UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte DANIEL A. KEARL, TED W. BARNES,
DAVID CHAMPION, and GREGORY HERMAN

Appeal 2008-3332
Application 10/222,417
Technology Center 1700

Decided: July 17, 2008

Before BRADLEY R. GARRIS, PETER F. KRATZ, and
CATHERINE Q. TIMM, *Administrative Patent Judges*.

TIMM, *Administrative Patent Judge*.

DECISION ON APPEAL

Appellants appeal under 35 U.S.C. § 134(a) from the Examiner's decision rejecting claims 1-9, 23-32, 34-40, and 45-52. We have jurisdiction under 35 U.S.C. § 6(b).

We AFFIRM-IN-PART.

I. BACKGROUND

The invention relates to a fuel cell system or apparatus including fuel cells or fuel cell blocks which can be electrically reconfigured by a control module. (Spec. 2, ¶ 8). Fuel cells or fuel cell blocks may be reconfigured, for example, to maximize efficiency, to provide for multiple voltages and currents to be supplied simultaneously to electrical appliances, or to rotate usage among individual fuel cells or fuel cell blocks to add longevity and reliability to the system. (Spec. 5, ¶ 29; 7, ¶ 34). Another aspect of the invention includes positioning the cells that operate most often centrally such that outer, non-operational cells or blocks can utilize heat from the centrally located cells or blocks to quickly bring those cells online. (Spec. 12-13, ¶ 45). Claims 1, 5, 7, 8, 25 and 35 are illustrative of the subject matter on appeal:

1. A fuel cell apparatus comprising fuel cell blocks electrically re-configurable by a control module, wherein said control module re-configures said fuel cell blocks by selectively connecting said fuel cell blocks with any of series, parallel or a combination of series and parallel connections so as to maximize apparatus efficiency, said control module being configured and able to selectively make series, parallel and a combination of series and parallel connections between said fuel cell blocks.

5. A fuel cell apparatus comprising fuel cell blocks electrically re-configurable by a control module, wherein said control module re-configures said fuel cell blocks by selectively connecting said fuel cell blocks in series, in parallel or in a combination of series and parallel so as to maximize apparatus efficiency,

wherein said control module is programmed to reconfigure said fuel blocks to simultaneously provide multiple electrical outputs comprising different currents and/or different voltages.

7. The apparatus of claim 6, wherein said control module is programmed to accept feedback from parasitic components of said fuel cell

apparatus as input for calculating an optimal reconfiguration of said fuel cell blocks.

8. The apparatus of claim 1, wherein said control module is programmed to reconfigure said fuel cell blocks at regular intervals to even out usage of said fuel cell blocks

25. A fuel cell control module comprising circuitry programmed to re-configure connections among a plurality of fuel cells to selectively connect the plurality of fuel cells in series, parallel, or a combination of series and parallel in response to load conditions;

wherein one or more of said plurality of fuel cells that is in active operation most often is placed central to said plurality of fuel cells to provide heat to less active fuel cells of said plurality of fuel cells.

34. A method of varying the power output of a fuel cell apparatus comprising:

arranging fuel cell blocks in an automatically re-configurable structure; and

selectively re-configuring said fuel cell blocks by selectively connecting the multiple fuel cell blocks with any of series, parallel, or a combination of series and parallel connections to load conditions.

35. The method of claim 34, further comprising simultaneously providing multiple voltages to a load device by re-configuring said fuel cell blocks.

The Examiner relies on the following prior art references to show unpatentability:

Marsh	US 2002/0045082 A1	Apr. 18, 2002
Foster	US 6,500,577 B2	Dec. 31, 2002
Dickman	US 6,835,481 B2	Dec. 28, 2004
Schmidt	US 6,858,335 B2	Feb. 22, 2005

The Examiner maintains the following rejections:

1. Claims 1-4, 6-9, 23-26, 29-32, 34-40, and 50-52 rejected under 35 U.S.C. § 103(a) as obvious over Dickman et al. ("Dickman") in view of Marsh;

2. Claims 5, 25, and 45-49 rejected under 35 U.S.C. § 103(a) as obvious over Dickman in view of Marsh and further in view of Foster; and

3. Claims 27 and 28 rejected under 35 U.S.C. § 103(a) as obvious over Dickman in view of Marsh and further in view of Schmidt et al. ("Schmidt").

We discuss the claims under the following subheadings:

Rejection based on Dickman in view of Marsh

A. Claims 1, 23, 29, 34, and 38;

B. Claims 2-3, 24, 26, 30-32, 36-37, and 39-40;

C. Claims 4, 6, and 9;

D. Claim 7;

E. Claim 8;

F. Claims 25 and 50-52;

G. Claims 5[1] and 35;

Rejection based on Dickman in view of Marsh and Foster

H. Claims 25, 45, and 46;

I. Claims 47-49; and

Rejection based on Dickman in view of Marsh and Schmidt

J. Claims 27 and 28.

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[1] Even though claim 5 was finally rejected further in view of Foster, Appellants and Examiner have limited the issue regarding claim 5 to those coincident with claims 35 and 50, which stand rejected based only on Dickman in view of Marsh. (*See* App. Br. 15; Ans. 11; Reply Br. 9-10).

