

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte KAREN E. MURDOCH

Appeal 2008-2583
Application 10/320,912
Technology Center 1700

Decided: July 28, 2008

Before BRADLEY R. GARRIS, PETER F. KRATZ, and
KAREN M. HASTINGS, *Administrative Patent Judges*.

HASTINGS, *Administrative Patent Judge*.

DECISION ON APPEAL

Appellant appeals under 35 U.S.C. § 134(a) from the Examiner's final rejection of claims 1- 6, and 13-19. We have jurisdiction under 35 U.S.C. § 6(b).

We AFFIRM.

BACKGROUND

The invention relates to an electrochemical device for a gas production method which acts as a separator for the gaseous components of gaseous stream, for example, to remove excess hydrogen and water vapor from methane gas (Spec. 1-2, ¶ [5]). The electrochemical device can also act as a water pump (Spec. 2, ¶¶ [6]. [10]). Claims 1 and 5 are illustrative:

1. An electrochemical device for a gas production system, comprising:

a first electrochemical cell that receives a mixed gas stream from a first feed, the mixed gas stream containing at least a desired gas, hydrogen and water, wherein the first electrochemical cell removes at least a portion of the water from the mixed gas stream such that the mixed gas stream has residual water; and

a second electrochemical cell that receives the mixed gas stream having the residual water and a dry feed stream from a second feed, wherein the second electrochemical cell removes the residual water from the mixed gas stream and wherein the dry feed stream absorbs the residual water to obtain the desired gas.

5. The electrochemical device of claim 1, further comprising a third electrochemical cell that receives the dry feed stream after the dry feed stream has absorbed the residual water from the mixed gas stream, wherein the third electrochemical cell acts as a metering device to output the dry feed stream and the residual water in a metered fashion.

The Examiner relies upon the following references in the rejections of the claims:

Giner	4,167,457	Sep. 11, 1979
Reiss	4,354,857	Oct. 19, 1982
Hersey	4,829,785	May 16, 1989
McElroy	5,505,824	Apr. 9, 1996

Claims 1-4, 6, 13, and 15 are rejected under 35 U.S.C. § 103(a) as being unpatentable over McElroy in view of Reiss and Giner. To reject dependent claims 5, 14, and 16-19 under 35 U.S.C. § 103(a), the Examiner adds Hersey to the combination of McElroy, Reiss, and Giner.

Appellant does not separately argue with any reasonable specificity the individual claims rejected in each rejection under 35 U.S.C. § 103(a) (App. Br. 3-6; Reply Br. 1-3). Therefore, we select independent claim 1 and dependent claim 5 to decide the issues on appeal.

ISSUES

The main issues raised by this appeal are whether Appellant has overcome the rejections by showing that the applied reference evidence does not support the Examiner's conclusion of obviousness.

PRINCIPLES OF LAW

“Section 103 forbids issuance of a patent when ‘the differences between the subject matter sought to be patented 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 art to which said subject matter pertains.’” *KSR Int'l Co. v. Teleflex Inc.*, 127 S. Ct. 1727, 1734 (2007). The legal question of obviousness is resolved on the basis of underlying factual determinations including (1) the scope and content of the prior art, (2) any differences between the claimed subject matter and the prior art, (3) the level of skill in the art, and (4) secondary considerations, if any. *Graham v. John Deere Co. of Kansas City*, 383 U.S. 1, 17-18 (1966). *See also KSR*, 127 S. Ct. at 1734 (“While the sequence of these questions

might be reordered in any particular case, the [*Graham*] factors continue to define the inquiry that controls.”)

The test for obviousness is what the combined teachings of the references would have suggested to one of ordinary skill in the art. *See, In re Young*, 927 F.2d 588, 591 (Fed. Cir. 1991).

