

The opinion in support of the decision being entered today was *not* written for publication and is *not* binding precedent of the Board.

UNITED STATES PATENT AND TRADEMARK OFFICE

**BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES**

Ex parte JAE-HO MOON,
DAE-SOON LIM, and O-HYUN BAEK

Appeal No. 2005-0247
Application No. 10/171,657

HEARD: May 4, 2005

Before KRASS, BARRY, and SAADAT, *Administrative Patent Judges*.
BARRY, *Administrative Patent Judge*.

DECISION ON APPEAL

A patent examiner rejected claims 1-27. The appellants appeal therefrom under 35 U.S.C. § 134(a). We affirm.

BACKGROUND

The invention at issue on appeal is a "bubble-jet type" ink jet print head. (Spec. at 1.) Such a print head heats ink to a form a bubble therein, which ejects ink droplets.¹

¹In contrast, an "electro-mechanical transducer type" employs a piezoelectric crystal bends that bends to change a volume of ink, thereby causing ink droplets to be expelled. (Spec. at 2.)

(*Id.* at 2.) More specifically, the appellants' print head features a nozzle plate having nozzles through which ink is ejected. A substrate supports the nozzle plate, and an ink chamber is disposed between the substrate and the nozzle plate. A doughnut-shaped or a polygonal-shaped heater surrounds the central axis of each nozzle, the resistance of the heater varying at regular intervals. Electrodes apply current to the heater. (*Id.* at 3.)

In operation, the appellants' print head first forms bubbles around the heater at regular angles to the central axis of the nozzle and then forms additional bubbles between the earlier formed ones, thereby forming a larger, doughnut-shaped bubble. They assert that this "prevent[s] the formation of an unbalanced doughnut-shaped bubble due to variations in local resistance of the heater, which may be caused by a process error." (*Id.* at 21.) Setting the center of the doughnut-shaped bubble on the central axis of the nozzle, moreover, causes a droplet of ink formed within the bubble to be ejected in a direction vertical to the nozzle plate. (*Id.*)

A further understanding of the invention can be achieved by reading the following claim.

13. A bubble-jet type printhead having a plurality of nozzles each configured to eject an ink drop therethrough, comprising:

a nozzle plate having said plurality of nozzles disposed therein, said nozzle plate being placed on a substrate to form a cavity underneath said nozzle plate, said cavity being in fluid communication with each of said plurality of nozzles to provide a supply of ink thereto; and

a plurality of heating elements, each of said heating elements having a first portion that has a first resistance and a second portion that has a second resistance different from said first resistance, each of said heating elements generating an annular bubble with balanced distribution within said cavity, said annular bubbles each having a virtual chamber formed within the corresponding annular bubbles and ink present in the virtual chamber is ejected through a corresponding one of said nozzles.

Claims 1, 6, 7, 9,11-19, 24, 25, and 27 stand rejected under 35 U.S.C. § 103(a) as obvious over U.S. Patent No. 4,870,433 ("Campbell"). Claims 2-5, 8, 20, 23, and 26 stand rejected under § 103(a) as obvious over Campbell and U.S. Patent No. 4,914,562 ("Abe"). Claim 10 stands rejected under § 103(a) as obvious over Campbell and U.S. Patent No. 5,305,018 ("Schantz").

OPINION

Our opinion addresses the claims in the following order:

- claims 1, 6, 7, 9,11-19, 24, 25, and 27
- claims 2-5, 8, 10, 20, 23, and 26.

A. CLAIMS 1, 6, 7, 9, 11-19, 24, 25, AND 27

"[T]o assure separate review by the Board of individual claims within each group of claims subject to a common ground of rejection, an appellant's brief to the Board must contain a clear statement for each rejection: (a) asserting that the patentability of claims within the group of claims subject to this rejection do not stand or fall together, and (b) identifying which individual claim or claims within the group are separately patentable and the reasons why the examiner's rejection should not be sustained." *In re McDaniel*, 293 F.3d 1379, 1383, 63 USPQ2d 1462, 1465 (Fed. Cir. 2002) (citing 37 C.F.R. §1.192(c)(7) (2001)). "If the brief fails to meet either requirement, the Board is free to select a single claim from each group of claims subject to a common ground of rejection as representative of all claims in that group and to decide the appeal of that rejection based solely on the selected representative claim." *Id.*, 63 USPQ2d at 1465.

Here, although the appellants assert that "[c]laim 1 stands or falls alone," (Appeal Br. at 6), they argue claims 1, 6, 7, 9, 11-19, 24, 25, and 27 as a group. (*Id.* at 7-9.) Therefore, claims 1, 6, 7, 9, 11, 12, 14-19, 24, 25, and 27 stand or fall with representative claim 13. With this representation in mind, rather than reiterate the

positions of the examiner or the appellants *in toto*, we focus on the two points of contention therebetween, which follow:

- annular bubble with virtual chamber
- ink ejection.

1. Annular Bubble with Virtual Chamber

The examiner makes the following findings.