Our rationale for grouping the claims under these particular subheadings are discussed below under each separate subheading.

II. DISCUSSION

Rejection based on Dickman in view of Marsh

A. Claims 1, 23, 29, 34, and 38

Appellants present separate arguments for claims 1, 23, 29, 34, and 38 as a group. Therefore, we select claim 1 to represent the issues on appeal for this group. *See* 37 C.F.R. § 41.37(c)(1)(vii).

Appellants argue that "Dickman teaches a fuel cell system in which fuel cell stacks may be electrically ***hard-wired*** in any desired configuration" but "does not ever teach or suggest that this configuration of the fuel cell stacks, once made, can be changed or 'selectively' re-configured to 'maximize apparatus efficiency' as clamed." (App. Br. 8; Reply Br. 2-3). Appellants argue that the Examiner erred in finding that "Dickman teaches that the 'fuel cell blocks are electrically reconfigurable to be in series, in parallel or in a combination of series and parallel.'" (App. Br. 8-9; Reply Br. 3). Appellants argue that the only function of the control system taught by Dickman "is to turn individual fuel cell stacks on or off" or "activating or deactivating the cells." (App. Br. 9; Reply Br. 2-3). Further, Appellants argue that "Marsh only considers the possibilities of connecting the cells in series or in parallel" and not a combination of series and parallel. (App. Br. 9-10).

The Examiner responds that in Dickman "there are switches between the stacks to control which fuel cells are on- or off-line, depending on load demand." (Ans. 7). The Examiner argues that "it is apparent to one having ordinary skill in the art that the configuration of the stacks may be changed."

(Ans. 7). According to the Examiner, the fuel cell stacks could be wired in both series and parallel, and switching off the parallel switches would leave reconfigured fuel cell stacks in series. (Ans. 8).

The issue on appeal arising from the contentions of Appellants and the Examiner is: have Appellants demonstrated that the Examiner reversibly erred in determining that Dickman and Marsh would have suggested to one of ordinary skill in the art a control module that can reconfigure the fuel cell blocks by selectively connecting the fuel cell blocks with any of series, parallel or a combination of series and parallel connections as recited in claim 1? We answer this question in the negative.

The evidence of record supports the following Findings of Facts (FF):

1. The Specification recites that "the fuel cell supply (400) may include at least one tap [412] between each of the fuel cell blocks [402]" and that "[e]ach of the taps [412] may be electrically tied to at least one switch [422] to selectively connect or disconnect one or more of the fuel cell stacks [402] to one another and/or to a voltage converter." (Spec. 8, ¶ 36; Figure 5A-5C).

2. The Specification recites

> The fuel cell supply (602) preferably includes a number of fuel cells or fuel cell stacks that are interconnected by switches that can be opened or closed to create different configurations of fuel cells and fuel cell stacks connected to the rest of the system (600). The control module may be programmed to reconfigure the fuel cell supply (602) by selectively and/or progressively connecting one or more fuel cells or fuel cell stacks of the fuel cell supply (602) to the DC-to-DC converter (604) or to one another to meet the load demands and operate at peak performance.

> The connection of fuel cells or fuel cell stacks may be done in series, parallel, or a combination of series and parallel according to the calculations made by the control module (606). When the control module (606) receives the various inputs and calculates an optimal fuel cell stack configuration to meet the load demands, the control module may cause various switches in the fuel cell supply (602) to open or close to effect the reconfiguration of the fuel cell supply (602) and the resulting output of the fuel cell supply (602) to the rest of the system (600).

(Spec. 7, ¶ 34; Figures 5A-5C).

3. Alternatively, the Specification states that "[a]ccording to the embodiment of FIG. 7, the fuel cell power system (700) may include the multiple fuel cell blocks [402] each electrically connected to a switch network (702)." (Spec. 13, ¶ 46; Figure 7).

4. The Specification also states that "[a]ccording to the embodiment of FIG. 8, there may be multiple nodes (401) for interconnecting the fuel cell blocks [402] in any number of configurations. Each of the nodes (401) represents a possible electrical connection point that may include a switch (FIGs. 5B and 5C) that can be selectively opened and closed to electrically reconfigure the fuel cell blocks [402]." (Spec. 13, ¶ 47; Figure 8).

5. Dickman teaches

> contactors or other suitable devices 100 that may be actuated to electrically isolate one or more of the fuel cell stacks 76 in assembly 77 from the applied load. The contactors may be actuated either manually, such as to remove a stack for servicing, automatically, such as upon exceeding

> certain operating parameters or load conditions, and/or by a control system.

