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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

Ex parte NICOLAS ARAB, ARNOLD ESTRADA,
DANIEL FINE, and ROSS JOHNSON

Appeal 2019-004013
Application 15/070,108
Technology Center 1700

Before DONNA M. PRAISS, MICHELLE N. ANKENBRAND, and
JEFFREY R. SNAY, *Administrative Patent Judges*.

PRAISS, *Administrative Patent Judge*.

DECISION ON APPEAL¹

Appellant² appeals under 35 U.S.C. § 134(a) from the Examiner's decision rejecting claims 1, 3, 5, 7–9, 11–13, 17, 21–24, 26, 28, 30, 36–38, 40, and 64–67. We have jurisdiction over the appeal under 35 U.S.C. § 6(b).

We REVERSE.

¹ Our Decision refers to the Specification (“Spec.”) filed Mar. 15, 2016, Appellant’s Appeal Brief (“Appeal Br.”) filed Nov. 20, 2018, the Examiner’s Answer (“Ans.”) dated Mar. 8, 2019, and Appellant’s Reply Brief (“Reply Br.”) filed Apr. 26, 2019.

² We use the word “Appellant” to refer to “applicant” as defined in 37 C.F.R. § 1.42. Appellant identifies Luminex Corporation as the real party in interest. Appeal Br. 3.

STATEMENT OF THE CASE

The invention relates “to methods and devices for forming droplets.”
Spec. ¶ 2. The Specification discloses droplet formation by compartmentalizing reactions and surrounding a first fluid with a second fluid or a second fluid and one or more surfaces. *Id.* ¶¶ 4–5. The Specification’s emulsification device includes, among other things, a channel having an inlet portion and first, second, and third steps having certain dimensions and relationships between dimensions. *Id.* ¶¶ 8–9. The Specification states that “the dimensions and geometry of the channel and steps are configured to produce highly monodispersed emulsions at high frequency [and] from a single fluid flow.” *Id.* ¶ 61.

Claim 1, reproduced below from the Claims Appendix to the Appeal Brief, is illustrative.

1. An emulsification device comprising:
 - a channel having an inlet portion having a channel height CH and a width CW, wherein the ratio of CW/CH is greater than 0.2 and less than 5.0;
 - a first step in fluid communication with the inlet portion, wherein:
 - the first step has a tread length T1 and a step height SH1;
 - SH1 is greater than CH by a riser height R1; and
 - the ratio of SH1/CH is greater than 1.0 and less than 5.0;
 - a second step in fluid communication with the first step, wherein:
 - the second step has a tread length T2 and a step height SH2;
 - SH2 is greater than SH1 by a riser height R2;
 - the ratio of SH2/CH is greater than 1.0 and less than 5.0;
 - and

the ratio of T2/CH is less than the ratio of T1/CH;
a third step in fluid communication with the second step,
wherein:
the third step has a step height SH3;
SH3 is greater than SH2 by a riser height R3; and
R3 is greater than zero.

Claims 13 and 36 are each directed to a method of forming an emulsion that comprises the device according to claim 1. The remaining claims on appeal depend directly or indirectly from claims 1, 13, and 36.

ANALYSIS

We review the appealed rejections for error based upon the issues Appellant identifies. *Ex parte Frye*, 94 USPQ2d 1072, 1075 (BPAI 2010) (precedential) (*cited with approval in In re Jung*, 637 F.3d 1356, 1365 (Fed. Cir. 2011) (“[I]t has long been the Board’s practice to require an applicant to identify the alleged error in the examiner’s rejections.”)). After considering the positions of both the Examiner and Appellant, we are persuaded the Examiner reversibly erred for the reasons set forth in Appellant’s briefs and discussed below.

Rejection 1: Obviousness over Bio-Rad and Hvichia

The Examiner rejects claims 1, 3, 5, 7–9, 11–13, 17, 21–23, 36, and 64–67 under 35 U.S.C. § 103 as being unpatentable over Bio-Rad³ in view of Hvichia.⁴ Ans. 5–10.

The Examiner finds Bio-Rad discloses an emulsification device having an inlet portion and first, second, and third steps. Ans. 5. The Examiner finds Bio-Rad’s emulsification device discloses the various dimensions and relationships claim 1 requires except the recited “ratio of T2/CH [tread length 2/channel height] is less than the ratio of T1/CH [tread length 1/channel height].” *Id.* at 5–6. The Examiner finds Hvichia discloses a device having a channel with segregating steps in which the length of the second step is less than the length of the first step. *Id.* at 6. The Examiner concludes it would have been obvious to modify Bio-Rad’s device with Hvichia’s step lengths “to provide for means of segregating particles and droplets as taught by Hvichia.” *Id.*

Appellant contends the Examiner’s reasoning does not support a legal conclusion of obviousness because (1) Hvichia does not use the word “droplet”; (2) Hvichia does not teach segregating particles and droplets; (3) Bio-Rad does not mention segregating particles and droplets; and (4) Bio-Rad does not disclose or suggest that such segregation would be beneficial. Appeal Br. 8–9. Appellant further argues that the fluid flows

³ US 2014/0024023A1, published Jan. 23, 2014 (“Bio-Rad”). We cite the applicant’s name instead of the first-named inventor for consistency with the record in this Appeal.

