

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte SHEN BUSWELL, DEANNA J. BERGSTROM,
and DANIEL FRECH

Appeal 2008-3351
Application 10/642,872
Technology Center 1700

Decided: August 20, 2008

Before EDWARD C. KIMLIN, CHARLES F. WARREN, and
ROMULO H. DELMENDO, *Administrative Patent Judges*.

DELMENDO, *Administrative Patent Judge*.

DECISION ON APPEAL

STATEMENT OF THE CASE

Appellants appeal under 35 U.S.C. § 134(a) from a final rejection of all pending claims (claims 1-8, 10-12, 14, 15, and 17-25). (Final Office Action entered June 13, 2006). We have jurisdiction under 35 U.S.C. § 6(b).

Appellants' claimed invention relates to methods of forming fluid feed slots in a substrate for use in fluid ejecting devices, particularly print head dies. (Spec. ¶ 00020). The slots "can comprise a central region and at least one terminal region joined with the central region." (*Id.* ¶ 00023). In one aspect, the terminal region has a bowl-shaped portion with "a diameter at a first surface of the substrate that is greater than a width of the central region at the first surface. The increased width . . . can reduce areas of stress concentration by distributing stresses over a greater amount of substrate material." (*Id.*).

Representative claims 1, 2, 5, 10, 14, and 20 read as follows:

1. A method comprising:

forming a slot into a substrate and extending between a first substrate surface and a generally opposing second substrate surface, the slot extending along a long axis that extends generally parallel the first surface and being defined, at least in part, by a pair of sidewalls which extend generally parallel to the long axis; and,

forming at least one bowl-shape into the substrate so that the long axis passes therethrough, the bowl shape being connected to the pair of sidewalls of the slot and defining, at least in part, a terminal region at an end of the slot.

2. The method of claim 1, wherein said act of forming at least one bowl shape comprises forming at least one bowl shape into the first surface of the substrate, and wherein the at least one bowl shape has a width at the first surface measured generally orthogonal to the long axis that is greater than a width at the first surface measured generally orthogonal to the long axis between the pair of sidewalls.

5. The method of claim 1, wherein said acts of forming occur concurrently.

10. A method comprising:

forming a fluid-feed slot between a first substrate surface and a second generally opposing substrate surface, the fluid-feed slot extending along a long axis which extends generally parallel to the first surface, and having a central region and at least one terminal region arranged along the long axis wherein the terminal region is wider at the first surface than the central region as measured generally orthogonally to the long axis; and,

blending the slot at the first surface, at least in part, to decrease stress concentrations on substrate material proximate the first surface.

14. A method comprising:

forming a fluid-feed slot by removing substrate material between a first substrate surface and a second generally opposing substrate surface, the fluid-feed slot extending along a long axis which lies generally parallel to the first substrate surface, the fluid-feed slot having a cross-section at the first surface and taken generally parallel the first surface comprising a narrower central region positioned between two wider terminal regions; and,

rounding the slot at the first surface by removing additional substrate material, at least in part, to decrease stress concentrations on substrate material proximate the first surface.

20. A method comprising:

forming a central region of a slot into a semiconductor substrate the central region extending between a first substrate surface and a generally opposing second substrate surface; and,

forming two terminal regions of the slot into the first surface generally contiguous with and interposed by the central region, each of the two terminal regions having a width at the

first surface taken generally orthogonal to a long axis of the slot that is greater than a width of the central region at the first surface taken generally orthogonal to the long axis of the slot.

The references relied upon by the Examiner to reject the claims on appeal are:

Baughman	US 5,441,593	Aug. 15, 1995
Soik	US 6,745,469 B1	Jun 8, 2004

The following rejections are before us for review:

I. Claims 1-3, 6, 7, 10-12, 14, and 17-25 are rejected under 35 U.S.C. § 102(b) as anticipated by Baughman.

II. Claims 1-4, 6, 7, 10-12, 14, 15, 17, 18, and 20-25 are rejected under 35 U.S.C. § 102(b) as anticipated by Soik.¹

III. Claims 5 and 8 are rejected under 35 U.S.C. § 103(a) as unpatentable over Soik.

We AFFIRM IN PART. We affirm rejection I as to claims 1, 3, 6, 7, and 17-19, but reverse with respect to claims 2, 10-12, 14, and 20-25. We affirm rejection II as to claims 1, 3, 4, 6, 7, 17, and 18, but reverse with respect to claims 2, 10-12, 14, 15, and 20-25. We affirm rejection III.

