A-64 033671,

and requested revocation of the patent and on an auxiliary basis oral proceedings.

The respondent (patentee) requested the board to maintain the patent in the form specified in the decision under appeal or on the basis of one of four auxiliary requests. The respondent also requested oral proceedings on an auxiliary basis.

III. According to the appellant, it is an open question how the opposition division was able to say that only by providing distance control means was use of an electrometer possible. On the basis of the facts given in the decision, no inventive step over a combination of documents D2 and D4 could be recognised. An inventive step is also absent in view of a combination of documents D2 and D8 (see page 7, line 20 to page 8, line, disclosing details of a distance control means), the combination being obvious because document D8 recites that by keeping distance constant, measuring quality can be improved. Moreover, the subject matter of claim 1 was not novel over the disclosure of document D8, which recites most of its features explicitly and the remaining features implicitly (see Figures 1 and 3 and description). With respect to the first auxiliary request, a spark prevention device is known from document D4 (see page 7, line 18 to page 8, line 7) because it is there recited that to avoid discharge a distance of at least 50 µm has to be maintained so that this subject matter is also obvious. Moreover, the distance detection sensor known from document D9 in the field of static electricity measuring has a measuring head adjusted for constant distance from the surface to be measured via a robot arm responsive to output from distance sensors.

IV. According to the respondent, claim 1 as upheld by the opposition division can also be upheld in view of document D8. The construction known from document D8 cannot be considered a distance control means in the sense of the invention because the rollers cannot keep a constant distance for drum locations where they are not mounted. Since the disclosure of document D8 does not relate to fine dot patterns, it does not address

the detail problems according to the invention. In view of the small distance between the measurement electrode and the photosensitive substance, a danger of sparks increases and this is addressed by the spark prevention means according to the first auxiliary request. The second and third auxiliary request include a feature pertaining to the distance control means being composed of distance measuring means and a sensor portion driving means, distinguishing the claimed subject matter from document D8. Moreover, a number of documents are required to challenge inventive step, their combination in itself however being indicative of inventive step.

V. Oral proceedings were appointed consequent to the auxiliary requests of the parties. During the oral proceedings, the appellant made particular reference to document D4 and the disclosure of a gap of 50µm, high resolution and the adjustment and maintenance of the gap. Discharge was also disclosed, any difference between area and spark discharge being immaterial in the context of the patent. The appellant argued further that the subject matter of the preamble of claim 1 was very standard and known for example from document D2.

The respondent explained that the underlying problem was the resolution of latent images in a non destructive manner. For this purpose, it is necessary to have a small movable sensor. However, the closer a sensor gets, the more it is subject to the likelihood of sparks. Rollers according to document D8 represent a different approach and are not suitable for the resolution required. Document D4 had been overestimated in the proceedings and is not prior art determining resolution of latent images, in fact electrode

structures of a grating pattern electrode are the subject of this document. The electrostatic effects are different and the charges will gather in the aluminium electrode structure, whereas in the setup of the invention the charge does not shift. This is because there is only a "substrate" and not an electrode on a substrate as in the prior art. The spark conditions are accordingly different. While document D4 may give some hints towards the sensor alone, its real focus is the sensor and its underlying mathematics. Therefore the purpose of the sensor is different in the teaching of document D4 which only briefly touches on electrophotography on page 2. Moreover the nature of the discharge is not specific in document D4, i.e. area or spark discharge. The device according to document D9 requires adaptation for use in an electrostatic recorder.

VI. Claim 1 of the requests filed, is worded as follows:

Main Request

An electrostatic recorder comprising electrostatic charge means for uniformly charging a surface of a revolving photosensitive substance (6), exposure and latent image forming means for carrying out exposure and for forming an electrostatic latent image on the surface of said photosensitive substance, development means for forming a visible image, transfer means for transferring said visible image onto a blank, an electrostatic latent image measuring unit, and control means (21, 25, 30, 31, 23, 32) for varying control factors related to stages of a printing process from electrostatically charging the surface of said photosensitive substance (6) by said electrostatic

charge means to transferring the visible image onto a blank by said transfer means in accordance with the results of measurement of the electrostatic latent image,
characterized in that

the exposure and latent image forming means are arranged to form a dot pattern of exposed parts having a width of one dot and non-exposed parts on the surface of said photosensitive substance,

the electrostatic latent image measuring unit is adapted to measure said pattern and to output signals in accordance with said pattern, and

distance control means (1) are provided for maintaining a distance between a measuring electrode (3a) of the latent image measuring unit and the revolving photosensitive substance (6) constant.