Campbell describes the operation of the heater with respect to Fig. 2 at Col. 3:50-66). Campbell teaches that the bubble normally forms on both elongated portions (23) to form bubbles (26a) and on both end portions to form bubbles (26b). The bubbles continue to grow and stick together at the **perimeter** (emphasis added) and at the center during bubble growth, until a pillow-shaped bubble is formed. Extending this teaching to the embodiment of Fig. 3, it can be seen that the bubbles will form around the perimeter of the annular heater (12). At some point in time, the bubbles will have formed around the perimeter of the heater, but will not have reached sufficient size to fill-in the open, center portion of the heater. At this time, the claimed virtual chamber would exist.

(Examiner's Answer at 7.) The appellants make the following argument.

[D]ue to the elongated form of Campbell's heating element, an annular bubble will not be formed. Instead, when the bubbles 26a and 26b coalesce into a single bubble, a pillow shaped bubble 22 is formed, wherein the central portion of bubble 22 pertaining to bubbles 26a, having been formed faster than the portions pertaining to bubbles 26b, will have a higher level in the ink. Due to this level of the bubble 22 being higher than the other portions of the bubble, no virtual chamber (pocket) is formed and there is no ink, only air, within the bubble.

(Appeal Br. at 8.) In addressing the point of contention, the Board conducts a two-step analysis. First, we construe the representative claim to determine its scope. Second, we determine whether the construed claim would have been obvious.

a. Claim Construction

"Analysis begins with a key legal question — *what is the invention claimed?*" *Panduit Corp. v. Dennison Mfg. Co.*, 810 F.2d 1561, 1567, 1 USPQ2d 1593, 1597 (Fed. Cir. 1987). In answering the question, "the Board must give claims their broadest reasonable construction. . . ." *In re Hyatt*, 211 F.3d 1367, 1372, 54 USPQ2d 1664, 1668 (Fed. Cir. 2000). "Moreover, limitations are not to be read into the claims from the specification." *In re Van Geuns*, 988 F.2d 1181, 1184, 26 USPQ2d 1057, 1059 (Fed. Cir. 1993) (citing *In re Zletz*, 893 F.2d 319, 321, 13 USPQ2d 1320, 1322 (Fed. Cir. 1989)).

Here, claim 13 recites in pertinent part the following limitations: "each of said heating elements generating an annular bubble with balanced distribution within said cavity, said annular bubbles each having a virtual chamber formed within the corresponding annular bubbles. . . ." Giving the representative claim its broadest, reasonable construction, the limitations require generating an annular shaped bubble having a space in its middle.

b. Obviousness Determination

Having determined what subject matter is being claimed, the next inquiry is whether the subject matter would have been obvious. The question of obviousness is "based on underlying factual determinations including . . . what th[e] prior art teaches explicitly and inherently. . . ." *In re Zurko*, 258 F.3d 1379, 1383, 59 USPQ2d 1693, 1696 (Fed. Cir. 2001) (citing *Graham v. John Deere Co.*, 383 U.S. 1, 17-18, 148 USPQ 459, 467 (1966); *In re Dembiczak*, 175 F.3d 994, 998, 50 USPQ 1614, 1616 (Fed. Cir. 1999); *In re Napier*, 55 F.3d 610, 613, 34 USPQ2d 1782, 1784 (Fed. Cir. 1995)). Of course, "[e]very patent application and reference relies to some extent upon knowledge of persons skilled in the art to complement that [which is] disclosed. . . ." *In re Bode*, 550 F.2d 656, 660, 193 USPQ 12, 16 (CCPA 1977) (quoting *In re Wiggins*, 488 F.2d 538, 543, 179 USPQ 421, 424 (CCPA 1973)). Those persons "must be presumed to know something" about the art "apart from what the references disclose." *In re Jacoby*, 309 F.2d 513, 516, 135 USPQ 317, 319 (CCPA 1962).

Here, Campbell "provide[s] a thermal drop-on-demand ink jet print head. . . ." Col. 2, l. 13. Because the reference explains that "a heater is selectively energized to form a 'bubble' in the adjacent ink," col. 1, ll. 12-13, and "[t]he rapid growth of the bubble causes an ink drop to be ejected from a nearby nozzle," *id.* at ll. 13-14, we find

that Campbell's thermal drop-on-demand ink jet print head constitutes a "bubble-jet type" ink jet print head. The reference's print head "comprises a suitable substrate member 10, upon one surface 11 of which is formed an array of resistive heater elements 12, only one of which is shown in FIGS. 1 and 2 of the drawings." Col. 2, ll. 49-52. "A second substrate 18 is fixed in position adjacent to substrate 10 so that a nozzle 19 is opposite each of the resistive heating elements 12. Substrate 18 is shaped to provide an ink flow channel 20 to distribute a marking fluid such as ink to the print cavity 21 which holds a predetermined volume of ink between the resistive heater elements 12 and the corresponding nozzle 19." Col. 3, ll. 1-13.

