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Datasheet for the decision of 27 January 2016

Case Number: T 0568/13 - 3.5.05

Application Number: 06765369.1

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Language of the proceedings: EN

Title of invention:
Flexible touch screen display

Applicant:
Flexenable Limited

Headword:
Flexible touch screen/FLEXENABLE

Relevant legal provisions:
EPC Art. 56

Keyword:
Inventive step - main request (no) -
auxiliary request (yes, after amendment)

Decisions cited:

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Beschwerdekammern
Boards of Appeal
Chambres de recours

European Patent Office
D-80298 MUNICH
GERMANY
Tel. +49 (0) 89 2399-0
Fax +49 (0) 89 2399-4465

Case Number: T 0568/13 - 3.5.05

D E C I S I O N
of Technical Board of Appeal 3.5.05
of 27 January 2016

Appellant: (Applicant)	Flexenable Limited 34 Cambridge Science Park Milton Road Cambridge Cambridgeshire CB4 0FX (GB)
Representative:	Martin, Philip John Marks & Clerk LLP 62-68 Hills Road Cambridge CB2 1LA (GB)
Decision under appeal:	**Decision of the Examining Division of the European Patent Office posted on 24 July 2012 refusing European patent application No. 06765369.1 pursuant to Article 97(2) EPC.**

Composition of the Board:

Chair	A. Ritzka
Members:	K. Bengi-Akyuerek
	F. Blumer

Summary of Facts and Submissions

I. The appeal is against the decision of the examining division to refuse the present European patent application on the grounds of lack of inventive step (Article 56 EPC) with respect to the claims of a main request (sole claim request), having regard to the disclosure of

D1: US-A-5 623 280.

In an *obiter dictum* (section 3.2 of the decision under appeal), the examining division referred for the first time to an annexed prior-art document as an example of the use of an electronic-paper display medium and an active-matrix backplane including organic electronics, namely

D6: J.A. Rogers and Z. Bao: "Printed Plastic Electronics and Paperlike Displays", Journal of Polymer Science, Vol. 40, pp. 3327-3334, 2002.

The following prior-art document was also cited in the course of the examination proceedings:

D3: US-A-2001/0022632.

II. With the statement setting out the grounds of appeal, the appellant filed amended sets of claims according to a main request and five auxiliary requests. It requested that the decision of the examining division be set aside and that a patent be granted on the basis of the main request or one of the auxiliary requests.

III. In an annex to the summons to oral proceedings pursuant to Article 15(1) RPBA, the board expressed its

preliminary opinion on the appeal. It introduced prior-art document D6 into the appeal proceedings under Article 114(1) EPC as evidence of the skilled person's common general knowledge in the technical field concerned. In particular, it raised objections under Articles 123(2) and 56 EPC, based on D3 as closest prior art.

IV. With a letter of reply dated 24 December 2015, the appellant submitted amended claims as a new main request and as new auxiliary requests 1 to 3, replacing the former main request and auxiliary requests 2 to 4 on file.

V. Oral proceedings were held as scheduled on 27 January 2016, during which the appellant filed a new claim request as "auxiliary request 1", in response to objections raised under Article 56 EPC by the board during the oral proceedings. The main request and auxiliary request 1 were admitted into the proceedings and their allowability was discussed.

The appellant's final request was that the decision under appeal be set aside and that a patent be granted on the basis of the main request as filed with letter dated 24 December 2015, or, subsidiarily, on the basis of auxiliary request 1 as filed during the oral proceedings before the board.

At the end of the oral proceedings, the decision of the board was announced.

VI. Claim 1 of the **main request** reads as follows:

"A touch sensitive active matrix display device, the device comprising:

a display (101) having a viewing surface; and

a touch sensitive sensor (103) integrated with and under said display (101), said touch sensitive sensor (103) comprising a flexible substrate, a lower conductive layer (107) on said flexible substrate and an upper conductive layer (105) separated from said lower conductive layer (107) by a spacer arrangement; and wherein:

said touch sensor (103) is operable by touching said viewing surface of said display;

wherein

said display comprises electronic paper display medium and has a backplane (102) comprising an active matrix, said active matrix having an array of field-effect transistors comprising an organic semiconductor, said transistors configured to control said display (101); and

in that said backplane is disposed directly onto said upper conductive layer (105) with a dielectric isolation layer (109) deposited between said upper conductive layer and the electroactive layers of backplane; with said dielectric isolation layer providing electrical insulation between said upper conductive layer and electroactive layers of backplane (102);

whereby said touch sensitive active matrix display device is a combined display and touch sensitive sensor device that is flexible as a whole."