“The combination of familiar elements according to known methods is likely to be obvious when it does no more than yield predictable results.” *KSR*, 127 S. Ct. at 1739. The question to be asked is “whether the improvement is more than the predictable use of prior art elements according to their established functions.” *KSR*, 127 S. Ct. at 1740. The Supreme Court also noted in *KSR* that an obviousness analysis “need not seek out precise teachings directed to the specific subject matter of the challenged claim, for a court can take account of the inferences and creative steps that a person of ordinary skill in the art would employ.” *KSR*, 127 S. Ct. at 1741.

It is well established that while the features of an apparatus claim may be recited functionally, the apparatus must be distinguished from the prior art in terms of structure, rather than function. *See In re Schreiber*, 128 F.3d 1473, 1477 (Fed. Cir. 1997).

OPINION

We have thoroughly reviewed each of Appellant's arguments for patentability. However, we are in agreement with the Examiner that the claimed subject matter would have been obvious to one of ordinary skill in the art within the meaning of § 103 in view of the applied prior art.

Accordingly, we will sustain the Examiner's rejection for essentially those reasons expressed in the Answer, as well as the reasons discussed below.

The Obviousness Rejection of Claims 1-4, 6, 13, and 15

We choose independent claim 1 to represent this claim grouping¹.

We agree with the Examiner's finding that McElroy teaches an electrochemical separator to separate hydrogen from a methane/hydrogen/water vapor mixture, followed by a gravity phase separator to separate water vapor from the methane/water mixture (McElroy, e.g., Fig. 2; Ans. 3). We also agree with the Examiner that Reiss teaches multiple constituents of a gaseous stream may be separated using electrochemical cells arranged in stages (Reiss, col. 5, ll. 34-41; col. 6, ll. 4-10; Ans. 4).

Therefore, each of McElroy and Reiss exemplifies well established techniques for separating gaseous material components. We agree with the Examiner that to modify McElroy to use a (second) electrochemical separator as in Reiss, in place of the gravity phase separator, would have been prima facie obvious. We find that using an electrochemical separator as in Reiss achieves the predictable result of separating gaseous constituents and was a known alternative way of separating components of a gaseous stream versus the gravity separator as taught in McElroy. This is further bolstered by Reiss's teaching, as pointed out by the Examiner, that multiple separators may be used in series to provide separation of other materials from the same gaseous mixture. Thus, the claimed improvement appears to be no more than the predictable use of prior art elements according to their established functions. *KSR*, 127 S. Ct. at 1739, 1740. Appellant has not shown that there is more than a predictable result flowing from separating the water vapor using an electrochemical molecular sieve as in Reiss versus

¹ Appellant makes the same argument directed to the same limitation found in both independent claim 1 and independent claim 13 (Br. 3).

condensing the water vapor in a heat exchanger followed by a gravity phase separator as set forth in McElroy.

Appellant has not disputed the Examiner's findings and conclusion of obviousness with respect to the teachings of Giner (Ans. 5). Thus, we adopt the Examiner's findings and conclusion of obviousness based on the combined teachings of McElroy, Reiss, and Giner.

Appellant's first contention is that McElroy does not teach removing a portion of the water as required in claim 1, and that the capabilities (i.e., inherent possession of the functionalities) of an apparatus is only a consideration in anticipation rejections, not obviousness rejections (App. Br. 3-4; Reply Br. 2). Appellant further argues that there is no motivation to substitute the electrochemical separator of Reiss for the gravity phase separator of McElroy since the Examiner's proposed rationale that it would achieve a more complete separation is unsupported by any evidence (App. Br. 4-5; Reply Br. 2). We disagree.

First, the principles of inherency and obviousness are not necessarily incompatible. *See, In re Napier*, 55 F.3d 610, 613 (Fed. Cir. 1995) ("The inherent teachings of a prior art reference, a question of fact, arises both in the context of anticipation and obviousness." (citation omitted)).