First Auxiliary Request

This request differs from the main request by addition of the following feature at the end of the claim, the word "and" before "distance control means" being consequentially deleted.

", and
spark prevention means are provided for preventing discharge between a measuring electrode of the latent image measuring unit and the photosensitive substance (6)."

Second Auxiliary Request

This request differs from the main request by addition of the following feature at the end of the claim.

", the distance control means being composed of a distance measuring means (1) and a sensor portion driving means."

Third Auxiliary Request

This request amounts to a combination of the first and second requests and differs from the main request by addition of the following features at the end of the claim.

", the distance control means being composed of a distance measuring means (1) and a sensor portion driving means, and

spark prevention means are provided for preventing discharge between a measuring electrode of the latent image measuring unit and the photosensitive substance (6)."

Fourth Auxiliary Request

This request differs from the third auxiliary request by addition of the following feature at the end thereof.

", said spark prevention means including a reference power source having a potential between the highest voltage and the lowest voltage of the photosensitive substance (6), and a common potential for a measurement circuit is adopted as a reference power source voltage for the electrostatic latent image measuring unit."

VII. At the end of the oral proceedings, the board gave its decision.

Reasons for the Decision

1. The appeal complies with the provisions mentioned in Rule 65(1) EPC and is therefore admissible.

2. *Main request - Novelty*

2.1 Document **D2** discloses a printer in Figure 2 thereof. The printer includes a gridded charge corona 30 that is operable to charge drum shaped photoconductor 31, as this drum rotates at a substantially constant speed in the direction indicated by arrow 32. An imaging station comprising LED printhead 33 operates to discharge selected areas of photoconductor 31 in accordance with the binary print image applied thereto, thereby forming a discharged latent image on photoconductor 31. A developer station comprising magnetic brush developer 34 operates to tone the photoconductor's latent image. Developer station 34 includes development electrode voltage source 55. A machine control 50 is provided. The photoconductor's toned image is transferred to paper substrate at transfer station 137, as the paper moves along path 39. Electrostatic probe means 37,38, having a sensing probe 37, is provided to measure or sense the voltage level of selected areas of photoconductor 31.

The claimed subject-matter therefore differs from the disclosure of document D2 by virtue of the "width of one dot" recitation and also of distance control means.

2.2 Document **D4** relates to electrostatic surface potential measurement. A probe (shown in Figures 1 and 4) operates with a gap of 50µm (gap G in Figure 1, set by a micrometer in Figure 5) from the surface of the object to be measured and has a detector diameter of 50µm (diameter D in Figure 1). Patterns to be measured were Al photoetched etched at 0.1 to 10/mm, a value of 50µm being shown in Figure 6. Document D4 teaches in accordance with item {1} on page 4 that resolution must be high and that the diameter D and gap G are closely associated with item {1}. Furthermore, the gap between the detecting electrode and the surface must be adjusted with a high degree of accuracy and maintained constant. Document D4 establishes that the setting of the gap is the most important factor in determining the resolution characteristics of the probe (see the bottom of page 7) and 25 µm would be preferable. However, since, in practice, discharge occurs, the minimum limit was 50µm. The gap is set by a micrometer and a moving table for the surface to be measured is employed.

The claimed subject matter therefore differs from the disclosure of document D4 by virtue of the specific features relating to a typical electrostatic recorder according to the preamble of claim 1 as well as a distance control means for maintaining a distance to a revolving photosensitive drum.

2.3 Document **D5** relates to measurement of charge distribution and gives consideration to miniaturisation of detector electrode. The detector head has to be placed in close vicinity of the specimen. If the detector is excessively close to the charged body, electrical charge accumulated is discharged.

The claimed subject matter therefore differs from the disclosure of document D5 by virtue of the features of a typical electrostatic recorder according to the preamble of claim 1 as well as a distance control means for maintaining a distance to a revolving photosensitive drum.

2.4 Document **D8** relates to an apparatus for measuring surface potential of a photoconductor drum provided in a process unit with which a copy machine is equipped. Detection of the surface potential of the photoconductor is performed by a surface potential sensor mounted in a supporting member. A roller is attached to the supporting member, such that even if the rotational axis of the photoconductor drum is decentred, the roller moves the supporting member in a radial direction so that the distance between the sensor and the photoconductor is maintained constant.

While control means and transfer means are implicit to a copy machine, these items are not mentioned explicitly in document D8. The claimed subject matter differs from the disclosure of document D8 by virtue of the "width of one dot" feature.