(Dickman, col. 10, ll. 10-16).

6. Dickman teaches that the control system 120 including the controller 122 can "selectively isolate a stack from the applied load by sending a control signal to the corresponding contactor 100," for example, if "operating outside of acceptable operating parameters." (Dickman, col. 11, ll. 46-52; Figure 10).

7. Dickman teaches automatically taking stacks off-line when load demands are reduced, for example, late at night, for increase efficiency and life of stacks. (Dickman, col. 12, ll. 14-21).

8. Dickman teaches that "[t]he fuel cell stacks may be electrically connected in series, parallel or a combination of series and parallel to meet the output voltage requirements of system 60." (Dickman, col. 8, ll. 61-63).

9. Marsh teaches a microprocessor monitoring changes in the load such that "the processor 88 can adjust the system configuration to achieve/maintain the required performance." (Marsh 3, ¶ ¶ 51-52).

10. Figure 9 of Marsh clearly illustrates cells wired in a combination of parallel and series using switches allowing "the individual cells or groups of cells (power chip 15) to be wired in various configurations, i.e., parallel or series." (Marsh 4, ¶¶ 56 and 57; Figure 9).

"[A]s an initial matter, the PTO applies to the verbiage of the proposed claims the broadest reasonable meaning of the words in their ordinary usage as they would be understood by one of ordinary skill in the art, taking into account whatever enlightenment by way of definitions or otherwise that may be afforded by the written description contained in the

applicant's specification." *In re Morris*, 127 F.3d 1048, 1054 (Fed. Cir. 1997).

We look first to Appellants' Specification to determine what is meant by the phrase "re-configures said fuel cell blocks by selectively connecting said fuel cell blocks with any of series, parallel or a combination of series and parallel connections" of claim 1.[2] According to Appellants' Specification, a control module may "reconfigure" fuel cell blocks by causing various switches to open to disconnect or to close to connect certain fuel cells to one another or to a voltage converter. (FF 1-4). Thus, we note that Appellants' Specification provides no other examples of reconfiguring fuel cell blocks other than opening and closing switches to change the electrical arrangement of pre-wired fuel cell blocks. (FF 1-4).

A claimed invention is unpatentable if the differences between it and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the pertinent art. 35 U.S.C. § 103(a)(2000); *Graham v. John Deere Co. of Kansas City*, 383 U.S. 1, 13-14 (1966). Factors to consider in determining obviousness include "'the scope and content of the prior art,' the 'differences between the prior art and the claims at issue,' and 'the level of ordinary skill in the pertinent art.'" *Dann v. Johnston*, 425 U.S. 219, 226 (1976) (*quoting Graham*, 383 U.S. at 17). "On appeal to the Board, an

[2] We note that claim 1 is an apparatus claim and, therefore, is directed to a structure. We construe the operational limitations of claim 1 as requiring that the structural components are capable of operating as claimed. If the prior art structure possesses all the claimed characteristics including the capability of performing the claimed function, then there is a prima facie case of unpatentability. *In re Ludtke*, 441 F.2d 660, 663-64 (CCPA 1971).

applicant can overcome a rejection by showing insufficient evidence of prima facie obviousness or by rebutting the prima facie case with evidence of secondary indicia of nonobviousness." *In re Kahn*, 441 F.3d 977, 985-86, (Fed. Cir. 2006) (emphasis omitted). We find that the Appellants have neither shown that the evidence was insufficient for a prima facie case of obviousness nor sufficiently rebutted the prima facie case of obviousness.

Dickman clearly teaches an apparatus including fuel cell blocks electrically connected through contactors 100 (switches). (FF 5). Dickman also teaches that a controller 122 can selectively open contactors 100 to disconnect, or close contactors 100 to connect, the fuel cell blocks as needed, for example, to meet the load demands and operate at peak performance. (FF 6-8). The electrical connections may be series, parallel or a combination of series and parallel connections (FF 8). Thus, we determine that it would have been obvious to one of ordinary skill in the art having the teachings of Dickman to electrically connect fuel cell blocks together using contactors 100 in such an arrangement that merely connecting or disconnecting the fuel cells via the connectors 100 would cause the cell blocks to be reconfigured to any of series, parallel or combination of series and parallel arrangements to meet the load demands and operate at peak performance. We determine that, based on the teachings of Dickman, it would have been within the skill of one of ordinary skill in the art to provide such an arrangement of fuel cells, connectors 100 and controller 122 with a reasonable expectation of success with mere routine experimentation. *See KSR Int'l Co. v. Teleflex Inc.*, 127 S. Ct. 1727, 1742 (2007)("A person of ordinary skill is also a person of ordinary creativity, not an automaton.").

