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Datasheet for the decision of 22 November 2007

Case Number: T 0230/05 - 3.4.03

Application Number: 95102536.0

Publication Number: 0670524

IPC: G03G 5/14

Language of the proceedings: EN

Title of invention:
Electrophotographic photoconductors

Patentee:
FUJI ELECTRIC CO., LTD.

Opponent:
AEG Elektrofotografie GmbH

Headword:
-

Relevant legal provisions:
EPC Art. 56, 84, 123(2), 123(3)

Relevant legal provisions (EPC 1973):
-

Keyword:
"Inventive step (main request) - no"
"Inventive step (auxiliary request) - yes"

Decisions cited:
-

Catchword:
-

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Beschwerdekammern | Boards of Appeal | Chambres de recours

Case Number: T 0230/05 - 3.4.03

D E C I S I O N
of the Technical Board of Appeal 3.4.03
of 22 November 2007

Appellant: (Opponent)
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Decision under appeal:
Decision of the Opposition Division of the European Patent Office posted 23 December 2004 rejecting the opposition filed against European patent No. 0670524 pursuant to Article 102(2) EPC.

Composition of the Board:

Chairman: R. G. O'Connell
Members: E. Wolff
T. Bokor

Summary of Facts and Submissions

I. European patent 0 670 524 was opposed on the ground that the claimed invention lacked an inventive step. The opposition was rejected.

II. The appellant opponent asks for the decision of the opposition division to be set aside and for revocation of the patent on the ground that the invention claimed does not involve an inventive step given the disclosures in documents

E2 EP-A-0 525 918

E7 JP-A-1 86152 & PAJ vol. 13, no. 316 (P900) [3664], 18 July 1989

E9 DE-A-3 414 791

III. The respondent proprietor requests that the appeal be dismissed and the patent be maintained as granted (main request) or that the patent be maintained on the basis of the claims submitted during the oral proceedings (auxiliary request).

Claim 1 of the Main request reads as follows

1. An organic electrophotographic photoconductor comprising:
an electroconductive substrate consisting of an aluminium alloy,
an intermediate layer formed on said electroconductive substrate, said intermediate layer mainly comprising an alcohol-soluble polyamide resin,

a charge-generation layer formed on said intermediate layer; and
a charge-transport layer formed on said charge generation layer,
characterized in that,
said electroconductive substrate has an iron content of 0.1% by weight or less and in that said intermediate layer has a thickness of 0.5 μm or more.

Claim 1 of the auxiliary request differs in that the first feature of the claim now reads (addition shown in bold letters) "an electroconductive substrate consisting of an aluminium alloy, **said substrate having been cleaned by wet-washing using a water-soluble weak-alkali detergent**".

IV. The appellant's arguments are, in summary, as follows.

Document E2, seen by the opposition division as being the closest prior art, discloses all the features of claim 1, except for the claimed low Fe-content of the substrate. The use of low Fe-content Al-alloys is known from document E7. Both documents related to electro-photographic photoconductors with the same layer structure of Al-substrate, intermediate layer, charge generating layer and charge transfer layer. Document E2 additionally discloses use of an alcohol-soluble polyamide resin as intermediate layer with a layer thickness greater than 0.5 μm. Document E9 merely confirms that it was known at the time that the surface condition of the substrate is an important factor affecting image quality. Given what was known to the skilled person, the invention claimed in claim 1 of the main request lacked an inventive step.

The additional feature of the auxiliary request, which is that "**said substrate having been cleaned by wet-washing using a water-soluble weak-alkali detergent",** does not add anything to the invention because it was obvious that iron-containing materials are more likely to be adversely affected by a water-based cleaning process.

V. The respondent proprietor argues, in summary, thus.

The invention set out to solve the problem of avoiding black spots forming after repetitive use of the organic electrophotographic photoreceptor.

The problem addressed by document E2, cited by the opposition division as constituting the nearest prior art, was to provide a surface which did not have the surface imperfections that result from machining the surface with a cutting tool. Document E2 disclosed a method of providing a metal body with a treated surface which was not a machine-cut surface finish. Document E2 did not attempt to solve the problem of black spots forming after repetitive use of the organic electrophotographic photoreceptor.

