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 JOSEPH REMICK, ANTHONY J.D. FEURTADO, MARYAM MOBED-MIREMADI, TIM J. LAZARUK, and JAY K. BASS

Appeal 2007-1163
Application 10/172,470
Technology Center 1600

Decided: June 14, 2007

Before DONALD E. ADAMS, ERIC GRIMES, and LORA M. GREEN, *Administrative Patent Judges*.

GRIMES, *Administrative Patent Judge*.

DECISION ON APPEAL

This is an appeal under 35 U.S.C. § 134 involving claims to a flow cell assembly. The Examiner has rejected the claims as anticipated or obvious. We have jurisdiction under 35 U.S.C. § 6(b). We affirm-in-part.

BACKGROUND

The Specification describes "a flow cell assembly for conducting at least one reaction in the synthesis of an array of biopolymers on the surface of a support" (Specification 4). The flow cell assembly comprises a flow

cell chamber, a manifold, and a vacuum source (*id.*). "The manifold compris[es] at least 3 inlets, a wash reagent inlet, an inlet for a reagent for conducting a step of said synthesis, and a vent. The flow cell assembly may also comprise . . . a controller for controlling . . . the vent and the vacuum source." (*Id.* at 4-5.)

The Specification also describes methods for the synthesis of chemical compounds on supports, which "employ one or more flow cells or chambers, in a different repetitive step in the synthesis" (*id.* at 5). Specifically, the Specification describes a method in which "the support is placed in the flow cell, which is then filled with a reagent for carrying out the particular step of the synthesis." After the reagent has sufficient time "to interact with the materials on the surface of the support," the "reagent is removed from the flow cell at a pressure that does not substantially exceed atmospheric pressure. This may be accomplished by simultaneously venting and applying a vacuum to the flow chamber." (*Id.*)

DISCUSSION

1. CLAIMS

Claims 23-28 are pending and on appeal. The claims have been argued in four groups (Br. 4-8); the claims within each group stand or fall together. 37 C.F.R. § 41.37(c)(1)(vii). We will focus on claims 23, 24, 26, and 28, which are representative and read as follows:

23. A flow cell assembly for conducting at least one reaction in the synthesis of an array of biopolymers on the surface of a support, said flow cell comprising:

(a) a flow cell chamber,

(b) a manifold in fluid communication with said chamber, said manifold comprising at least a separate wash reagent inlet in fluid

communication with a dispensing station for said wash reagent, a separate inlet for a reagent for conducting a step of said synthesis in fluid communication with a dispensing station for said reagent, and a separate vent,

(c) a vacuum source in fluid communication with said flow cell chamber, and

(d) a controller communicating with a computer comprising software to control said vent and said vacuum source to simultaneously vent and apply vacuum to the flow chamber.

24. A flow cell assembly according to Claim 23 further comprising a fluid level sensor and a controller for controlling said inlets.

26. An apparatus for synthesizing an array of biopolymers on the surface of a support, said apparatus comprising:

(a) one or more flow cell assemblies of Claim 23,

(b) one or more fluid dispensing stations in fluid communication with said one or more flow cell assemblies,

(c) a station for monomer addition to said surface of said support, and

(d) a mechanism for moving a support to and from said station for monomer addition and a flow cell and from one flow cell to another flow cell.

28. An apparatus according to Claim 26 wherein said mechanism is a robotic arm.

Thus, claim 23 is directed to a flow cell assembly comprising a flow cell chamber, a manifold, a vacuum source, and a controller. The manifold comprises a wash reagent inlet, a separate inlet for another reagent, and a separate vent. The controller "communicat[es] with a computer comprising software to control [the] vent and [the] vacuum source to simultaneously vent and apply vacuum to the flow chamber." We interpret this recitation to require that the vent be open while the vacuum is applied.

Claim 24 depends from claim 23 and requires that the assembly additionally comprises a fluid level sensor and a controller for controlling the inlets.