ISSUES

Have Appellants shown reversible error in the Examiner's factual

¹Claim 16 is also listed as rejected in the Grounds of Rejection to be Reviewed on Appeal section of Appellants' Brief (App. Br. 4), and in the Grounds of Rejection section of the Examiner's Answer (Ans. 2). However, it is clear from the prosecution record that Appellants cancelled claim 16 in papers submitted June 20, 2005 in response to a requirement for restriction/election.

findings that the subject matter of claims 1-3, 6, 7, 10-12, 14, and 17-25 is anticipated by Baughman?

Have Appellants shown the Examiner reversibly erred in finding that the subject matter of claims 1-4, 6, 7, 10-12, 14, 15, 17, 18, and 20-25 is anticipated by Soik?

Have Appellants shown that the Examiner reversibly erred in determining that the subject matter of claims 5 and 8 would have been obvious to one of ordinary skill in the art over the teachings of Soik?

FINDINGS OF FACT

The record supports the following findings of fact, as well as any other findings of fact indicated in this opinion, by at least a preponderance of the evidence.

1. Appellants' Specification describes a substrate containing "fluid-feed slot(s) [that] can allow fluid, commonly ink, to be supplied from an ink supply or reservoir to fluid ejecting elements contained in ejection chambers within the print head die." (Spec. ¶ 00021).
2. Appellants' Specification discloses an exemplary embodiment with bowl-shaped terminal regions at the ends of slots formed in a substrate. (*Id.* ¶ 00035; Figs. 5, 5c).
3. Appellants' Specification states that "bowl-shaped terminal region(s) can comprise a hemisphere, or a frusto-conical shape, among others." (Spec., ¶ 00038).
4. Appellants' Figs. 5, 5a, and 5c are reproduced below:

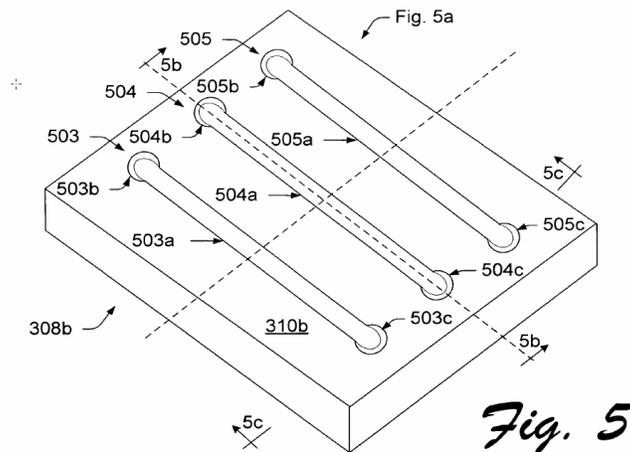


Fig. 5

Fig. 5 depicts a slotted substrate 308b having ink feed slots 503, 504, 505 in a first surface 310b, wherein the ink feed slots comprise central regions 503a, 504a, 505a, and bowl-shaped terminal regions 503b and c; 504b and c; 505b and c. (*Id.* ¶ 00035, 00036).

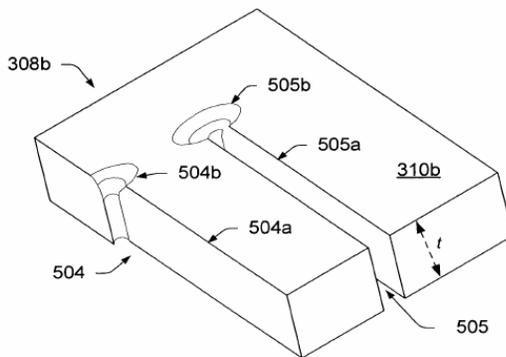


Fig. 5a

Fig. 5a depicts a portion of first surface 310b of substrate 308b including central region 505a and bowl-shaped terminal region 505b. (*Id.* ¶ 00037).