2.5 Document **D9** discloses a static electricity measuring device including a measuring unit (3 in Figure 1) including a detector 1 for detecting static electricity and distance detection sensors 2 for measuring a distance to an object to be measured and outputting distance data. The device includes a device body 4 and a robot arm 5 connecting the measuring unit to the device body, the arm being extendable in accordance with the distance data, the distance of the device to the object automatically being corrected.

The claimed subject matter therefore differs from the disclosure of document D9 because there is no disclosure of use in an electrostatic recorder.

2.6 Therefore, in view of the differences mentioned, the subject mater of claim 1 is novel over any one of documents D2, D4, D5, D8 or D9.

3. *Inventive Step*

3.1 Having regard to document D2 and the new features of claim 1, the board agrees with the opposition division that the problem underlying the invention was to provide more precise values of latent image voltages for defining more accurately printing process control factors. The board also agrees that higher accuracy is a general desideratum for the skilled person, which in itself does not imply presence of an inventive step.

The respondent does not see higher resolution of latent images being provided by the prior art. Nevertheless, as is apparent from the novelty considerations advanced in section 2.2 above in relation to document D4, electrostatic surface potential measurement at high resolution is known. The main line of argument of the respondent in support of inventive step thus relies on challenging the relevance of the teaching of document D4 to the invention claimed, in particular because the specific setup of document D4 relates to electrostatic surface potential measurement for electrode structures. A step back from the position taken in the decision under appeal is implied by this challenge, since in that decision it was assumed that a skilled person was aware of small size electrometers and furthermore that the use of such electrometers had also been suggested according to document D4 for electrostatic measuring in relation to the recording member in electrophotography. This assumption also reflects the position of the appellant. Thus, the question in relation to the main line of argument of the respondent is whether the submission of the respondent is correct that document D4 has been overestimated.

3.2 The board sought the answer to this question in document D4 itself. Reference to the first full sentence on page 2 reveals the following, "Surface potential measurement is indispensable for evaluating the characteristics of a photosensitive member for use with electrophotography and a recording member for use with electrostatic recording." In the view of the board, the submission of the respondent that this reference is of the character of a reference "only made in passing", if this is to be understood as indicating only a faint possibility, cannot be considered

persuasive because this wording signifies to the skilled person that measurement of surface potential is mandatory. Document D4 continues "However, surface potentiometers which are conventionally used in this field have not yet obtain(ed) sufficient resolution for analysing the relationship between an electrostatic charge image formed on a recording member and a toner image which is made visible by development". This wording means that the problem of lack of resolution and the desideratum of higher resolution have been recognised in document D4. At the bottom of page 2, document D4 then recites "Therefore, in this report, a very small probe suitable for high resolution measurement was manufactured..." In the view of the board, the skilled person concludes from these passages that the small probe of the report is likely to meet the required higher resolution requirement in the instances of unsatisfactorily low resolution identified in document D4.

The board therefore concludes that the appellant and the opposition division were correct in considering that the use of such electrometers had also been suggested according to document D4 for electrostatic measuring in relation to the recording member in electrophotography. The specific setup disclosed in document D4 relates to electrode structure and only confirms that the necessary resolution is possible but does not run counter the indication of applicability to electrostatic recording because the function of the probe is the same in both uses. Therefore, while the submissions of the respondent about the detailed setup are relevant to that setup, they do not counter the relevance of the teaching of document D4 to electrostatic measuring in relation to the recording

member in electrophotography. Accordingly, the main line of argument of the respondent fails to persuade the board.

3.3 Distance control plays a pivotal role in the teaching of document D4, both from the point of view of resolution and discharge inhibition purposes. This is why the distance is determined by a micrometer. The importance of distance control is reinforced by the last paragraph on page 6 of document D5 referred to by the opposition division. The skilled man therefore knows that this distance must be controlled. The opposition division saw a prejudice against application of the teaching of document D4 to a rotating drum because eccentricity thereof would prevent the necessary control. Since no available prior art document before the division showed electrometers with distance control means, the opposition division had no information before it as to how the distance control means might be effected. While the issue of applicability of the teaching of document D4 to a rotating photosensitive surface remains the same in the appeal proceedings, the situation has changed from that before the opposition insofar as documents D8 and D9 are now available. Document D8 shows that, in general, tracking a rotating surface to ensure distance control for electrostatic measurement is known. Therefore, provision of distance control means is as such not considered to involve an inventive step.