Claim 26 is directed to an apparatus comprising a flow cell assembly of claim 23, a fluid dispensing station, a station for monomer addition to the surface of a support, and a mechanism for moving a support between the monomer addition station and a flow cell, and from one flow cell to another. We interpret claim 26 to include both a mechanism that moves a support from a flow cell to another flow cell within the same flow cell chamber and a mechanism that moves a support between flow cells in different flow cell chambers.

Claim 28 depends from claim 26 and requires that the support moving mechanism is a robotic arm.

2. REFERENCES

The Examiner relies on the following references:

Hansen	US 5,508,197	Apr. 16, 1996
Brennan	US 5,814,700	Sep. 29, 1998
Kedar	US 6,165,778	Dec. 26, 2000

3. ANTICIPATION

Claims 23 and 25-27 stand rejected under 35 U.S.C. § 102(b) as anticipated by Brennan. The Examiner relies on Brennan for disclosing

> a flow cell assembly (Fig. 1) for conducting at least one reaction in the synthesis of an array of biopolymer, the flow cell [assembly] comprising a flow cell chamber (#32), a manifold in communication with the chamber (head assembly #20/21) having a separate wash reagent inlet in fluid communication with a dispensing station (bank of nozzles, having nozzles for dispensing), a separate inlet for a reagent for conducting a

> synthesis step in communication [with] a dispensing station (each bank of nozzles is coupled to a different reagent for polymer synthesis . . .) and a separate vent (gas outlet #71), a vacuum source in fluid communication with the flow cell (#83 . . .) and a controller for communication with a computer comprising software to control said vent and vacuum source.

(Answer 3.)

The Examiner finds that Brennan "teaches a computer programmed to control 'simultaneous functions' that provide reagent flow into and out of the flow cell" (*id.* at 4). In addition,

> Brennan teaches that liquid is retained within the flow cell until the pressure differential is increased wherein the increased pressure differential is provided by "a combination of positive pressure ..... and a vacuum." Brennan teaches pressure is applied to the flow cell via a gas inlet which inherently must be open (i.e. vent) to allow the passage of gas to thereby increase the pressure.

(*Id.*, citations to Brennan omitted.) Therefore, the Examiner argues, "the computer controlled application of positive pressure vents the flow cell as claimed" and that, because Brennan teaches the "combined application of pressure and vacuum in *a single step* of a computerized program . . . and under the control of . . . computer software . . . , Brennan teaches the controller and software providing simultaneous vent/vacuum as claimed" (*id.*).

We conclude that the Examiner has set forth a prima facie case that claim 23 is anticipated. Brennan describes "a polymer synthesis apparatus for building a polymer chain by sequentially adding polymer units in a reagent solution. The synthesis apparatus comprises a head assembly having a plurality of nozzles mounted thereto. . . . Each nozzle is coupled to a

reservoir of liquid reagent for controlled delivery therethrough." (Brennan, col. 3, ll. 49-56.) In the embodiment depicted in Figure 1, "each bank or row **40** of nozzles is coupled to a different liquid reagent applied in a particular polymer synthesis" (*id.* at col. 6, ll. 49-51). Using these nozzles, Brennan describes distributing various reagents for conducting the synthesis, including "the solvent wash/reaction solvent acetonitrile" (*id.* at col. 6, ll. 51-57).

The synthesis apparatus also includes a base assembly having at least one reaction well (*id.* at col. 3, ll. 56-57). A common chamber is formed between the head and base assemblies (*id.* at col. 3, ll. 62-65). A nozzle and a reaction well can be aligned to deposit a liquid reagent into the reaction well (*id.* at col. 3, ll. 60-62). "After a sufficient amount of time has passed to complete the synthesis reaction . . . , the reagent solution is purged from well **26** through orifice **74** and into lower catch basin **81** by increasing the gas pressure differential" (*id.* at col. 10, ll. 36-40). The purged reagent is removed through a drain outlet (*id.* at col. 10, ll. 42-43).