Second, it is axiomatic that claims are given their broadest reasonable interpretation in light of the specification as they would be interpreted by one of ordinary skill in the art. *In re Am. Acad. of Sci. Tech. Ctr.*, 367 F.3d 1359, 1364 (Fed. Cir. 2004). Claim 1 merely recites two electrochemical cells in series, with each cell described only by functional language. As such, we are only required to give such language weight to the extent that the prior art combination is or is not capable of meeting the functional

limitation. *See e.g., In re Schreiber*, 128 F.3d 1473, at 1478-1479 (Fed. Cir. 1995) (the functional limitations at issue were found to be inherent in the prior art reference). Claim 1 recites in pertinent part that “...the first electrochemical cell removes at least *a portion* of the water from the mixed gas stream...” (emphasis provided). This language plainly does not set forth any minimum portion of water that must be removed.

Appellant’s Specification states that the “...[t]he [electrochemical] device 106 acts as both a water pump and a hydrogen separator. *As is known in the art, the excess hydrogen can be easily separated from the stream using an electrochemical cell ...*To remove *excess water* from the wet methane stream 110, the electrochemical device 106 incorporates a *second* electrochemical cell ...” (Spec. 3, [12],[13]; emphasis provided). The Specification never defines any minimum amount of water (that is, water vapor) to be removed in the first cell; rather, it focuses on the ability of the first cell to remove the hydrogen. Thus, we determine that claim 1 encompasses a first electrochemical cell that is capable of removing as little as a trace amount of water vapor from the gas stream.

The Examiner found that “...the electrochemical separator of McElroy would have been capable of ...[removing] at least a portion of the water from the mixed gas stream.” (Ans. 3). At this point, the burden shifts to Appellant to show that the prior art structure does not inherently possess the functionality of the claimed apparatus. *In re Schreiber* at 1478, citing *In re Spada*, 911 F.2d at 708 (Fed.Cir. 1990); *see also In re Best*, 562 F.2d 1252, 1254-55 (CCPA 1976). Appellants have not made any showing, nor provided any line of technical reasoning, why the prior art structure of the electrochemical separator of McElroy does not inherently possess the

functionality recited in claim 1, and hence Appellant fails to meet their burden of rebutting the prima facie case of unpatentability established by the Examiner in this regard.

Indeed, Appellant admits that the “typical electrochemical separators” of the prior art separate out a “little” of the water from the methane/hydrogen/water vapor mixture (App. Br. 2). The Specification does not describe how the first electrochemical cell of the claims differs in any way from the prior art electrochemical cells, or from the electrochemical cell of McElroy, used to separate hydrogen from methane/hydrogen/water gas mixture.

Thus, even assuming arguendo that the claim requires that the electrochemical separator separates out a portion of the water, we determine that at least a portion of the water vapor would have been so separated out in McElroy’s electrochemical separator. This is further bolstered by the Examiner’s discussion of EP 0389263 (Ans. 7) which shows that protonic pumping of water across the membrane in addition to hydrogen occurs in an electrochemical cell that appears to be structurally indistinguishable from the cell taught in McElroy. We again note that a broadest reasonable interpretation of the claim language “a portion” encompasses removing a minimum amount, for example as little as .0001%, of the water vapor in the first cell.

These circumstances support our determination that the electrochemical separator of McElroy appears to be indistinguishable from the first electrochemical separator of Appellant’s. Thus, we determine that the teaching of the electrochemical separator of McElroy that separates the hydrogen from the methane/hydrogen/water vapor mixture is also sufficient

to meet the functional claim language that the first electrochemical separator “removes *a portion* of the water” (emphasis provided).

Appellant’s further argument, that there is no motivation to substitute the electrochemical separator of Reiss for the gravity phase separator of McElroy since the Examiner’s proposed rationale that it would achieve a more complete separation is unsupported by any evidence (App. Br. 4-5; Reply Br. 2), is also not persuasive of any error in the Examiner’s obviousness determination.

First, we do not find it necessary to rely upon the Examiner’s proposed advantage, namely, “for a more complete separation”, to support the obviousness of the proposed modification of McElroy, since the claimed improvement appears to be no more than the predictable use of prior art elements according to their established functions, as discussed previously.

Second, although not necessary for our decision, we agree with the Examiner that one of ordinary skill in the art would have appreciated that a “molecular sieve” separation as taught in Reiss would have resulted in a more complete (i.e., at a molecular level) separation than a gravity phase separator (Ans. 4, 8).