3.4 The respondent has advanced a second line of argument that the distance control means disclosed by document D8 is not a distance control means within the meaning of the invention. The respondent did not identify specific features of the claim in support of this

submission but relied on the allegation that the necessary accuracy is not provided by the means according to document D8 because the rollers are remoter from the probe (this not being excluded by the claimed wording). Even supposing the board accepts this premise, higher accuracy in distance control is, analogously to higher resolution, a general desideratum which does not imply presence of an inventive step. Thus, even if the claim should be interpreted in the narrower sense of distance control means as understood by the respondent, it is thus no more than a matter of routine to choose a more accurate distance control means. Just such a means is disclosed for example in document D9, where the distance sensors are proximate the electrostatic probe and a stated advantage is reduction of distance variation (see page 5), any adaptation for mounting in an electrostatic recorder being a matter of routine for the skilled person.

Accordingly, the second line of argument of the respondent fails to convince the board of inventive step, even if claim 1 is interpreted more narrowly in accordance with the submissions of the respondent.

3.5 A third line of argument of the respondent is that the combination of documents necessary to reach the subject matter of claim 1, in itself, implies the presence of an inventive step. The board is not convinced by this submission because the real key to the subject matter claimed derives from the combination of the electrostatic recorder of document D2 with document D4 for increasing resolution with accurate distance control, which the board considers obvious for the reasons given at length above. The other documents play a subordinate role because they are of a less

fundamental nature relating only to confirming practical implementation of this combination. Thus document D5 only reaffirms the importance of distance control known from document D4. Similarly, document D8 simply confirms that implementing distance control for a revolving photosensitive surface is known. Finally the choice of an accurate distance control means is necessary to meet the teaching of document D4 and is provided by the teaching of document D9.

3.6 Therefore, the subject matter of claim 1 cannot be considered to involve an inventive step within the meaning of Article 56 EPC.

4. *First Auxiliary Request*

Since this claim incudes the features of the claim of the main request, the novelty and inventive step considerations advanced above also apply thereto. The claim further includes a feature relating to spark prevention means provided for preventing discharge between a measuring electrode of the latent image measuring unit and the photosensitive substance. The problem of discharge is however known both from document D4 (see the bottom pf page 7) and document D5 (see page 27, just after the reference to a small electrometer used by the opposition division). Since the spark prevention means claimed is provided for preventing discharge, the board cannot identify any clear structural feature in the claim applicable solely to "sparks" and thus agrees with the appellant that any difference between area and spark discharge is immaterial in the context of the claim. Accordingly, the board is of the view that discharge in this context corresponds to that mentioned in documents D4 and D5,

from which it is obvious that, in general, some means should be provided to avoid discharge. In the case of document D4, such means is provided and the discharge problem addressed by selecting the air gap G shown in Figure 1 of 50µm to avoid discharge, despite a gap of 25µm being preferable from the view of resolution characteristics. Nothing in the wording of the claim according to the first auxiliary request amounts to more than means comprising such a purposefully selected air gap.

Accordingly, the subject-matter of claim 1 according to the first auxiliary request cannot be considered to involve an inventive step within the meaning of Article 56 EPC.

5. *Second Auxiliary Request*

Since this claim includes the features of the claim of the main request, the novelty considerations advanced above also apply to this claim. This claim also includes a feature relating to the distance control means being composed of a distance measuring means and a sensor portion driving means. It makes explicit the interpretation of the distance control means read into the main request by the respondent (see section 3.4 above). A distance control means with these features is known from document D9. As has been explained in connection with the main request, the use of such distance control means amounts to no more than a routine choice. Accordingly, the subject matter of claim 1 according to the second auxiliary request cannot be considered to involve an inventive step within the meaning of Article 56 EPC.

6. *Third Auxiliary Request*

This request does not contain any subject matter which was not contained in either the first or second auxiliary request. The combination of the subject matter concerned is obvious for the reasons already given and thus does not lead to subject mater involving an inventive step. Accordingly, the subject matter of claim 1 according to the third auxiliary request cannot be considered to involve an inventive step within the meaning of Article 56 EPC.

7. *Fourth Auxiliary Request*

While the air gap and distance control means were mentioned in the decision under appeal, structure going beyond this in relation to spark prevention means was not dealt with in the proceedings before the first instance, this not being necessary in view of the decision then reached. The centre of gravity of the claim according to the fourth auxiliary request has therefore changed from that before the first instance so that the board is not in a position to decide the case immediately without giving rise to a loss of instance. Accordingly, in order to guarantee that no loss of instance occurs, the board considers it appropriate to remit the case back to the first instance in accordance with Article 111(1) EPC without examination of the fourth auxiliary request in relation to any of the Articles of the Convention.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.

2. The main request and auxiliary requests 1 to 3 are rejected.

3. The case is remitted to the first instance for further prosecution with respect to auxiliary request 4.

The Registrar: The Chairman:

P. Martorana E. Turrini