Marsh provides further evidence that the claimed apparatus configuration would have been within the capabilities of one of ordinary skill in the art. Figure 9 of Marsh illustrates one particular arrangement of switches 97A, 97B and 97C and fuel cell blocks 12 in a combination of series and parallel, whereby merely opening and closing the switches would change whether the fuel cells were connected in series, parallel or a combination of series and parallel. (FF 10). Since Marsh also teaches adjusting the system configuration to achieve/maintain performance (FF 9), one of ordinary skill in the art would have utilized the arrangement taught by Figure 9 of Marsh in the system of fuel cells and connectors taught by Dickman to meet the load demands and operate at peak performance.

We determine that the Examiner has not reversibly erred in determining that Dickman or the combination of Dickman and Marsh would have suggested to one of ordinary skill in the art a control module that can reconfigure the fuel cell blocks by selectively connecting the fuel cell blocks with any of series, parallel, or a combination of series and parallel connections as recited in claim 1. Accordingly, we sustain the Examiner's rejection of claims 1, 23, 29, 34, and 38 under 35 U.S.C. § 103(a).

B. Claims 2-3, 24, 26, 30-32, 36-37, and 39-40

Appellants have provided no separate arguments directed to the merits of claims 2-3, 24, 26, 30-32, 36-37, and 39-40. Claims 2-3 depend from independent claim 1, claims 24 and 26 depend from independent claim 23, claims 30-32 depend from independent claim 29, claims 36-37 depend from independent claim 34, and claims 39-40 depend from independent claim 38. *See In re Wood*, 582 F.2d 638, 642 (CCPA 1978)(holding that it is appropriate for the Board to consider the appealed dependant claims to stand

or fall with the independent claim where Appellants fail to argue separately the patentability of dependent claims). Thus, we sustain the rejection of claims 2-3, 24, 26, 30-32, 36-37, and 39-40 for the same reasons discussed above for claims 1, 23, 29, 34, and 38.

C. Claims 4, 6, and 9

Appellants present separate arguments for claim 4. (App. Br. 11). Appellants argue that "Dickman does not teach or suggest any reconfiguration of the fuel cell blocks, let alone in response to changes in load demand." (App. Br. 11; Reply Br. 5-6). The Examiner responds that "[t]he reconfiguration argument was addressed above, and the reconfiguration in response to load demand is taught by Dickman specifically." (Ans. 8-9).

Appellants present separate arguments for claim 6. (App. Br. 12). Appellants also present separate arguments for claim 9. (App. Br. 13). However, for claims 6 and 9, Appellants merely argue that "[t]he cited prior art fails to teach or suggest this subject matter. Moreover, the final Office Action fails to indicate where the cited prior art suggests this subject matter." (App. Br. 12 and 13). When the Examiner responds by indicating what portion of the prior art is being relied upon for the various teachings (Ans. 9 and 10), Appellants merely reply by arguing that Dickman still does not teach the reconfiguring requirement discussed above. (Reply Br. 6 and 7-8).

Since Appellants arguments regarding claims 4, 6, and 9 are based on the "reconfiguring" argument discussed above for claims 1, 23, 29, 34, and 38, the contentions regarding claims 4, 6, and 9 fail for the same reasons

discussed above for claims 1, 23, 29, 34, and 38. Accordingly, we sustain the Examiner's rejection of claims 4, 6, and 9 under 35 U.S.C. § 103(a).

D. Claim 7

Appellants present separate arguments for claim 7. (App. Br. 12). Specifically, Appellants argue that "[t]he cited prior art fails to teach or suggest this subject matter. Moreover, the final Office Action fails to indicate where the cited prior art suggests this subject matter." (App. Br. 12; Reply Br. 7).

The Examiner responds that "both Dickman and Marsh teach control systems that receive inputs and configure the sells [sic, cells] or stacks accordingly" and that "Dickman teaches that suitable inputs to the controller include current operating conditions such as load." (Ans. 9). The Examiner further responds that "Marsh can receive inputs from the load in order to control the power profile." (Ans. 9).

The issue on appeal arising from the contentions of Appellants and the Examiner is: have Appellants demonstrated that the Examiner reversibly erred in determining that one of ordinary skill in the art having the teachings of Dickman and Marsh would have programmed the control module "to accept feedback from parasitic components of said fuel cell as input?" We answer this question in the negative.

The evidence of record supports the following additional Findings of Facts (FF):

11. Appellants' Specification recites that "[t]he capacity of the secondary battery (610) and/or a super-capacitor may involve weighing several factors including, but not limited to: anticipated load profiles, system

weight and volume, component cost and complexity, fuel cell start-up duration and parasitic load (e.g. electrical control, switch, and devices, etc.), and system efficiency." (Spec. 6, ¶ 31).

12. Dickman teaches that "[t]wo-way communication links enable the controller to receive inputs from and send control signals to various components of the fuel cell system. Examples of suitable inputs include one or more current operating conditions, such as temperature, pressure, flow rate, composition, state of actuation, load, etc." (Dickman, col. 11, ll. 29-34).