Claim 1 of **auxiliary request 1** comprises all the features of claim 1 of the main request, with the only difference that its penultimate paragraph has been replaced by the following phrase (amendments compared with claim 1 of the main request underlined by the board):

"in that said transistors of said backplane (102) are disposed directly onto said upper conductive layer (105) without a separate substrate to support the backplane (102), with a dielectric isolation layer (109) deposited between said upper conductive layer and the electroactive layers of the backplane, with said dielectric isolation layer providing electrical insulation between said upper conductive layer and the electroactive layers of the backplane (102)".

Independent claim 19 of the above claim requests is directed to a corresponding fabrication method.

Reasons for the Decision

1. MAIN REQUEST

Claim 1 of this request corresponds to claim 1 of the main request underlying the appealed decision, and comprises the following limiting features (as enumerated by the board):

A touch-sensitive active matrix display device comprising:

A) a display
  A1) having a viewing surface;
  A2) comprising an electronic paper display medium;
  A3) having a backplane;
B) a touch-sensitive sensor
  B1) being integrated with and under said display;
  B2) comprising a flexible substrate, a lower conductive layer on said flexible substrate and an upper conductive layer separated from

said lower conductive layer by a spacer arrangement;

B3) being operable by touching said viewing surface of said display;

C) the backplane

C1) comprising an active matrix having an array of field-effect transistors comprising an organic semiconductor, said transistors configured to control said display;

C2) being disposed directly onto said upper conductive layer with a dielectric isolation layer deposited between said upper conductive layer and the electro-active layers of [the] backplane, the dielectric isolation layer providing electrical insulation between said upper conductive layer and [the] electro-active layers of [the] backplane;

D) said touch-sensitive active matrix display device being a combined display and touch-sensitive sensor device that is flexible as a whole.

1.1 Article 52(1) EPC: novelty and inventive step

In the board's judgment, present claim 1 does not meet the requirements of Article 56 EPC, for the reasons set out below.

1.1.1 The board concurs with the examining division and the appellant that the subject-matter of claim 1 is novel over the cited prior art (Article 54 EPC). As to the assessment of inventive step, in the decision under appeal (cf. section 2.1) document D1 was considered to be the closest prior art for the subject-matter claimed. However, the board agrees with the appellant that D1 is silent about reconciling a layer such as

substrate 40 including raised ribs or ridges (see D1, Fig. 3) with a backplane including transistors based on organic semiconductors, as required by feature C1) of claim 1. Rather, the board regards document D3 as a more suitable and promising starting point for assessing inventive step.

1.1.2 Like the present invention, D3 is concerned with a flexible touch-sensitive display device in which the display medium is disposed above the touch sensor (see e.g. abstract). It teaches that the device consists of a display medium ("liquid crystal 15"), a backplane ("LCD panel 1A") and a touch-sensitive sensor ("touch panel 2") which is integrated with and under said display (see e.g. Fig. 1 in conjunction with [0019]). The LCD panel is disposed directly onto the upper conductive layer ("electrode 21" on "film 22") of the touch panel, with a dielectric isolation layer (e.g. "adhesive layer 23" in Fig. 1 or "light reflection layer 19C" in Fig. 5) deposited between said upper conductive layer and the electro-active layers, i.e. the electrodes, of the LCD panel (see e.g. [0028] and [0029] together with [0040], third sentence). The touch panel further comprises a lower conductive layer ("electrode 24") on a flexible substrate ("substrate 25"), and a spacer arrangement ("gap adjusting material 26") separating the upper conductive layer from said lower conductive layer, whilst it is operable by touching said viewing surface of said display (see e.g. [0025] and Fig. 2).

1.1.3 At the oral proceedings before the board, the issue whether D3 was concerned with a touch-screen device being "flexible as a whole" according to feature D) was extensively discussed. The appellant contended, quoting paragraphs [0019], [0023], [0028], [0030] and in

particular Figure 2 of D3, that it merely taught that only a *part* of the touch-screen device, namely the LCD panel, was flexible and that therefore the device was not "truly flexible". As a consequence, D3 did not have the same purpose as the present invention and could therefore not be taken as closest prior art. Rather, based on its paragraph [0006], it was concerned with glare reduction in the touch-screen device.