Document E7 related to providing a good surface finish using a cutting technique. Since document E2 related to surface finishes not involving a cutting process, the skilled person would not combine these two documents.

Reasons for the decision

1. The appeal is admissible.

The main request

2. Novelty and inventive step

2.1 The closest prior art is document E2. It discloses, specifically in relation to examples 11 and 12 (page 9, line 51 to page 10, line 5) a photoconductive member having the following features:

i) *a substrate in the form of a treated aluminium alloy cylinder*, that is, an electroconductive substrate consisting of an aluminium alloy according to claim 1;

ii) *an intermediate layer formed by use of a coating solution of copolymerized nylon resin in a solvent and having a thickness of 1 μm*, that is, an intermediate layer formed on the electroconductive substrate and mainly comprising an alcohol-soluble polyamide resin, as required by claim 1, whereby the layer also has a thickness of >.5 μm, as required by the characterising portion of claim 1;

iii) *a charge generation layer formed from a solution of Є-type copper phthalocyanin and butyral resin as a binder and having a thickness of 0.15 μm,* that is, a charge-generation layer formed on said intermediate layer as required by claim 1, claim 1 containing no restriction on the thickness of the layer; and

iv) *a charge transport layer formed from a coating solution containing a hydrazone compound and styrene-*

methyl methacrylate copolymer resin as a binder resin, and having a thickness of 16 µm, that is, a charge-generation layer formed on said intermediate layer as required by claim 1, claim 1 containing no restriction on the thickness of the layer.

2.2 Thus, document E2 contains all the features of the invention claimed in claim 1 of the main request, except for specifying the iron content of the substrate, which according to claim 1 has to be 0.1% by weight or less.

2.3 The appellant opponent argued that the claimed invention was obvious when the teaching of document E2 was combined with that of E7, since the latter document promised an improvement in image quality provided the iron content of the drum was limited to between 0.01 to 0.40 percent by weight, that is to a range falling within the range claimed in claim 1 of the main request.

2.4 The respondent proprietor submitted that, as set out in the introductory part of the description of the patent, the invention solved the problem of deterioration of image quality over time. This was a different problem from that addressed by document E7, and occurred only when, prior to deposition of the intermediate layer, the substrate was cleaned with an aqueous solution rather than with the customary solvents. Water-based cleaning methods were essential on environmental grounds, but the respondents had found that they degraded the long-term performance of the imaging devices. The solution to this long-term degradation was found by the respondent to lie in using an aluminium substrate with an iron content which, as claimed, was below 0.1 percent by weight.

2.5 The appellant disagreed, pointing out that claim 1 of the main request was a device claim not limited to any particular cleaning technique.

2.6 The board concludes that, starting from document E2, the skilled person would learn from document E7 without any inventive contribution on his part to use a substrate with a low iron content. Although the surface finishing technique described in document E2 involves the impact of hard spheres on the surface of the substrate, machining was a standard surface finishing technique. Document E7 teaches that if the skilled person wanted to use the standard surface finishing method which involves cutting, he can nevertheless achieve a good surface quality if using a substrate with an iron content which falls within the range claimed in claim 1, because this reduces the surface damage that arises from pitting during machining. The claim is not limited to any particular manner of manufacturing the substrate. The board therefore judges the subject-matter of claim 1 of the main request to be obvious.

The auxiliary request

3. Claim 1 of the auxiliary request contains the additional feature that the electroconductive substrate has been cleaned by wet-washing using a water-soluble weak-alkali detergent.

4. Admissibility of the amendment

4.1 The auxiliary request was filed during the oral proceedings.

4.2 The appellant opponent contended that the request was belated, would require a further search, was a process feature in a product claim and hence lacked clarity, and did not overcome the objections under Article 56 EPC. It should not therefore be admitted into the proceedings.