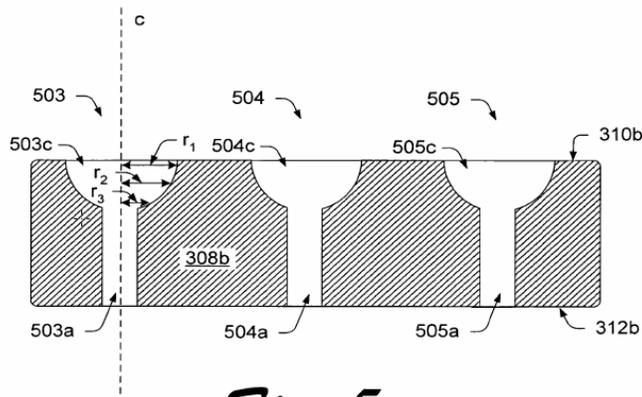


Fig. 5c

Fig. 5c depicts a cross-sectional view transverse to the long axis of ink fill slots 503, 504, 505 showing bowl-shaped terminal regions at the ends of the slots. (*Id.* ¶ 00041).

5. Baughman discloses forming an ink fill slot in a substrate between first and second surfaces, where the slot extends along a long axis parallel to the first surface and is defined by a pair of sidewalls and a bowl-shape along the length of the slot. (Figs. 1, 5c).
6. Baughman's Figs 1 and 5c are reproduced below:

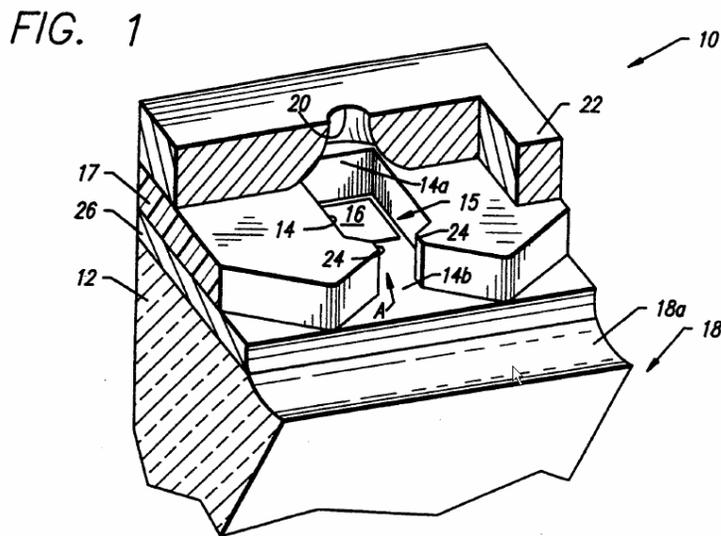


Fig 1 depicts a printing ejecting element 10 formed on substrate 12, an ink fill slot 18 with extension 18a, resistor 16, layer 17 with projections 24, ink feed channel 14, ejection chamber 15, and nozzle 20 within nozzle plate 22. (Col. 3, l. 66 through col. 4, l. 19).

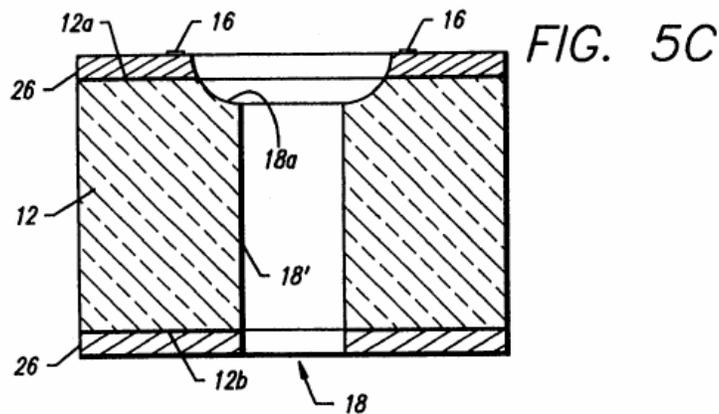


Fig. 5c depicts a cross-sectional view transverse to the long axis of ink fill slot 18 showing slot extension 18a, substrate 12, and passivating layers 26.