13. Marsh teaches a separate power circuit 96 "to tap off some part of the electricity generated by the fuel cell 12 to power the onboard electronics" having its own regulation and conditioning circuits. (Marsh 3, ¶ 54).

We look to Appellants' Specification to find a meaning to the term "parasitic components." *In re Morris*, 127 F.3d at 1054. However, the Specification only uses the term "parasitic loads," which appears to refer to the load required to power controls, switches and devices of the fuel cell system itself. (FF 11). Thus, it appears that the term "parasitic components" refers to the controller, switches and the internal devices requiring power that make up the fuel cell system.

As indicated by the Examiner, Dickman clearly teaches that the controller receives input from "various components" and examples of inputs include "current operating conditions." (FF 12). We determine that one of ordinary skill in the art would have appreciated that "current operating conditions" include those operating conditions required to power the controller, connectors and the other components of the fuel cell system itself,

i.e., the "parasitic components." Further, Marsh clearly teaches the need to power "onboard electronics," i.e., the "parasitic components," from the fuel cells. (FF 13). Thus, it would have been within the skill of one of ordinary skill in the art to arrange the controller taught by Dickman to receive inputs from parasitic components, such as the "onboard electronics" taught by Marsh, in order to consider the overall load needed to operate the fuel cell system. *See KSR Int'l Co. v. Teleflex Inc.*, 127 S. Ct. at 1742.

Therefore, we determine that the Examiner did not reversibly err in determining that one of ordinary skill in the art having the teachings of Dickman and Marsh would have programmed the control module "to accept feedback from parasitic components of said fuel cell apparatus as input." Accordingly, we sustain the Examiner's rejection of claim 7 under 35 U.S.C. § 103(a).

E. Claim 8

Appellants present separate arguments for claim 8. (App. Br. 12). Specifically, Appellants argue that "[t]he cited prior art fails to teach or suggest this subject matter. Moreover, the final Office Action fails to indicate where the cited prior art suggests this subject matter." (App. Br. 12; Reply Br. 7).

Although discussed along with paragraphs directed towards claims 6 and 7, the Examiner responds that "the control system of Dickman may be used to selectively isolate a stack from the applied load… thus reconfiguring the fuel cell block to an optimal configuration." (Ans. 9). The Examiner also responds that "Dickman teaches that the controller may select a stack to be removed … in a sequence that rotates the stacks such that the overall

operating time of the stacks is approximately the same, thus evening out usage of the stacks." (Ans. 9).

The issue on appeal arising from the contentions of Appellants and the Examiner is: have Appellants demonstrated that the Examiner reversibly erred in determining that one of ordinary skill in the art having the teachings of Dickman and Marsh would have programmed the control module "to reconfigure said fuel cell blocks at regular intervals to even out usage"? We answer this question in the negative.

The evidence of record supports the following additional Findings of Facts (FF):

14. The Specification recites that "the control module (606) may regularly, continuously, or otherwise rotate usage among the individual stacks of the fuel cell supply (602) to add longevity and reliability to the system (600)." (Spec. 7, ¶ 34).

15. Dickman teaches automatically taking one or more cells out of service at regular intervals (hourly, daily, weekly or monthly) to increase the lifetime of the total system. (Dickman, col. 12, ll. 32-47).

16. Marsh also teaches "moving the active 'loaded' area [of the fuel cells] around on the chip" for better performance and better utilization characteristics. (Marsh 4, ¶ 61).

We resort to the Specification to determine what is meant by the phrase "reconfigure said fuel cell blocks…to even out usage." *In re Morris*, 127 F.3d at 1054. We find that the Specification indicates that usage is rotated "among the individual stacks." (FF 14). In other words, the fuel cell blocks are "reconfigured" to halt the usage of one or more of the fuel cells at a regular interval.

Dickman and Marsh both teach reconfiguring or halting the usage of one or more fuel cells or fuel cell blocks. (FF 15-16). In particular, Dickman clearly suggests doing so at regular intervals, e.g., "hourly, daily, weekly or monthly." (FF 15). Thus, one of ordinary skill in the art having the teachings of Dickman and/or Marsh would have been motivated and able to program a controller to halt the usage of one or more fuel cells at regular intervals. *See KSR Int'l Co. v. Teleflex Inc.*, 127 S. Ct. at 1742. Therefore, we determine that the Examiner did not reversibly err in determining that one of ordinary skill in the art having the teachings of Dickman and Marsh would have programmed the control module "to reconfigure said fuel cell blocks at regular intervals to even out usage." Accordingly, we sustain the Examiner's rejection of claim 8 under 35 U.S.C. § 103(a).