⁴ US 9,631,179 B2, issued Apr. 25, 2017 (“Hvichia”).

relative to Bio-Rad and Hvichia's respective step structures are in opposite directions and the Examiner has not provided any rationale why a person having ordinary skill in the art would have modified Bio-Rad's steps going "down" to steps going "up." Appellant points out Hvichia is directed to segregating particles by size rather than droplet formation or emulsification. Appeal Br. 7; Reply Br. 2-3.

Appellant's arguments are persuasive of harmful error. Bio-Rad is directed to a system for forming emulsion droplets via a channel junction at which a stream of sample fluid is divided into droplets by a dividing flow of carrier fluid. Bio-Rad ¶ 8. As shown in Bio-Rad's Figures 31-33 below, Bio-Rad's fluids flow down steps so the fluids encounter a region of greater height within Bio-Rad's flow passage.

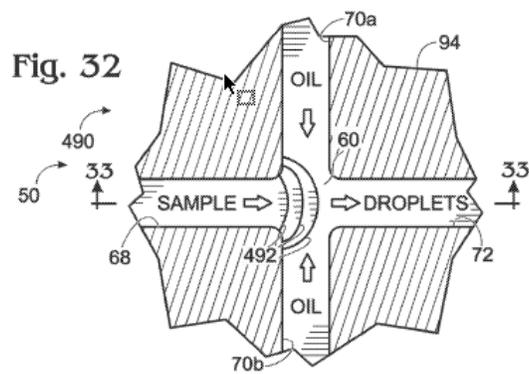
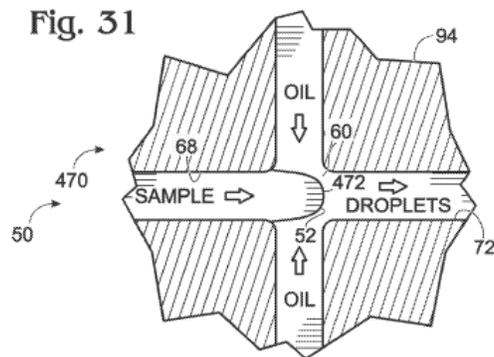
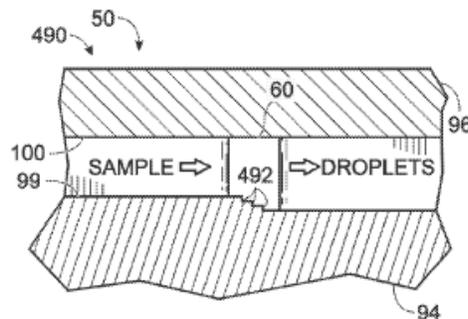


Fig. 33



Figures 31–33 are fragmentary sectional views of Bio-Rad’s droplet generation device with Figure 33 taken generally along Figure 32’s line 33–33. Bio-Rad ¶¶ 41–43. As Appellant correctly points out, Bio-Rad is not directed to segregating particles *and* droplets and does not suggest that such segregation is beneficial.

Hvichia is directed to segregating and manipulating biological cells, organelles, cell conglomerates, and other particles from mixed populations of particles or cells. Hvichia 1:37–40. Hvichia teaches this is done via a segregating step having a leading edge, so an upstream portion to the leading edge has a height facilitating passage of both larger and smaller particles, but a height of a downstream portion facilitates passage of smaller particles (e.g., red blood cells) while inhibiting passage of larger particles (e.g., circulating tumor cells). *Id.* at 1:54–65, 2:42–46. As shown in Hvichia’s Figure 1D below, the particles or cells flow up steps encountering regions of decreasing height.

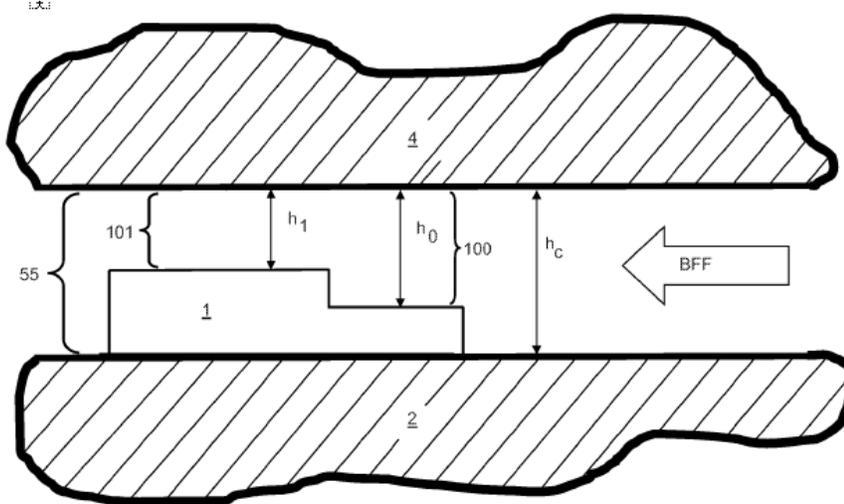


Fig. 1D

Figure 1D is a cross-sectional view of Hvichia's separation element 1 disposed in a fluid channel defined by a gap between cover 4 and apparatus body 2. Hvichia 3: 42–45. Thus, Hvichia provides areas of decreasing height to segregate particles or cells, not areas of increasing height for droplet formation.