7. Baughman discloses forming ink fill slot 18 and extension 18a by etching substrate 12. (Col. 5, ll. 35-43).
8. Baughman's illustration of part of a slot with constant width dimensions and lack of description that the entire slot has any change in width dimensions would have indicated to one of ordinary skill in the art that the slot has a constant width from end to end. (Fig. 1).
9. Baughman's illustration of part of a slot with an unchanging bowl-shaped region 18a and lack of description that the entire slot's

bowl-shaped region has a change in shape would have indicated to one of ordinary skill in the art that the bowl-shaped region extends from end to end of the slot. (Fig. 1).

10. That Baughman would have indicated to one of ordinary skill in the art that the slot disclosed therein has a constant width and shape from end to end is consistent with Appellants' disclosure of prior art slots. (Spec. ¶ 00032, Fig. 4).
11. Soik discloses a plate having a contour "V" cut formed in an inflow side, and including a slot forming an arcuate trough along the slot length, with arcuate slot end portions. (Col. 8, ll. 48-53; Col. 9, ll. 5-19; Figs. 7, 9).
12. Soik does not disclose a slot having wider widths at the terminal regions than at the central regions along a slot extending end-to-end parallel to a first surface.
13. Soik describes problems associated with forming slots in substrates when making screen media across which fluid slurry is filtered, including confronting stress cracking problems associated with process steps such as milling and deburring. (Col. 2, ll. 25-28; 3, ll. 26-44).
14. Soik discloses an "arrangement of the inlet contour, the back groove, and the slot [that] reduces post machining processing and improves the strength of the screen media by, among other things, relieving stress concentrations." (Col. 6, ll. 22-26).

PRINCIPLES OF LAW

“To anticipate a claim, a prior art reference must disclose every limitation of the claimed invention, either explicitly or inherently.” *In re Schreiber*, 128 F.3d 1473, 1477 (Fed. Cir. 1997).

“During examination, ‘claims ... are to be given their broadest reasonable interpretation consistent with the specification, and ... claim language should be read in light of the specification as it would be interpreted by one of ordinary skill in the art.’” *In re Am. Acad. Sci. Tech. Ctr.*, 367 F.3d 1359, 1364 (Fed. Cir. 2004) (quoting *In re Bond*, 910 F.2d 831, 833 (Fed. Cir. 1990)).

“Two criteria have evolved for determining whether prior art is analogous: (1) whether the art is from the same field of endeavor, regardless of the problem addressed, and (2) if the reference is not within the field of the inventor's endeavor, whether the reference still is reasonably pertinent to the particular problem with which the inventor is involved.” *In re Clay*, 966 F.2d 656, 658 (Fed. Cir. 1992).

ANALYSIS

Anticipation Rejection of Claims 1-3, 6, 7, 10-12, 14, and 17-25 over Baughman

Claim interpretation of “terminal regions” of a slot.

Appellants contend that “the Examiner’s [claim] interpretation is not the ‘broadest reasonable interpretation’ according to MPEP § 2111 and is not consistent with the interpretation that those skilled in the art would reach.” (App. Br. 13, ll. 5-7). Appellants contend: “One of ordinary skill would not construe forming ‘terminal regions’ [Claims 1, 10-12, 14, 18, 19, and 20-25] and ‘the end of the slot’ [claims 1, 18] to mean ‘at the central

region of the slot’. The claim language does not lead to this meaning and the meaning is not consistent with the specification.” (*Id.* 12, ll. 16-21). Furthermore, Appellants direct us to Figs. 5 and 5a and related text in the Specification and state that “terminal regions are at the ends of a slot.” (*Id.* 12, ll. 19-21).

We agree with Appellants. The Examiner relied on Baughman’s Fig. 5c for a description of the subject matter of claims 1-3, 6, 7, 10-12, 14, and 17-25. (Ans. 3, l. 1 through 5, l. 2; FF 6). In this figure, the Examiner found: “When looking at the shape of the slot in the transverse cross-sectional view . . . one sees that the slot has two ends, one at the top surface and one at the bottom surface. The bowl-shaped region is at one end of the slot.” (Ans. 8, ll. 7-9; FF 6). With respect to Soik, the Examiner states: “Both Soik and Baughman have the same cross-sectional shape of a slot. Therefore, the arguments cited above for Baughman are repeated for Soik.” (Ans. 11, l. 16 through 12, l. 1).