F. Claims 25 and 50-52

Under the subsequent heading addressing the rejection of claim 25 based on Dickman in view of Marsh and Foster, Appellants state that "Dickman and Marsh fail to teach or suggest the subject matter of claims 25, 45 and 46." (App. Br. 16).

We note that the Examiner has provided no specific evidence to support a determination that it would have been obvious for one of ordinary skill in the art having the teachings of Dickman and Marsh to arrange the fuel cell operated most often placed central to the other fuel cells. (App. Br. 3-4). To the contrary, in the subsequent rejection of claim 25, the Examiner acknowledges that "[t]he combination of Dickman et al. and Marsh as described above … fail to teach the placement of the cells programmed to be used most often in a location central to the other cells in order to dissipate

heat to the outer cells" and relies on the teaching of Foster instead. (Ans. 5-6). Therefore, we cannot sustain the Examiner's rejection of claim 25 based on the teachings of Dickman and Marsh under 35 U.S.C. § 103(a).

Appellants present separate arguments for claim 50, claims 4 and 51 as a group, and claims 9 and 52 as a group. (App. Br. 11 and 13). We adressed the merits of claims 4 and 9 above. Claims 50-52 depend from independent claim 25 and thus include all the limitations of this independent claim. *See* 35 U.S.C. § 112. Thus, the rejections of claims 50-52 based on the teachings of Dickman and Marsh fail for the same reasons as claim 25, and we also cannot sustain the Examiner's rejection of claims 50-52 under 35 U.S.C. § 103(a).

G. Claims 5 and 35

Appellants present separate arguments for claims 5 and 35 but do not present these arguments as a group. (App. Br. 11, 13, and 15). We group these claims together, however, because Appellants' arguments regarding these claims are similar and because it is unclear how the scope of these claims are distinguishable based on Appellants' Specification, as discussed below.

Regarding claim 35, Appellants argue that "the Action utterly fails to address the subject matter of claim 35 or to indicate how or where Dickman and Marsh actually teach or suggest 'simultaneously providing multiple voltages to a load device by re-configuring said fuel cell blocks,'" (App. Br. 11).

The Examiner responds that "[t]he control system of Marsh … is capable of providing 'various voltages.'" (Ans. 8). To which Appellants

reply that "[n]either Marsh, nor the other cited prior art, teach or suggest 'simultaneously' providing multiple voltages, as claimed." (Reply Br. 5).

Regarding claim 5, Appellants argue that "the final Office Action addresses *exclusively* the subject matter of claim 25" and never addresses "how or where the cited references teach or suggest a 'control module [that] is programmed to reconfigure said fuel blocks to simultaneously provide multiple electrical outputs comprising different currents and/or different voltages.'" (App. Br. 15).

The Examiner responds that the limitation of providing multiple outputs is "discussed above in the rebuttal of claim 50" and "is taught by Dickman." (Ans. 11). With respect to claim 50, the Examiner discussed that "Dickman teaches that in a residential fuel cell system, major household appliances (dishwasher, dryer, hairdryer, etc.) are plugged into the fuel cell system… [such that] [t]he control system of Dickman is capable of providing power to all or some of these devices." (Ans. 10). The Examiner further argues that "one of ordinary skill in the art would recognize that these devices would have different current or voltage requirements." (Ans. 10).

Appellants reply that "[n]either Dickman nor the other cited prior art teach or suggest 'simultaneously' providing multiple voltages, as claimed." (Reply Br. 8). Appellants reply that "Appellant's claims recite not just the provision of multiple electrical outputs, but the ***simultaneous*** output of such multiple currents or voltages" which is "outside the scope and content of the cited prior art." (Reply Br. 9-10).

The issue on appeal arising from the contentions of Appellants and the Examiner is: have Appellants demonstrated that the Examiner reversibly

erred in determining that one of ordinary skill in the art having the teachings of Dickman and Marsh would have programmed the control module of Dickman's fuel cell apparatus to simultaneously provide multiple "voltages" or multiple "electrical outputs comprising different current and/or different voltages" as recited in claims 5 and 35? We answer this question in the negative.

The evidence of record supports the following additional Findings of Facts (FF):

17. Appellants' Specification recites that "the fuel cell power structures enabling electrical reconfigurability according to the present invention advantageously provide for multiple voltages and currents to be supplied simultaneously to electrical appliances." (Spec. 5, ¶ 29).

18. Appellants' Specification also recites

> [i]t will be understood that the multiple configurations enabled by the structures described above may be implemented to simultaneously provide multiple voltages to a load device by re-configuring the fuel cell blocks. Many modern electronics require multiple and different voltages currents (e.g. a computer requiring power for a CPU, a display, a fan, etc.), and the present invention allows for the fuel cell stacks to be reconfigured to provide the multiple electrical requirements simultaneously.

(Spec. 14, ¶ 48).