In view of the different effects and functions of Bio-Rad's and Hvichia's devices, rational underpinnings do not support the Examiner's modification of Bio-Rad's device with Hvichia's dimensions. The Examiner's rejection does not sufficiently explain why it would have been obvious for one of ordinary skill in the art to have combined Bio-Rad and Hvichia.

Moreover, although Hvichia is concerned with both the step heights within the channel to segregate particles or cells (*id.* at 1:54–65) and the width of the channel to provide bulk fluid flow (*id.* at 2:10–14), Hvichia does not teach or suggest using a certain tread length for its first and second steps in order to achieve a desired effect. Therefore, Hvichia's disclosure

does not provide a reason for the first and second steps' tread lengths having a "ratio of T2/CH is less than the ratio of T1/CH," as claim 1 recites.

In view of the above and for the reasons provided in the Appeal Brief and the Reply Brief, we reverse the Examiner's rejection of claim 1 over Bio-Rad and Hvichia.

Because claims 13 and 36 require the device of claim 1, as do claims dependent from claims 1, 13, and 36, we do not sustain the Examiner's rejection of claims 3, 5, 7-9, 11-13, 17, 21-23, 36, and 64-67 over Bio-Rad and Hvichia for the same reasons.

Rejections of claims 24, 26, 28, 30, 37, 38, and 40

The Examiner rejects claims 24, 28, and 40 under 35 U.S.C. § 103 as being unpatentable over Bio-Rad in view of Hvichia and further in view of Hiddessen,⁵ claim 26 under 35 U.S.C. § 103 as being unpatentable over Bio-Rad in view of Hvichia and further in view of Harris,⁶ claim 30 under 35 U.S.C. § 103 as being unpatentable over Bio-Rad in view of Hvichia and further in view of Bibette,⁷ claim 37 under 35 U.S.C. § 103 as being unpatentable over Bio-Rad in view of Hvichia and further in view of Harvard,⁸ and claim 38 under 35 U.S.C. § 103 as being unpatentable over

⁵ US 2011/0217712 A1, published Sept. 8, 2011 ("Hiddessen").

⁶ US 3,457,336, issued July 22, 1969 ("Harris").

⁷ US 5,938,581 A, published Aug. 17, 1999 ("Bibette").

⁸ Link et al., *Geometrically Mediated Breakup of Drops in Microfluidic Devices*, 92 Physical Rev. Letters 054503-1 (Feb. 6, 2004) ("Harvard"). Consistent with the record in this Appeal, we refer to this reference as "Harvard."

Bio-Rad in view of Hvichia and Harvard and further in view of Paine.⁹

Ans. 11–14.

The Examiner’s reliance on additional prior art in the rejections of claims 24, 26, 28, 30, 37, 38, and 40 does not cure the deficiencies discussed above with regard to claim 1. Therefore, we do not sustain the Examiner’s rejections of claims 24, 26, 28, 30, 37, 38, and 40 under § 103.

Drawing Objection

Appellant challenges the Examiner’s objection to the drawings. Appeal Br. 13. An appeal under 35 U.S.C. § 134(a) is limited to rejected claims; therefore, the objection to drawings is a petitionable matter rather than appealable subject matter. *In re Berger*, 279 F.3d 975, 984–85 (Fed. Cir. 2002) (citing *In re Hengehold*, 440 F.2d 1395, 1403 (CCPA 1971)); *see also* MPEP § 1201. Thus, Appellant should have raised this matter in a timely-filed petition under 37 C.F.R. § 1.181. *See* 37 C.F.R. § 1.113(a).

CONCLUSION

For these reasons and those the Appellant provides, we reverse the Examiner’s rejections of claims 1, 3, 5, 7–9, 11–13, 17, 21–24, 26, 28, 30, 36–38, 40, 64–67 under 35 U.S.C. § 103.

⁹ US 5,455,315 A, issued Oct. 3, 1995 (“Paine”).

DECISION SUMMARY

In summary:

Claim(s) Rejected	35 U.S.C. §	Reference(s)/Basis	Affirmed	Reversed
1, 3, 5, 7-9, 11-13, 17, 21-23, 36, 64-67	103	Bio-Rad, Hvichia		1, 3, 5, 7- 9, 11-13, 17, 21-23, 36, 64-67
24, 28, 40	103	Bio-Rad, Hvichia, Hiddessen		24, 28, 40
26	103	Bio-Rad, Hvichia, Harris		26
30	103	Bio-Rad, Hvichia, Bibbette		30
37	103	Bio-Rad, Hvichia, Harvard		37
38	103	Bio-Rad, Hvichia, Harvard, Paine		38
Overall Outcome				1, 3, 5, 7- 9, 11-13, 17, 21-24, 26, 28, 30, 36-38, 40, 64-67

REVERSED