However, the board first notes that it is apparent from the application as originally filed that the present invention - like D3 - is, in the first place, concerned with improving the optical clarity of a touch-screen display by locating the touch-sensitive sensor *beneath* (rather than *above*) the corresponding display media (see e.g. page 1, last paragraph and page 3, second paragraph). Secondly, regardless of whether or not "flexible as a whole" (see feature D) of claim 1) or "truly flexible" (see page 2, third paragraph of the application as filed) are to be understood as meaning that all the sub-components of the underlying touch-screen device are to be flexible (i.e. bendable by a user), and whether or not the sketch in Figure 2 of document D3 illustrates only a specific example relating to a non-transmission type LCD device (see e.g. D3, [0014] and [0025]), this prior-art document manifestly teaches that not only the LCD panel but also the touch-panel electrodes and the touch-panel substrate of the touch-screen device may indeed be elastic and thus flexible (see e.g. D3, [0031], second sentence: *"... the liquid-crystal-display-panel-side electrode in the touch panel ... is preferably excellent in flexibility and easily deformable ..."* and [0036], last sentence: *"... when electrically conductive characteristic is given to a high elastic body, the high elastic body can be preferably used as a*

touch panel substrate ...").

1.1.4 Also, in the absence of a more detailed and solid definition of the term "backplane" in present claim 1, the board considers that the LCD panel of D3 falls well within its broad ambit. The board also finds that, contrary to the appellant's view, the information that the *backplane* is supposed to be disposed directly onto the upper conductive layer of the touch-sensitive sensor according to feature C2) does not necessarily mean that its constituent *transistors* are directly disposed onto that layer as well. This is due to the fact that the backplane may well comprise other components than only the field-effect transistors according to the present invention (see e.g. Figs. 2 to 4 in which backplane 102 also comprises substrate 102b). Thus, the term "backplane" cannot be taken as a synonym for "field-effect transistors" in the present case. Accordingly, D3 unambiguously discloses not only feature D) but also feature B2).

1.1.5 As to features A2) and C1) of claim 1, however, D3 relies upon an LCD display medium rather than an electronic-paper display and fails to disclose any implementation of a display-control circuitry for the LCD display. Hence, the board concludes that features A2) and C1) are the features distinguishing present claim 1 from the disclosure of D3.

1.1.6 Concerning feature A2), the board takes the view that using a reflective *electronic-paper display* (instead of a transmissive *liquid-crystal display*) represents one of several equally likely implementation alternatives relating to the type of voltage-controlled display medium used from which the skilled person would choose depending on practical circumstances (such as

implementation complexity or fabrication preferences). The usability of different alternative display media, with their known benefits and drawbacks, is also highlighted by the present application itself (cf. page 4, second paragraph and page 14, last paragraph of the description as filed; see also appealed decision, reasons 2.3).

1.1.7 As to feature C1), the board is aware that, in the field of touch-screen displays, there are generally two main kinds of applicable display-control circuits, namely passive (i.e. "passive-matrix display") or active (i.e. "active-matrix display") ones, the choice of which depends primarily on implementation costs. Furthermore, the most common *active-matrix* display technology for LCD or electronic-paper displays is based on field-effect thin-film transistors (TFTs), which may include organic semiconductors such as conjugated polymer TFTs due to their mechanical flexibility (see e.g. D6, abstract). The argument of the appellant that the skilled person would not resort to the use of organic material because they were soft and could be easily damaged is not persuasive, since already the abstract of D6 refers positively to the mechanical flexibility and bendability of organic active-matrix backplane circuits. The board also notes in passing that this is also underpinned by the present application itself (see e.g. page 5, second paragraph of the description as filed), apparently demonstrating that the beneficial mechanical properties of such organic semiconductor materials were well known at the application's priority date.

1.1.8 Overall, the board holds that distinguishing features A2) and C1) are associated with separate partial objective problems and that their solutions

constitute a mere juxtaposition of obvious implementation measures which do not produce any surprising synergistic effect going beyond the sum of their individual effects. Thus, the subject-matter of present claim 1 does not involve an inventive step having regard to D3 and the skilled person's common general knowledge as evidenced by D6.