19. Figure 8 illustrates a switch network 702 connected to multiple fuel cell stacks and lines labeled V1 and V2. (Spec. Figure 8). However, there is no text in Appellants' Specification to describe what is meant by V1 and V2. (*See* Spec.). Further, none of the examples provided in Appellants' Specification appear to be directed to a configuration of fuel cell stacks that

specifically provide for multiple voltages or multiple outputs. (*See* Spec. 13-14, ¶ 47-48; Figures 8-12).

20. The term "outputs" is not separately used in Appellants' Specification. (*See* Spec.).

21. Dickman teaches that the current from a stack assembly "may be used to satisfy the energy demands, or applied load, of an energy-consuming device 80." (Dickman, col. 4, ll. 44-46).

22. According to Dickman, "energy consuming device 80" could include a single appliance, tool, or vehicle, "one or more residential dwellings," "commercial buildings, microwave relay stations, signaling or communication equipment, etc." (Dickman, col. 4, ll. 46-51).

23. Further, device 80 is "meant to represent one or more devices or collection of devices that are adapted to draw electric current from the fuel cell system. To further illustrate this point, device 80 is shown in FIG. 5 as including a pair of devices 80_1 and 80_2." (Dickman, col. 4, ll. 53-58).

We look to the Specification in determining what is meant by simultaneously providing "multiple voltages" or "multiple electrical outputs comprising different current and/or different voltages." *In re Morris*, 127 F.3d at 1054. Appellants' Specification provides only cursory discussions without specific examples that the reconfigurability of the invention provides for simultaneously providing multiple voltages or currents. (FF 17-19). Also, Appellants' Specification does not use, and thus provides no special meaning to, the term "outputs." (FF 20). Thus, we find no distinguishable scope to claim 5 based on the use of the term "outputs."

Further, Appellants' Specification suggests that it would be within the skill of one of ordinary skill in the art to provide multiple configurations by

re-configuring the fuel cell blocks in order to simultaneously provide multiple voltages without further disclosure using no more than routine experimentation. (FF 18).

Above, we determined that it would have been obvious to one of ordinary skill in the art having the teachings of Dickman to electrically connect fuel cell blocks together using connectors 100 in such an arrangement that merely connecting or disconnecting the fuel cells via the connectors 100 would cause the cell blocks to be reconfigured to any of series, parallel or combination of series and parallel arrangements to meet the load demands and operate at peak performance. Further, we note that Dickman teaches using the fuel cell system for providing electrical energy to a variety of devices simultaneously (such as the several devices connected to the energy supply of a residential building). (FF 21-23).

Thus, we determine that, to the extent that one of ordinary skill in the art having the teachings of Applicants' Specification would have been able to provide multiple voltages or outputs with routine experimentation, one of ordinary skill in the art having the teachings of Dickman likewise would have been able to provide multiple voltage or outputs with mere routine experimentation to provide multiple voltages simultaneously to different devices, as suggested by Dickman. *See KSR Int'l Co. v. Teleflex Inc.*, 127 S. Ct. 1727, 1742 (2007)("A person of ordinary skill is also a person of ordinary creativity, not an automaton."); *see also In re Peterson*, 315 F.3d 1325, 1330 (Fed. Cir. 2003) ("The normal desire of scientists or artisans to improve upon what is already generally known provides the motivation to [optimize].").

Therefore, we determine that the Examiner did not err in determining that one of ordinary skill in the art having the teachings of Dickman would have programmed the control module of Dickman's fuel cell apparatus to simultaneously provide multiple "voltages" or multiple "electrical outputs comprising different current and/or different voltages" as recited in claims 5 and 35 for powering multiple devices of different voltages or currents. Accordingly, we sustain the Examiner's rejection of claims 5 and 35 under 35 U.S.C. § 103(a).

Rejection based on Dickman in view of Marsh and Foster

H. Claims 25, 45, and 46

Appellants present separate arguments for the rejection of claims 25, 45, and 46 based on Dickman in view of Marsh and Foster as a group. (App. Br. 15-16). Therefore, we select claim 25 to represent the issues on appeal for this group. *See* 37 C.F.R. § 41.37(c)(1)(vii).

Appellants argue that "Dickman and Marsh fail to teach or suggest the subject matter of claims 25, 45 and 46." (App. Br. 16). Appellants also argue that Foster teaches arranging fuel cells "for heat *dissipation*" but "does not provide a teaching or suggestion of the subject matter of claim 25 in which the most active fuel cells are centrally placed so as to retain heat to heat up less active fuel cells." (App. Br. 16; Reply Br. 10-11).

The Examiner responds that

> The heat that is dissipated from the central cells of Foster is transferred to the outer cells when it is dissipated, since the mechanism by which the heat moves would inherently be the same in both Foster and the instant invention. In other words, the cells of Foster are arranged in a certain array, and heat that is produced by cells in that array is dissipated.