The Examiner’s interpretation of the claimed subject matter of the terminal regions or ends of a slot is inconsistent with Appellants’ description in the Specification. In the Examiner’s interpretation, the terminal regions of the slot are placed at the top and bottom surfaces of the substrate with the slot’s central region within the interior of the substrate. This interpretation of a “terminal region” requires one to view the slot from a transverse or side perspective (i.e., the slot’s end-to-end axis between terminal regions is perpendicular to the top surface). In contrast, a person having ordinary skill in the art would have understood from the Specification that the claimed “terminal regions” of the fluid feed slots are located at the ends of the slots, as viewed looking at the top surface of the substrate (i.e., the end-to-end axis

between terminal regions of the slot is parallel to the top surface). (FF 1, 2, 4). Thus, we cannot agree with the Examiner's interpretation of the claimed "terminal" and "central" regions as running perpendicular to the top surface from a transverse view. *In re Am. Acad. Sci. Tech Ctr.*, 367 F.3d at 1364. Claims 1, 3, 6, 7, 17-19.

Appellants submit separate, but similar, arguments for claims 1 and 18. We address these common or similar arguments together. Claims 3, 6, 7, 17, and 19, which are not separately argued, stand or fall together with their respective base claims. 37 C.F.R. § 41.37(c)(1)(vii).

The Examiner found that Baughman discloses every limitation of claims 1 and 18. (Ans. 3-5; FF 5, 6). Appellants argue that "Baughman fails to disclose forming a slot and forming terminal regions in the slot as recited in the claims." (App. Br. 11, l. 26 through 12, l. 1). Furthermore, Appellants contend that Baughman cannot anticipate the subject matter of claim 1 because the reference "fails to disclose forming a bowl shape terminal region," and that "one of ordinary skill in the art would not interpret the central portion of the slot from Baughman as a terminal region." (*Id.* 14, l. 23 through 15, l. 1). Similarly, with respect to claim 18, Appellants argue: "Baughman fails to discuss and does not illustrate 'ends' of the slot 18a. Thus, Baughman fails to teach or suggest forming the claimed terminal region at an end of the slot." (*Id.*, 16, ll. 22-24).

While we agree with Appellants' claim construction of "terminal regions" of the slot, Appellants' arguments are unpersuasive. As discussed above, the claimed "terminal regions" are at the ends of the slots extending end-to-end and parallel to the first surface. Baughman discloses a bowl-shaped slot 18a within layer 26, which extends along the top surface of

substrate 12. (FF 6). Though Fig. 1 shows only a section of the slot (i.e., the central region of the slot), a person having ordinary skill in the art would have understood from Baughman's disclosure, including the disclosure relating to the method by which the slots are produced, that the slot runs a fixed length, comprises two ends, and has a bowl-shaped region that extends from end to end along the top surface. (FF 7, 8). If other sections of the slot not shown in Fig. 1 had different dimensions, Baughman would have disclosed the change in shape. Baughman did not do so. Thus, one of ordinary skill in the art would have understood Baughman to disclose a slot with an unchanging bowl-shaped region extending from end to end, and therefore comprises bowl-shaped terminal regions. (FF 9).

Moreover, a slot with a constant width and shape from end to end is consistent with Appellants' disclosure of prior art slots. (FF 10). Appellants have not directed us to any persuasive evidence that Baughman's slot changes shape outside its illustrated central region of Fig. 1.

For these reasons, we find Appellants have not shown the Examiner reversibly erred in rejecting claims 1 and 18.

Claims 2, 10-12, 14, and 20-25.

The Examiner found that Baughman discloses every limitation of claims 2, 10-12, 14, and 20-25. (Ans. 3-5). Appellants argue that Baughman cannot anticipate the claimed invention because the reference does not disclose a width at a first surface of the terminal region of the slot that is greater than a width of the central region of the slot. (App. Br. 14, ll. 7-13; 15, l. 10 through 16, l. 18).