The synthesis apparatus may also include "an inlet into the common chamber positioned upstream from the nozzles, and an outlet out of the common chamber positioned downstream from the nozzles. A pressurized gas source is coupled to the inlet for continuously streaming a gas through the common chamber . . . and out of the outlet." (*Id.* at col. 3, l. 66, to col. 4, l. 5.) In Figure 1, gas inlet 70 and gas outlet 71 are on the head assembly. "By preventing or restricting the outflow of inert gas through the gas outlet **71**, the pressure inside [the common chamber] can be increased, thereby increasing the pressure differential to purge the wells" (*id.* at col. 11,

ll. 5-8). We agree with the Examiner that gas inlet 70, as well as gas outlet 71, can be considered a vent.

Brennan discloses that "the pressure differential may also be created by forming a vacuum in [the] lower catch basin" using a vacuum pump coupled to the drain outlet of the base assembly, or by "a combination of positive pressure in [the] common chamber . . . and a vacuum in [the] catch basin" (*id.* at col. 11, ll. 47-55). We agree with the Examiner that, when both positive pressure and vacuum are used to create this pressure differential, gas inlet (or vent) 70 is open while the vacuum is applied.

Brennan also discloses a control mechanism to coordinate all of the simultaneous functions, including pressure regulation (*id.* at col. 11, ll. 61-64). Specifically, Brennan states that the "software was designed to support simultaneous independent synthesis of oligonucleotides" (*id.* at col. 13, ll. 50-52). Thus, we agree with the Examiner that Brennan describes a "controller communicating with a computer comprising software to control the vent [i.e., gas inlet 70] and the vacuum to simultaneously vent and apply vacuum to the flow chamber."

Appellants argue that Brennan "does not disclose or suggest a controller communicating with a computer comprising software to control the vent and the vacuum source to simultaneously vent and apply vacuum to the flow chamber" (Br. 4). Specifically, Appellants argue that "the Answer identified . . . gas outlet #71 of Brennan as satisfying the claimed 'separate vent'" (Reply Br. 2). However, Appellants argue:

> It is gas inlet #70 that the reference refers to as providing a positive pressure inside common chamber #31. Accordingly, application of a vacuum through drain outlet #83 in Brennan

> together with the provision of positive pressure of gas entering gas inlet #70, even if simultaneous and even if controlled by Brennan's software, does not satisfy the claim limitation of element (d) of Claim 23 under this interpretation of Brennan in light of the components of Brennan identified in the Answer as corresponding to the claimed elements.

(*Id.* at 3.)

We are not persuaded by this argument. Although the Examiner identifies gas outlet 71 as a vent, she also identifies gas inlet 70 as a vent. For the reasons discussed above, we agree with the Examiner that gas inlet 70 meets the limitations of the separate vent recited in claim 23. The fact that the Examiner also refers to gas outlet 71 as a vent has no bearing on whether gas inlet 70 meets these claim limitations.

We conclude that the Examiner has set forth a prima facie case that claim 23 is anticipated by Brennan, which Appellants have not rebutted. We therefore affirm the rejection of claim 23 under 35 U.S.C. § 102. Claim 25 falls with claim 23.

With regard to claim 26, the Examiner argues that, in Brennan,

> each well is encompassed by the claimed flow cell and each well comprises substrates (#75). [T]he mechanism for moving the substrate also moves the flow cell. Additionally, the transport mechanism . . . moves the flow cell and substrate to a station for monomer addition (i.e. the position under the monomer-specific nozzle).

(Answer 5.)

Appellants argue that "Brennan fails to disclose . . . a mechanism for moving a support to and from the station for monomer addition and a flow cell and from one flow cell to another flow cell" (Br. 7). We agree.

Brennan describes "a transport mechanism coupled to at least one of the head assembly and the base assembly to produce relative movement therebetween," which "positions the reaction well and a selected one nozzle in alignment for deposition of a liquid reagent into the reaction well" (Brennan, col. 3, ll. 57-62). Disposed in the reaction well is at least one solid support "for growing and immobilizing a polymer chain thereon" (*id.* at col. 10, ll. 4-6). As pointed out by the Examiner, the transport mechanism moves the substrate *and* the flow cell, i.e., the well that contains the substrate (Answer 5). Thus, it does not move a support "to and from said station for monomer addition *and a flow cell*," nor does it move a support "from one flow cell to another flow cell." Therefore, we agree with Appellants that the Examiner has not demonstrated that Brennan anticipates claim 26 or claim 27, which depends from claim 26. We therefore reverse the rejection of claims 26 and 27 under 35 U.S.C. § 102.