4.3 The respondent proprietor submitted that the added feature was present in the application as filed and had been added at least partly in response to the arguments presented by the appellant opponent during the oral proceedings. Those arguments were based on the cited documents. The amendment could therefore not have taken the appellant opponent by surprise, nor was a fresh search required, since the added feature presents an important aspect of the invention which would have been taken into account when the search was carried out.

4.4 The board finds the respondent proprietor's submissions persuasive. Moreover, the amended claim *prima facie* does not introduce any new matter and provides a distinction over the cited prior art that could render the invention as claimed novel and inventive. The requirements placed on an amendment filed late in the proceedings are therefore fulfilled. The auxiliary request is admissible.

5. Amendment (Article 123(2) and (3))

5.1 The introductory part of the description refers several times to the invention being concerned with cleaning the substrate with water-soluble weak-alkali detergents. Paragraph [0010] on page 3, however, states the object of the invention to be providing an organic electrophotographic photoconductor forming excellent images ... "after subjecting the electroconductive

substrate in the process including the step of treating with an organic base solvent such as trichloroethylene and Freon® as a cleaning agent" (underlining added by the board).

5.2 The reference to an organic base solvent as a cleaning agent is a discrepancy which is resolved by reference to the description in paragraph [0023] of example 1, and also the concluding remarks of the description in paragraph [41], which put it beyond question that what is meant is that the substrate still forms excellent images after the step of cleaning it with water-soluble weak-alkali detergents.

5.3 The board is satisfied that, even with the afore-mentioned discrepancy, claim 1 as amended does not go beyond the contents of the application as filed.

6. Novelty and inventive step

6.1 The board accepts that, as explained by the respondent proprietor, the added feature, although presented in the form of a processing step, provides a substrate that is distinguishable from those made with the aid of other cleaning processes. The product claimed is therefore new over the product discloses in document E2.

6.2 The objective problem addressed by the invention as claimed is thus to provide a substrate which is cleaned by an environmentally preferable wet-washing process without sacrificing the long-term image quality of substrates made using conventional solvent-based cleaning methods.

6.3 The solution proposed by the invention as claimed is to use a wet-washing process in combination with a substrate which has an iron content lower than 0.1% by weight, in combination with the other features set out in claim 1.

6.4 The appellant opponent submitted that the invention as claimed was obvious because a combination of the teachings of document E2 and the disclosure in document E7 of a substrate with less than 0.1% by weight of iron would have led the skilled person to the invention without requiring any inventive contribution.

6.5 The board cannot accept this argument. Document E7 addresses the quite different problem of providing a substrate made of an aluminium alloy that, on the one hand, allows satisfactory working during manufacture, in particular for drawing or extrusion, and which, on the other hand, lends itself to machining with a cutting tool without producing undue surface roughness. After machining, the surface is ultrasonically cleaned in an FCKW (chlorofluorocarbon) bath followed by the application of an intermediate layer (page 13, line 37 to page 14, line 8). There is, other than in hindsight, no indication in document E7 that an iron content of less than 0.1% by weight solves the quite different problem of surface imperfections which lead to image imperfections observed after repetitive printing and which are caused by cleaning with a water-soluble weak-alkali detergent.

6.6 Document E9 is concerned with reducing surface damage owing to machining of the substrate surface by limiting the iron content of the aluminium substrate. Machining

serves to provide an even surface for the subsequent deposition of a photoconductive layer which consists of an amorphous material embedded in a silicon matrix (see for example, page 3, lines 20 -27). There is no mention of methods of cleaning the substrate prior to deposition of a sequence of layers (page 4, lines 47 to 49), starting with an intermediate layer of amorphous or microcrystalline silicon.

6.7 For the foregoing reason the board concludes that the invention claimed in claim 1 of the auxiliary request involves an inventive step as required by Article 56 EPC 1973.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.

2. The case is remitted to the department of first instance with the order to maintain the patent in the following version:

   - Claims 1 and 2 as filed in the oral proceedings

   - Description as granted

   - Figure as granted

Registrar Chair

S. Sánchez Chiquero R. G. O'Connell