We agree with Appellants. Claim 2 and independent claims 10, 14, and 20 recite, in relevant part, as follows:

2. “The method of claim 1, wherein . . . the at least one *bowl shape has a width at the first surface . . . that is greater than a width at the first surface . . . between the pair of sidewalls.*”

10. “A method comprising . . . “the fluid-feed slot extending along a long axis which extends generally parallel to the first surface, and having a central region and at least one terminal region arranged along the long axis *wherein the terminal region is wider at the first surface than the central region.*”

14. “A method comprising . . . “the fluid-feed slot having a cross-section at the first surface and taken generally parallel the first surface comprising *a narrower central region positioned between two wider terminal regions.*”

20. “A method comprising . . . each of the two terminal regions having a *width at the first surface . . . that is greater than a width of the central region at the first surface.*”

(Emphasis added, Claims 2, 10, 14, and 20; App. Br. 23-26).

Here, the claims require that the terminal regions have a width greater than the width of the central region sidewalls. The Examiner has not identified any portion of Baughman that describes these claim limitations, either explicitly or inherently. (FF 8). For this reason, we find that the Examiner erred in rejecting claim 2, independent claims 10, 14, 20, and their dependent claims 11, 12, and 21-25, as anticipated by Baughman.

Anticipation Rejection of Claims 1-4, 6, 7, 10-12, 14, 15, 17, 18, and 20-25 over Soik

Claims 1, 3, 4, 6, 7, 17, and 18.

Appellants submit separate, but similar, arguments for claims 1 and 18, and therefore, we address these common or similar arguments together. Claims 3, 4, 6, 7, and 17, which are not separately argued, stand or fall together with their respective base claims. 37 C.F.R. § 41.37(c)(1)(vii).

The Examiner found that Soik discloses every limitation of claims 1 and 18. (Ans. 5-6). Appellants argue that “Soik fails to teach or suggest forming a bowl-shape that defines a terminal region at an end of the slot as recited in claim 1.” (App. Br. 18, ll. 4-5). Regarding claim 18, Appellants argue that “Soik illustrates ends of its grooves but fails to teach or suggest a bowl-shaped terminal region.” (*Id.* 19, ll. 13-14).

Appellants’ arguments are unpersuasive. Soik discloses a plate having a contour “V” cut formed in an inflow side, and including a slot forming an arcuate trough along the slot length, with arcuate slot end portions. (FF 11; Figs. 7, 9). Appellants’ own Specification indicates that “[a] bowl-shaped terminal region(s) can comprise a hemisphere, or a frusto-conical shape, among others.” (FF 3). Thus, contrary to Appellants’ contentions, Soik describes the claimed “bowl-shape,” consistent with Appellants’ description. Soik’s disclosed “bowl shape” extends along the length of the slot, and therefore defines a terminal region at the end of the slot. (FF 11). Accordingly, Appellants have not shown that the Examiner reversibly erred in finding the claimed subject matter anticipated by the prior art.

Claims 2, 10-12, 14, 15, and 20-25.

The Examiner found that Soik discloses every limitation of claims 2, 10-12, 14, 15, and 20-25. (Ans. 5-6). Similar to their arguments presented above with respect to Baughman, Appellants argue that Soik cannot

anticipate the claimed invention because the reference does not disclose a width at a first surface of the terminal region of the slot that is greater than a width of the central region of the slot.

We agree with Appellants. The Examiner did not establish that Soik discloses, either explicitly or inherently, widths that are greater at the slot terminal regions than at the central regions. Rather, like Baughman, Soik describes a constant width along the slot length that extends from end-to-end in a direction parallel to a first surface. (FF 12). As discussed above, the claimed “terminal regions” must be interpreted in light of the Specification. When properly construed, Soik does not disclose the claim limitations in question.

Accordingly, we agree with Appellants that the Examiner erred in finding claims 2, 10-12, 14, 15, and 20-25 anticipated by the prior art.

Obviousness Rejection of Claims 5 and 8 in View of Soik

The Examiner found that Soik discloses every limitation of claims 5 and 8 except for “a required order of the process steps.” (Ans. 6, l. 7). However, the Examiner determined that “[i]t would have been obvious . . . to conduct the steps as cited, since the same end product occurs, and conducting them concurrently saves time, and conducting them in a particular order allows for optimizing the processes for best results . . . when the processes are different.” (Ans. 6, ll. 9-13).