4. OBVIOUSNESS

Claim 24 stands rejected under 35 U.S.C. § 103 as obvious over Brennan in view of Kedar. Claim 24 depends from claim 23. The Examiner relies on Brennan for teaching a flow cell assembly according to claim 23, as well as computer-controlled inlets (Answer 6). The Examiner relies on Kedar for teaching that "fluid level sensors are used to detect fluid within reservoirs and vessels to thereby control [a] device according to fluid presence" (*id.*). The Examiner argues that "[i]t would have been obvious to one of ordinary skill in the art at the time the claimed invention was made to apply the fluid sensors of Kedar to the device of Brennan for the benefit of

controlling the device according to detected fluid levels as taught by Kedar" (*id.*).

Appellants argue that Brennan does not teach all of the elements of claim 23 and Kedar does not cure Brennan's deficiencies (Br. 7-8).

We are not persuaded by this argument, for the reasons discussed above. We conclude that the Examiner has set forth a prima facie case that claim 24 would have been obvious over Brennan in view of Kedar, which Appellants have not rebutted. We therefore affirm the rejection of claim 24 under 35 U.S.C. § 103.

Claim 28 stands rejected under 35 U.S.C. § 103 as obvious over Brennan in view of Hansen. The Examiner relies on Brennan for teaching the features of claim 26 (Answer 7). The Examiner relies on Hansen for teaching the use of robotic arms "for computer-controlled movement of supports" (*id.*). The Examiner argues that it would have been obvious "to apply the robotic arm mechanism of Hansen et al to the manifold device of Brennan for the expected benefit of computer-controlled movement of supports as desired in the manifold art as taught by Hansen" (*id.*).

Appellants argue:

> Hansen does not cure the deficiencies of Brennan because Hansen does not teach or suggest elements of Claim 26 not taught by Brennan. For example, Hansen does not disclose or suggest a mechanism for moving a support to and from the station for monomer addition and a flow cell and from one flow cell to another flow cell.

(Br. 8.)

We agree with Appellants that the Examiner has not set forth a prima facie case of obviousness. Hansen describes using a computer-controlled

robotic arm to move a microtiter plate containing reagents onto a plate holder (Hansen, col. 5, ll. 8-20 and ll. 45-61). One of ordinary skill in the art may have been motivated by this teaching to use a robotic arm to move, for example, the microtiter plate of the base assembly described in Brennan (Brennan, col. 6, ll. 5-7).

However, the Examiner has not provided any reason why one of ordinary skill in the art would have used this robotic arm to move support 75 "to and from [a] station for monomer addition and a flow cell", i.e., a well of the microtiter plate, or "from one flow cell to another flow cell" in the apparatus described in Brennan. *See KSR Int'l v. Teleflex Inc.*, 127 S. Ct. 1727, ___ 82 USPQ2d 1385, 1396 (2007) ("[A] patent composed of several elements is not proved obvious merely by demonstrating that each of its elements was, independently, known in the prior art. Although common sense directs one to look with care at a patent application that claims as innovation the combination of two known devices according to their established functions, it can be important to identify a reason that would have prompted a person of ordinary skill in the relevant field to combine the elements in the way the claimed new invention does."). Therefore, we reverse the rejection of claim 28 under 35 U.S.C. § 103.

SUMMARY

We affirm the rejection of claims 23 and 25 under 35 U.S.C. § 102(b) and the rejection of claim 24 under 35 U.S.C. § 103. However, we reverse the rejection of claims 26 and 27 under 35 U.S.C. § 102(b) and the rejection of claim 28 under 35 U.S.C. § 103.

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

AFFIRMED-IN-PART

lbg

AGILENT TECHNOLOGIES, INC.
LEGAL DEPARTMENT, DL429
INTELLECTUAL PROPERTY ADMINISTRATION
P.O. BOX 7599
LOVELAND CO 80537-0599