1.2 In conclusion, the main request is not allowable under Article 56 EPC.

2. AUXILIARY REQUEST

Claim 1 of "auxiliary request 1" differs from claim 1 of the main request basically in that it now specifies that

C2') the field-effect transistors of the backplane are disposed directly onto said upper conductive layer without a separate substrate to support the backplane.

This amendment is supported in particular by page 8, third paragraph, second sentence and page 12, second paragraph in conjunction with Figure 5 of the application as originally filed, and thus complies with Article 123(2) EPC.

2.1 Article 52(1) EPC: novelty and inventive step

The board is satisfied that the claims of this auxiliary request meet the requirements of Article 56 EPC, for the following reasons:

2.1.1 The feature analysis concerning claim 1 of the main request set out above applies *mutatis mutandis* to

claim 1 of this request, except for feature C2).

2.1.2 The new feature C2') now clearly indicates that the *field-effect transistors* (rather than merely the backplane) are specifically fabricated directly onto the upper conductive layer of the touch-sensitive sensor, without any substrate in between (unlike feature C2) of the main request; see point 1.1.4 above). This is obviously done to further reduce the overall thickness of the touch-screen device under consideration (see e.g. page 12, second paragraph of the description as filed).

2.1.3 With regard to that new feature, it is apparent from D3 that the electrodes (such as electrodes 13 and 16 in Figs. 1, 3 and 5 of D3) of the LCD panel, which corresponds to the backplane as claimed, are separated at least by a substrate (see e.g. substrate 12 and polariser 11 in Figs. 1, 3 and 5 of D3) from the upper electrode (e.g. electrode 21 in Figs. 1, 3 and 5 of D3) of the touch panel throughout the entire disclosure of D3. That means that D3 - besides features A2) and C1) - also fails to disclose feature C2') of claim 1 of the auxiliary request.

2.1.4 The board agrees with the appellant that there is moreover no motivation for the skilled person in the field of touch-screen devices to change the positioning of the electrodes and thus the placement of the transistors when using active-matrix backplanes as required by features C1) and C2'), since the problem of making the overall device thinner is already resolved in D3 by adjusting the thickness of the substrates involved in the underlying touch-screen device (see e.g. [0024]) or by employing a metal thin film as a light reflection layer (see e.g. [0040]). The board

concludes from this that the subject-matter of claim 1 is not rendered obvious by the teaching of D3.

2.1.5 This conclusion also holds true for document D1, which is even more remote from the solution proposed by present claim 1, since the substrate located between the conductive layers of the backplane and the touch panel comprises ribs or ridges (see e.g. D1, column 4, lines 9-29 in conjunction with Fig. 3), thereby making the fabrication of mechanically sensitive organic field-effect transistors directly onto the upper conductive layer of the touch sensor virtually unfeasible. Furthermore, D1 is completely silent as to the omission of a substrate between the backplane and the touch-panel part of the underlying touch-screen device (see point 1.1.1 above). Therefore, even if the teachings of D3 and D1 were combined, the skilled person would not arrive at the solution claimed.

2.2 Consequently, in the light of the cited prior art, the subject-matter of present claim 1 is held to be new and to involve an inventive step within the meaning of Articles 54 and 56 EPC. The above observations also apply to corresponding independent method claim 19.

3. Since all the other relevant formal objections raised by way of an *obiter dictum* in the decision under appeal (see in particular section 3.1) are likewise found to be overcome, the board decides that a patent is to be granted on the basis of claims 1 to 19 according to "auxiliary request 1".

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.

2. The case is remitted to the examining division with the order to grant a patent based on the following documents:
   - Claims 1 to 19, filed as "auxiliary request 1" during the oral proceedings before the board;
   - Description:
     - page 1 as published;
     - pages 2, 2a, 3 to 8, 10 to 12 as filed with letter dated 24 December 2015;
     - pages 9, 12a as filed during the oral proceedings before the board;
     - pages 13 to 16 as published;
   - Drawing pages:
     - pages 1/4 and 4/4 as published;
     - pages 2/4 and 3/4 as filed with letter dated 31 May 2012.

The Registrar: The Chair:

P. Martorana A. Ritzka

Decision electronically authenticated