"An[] embodiment of resistive heater elements 12 is shown in FIG. 3 in which the elongated portions 31 are curved and are joined by end portions 32 to form a small elongated opening 30. Thin conductive strips 33 are formed at spaced intervals on elongated portions 31. The conductive strips 33 extend radially on curved elongated portions 31 to force the electrical current path to follow the curvature and avoid current crowding problems." Col. 4, ll. 20-29. Furthermore, Figure 3 shows that the curved elongated portions 31 and the end portions 32 collectively form an annular shaped heating element 12, with an opening 30 in the middle.

"[A] data pulse is supplied to control electrode 16 to energize the associated resistive heater element 12. . . ." Col. 3, ll. 8-9. "[B]ubbles will nucleate normally on both elongated portions . . . to form bubbles 26a and on both end portions 24 to form bubbles 26b. . . ." *Id.* at ll. 50-52. "Due to a slight variation in current density, bubble 26b will be formed with a slight delay from bubble 26a. These bubbles 26a and 26b continue to grow and coalesce or stick together at the perimeter . . . during bubble growth." *Id.* at ll. 52-57. Because the heating element 12 is annular, with the opening 30 in its middle, we agree with the examiner's finding that "[a]t some point in time, the bubbles [26a and 26b] will have formed around the perimeter of the heat[ing element 12]," (Examiner's Answer at 7), i.e., along the elongated portions 31 and the end portions 32, "but will not have reached sufficient size to fill-in the open[ing 30]. . . ." (*Id.*) We further agree with him that "[a]t this time, the claimed virtual chamber would exist." (*Id.*) More specifically, the opening in the middle of the growing bubbles would constitute a "virtual chamber" as claimed. At oral hearing, the appellants' attorney conceded the brief existence of such a chamber during growth of the bubbles in Campbell.

2. Ink Ejection

The appellants argue, however, that "there is no showing that the ink in this virtual chamber is the ink ejected through nozzle 19." (Reply Br.² at 8.) The examiner asserts, "[w]hile the Specification does teach that ink ejection can occur when the virtual chamber still exists, that is, when the middle portion of the doughnut-shaped bubble has a very small diameter, the Appellant [sic] has not claimed this feature." (Examiner's Answer at 9.)

a. Claim Construction

Claims 13 further recites in pertinent part the following limitations: "ink present in the virtual chamber is ejected through a corresponding one of said nozzles." Giving the representative claim its broadest, reasonable construction, the limitations require ejecting ink preset in the middle space of the annular shaped bubble.

b. Obviousness Determination

²Copying the Statement of Real Party in Interest, Related Appeals and Interferences, Status of Claims, Status of Amendments after Final Rejection, Summary of the Invention, Issues, Grouping of Claims, and Claims under Appeal sections of the appeal brief into the reply brief, (Reply Br. at 2-6, 10-16), is neither required by nor helpful to the Board.

As mentioned regarding the prior point of contention, *supra*, at some point in time during the growth of the bubbles generated by the heater element, an opening in the middle of the growing bubbles would constitute a virtual chamber. Because the heater element 12 is located in the ink-filled print cavity 21, Fig. 1, moreover, we find that the virtual chamber will contain ink.

Later during growth, the bubbles will "coalesce or stick together . . . at the center during bubble growth. The bubbles 26a, 26b grow into a single pillow-shaped bubble 22 (see FIG. 2) so that the momentum is directed toward the nozzle 19. . . ." Col. 3, ll. 55-59. Bounded by the surface 11 of the substrate 10 on the bottom, and the pressure from ink flowing into the print cavity 21 via the ink flow channel 20 on the sides, the ink previously contained in the virtual chamber will be forced toward the nozzle and then "ejected in an energy-efficient manner," *id.* at l. 60, therefrom. Therefore, we affirm the obviousness rejection of claim 13 and of claims 1, 6, 7, 9, 11, 12, 14-19, 24, 25, and 27, which fall therewith.

2. CLAIMS 2-5, 8, 10, 20, 23, AND 26.

Rather than arguing the rejections of claims 2-5, 8, 10, 20, 23, and 26 separately, the appellants rely on their aforementioned arguments. (Appeal Br. at 9-10.)

Unpersuaded by these arguments, we also affirm the rejections of claims 2-5, 8, 10, 20, 23, and 26

CONCLUSION

In summary, the rejections of claims 1-27 under § 103(a) are affirmed. "Any arguments or authorities not included in the brief will be refused consideration by the Board of Patent Appeals and Interferences. . . ." 37 C.F.R. § 1.192(a). Accordingly, our affirmance is based only on the arguments made in the briefs. Any arguments or authorities omitted therefrom are neither before us nor at issue but are considered waived. *Cf. In re Watts*, 354 F.3d 1362, 1367, 69 USPQ2d 1453, 1457 (Fed. Cir. 2004) ("[I]t is important that the applicant challenging a decision not be permitted to raise arguments on appeal that were not presented to the Board.") No time for taking any action connected with this appeal may be extended under 37 C.F.R. § 1.136(a)(1)(iv).

AFFIRMED

ERROL A. KRASS
Administrative Patent Judge

LANCE LEONARD BARRY
Administrative Patent Judge

MAHSHID D. SAADAT
Administrative Patent Judge

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