Appellants rely on the same arguments in support of patentability as presented with respect to claim 1, and furthermore argue that Soik is “non-analogous art and therefore cannot be used to form a prima facie obviousness rejection.” (App. Br. 21, ll. 17-18). Additionally, Appellants

argue that Soik is non-analogous art because “the problems associated with the papermaking process and pulp slurry are not reasonably pertinent to semiconductor substrate fabrication or inkjet systems that involve highly accurate and precise delivery of drops of ink.” (*Id.* 20, ll. 11-14). Also, Appellants argue: “[T]he Office Actions neither ascertained nor reported on the level of ordinary skill in the art. Thus, all the rejections are improper and should be reversed.” (App. Br. 20, ll. 20-22).

For reasons discussed below, we do not find Appellants’ arguments persuasive.

Non-analogous art.

Analogous art to a claimed invention can be from the same field of endeavor or reasonably pertinent to the particular problem confronting an inventor. *In re Clay*, 966 F.2d at 658.

Here, the inventor confronts problems associated with “forming slots in a substrate that can be incorporated into a print head die or other fluid ejecting device” (Spec. ¶ 00020), and using “various slot configurations [that] can among other attributes provide desired fluid flow characteristics and minimize stress concentration, while resulting in a stronger, more robust slotted substrate that is less prone to cracking.” (*Id.* ¶ 00023). Soik addresses problems associated with forming slots in substrates when making screen media across which fluid slurry is filtered, including confronting stress cracking problems associated with process steps such as milling and deburring. (FF 13). Soik describes an “arrangement of the inlet contour, the back groove, and the slot [that] reduces post machining processing and improves the strength of the screen media by, among other things, relieving stress concentrations.” (FF 14). Because Soik is reasonably pertinent to the

inventor's problem of forming slots with a particular shape to relieve stress concentrations, we find that it is analogous art to the claimed invention. *In re Clay*, 966 F.2d at 659 (“If a reference disclosure has the same purpose as the claimed invention, the reference relates to the same problem, and that fact supports use of that reference in an obviousness rejection.”).

For these reasons, Appellants fail to show the Examiner reversibly erred in determining claims 5 and 8 obvious in view of Soik.

Level of ordinary skill in the art.

The Examiner established that “[t]he level of skill would be that of knowing how to form slots by drilling, laser machining, or etching. . . . [and that] Soik is at this minimum level.” (Ans. 12, ll. 14-16). Appellants argue that this finding “trivializes the present application and is inaccurate” and that “[u]nder th[e Examiner’s] view, one of ordinary skill in the art can be a person who drills slots in a block of wood in their garage.” (Reply Br. 3, ll. 20-22). Appellants contend that “the inventor’s field of endeavor is forming highly precise semiconductor substrates for inkjet print heads or other fluid ejecting devices.” (*Id.* 3, ll. 22-24). Appellants conclude that the rejections cannot stand. (*Id.* 3, ll. 26-27).

We find Appellants’ contentions without merit. Appellants’ do not provide any persuasive evidence that the Examiner’s finding was in error. Appellants fail to show how a more precise description of the level of skill in the art would have changed the outcome of the Examiner’s determination of obviousness. Appellants do not show that the Examiner's finding of the level of skill of one of ordinary skill in the art caused reversible error in determining the claims obvious in view of Soik.

CONCLUSION

In view of the above discussion, we reverse the rejection under 35 U.S.C. § 102(b) over Baughman with respect to claims 2, 10-12, 14, and 20-25. We also reverse the rejection under 35 U.S.C. § 102(b) of claims 2, 10-12, 14, 15, and 20-25 over Soik.

We affirm, however, the 35 U.S.C. § 102(b) rejections of: (i) claims 1, 3, 6, 7, 17, 18, and 19 as anticipated by Baughman; and (ii) claims 1, 3, 4, 6, 7, 17, and 18 as anticipated by Soik. We also affirm the 35 U.S.C. § 103(a) rejection of claims 5 and 8 as obvious over Soik.

Accordingly, the decision of the Examiner to reject the appealed claims is affirmed in part.

No time period for taking any subsequent action in connection with this appeal may be extended under 37 C.F.R. § 1.136(a)(1)(iv).

AFFIRMED-IN-PART

Appeal 2008-3351
Application 10/642,872

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