> If the cells of the array of Foster were in the same pattern as those of the instant invention, and the same fuel cells of Foster were operational as the cells of the instant invention, then the heat would be transferred in the same manner.

(Ans. 11).

Appellants reply that "[t]his is the same as saying that, if Foster taught the subject matter claimed, the Examiner would have some grounds for rejecting claim 25." (Reply Br. 10).

The issue on appeal arising from the contentions of Appellants and the Examiner is: have Appellants demonstrated that the Examiner reversibly erred in determining that one of ordinary skill in the art having the teachings of Dickman, Marsh, and Foster would have positioned fuel cells "in active operation most often" central to the plurality of fuel cells? We answer this question in the affirmative.

The evidence of record supports the following additional Findings of Facts (FF):

24. Foster teaches that "[t]he individual fuel cells 10 may be arranged in planar, staggered, or overlapping rows or arrays, depending upon the space and heat dissipation requirements of a particular application." (Foster, col. 5, ll. 33-36).

"[R]ejections on obviousness grounds cannot be sustained by mere conclusory statements; instead, there must be some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness." *In re Kahn*, 441 F.3d 977, 988 (Fed. Cir. 2006) (*quoted with approval in KSR Int'l Co. v. Teleflex Inc.*, 127 S. Ct. 1727, 1741 (2007)).

The Examiner bears the initial burden, on review of prior art or on any other ground, of presenting a prima facie case of non-patentability. *In re*

Oetiker, 977 F.2d 1443, 1445 (Fed. Cir. 1992). Here, the Examiner has not established a prima facie case of obviousness with respect to claim 25. In particular, we determine that the Examiner has not adequately demonstrated that the teachings of Dickman, Marsh and/or Foster would have suggested to one of ordinary skill in the art to arrange fuel cells so that the most used fuel cells are central.

As discussed above, the Examiner acknowledges that Dickman and Marsh "fail to teach the placement of the cells programmed to be used most often in a location central to the other cells in order to dissipate heat to the outer cells." (Ans. 5). Foster does not satisfy the deficiency left by Dickman and Marsh. Rather, Foster only discusses heat dissipation in the context of arranging the fuel cells in a "planar, staggered, or overlapping rows or arrays." (FF 24).

The rejection fails because the evidence does not support the obviousness of placing the most used fuel cells of Dickman central to the other fuel cells. *Kahn*, 441 F.3d at 988. Thus, the Examiner has not provided sufficient evidence to establish a prima facie case of obviousness over claims 25, 45, and 46. *Oetiker*, 977 F.2d at 1445. Accordingly, we cannot sustain the Examiner's rejection of claims 25, 45, and 46 under 35 U.S.C. § 103(a).

I. Claims 47-49

Appellants have provided no separate arguments directed to claims 47-49. Claims 47-49 depend from independent claim 5. Thus, claims 47-49 fail for the same reasons discussed above for claims 5 and 35. *Wood*, 582 F.2d at 642. Accordingly, we sustain the Examiner's rejection of claims 47-49 under 35 U.S.C. § 103(a).

Rejection based on Dickman in view of Marsh and Schmidt

J. Claims 27 and 28

The Examiner rejects claims 27 and 28 under 35 U.S.C. § 103 as obvious over Dickman in view of Marsh and Schmidt. (Ans. 6). However, Appellants' arguments with respect to claims 27 and 28 are limited to "[t]he rejection of claims 27 and 28 should not be sustained for at least the same reasons given above with respect to independent claim 23." (App. Br. 16). Thus, the rejection of claims 27 and 28 is sustained for the same reasons discussed above for claims 1, 23, 29, 34, and 38. *Wood*, 582 F.2d at 642.

III. CONCLUSION

The totality of the evidence weighs in favor of the following conclusions:

(1) We sustain the Examiner's rejection of claims 1-4, 6-9, 23-24, 26, 29-32, and 34-40 rejected under 35 U.S.C. § 103(a) as obvious over Dickman in view of Marsh;

(2) We do not sustain the Examiner's rejection of claims 25 and 50-52 under 35 U.S.C. § 103(a), as obvious over Dickman in view of Marsh;

(3) We sustain the Examiner's rejection of claims 5 and 47-49 rejected under 35 U.S.C. § 103(a) as obvious over Dickman in view of Marsh and further in view of Foster;

(4) We do not sustain the Examiner's rejection of claims 25, 45, and 46 under 35 U.S.C. § 103(a) as obvious over Dickman in view of Marsh and further in view of Foster; and

(5) We sustain the Examiner's rejection of claims 27 and 28 rejected under 35 U.S.C. § 103(a) as obvious over Dickman in view of Marsh and further in view of Schmidt.

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IV. DECISION

The decision of the Examiner is affirmed-in-part.

V. TIME PERIOD FOR RESPONSE

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

AFFIRMED-IN-PART

PL initial:
sld

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