Appellant has not provided any sound scientific rationale to dispute the Examiner’s determination that a more complete separation would take place in an electrochemical cell; rather, they state that the cell (i.e., the molecular sieve) of Reiss is not capable of separating liquid water from gas. That argument is not on point, since the Examiner’s proposed modification includes a gas from gas separation (for example, separating water vapor from a mixture of methane with water vapor) as discussed previously.

The obviousness of the proposed combination is supported by the basic principle that both devices are known alternative separation devices being used for their intended purpose. Appellant's claimed invention appears to be no more than the predictable use of prior art elements (namely, electrochemical separators) according to their established function (namely, to separate gaseous components) to solve a known problem (namely, to remove the hydrogen and water vapor from the methane stream to produce a dry methane). *See KSR*, 127 S. Ct. at 1739.

Thus, we fully agree with the Examiner that one of ordinary skill in the art would have used the familiar alternative gaseous constituents separation device of Reiss in place of gravity phase separator (along with its preceding heat exchanger) described in McElroy with the results being predictable. *See KSR*, 127 S. Ct. at 1739 (“The combination of familiar elements according to known methods is likely to be obvious when it does no more than yield predictable results.”).

While Appellant may be correct that other modifications need to be made to McElroy, such as removing the heat exchanger 40 (App. Br. 5; Reply Br. 2), we do not find this persuasive of error. We agree with the Examiner that one of ordinary skill in the art would have readily appreciated that an electrochemical molecular sieve that separates components of a gaseous stream would not require the gaseous component(s) to be cooled down in a heat exchanger to condense water prior to separation from the methane, since that would be contrary to the operation and purpose of using such a separation device. “A person of ordinary skill is also a person of ordinary creativity, not an automaton.” *KSR*, 127 S. Ct. at 1742. Appellant has not convinced us that the Examiner reversibly erred in finding that there

was a reason originating in the prior art to substitute a separation device as taught by Reiss for the gravity separator with its preceding heat exchanger as taught by McElroy.

We have considered Appellant's other arguments in the Appeal Brief and Reply Brief, but do not find any of them persuasive.

Appellant has failed to successfully rebut the prima facie case of obviousness with argument or evidence of nonobviousness. We note that Appellant bases no argument upon objective evidence of nonobviousness, such as unexpected results.

Accordingly, we hereby sustain the rejection under 35 U.S.C. § 103 of claims 1-4, 6, 13, and 15 over McElroy, Reiss, and Giner.

The Obviousness Rejection of Dependent Claims 5, 14, 16-19

We choose claim 5 to represent this claim grouping. We agree with the Examiner's findings of facts based on Hersey and conclusion of obviousness (Ans. 6, 9).

Appellant contends there is no motivation to make the proposed combination with Hersey to obtain the claimed third electrochemical cell required in claim 5. We disagree.

One of ordinary skill in the art is also a person of ordinary creativity, not an automaton. KSR, 127 S. Ct. at 1742. Thus, to add a known electrochemical cell "pump" such as taught in Hersey to recycle the streams (e.g., a hydrogen stream that also contains water vapor) as explained by the Examiner would have been prima facie obvious to one of ordinary skill in the art (Ans. 6, 9). Appellant's argument that one would not use the electrochemical cell of Hersey to pump **liquid** water is not on point, since

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the prior art combination as proposed by the Examiner would have resulted in a gaseous stream of hydrogen and water vapor.

Accordingly, we sustain the Examiner's § 103 rejection of claims 5, 14, and 16-19 based on the combined teachings of McElroy, Reiss, Giner, and Hersey.

DECISION

We sustain the Examiner's § 103 rejection of claims 1-4, 6, 13, and 15 based on the combined teachings of McElroy, Reiss, and Giner.

We sustain the Examiner's § 103 rejection of claims 5, 14, and 16-19 based on the combined teachings of McElroy, Reiss, Giner, and Hersey.

The Examiner's decision is AFFIRMED.

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

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